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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

# FEASIBILITY STUDY
# ON
# CEMENT PLANT
# IN
# MADAGASCAR

(FINAL REPORT)

PROJECT NO. US/GLO/89/163
CONTRACT NO. 90/189

DECEMBER, 1991

UNICO INTERNATIONAL CORPORATION
ASO CEMENT CO., LTD.

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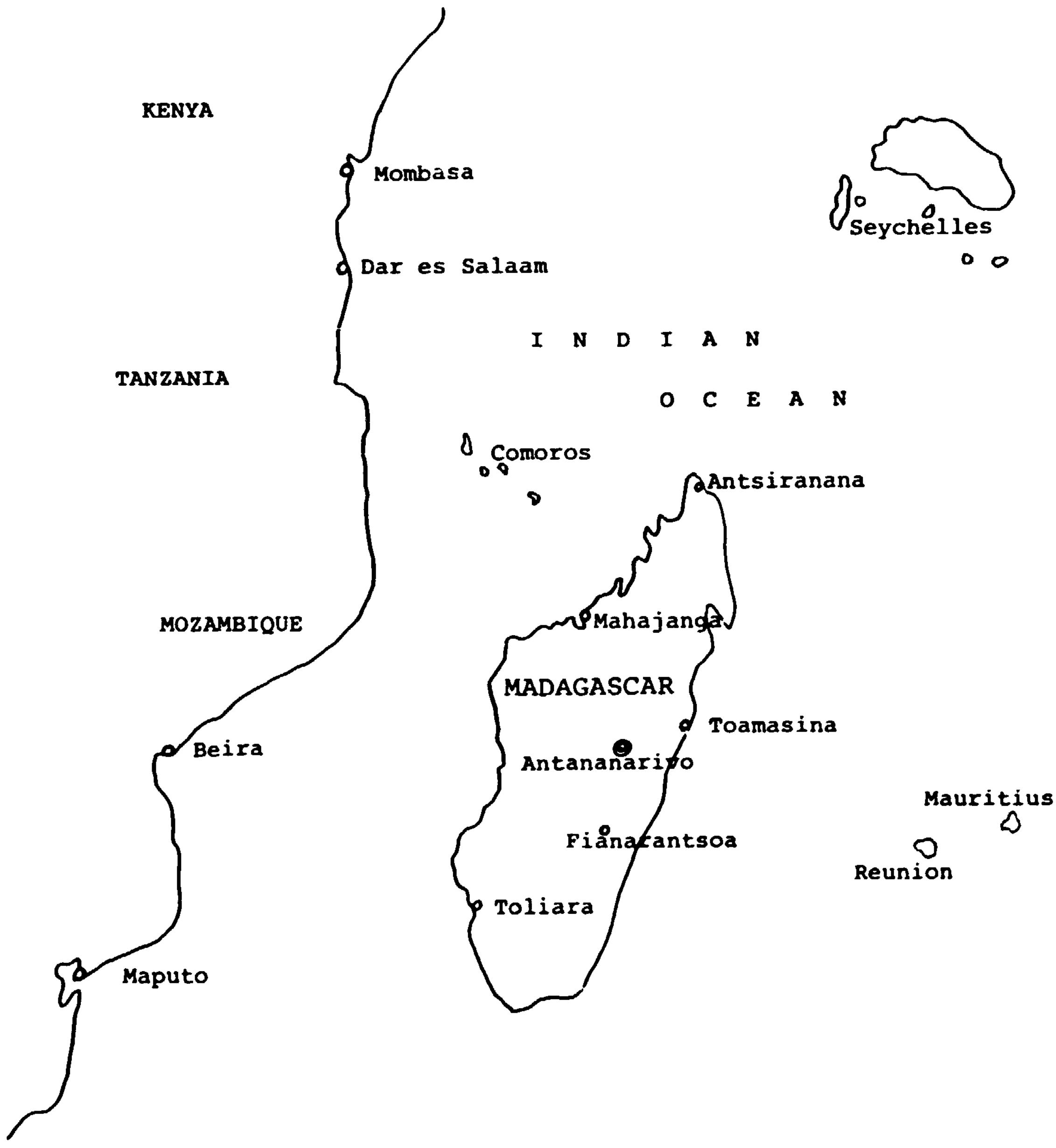
AREA MAP

OF

INDIAN OCEAN COMMITTEE COUNTRIES



# Chapter I

# EXECUTIVE SUMMARY

I. EXECUTIVE SUMMARY

1. Project Background and History

(1) Project History

To present the Indian Ocean Committee countries have relied on imports of cement from abroad but the construction of a common cement plant is a long standing concern. In fact the overall demand of the five IOC countries in the 1980s is considered to have been quite sufficient to justify the construction of a cement plant on an economic scale of operations. The total demand forecast for the IOC countries in the 1990s is 1 million tonnes whereas the supply capacity of the two plants in Madagascar is only for 60,000 tonnes.

In response to the above situation UNIDO initiated an Opportunity Study for construction of a cement plant on a commercial basis in Madagascar in March, 1989. The conclusions of this study are as follows.

a. The five countries of the IOC are to form the target market.

b. The results of the demand forecast are as follows.

(Unit: thousand tonnes)

| | 1990 | 2010 |
|---|---|---|
| Madagascar | 500 | 900 |
| Reunion | 394 | 729 |
| Mauritius | 258 | 537 |
| Comoros | 45 | 112 |
| Seychelles | 20 | 47 |
| TOTAL | 1,217 | 2,325 |

c. In order to keep in line with the increase in demand the production capacity of the plant is to be set at 600,000 tonnes per year.

d. The optimum site in Madagascar where raw materials are available is to be chosen for location of the plant.

e. The following two alternative cases are to be evaluated.

600,000 tonnes per year unit
(cement 400,000 T/Y plus clinker 200,000 T/Y)
400,000 T/Y unit
(cement 270,000 T/Y plus Clinker 130,000 T/Y)

f. The main conclusions point to construction of a 600,000 T/Y plant which could be organized in the following three ways.

- as a single 600,000 T/Y plant
- as a 400,000 T/Y unit plus a 200,000 T/Y unit
- as three 200,000 T/Y units

A modular form of plant would have the advantage of being able to adjust easily and flexibly to demand increases and changes.

g. An evaluation of construction costs of Chinese and West European proposals gave the conclusion that the Chinese plan was economical and highly profitable.

h. Local coal was found to be advantageously priced being half the cost of imported coal.

i. As the Study results pointed to relatively promising financial conditions it was recommended to proceed with a Feasibility Study

Following this recommendation , the Government of Madagascar initiated the promotion of the project realization. At the same time Japanese industries expressed a preliminary interest in technical cooperation and investment participation in the present project pending the results of the Feasibility Study.

(2) Outline of the Project

1) Project Idea

Prior to the initiation of the Feasibility Study the Government of Madagascar made the following points clear.

a. that the present project was to be implemented as a private sector project.

b. that the Madagascar and IOC governments would not undertake to participate in investment.

c. that there would be no intragovernmental cooperation between the IOC countries and that therefore no special tax benefits would be enjoyed.

In terms of industrial profitability the short transport distances involved meant that a supply of the domestic market was favorably placed in comparison with the export market with its fierce pricing competition.

Further, the results of a preliminary market study in the IOC countries showed that importers invariably demanded an internationally competitive price and international standards of quality as conditions of product purchase. It was therefore concluded impossible to assume that the targeted market would be the IOC countries. It remained to adopt a focus on the domestic market of Madagascar and to direct excess finished product to the IOC countries.

On the basis of the above approach the present report constitutes a further elaboration of the various conditions put forward in the Opportunity study together with a survey of the major markets of the domestic Madagascar market.

2) Alternatives Cases

The government of Madagascar has proposed two possible project sites for report evaluation that is the Toliara site and the Mahajanga site. Choice of these two sites reflects the availability of raw material limestone resources and access to a port facility in both cases.

The domestic cement market is concentrated on the highland region in which the metropolitan area is located, and due to the poor infrastructural provisions for overland transport a supplementary proposal for a finishing mill was made. The finishing mill would be constructed at Toamasina to act as a supply point to the metropolitan area using clinker transported over sea routes.

Further, in order to evaluate the comparative strengths of products destined for the domestic and for the export markets, and determine the profitability of plant scale two cases were postulated and compared. In one the plant scale was taken to be at a 300,000 tones per year level of output while it was set at 400,000 tones per year in the second case.

### 3) Project Promoters and Financing

#### a. Project Promoters

Realization of the project may be further followed up by Malagasy or Japanese private enterprises, provided that the study shows a minimum level of commercial profitability. The composition of the project promoters has not yet been finalized. A Japanese technology holder and a trading company may constitute the core group of the Japanese investors. Names of local partners have been suggested by the government and UNIDO Antananarivo office. However, no final composition of the project proponents has been formalized at this stage on either the Japanese or Malagasy side.

#### b. Financing Possibilities

The Government has assured to the maximum extent possible its support for the sound inauguration of a cement plant in Madagascar. It is seen as a symbolic breakthrough for the IOC countries to have their own cement production facility in the region. The project promoters and proponents therefore expect substantive government support. For instance the project could benefit from a soft loan, if the Government arranges the sovereign guarantee. This in turn would greatly improve the project cash flow.

The study assumes a debt equity ratio of 70-30. This ratio has been tentatively established and does not necessarily reflect the actual capital budgeting of the potential investor(s).
The potential Japanese investors intend to arrange financing and wish to assess the total

initial investment costs at 1997 valves, which is the start-up year. The equipment costs have therefore been adjusted using an escalation rate. Production costs (only forei   costs) and sales price have also been adjusted applying a different escalation rate. A detailed explanation is given in Chapter X.

2. Market and Plant Capacity

(1) International Market and Price Trend

While the ten major cement producing countries in the world showed an average annual 3.1% increase in output between 1985 and 1989 the production capacity actually decreased by an annual average of 1%. The difference was made up for by improvements in plant operating rates of an annual average 4.1% increase.

Conversely, while cement demand in the advanced industrialized nations stayed almost level over this period  the industrializing countries (i.e. China, Indonesia, Korea, India, etc.) showed a high average rate of increase between 7 and 12%.

Moreover imports of cement have recently been on the increase in the advanced industrialized countries beginning with the U.S.A , followed by Japan, West Germany, Great Britain, etc.
There has not been a corresponding increase in the supply capacity in response to the satisfactory growth in demand outlined above and so the demand supply gap has been closed by an increase in plant operating rates. However as long as reinforcement of production facilities in the form of new plant remains unfulfilled the prevailing international demand supply situation for cement will continue to be tight.

The international price of cement fluctuates according to the demand supply balance. Hereafter, if international demand supply becomes tight it is obvious that the price of cement will rise. Over and above the increasingly tight demand supply balance internationally the percentage of output destined for export has gradually fallen off and in 1989 the export share which had been around 7-8% previously decreased to 5%. The price of bulk cement has in fact risen recently in Europe from the previous level of $60/MT to around $80-90 /MT(C&F). Bagged cement is comparatively more costly than bulk cement due to bagging expenses, loading costs, freight costs, etc.

On the basis of the above the following forecast of import cement prices in the market area of the IOC countries has been projected.

| | Bulk cement (C&F US$/MT) | Bagged cement (C$F US$/MT) | Clinker (C$F US$/MT) |
|---|---|---|---|
| 1991 | 80 | 95 | 55 |
| 1992 | 86 | 102 | 59 |
| 1993 | 91 | 108 | 62 |
| 1994 | 95 | 113 | 66 |
| 1995 | 95 | 113 | 66 |
| 1996 | 95 | 113 | 66 |

(2) Cement Market in the IOC Countries

Leaving aside Madagascar, the results of the forecast of cement demand in the IOC countries is as follows.

1) Mauritius

The results of a demand projection carried out by the regression method are as follows.

| | Demand (MT) | Percapita Demand (kg) |
|---|---|---|
| 1990 | 346,137 | 317.2 |
| 1995 | 396,679 | 340.7 |
| 2000 | 471,465 | 379.4 |
| 2005 | 581,620 | 438.6 |
| 2010 | 742,752 | 524.9 |

At present Mauritius imports its entire supply of Bulk Cement.

2) Comoros

The results of a demand projection carried out by the regression method are as follows.

| | Demand (MT) | Percapita Demand (kg) |
|---|---|---|
| 1990 | 29,236 | 62.7 |
| 1995 | 35,316 | 64.7 |
| 2000 | 42,281 | 66.1 |
| 2005 | 50,307 | 67.2 |
| 2010 | 59,593 | 67.9 |

At present Comoros imports its entire supply of Bulk Cement.

3) Reunion

Since the Reunion's cement demand level is at saturation (with 597.6kg per capita in 1989) a calculation of cement demand using the regression method is deemed to result in unrealistic values. Therefore future demand of the island is assumed to stay at a level of 600 kg per capita. Incidentally, the achievement for 1989 is as follows.

| | | |
|---|---|---|
| Imports: | clinker | 270,000 MT |
| | bulk cement | 77,[illegible]97 MT |

Products:

| | |
|---|---|
| Ordinary Portland cement : | CPA 45, CPA 55 |
| Pozzolana cement : | CPJ 45, CPJ 35 |

4) Seychelles

The cement demand in 1989 was approximately 20,000 tons. Moreover as this is the location furthest situated from Madagascar in comparison to exports from Kenya exporting is at a competitive disadvantage. Therefore this market has not been regarded as of importance to the present project.

(3) Cement Market in Madagascar

1) General Outline

Due to the severe stagnation of the Madagascar economy which continued from the 1970s up to the first half of the 1980s cement demand slumped from the 1971 per capita level of 24.6 kg to 9.5 kg per capita in 1989. In order to overcome this economic crisis structural improvements were initiated as of 1986. That is the increase in cement demand in Madagascar can be said to be directly influenced by the success or failure of these national economic improvements.

At present, the cement demand of Madagascar is approximately 120,000 tons per year of which 50,000 tons is supplied by the two domestic plants and the remaining 70,000 tons met by dependence on imports.

The domestic cement is of CPA 30-35 class in terms of product quality (while imports are of CPA-45 class) but regardless of quality the market price is invariably high falling in a range between US$160 - 200.

2) Demand Forecast

The forecast results for cement demand in Madagascar arrived at using the regression method are shown as follows. Further, these have been projected using three alternative scenarios of a high, medium and low case for economic growth in the country.

CEMENT DEMAND (MT)

| | High | Medium | Low |
|---|---|---|---|
| 1990 | 120,186 | 120,186 | 120,186 |
| 1995 | 199,319 | 184,945 | 171,276 |
| 2000 | 339,187 | 287,927 | 243,931 |
| 2005 | 583,755 | 452,322 | 349,699 |
| 2010 | 1,013,512 | 715,826 | 504,142 |

3) Forecast of Effective Demand

Taking the projected output of the currently operating mills of Antsirabe and Amboanio to be 70,000 tonnes annual output the effective demand was projected using the medium growth scenario for demand forecast outlined above.

(4) Choice of Project Scale

As a result of evaluation of the above demand forecast, effective demand, demand situation in the IOC countries, the export ratio, etc. the appropriate scale of production was set for two cases, Case A at 300,000 tonnes per year and Case B at 400,000 tonnes per year(in both cases output figures represent production capacity for clinker).

(5) Marketing Plan

An evaluation of the available means of transportation concluded that the flexibility of rail was low and costs comparatively high so that a transport plan based on truck or coastal boat conveyance was drawn up. As the currently applied CMN tariff for Marine transport is considered excessive transport costs were estimated with reference to the international rates applying for small carriers (it is expected that costs will be lower still if estimates are made for in house carriers).

Price matching with imported bagged cement at the four major domestic ports of Toamasina, Antsiranana, Mahajanga and Toliara formed the basis for determining the sales price of products and a net back method of calculation was employed to calculate the ex-work price of the individual mills.

As a result of this analysis the CIF price of bagged cement in 1997 was taken to be $113/MT and the average ex-work prices of the various cases are as shown below.

| | |
|---|---|
| Case 1 (Toliara site): | US $ 165.14/MT |
| Case 2 (Mahajangaa site): | US $ 160.01/MT |
| Case 3 (Toliara and Toamasina sites combined ): | US $ 173.43/MT |

In Case 3 150,000 tonnes of clinker are to be sent from Toliara to Toamasina where they will undergo milling.

For the export price of products the FOB price at the port closest to the mill of origin was calculated using the net back method applied to the CIF price of each of the IOC countries after estimating the transport cost to each of the IOC country destinations.

| | | |
|---|---|---|
| Case 1 and 3 = | Bagged cement | avg. FOB US $ 80.75/MT |
| Case 2 = | Bagged cement | avg. FOB US $ 84.50/MT |
| Case 1 and 3 = | Clinker | avg. FOB US $ 44.00/MT |

(6) Choice of Production Plan

1) Standard specifications of finished product:
(AFNOR : NF P-15 X-301)
For export: CPA-5 or CPA-45
For domestic market: CPA-45

2) Project Scheme

Case 1

Project Site : Toliara - complete plant
Production Capacity : A : 300,000 T/Y
B : 400,000 Y/Y
Product : Bagged Cement
Clinker
Market : Bagged Cement : Domestic Market
Clinker : Reunion

Case 2

Project Site : Mahajanga (Amboanio)
-complete plant
Production Capacity : A : 300,000 T/Y
B : 400,000 T/Y
Product : Bagged Cement
Market : Domestic market
Export market : Comoros,
Seychelles, etc.

Case 3

Project Site : Toliara - complete plant
Toamasia - finishing mill
Production Capacity : A : 300,000 T/Y
B : 400,000 T/Y
Product : Bagged Cement
Clinker (Toliara plant)
Market : Bagged Cement : Domestic Market
Clinker : Reunion

(7) Production Capacity Schedule

(Clinker in 1000 MT)

| | Operational Rate | Case A | Case B |
|---|---|---|---|
| 1997 | 70 % | 210 | 280 |
| 1998 | 95 % | 285 | 380 |
| 1999- | 100 % | 300 | 400 |

## 3. Material and Inputs

### (1) General Availability

#### 1) Toliara Site

a. Limestone

Limestone in sufficient quantity and quality is found in deposits at 15 km distance from the project site.

b. Clay

The clay found lying together with the limestone strata mentioned above and that found separately in clay strata nearby assures a sufficient supply.

c. Silica

Can be obtained from the river bed of the Fiherenana river.

d. Gypsum

Is produced in the area around Mahaboka some 110 km from the project site.

e. Iron Component

At present no local sources have been identified and it is assumed that pyrite cinder will be imported.

f. Coal

Deposits are found at Saoka about 220 km distance from the Project site, however these deposits are not developed for exploitation yet. Import of coal from South Africa has therefore been assumed. As the Saoka deposits are sufficient to the project needs in terms of both quantity and quality it will be possible to shift to using domestic coal once these resources have been developed.

g. Electricity

In house generation using a diesel electric generator.

h. Others

Bags, fireproof bricks, steel balls and lubeoil will be imported.

1) Mahajanga Site

a. Limestone

New quarries are to be developed for part of the deposits found in the hilly area of the Amboanio area. Limestone in sufficient quantity and quality is available.

b. Clay

Clay is found lying together with the limestone strata mentioned above.

c. Silica

Can be obtained from the river bed of the Betsiboka river.

d. Gypsum

Is produced in an area 170 km west of the Amboanio site.

e. Coal and Iron Component

Same as in case 1 above

f. Electricity

In house generation using a diesel electric generator.

h. Others

Bags, fireproof bricks, steel balls and lubeoil will be imported.

(2) Annual Requirements

Refer to Table I-1.

TABLE I-1 ANNUAL CONSUMPTION (100% Operation Rate)

| | UNIT | CASE 1A | CASE 1B | CASE 2A | CASE 2B | CASE 3A | CASE 3B | NOTE |
|---|---|---|---|---|---|---|---|---|
| Production: Clinker | MT | 300,000 | 400,000 | 300,000 | 400,000 | 300,000 | 400,000 | |
| : Cement | MT | 312,000 | 416,000 | 312,000 | 416,000 | 312,000 | 416,000 | |
| 1. Raw Material: | | | | | | | | |
| Limestone | MT | 375,600 | 500,800 | 323,700 | 431,600 | 375,600 | 500,800 | |
| Clay | MT | 80,100 | 106,800 | 107,700 | 143,700 | 80,100 | 106,800 | |
| Silica | MT | 12,900 | 17,200 | 11,100 | 14,800 | 12,900 | 17,200 | |
| Iron Component | MT | 2,700 | 3,600 | 5,700 | 7,600 | 2,700 | 3,600 | |
| Gypsum | MT | 13,500 | 18,000 | 13,500 | 18,000 | 13,500 | 18,000 | |
| 2. Utilities: | | | | | | | | |
| Fuel (Coal) | MT | 45,600 | 60,800 | 45,600 | 60,800 | 45,600 | 60,800 | |
| Water | MT | 218,400 | 291,200 | 218,400 | 291,200 | 218,400 | 291,200 | |
| Diesel Oil | KL | 9,984 | 13,312 | 9,984 | 13,312 | 8,650 | 13,222 | |
| Electricity | MWH | - | - | - | - | 7,639 | 7,639 | |
| 3. Consumables: | | | | | | | | |
| Fire Bricks | MT | 49.92 | 66.56 | 49.92 | 66.56 | 49.92 | 66.56 | |
| Steel Ball | MT | 15.6 | 20.8 | 15.6 | 20.8 | 15.6 | 20.8 | |
| Lubeoil | KL | 7.8 | 10.4 | 7.8 | 10.4 | 7.9 | 10.5 | |
| 4. Others: | | | | | | | | |
| Paper Sack | Piece | 7,644,000 | 10,192,000 | 7,644,000 | 10,192,000 | 7,644,000 | 10,192,000 | |

## 4. Location and Site

Two plant sites were evaluated (i.e. the Toliara site of Case 1 and the Mahajanga site of Case 2). As an alternative to the Toliara case a third case was postulated in which a part of the clinker from Toliara would be sent for milling to the Toamasina finishing plant (Case 3).

### (1) Toliara Site

The Toliara site enjoys not only the availability of limestone, clay, gypsum, etc but also the anticipated availability of coal deposits once future development is carried out and the site is favored with natural port sites.

The candidate project is a vacant lot to the side of the jetty which is well located for access to the harbor and the access road for transport of raw materials, etc. does not pass through the urban areas.

The candidate site is almost completely government owned vacant land but some local inhabitants have taken up residence here and some of these will need to be transferred. Land costs in the neighboring area are very cheap and pose no problems in terms of project cost.

The loading facilities of the existing port can be used as they are for plant construction and after plant completion will be convenient for loading freight, and receipt of consumables, parts and imported raw materials.

The surface area required for the plant site is about 8 hectares.

(2) Mahajanga Site

Mahajanga is a town facing the mouth of the Betsiboka river. The port is extremely large but the shallow water depth is a crucial defect of the site. The maximum water depth at full tide is only 4m.and it is questionable whether a 6,000 ton craft could anchor. Further, the harbor is surrounded by the town area and so securing a site for industrial use would be difficult and there would be difficulties in obtaining access for large scale transport.

The candidate site for plant construction is about 30 km south west of the town in the Amboanio area and limestone deposits are available in the surrounding hilly area.

A section of the huge river mouth adjoins this same area of Amboanio and it is possible to employ barges for the delivery of dry bulk materials such as coal, iron component, etc. which could be unloaded at an in house jetty. However, Mahajanga port would need to be used for the delivery of imported capital equipment, parts and bagged cement. The cost of loading from the in house jetty to barges for transfer to the main outlying freight carriers would be too costly and is considered uneconomical.

The sur.ace area required for the plant site is 8 hectares. Land cost in the surrounding area is extremely low.

(3) Toamasina Site

Toamasina harbor is the main port of Madagascar and no problems whatsoever are envisaged in the handling of clinker there. However, an appropriate site was not identified in the vicinity of the port and it was necessary to look for a two hectare site in the suburban districts.

Since the main inputs to a milling plant are gypsum, electricity, paper sacks, steel balls, etc. with the exception of electric supply (to be purchased locally) these are all assumed to be met by import.

5. Project Engineering

(1) Outline of Production Processing

Cement production processing consists of the following stages.

1) Raw Material Preparation
   a. Raw material quarrying
   b. Compounding
   c. Milling
   d. Homogenizing

2) Calcining

3) Finishing

4) Bagging and Delivery

Further soot, smoke, dust and sulfur oxide etc. tend to arise during processes such as the movement of powdered substances or the combustion of fine particles. Special equipment to deal with these must be installed in order to prevent air pollution.

(2) Assessment of Different Processes

These are three production methods for Portland cement, that is the Wet process, Semi-dry process and the dry process. Since energy consumption involved is great the trend in almost all new plants is to choose the dry process which is relatively less energy consuming.

The kilns used in the calcining process are the vertical shaft kiln of a packed bed type and the rotary type kiln equipped with a horizontal shaft at an angle of 3 to 4.5%.

The vertical shaft kiln which is used at the Antsirabe mill has the advantage of only requiring a small equipment cost but this type of kiln poses problems with a large scale output over consuming some 15 to 20% more fuel than the suspension preheater kiln.

Recently almost all plants employ a rotary kiln with an attached suspension preheater to use the kiln exhaust heat in order to preheat the raw materials. Further, the new suspension preheater (NSP) kiln method is also popular. This method involves placing a preliminary calcinating furnace between the cyclone for SP use and the kiln itself. As there are few alkaline or volatile substances found in the raw materials of the present project it is recommended that the SP kiln method be employed.

(3) Scope of the Present Project

The scope of investment taken to be covered by the plan for the present project includes all necessary equipment and construction costs with the exception of costs for expansion of berth facilities at the Toliara site.

(4) Estimation of Construction Costs

The Base cost estimate for construction costs made on the basis of price levels in this current year of 1990 are as follows. (for details refer to Table I-2

TABLE I-2 ESTIMATED CONSTRUCTION COST (BASE)

(UNIT: 1,000$)

| | CASE 1-A | | | CASE 2-A | | | CASE 3-A | | |
|---|---|---|---|---|---|---|---|---|---|
| | F | L | TOTAL | F | L | TOTAL | F | L | TOTAL |
| Quarry | 2,830 | 122 | 2,952 | 2,372 | 122 | 2,494 | 2,830 | 122 | 2,952 |
| Cement Plant | 54,925 | 6,165 | 61,090 | 57,099 | 6,165 | 63,264 | 54,925 | 6,165 | 61,090 |
| Utility | 7,571 | 970 | 8,541 | 7,517 | 1,062 | 8,579 | 7,571 | 970 | 8,541 |
| Auxiliary | 841 | 1,784 | 2,625 | 841 | 1,784 | 2,625 | 841 | 1,784 | 2,625 |
| Shipping | 4,150 | 825 | 4,975 | 3,982 | 917 | 4,899 | 4,150 | 825 | 4,975 |
| Secondary Processing | | | | | | | 5,292 | 1,241 | 6,533 |
| Total | 70,317 | 9,866 | 80,183 | 71,811 | 10,050 | 81,861 | 75,609 | 11,107 | 86,716 |

| | CASE 1-B | | | CASE 2-B | | | CASE 3-B | | |
|---|---|---|---|---|---|---|---|---|---|
| | F | L | TOTAL | F | L | TOTAL | F | L | TOTAL |
| Quarry | 3,319 | 122 | 3,441 | 2,861 | 122 | 2,983 | 3,319 | 122 | 3,441 |
| Cement Plant | 62,675 | 6,592 | 69,267 | 65,175 | 6,592 | 71,767 | 62,675 | 6,592 | 69,267 |
| Utility | 8,858 | 1,106 | 9,964 | 8,803 | 1,198 | 10,001 | 8,858 | 1,106 | 9,964 |
| Auxiliary | 841 | 1,784 | 2,625 | 841 | 1,784 | 2,625 | 841 | 1,784 | 2,625 |
| Shipping | 4,150 | 825 | 4,975 | 3,982 | 917 | 4,899 | 4,150 | 925 | 4,975 |
| Secondary Processing | | | | | | | 5,292 | 1,241 | 6,533 |
| Total | 79,843 | 10,429 | 90,272 | 81,662 | 10,613 | 92,275 | 85,135 | 11,670 | 96,805 |

ESTIMATED CONSTRUCTION COST INCLUDING PRICE CONTINGENCY

| | F | L | Total |
|---|---|---|---|
| Case 1-A | 83,699 | 9,866 | 93,565 |
| Case 1-B | 95,022 | 10,429 | 105,451 |
| Case 2-A | 85,454 | 10,050 | 95,504 |
| Case 2-B | 97,162 | 10,613 | 107,775 |
| Case 3-A | 90,090 | 11,107 | 101,197 |
| Case 3-B | 101,413 | 11,670 | 113,083 |

6. Plant Organization and Overhead Costs

Personnel distribution at the different workplaces and sites involved is shown below.

| | Case 1 | Case 2 | Case 3 |
|---|---|---|---|
| Plant Manager | 1 | 1 | 1 |
| Quarry Site | 32 | 32 | 32 |
| Cement Plant | | | |
| -Production Dept. | 55 | 55 | 55 |
| -Engineering Dept. | 60 | 60 | 60 |
| -Delivery Dept. | 17 | 17 | 17 |
| -Administration Dept. | 44 | 44 | 44 |
| -Sales Dept. | 6 | 26 | 6 |
| Toamasina Mill | 0 | 0 | 19 |
| Total | 215 | 235 | 234 |

General overhead expenses are taken to be 60% of the total salary costs.

7. Manpower

Labor requirements for the various classes of staff are as follows.

| | Case 1 | Case 2 | Case 3 |
|---|---|---|---|
| Manager | 5 | 5 | 6 |
| Superintendent | 6 | 6 | 6 |
| Engineer | 22 | 22 | 24 |
| Foreman | 8 | 8 | 8 |
| Clark | 28 | 28 | 32 |
| Skilled Labor | 115 | 135 | 124 |
| Unskilled Labor | 31 | 31 | 34 |
| Total | 215 | 235 | 234 |

8. Implementation Schedule

(1) The key date schedule for project implementation is shown below.

| implementation aspect | period | scheduled implementation |
|---|---|---|
| a. Feasibility study | 7 months | Dec., '90 - Jul., '91 |
| b. Decision on project implementation | 5 months | Aug., '91 - Dec., '91 |
| c. Company foundation detailed project plan | 6 months | Jan., '92 - Jun., '92 |
| d. Fund raising, preparation of implementation, site acquisition | 8 months | May, '92 - Dec., '92 |
| e. Basic design, preparation of tender | 4 months | Jan., '93 - Apr., '93 |
| f. Tender, evaluation, EPC Contract | 8 months | May, '93 - Dec., '93 |
| g. Construction work | 34 months | Jan., '94 - Oct., '96 |
| h. Trial run, transfer | 4 months | Sep., '96 - Dec., '96 |
| i. Commercial operations | | from Jan., '97. |

(2) Total Investment Cost and Disbursement Schedule

The total capital requirement for the project budget was estimated with reference to te base cost estimates and taking into consideration an escalation factor. The various estimates and disbursement schedule are shown in Table I-3 and I-4.

9. Financial Analysis

(1) Basic Conditions

a. Pricing Rule

All of the prices and costs of the present report were forecast with reference to the base costs at the end of the year of 1990. The prices for 1977 are expressed in US$. The exchange rate against the US dollar employed is FMG 1,500 to one US$, J¥ 135 to one US$ and FF 5.09 to one US$.

b. Project Life Span

The project life span was taken to be 15 years for purposes of the financial evaluation.

(2) Financing Plan

a. Dept equity ratio

Debt: 70%

Equity: 30%

b. Conditions of Long Term Financing

-Financier : The Export-Import Bank of Japan

-Credit : Supplier's credit

-Repayment : 10 years semi-annual installments

-Grace period : full construction period

-Interest rate : 7.5 percent p.a.

TABLE I-3 TOTAL CAPITAL REQUIREMENT

(UNIT: 1000$)

| | CASE 1A | CASE 1B | CASE 2A | CASE 2B | CASE 3A | CASE 3B |
|---|---|---|---|---|---|---|
| LAND ACQUISITION | 125 | 125 | 1 | 1 | 145 | 145 |
| SITE PREPARATION | 1,400 | 1,400 | 888 | 888 | 1,500 | 1,500 |
| QUARRY EXPLOITATION | 3,566 | 4,161 | 3,008 | 3,604 | 3,566 | 4,161 |
| PLANT CONSTRUCTION | 89,999 | 101,290 | 92,496 | 104,171 | 97,631 | 108,922 |
| PREOPERATIONAL EXP. | 3,754 | 3,775 | 3,799 | 3,810 | 3,812 | 3,834 |
| INTEREST DUR'G CONST'N | 19,638 | 21,998 | 19,936 | 22,369 | 21,368 | 23,728 |
| INITIAL WORK'G CAPITAL | 1,085 | 1,444 | 1,319 | 1,759 | 1,142 | 1,513 |
| TOTAL | 119,567 | 134,193 | 121,447 | 136,602 | 129,164 | 143,803 |

TABLE I-4 CAPITAL DISBURSEMENT SCHEDULE

(UNIT: 1000$)

| | CASE 1A | CASE 1B | CASE 2A | CASE 2B | CASE 3A | CASE 3B |
|---|---|---|---|---|---|---|
| 1992 | 226 | 226 | 226 | 226 | 226 | 226 |
| 1993 | 1,691 | 1,691 | 1,280 | 1,280 | 1,766 | 1,766 |
| 1994 | 37,641 | 42,558 | 38,491 | 43,575 | 38,544 | 43,459 |
| 1995 | 41,073 | 46,099 | 41,770 | 46,955 | 45,634 | 50,660 |
| 1996 | 38,934 | 43,619 | 39,679 | 44,565 | 42,994 | 47,692 |
| TOTAL | 119,568 | 134,193 | 121,446 | 136,601 | 129,164 | 143,803 |

(3) Financial Analysis

1) The financial internal rate of return (FIRR) is as follows.

| | FIRR before Tax | FIRR After Tax |
|---|---|---|
| Case 1A | 17.49% | 15.47% |
| 1B | 18.07% | 15.97% |
| 2A | 14.55% | 12.72% |
| 2B | 15.81% | 13.89% |
| 3A | 19.71% | 17.68% |
| 3B | 18.13% | 16.02% |

2) Sensitivity Analysis

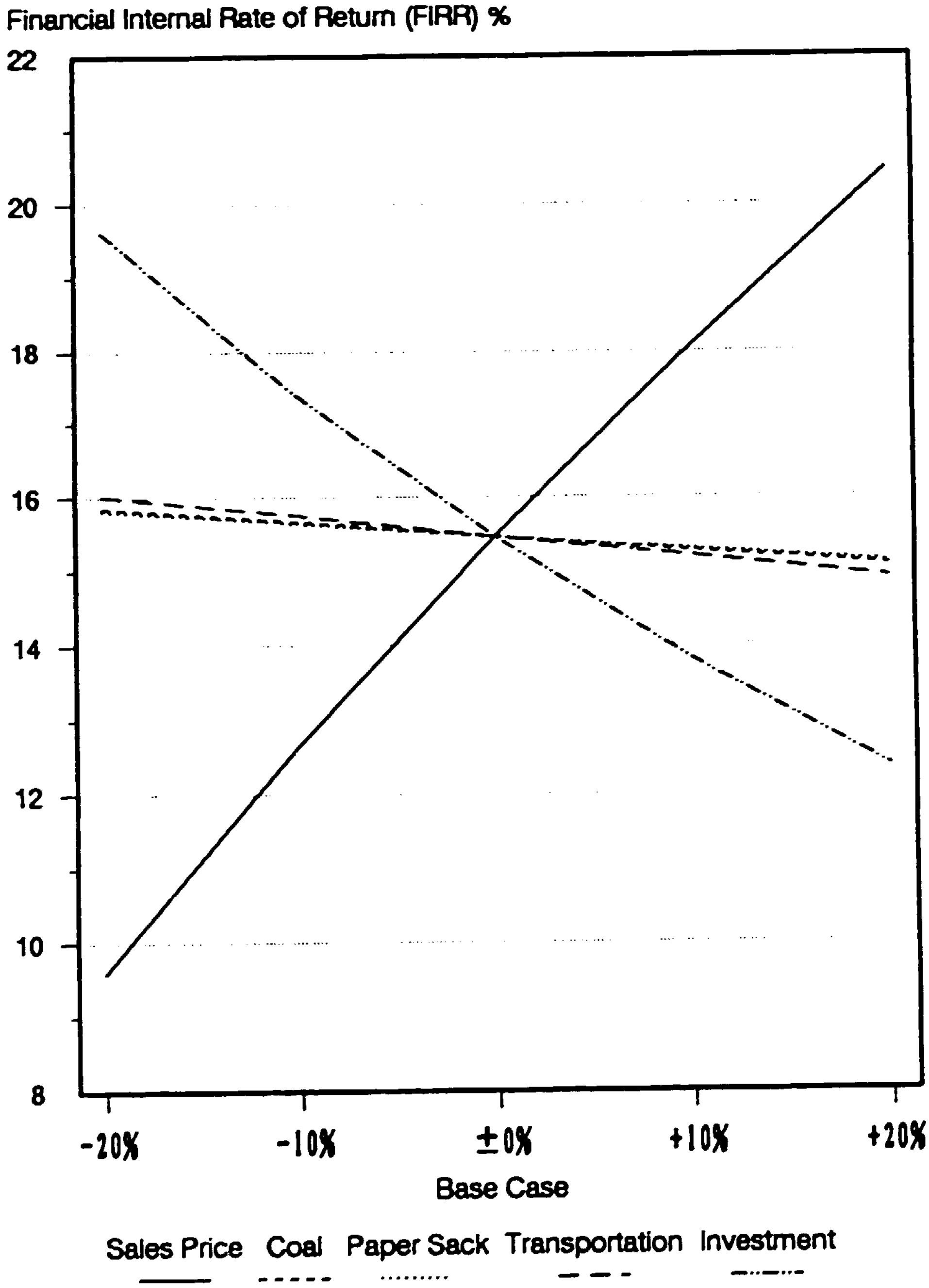
The results of a sensitivity analysis conducted on the product sales price, coal price, paper sack price and investment cost, etc. revealed that sensitivity was high with regard to the profit earning rate of the product sales and investment cost. Refer to Figure I-1.

(4) Economic Evaluation

1) Economic Internal Rate of Return (EIRR)

In Case 1 results of calculation of EIRR gave a figure of 18.23% which is 0.73% higher that the FIRR.

**Figure I-1 SENSITIVITY CURVE**
**CASE 1-A FIRR AFTER TAX**



2) Foreign Exchange Balance

The results of an evaluation of the foreign currency saving earning balance to accrue over the term of the project life in Cases 1A and 1B are shown below.
Case 1A : surplus US$ 293,114,000
Case 2B : surplus US$ 272,048,000

## 10. Conclusion and Recommendation

### (1) Case Study

1) In general terms the Toliara site (Case 1) is more favorably situated in terms of profitability in comparison to the Mahajanga site (Case 2).

2) In general terms Case B (400,000 tons per year) is more profitable than Case A (300,000 tons per year), but with regard to Case 3 (the Toliara-Toamasina case) it was found that Case A is better.

3) The optimum case of all postulated proves to be Case 3A followed in order of excellence by Case 3B, Case 1B, Case 1A, Case 2B and Case 2A.

4) The superiority of Case 3A in terms of profitability over that of Case 3B shows that 1. the profitability of a Finishing Mill located in the market is high and 2. The exporting of clinker is a factor which detracts from profitability.

### (2) Sensitivity Analysis

1) The sensitivity of profits to price fluctuations is most observable in the case the sales price of finished products. After this the investment amount is the factor showing the highest sensitivity. It follows from the above that it is

important to consider methods to reduce the construction costs involved.

2) The sensitivity of variable costs and domestic transport costs is low.

(3) Project Site

The Toliara location enjoys the following particular advantages for a domestic project site:

- Excellent harbor conditions
- The availability of an ideal plant site directly linked to the harbor
- The possibility of using domestic coal resources exploitable in the future
- The abundant deposits of limestone
- Relative proximity to the important export markets of the Reunion and Mauritius

(4) Profitability of the Finishing Mill

As is assumed that the profitability of a Finishing Mill aimed at the domestic market is extremely high it is desirable to carry out the construction of a finishing mill using imported clinker as raw material before beginning construction of a complete plant. Once marketing has been stabilized and an appropriate juncture reached the construction of the complete plant could be begun. However, in this case it is important to establish the availability of clinker and obtain a plant site in the neighborhood of the Toamasina harbor.

(5) Possession of in House Carriers

An important factor limiting economic activities in Madagascar is the insufficient provision of transportation facilities (including road facilities). In particular, the transportation costs involved in supplying and linking the main markets involved in the present project are quite high. This means that little advantage will be gained over competing countries because of the relative costliness of transport costs. One possible solution to this problematic situation is to consider the construction of in-house dry bulk carriers which could be used for the domestic and export transport of clinker. However, if this method is adopted there will be an increased burden of initial investment and so a key factor will be the reliable effective operation of such transport facilities.

(6) Economic Benefit

An economic internal rate of return (i.e. 18.23 percent -for Case 1A) is high enough to clear general cut-off rate level, and foreign exchange earning saving effect is also satisfactory.

(7) Conclusions

The following conclusions are drawn from the conditions assumed in the present study report.

1) In terms of profitability, Case 3 is the optimum proposal as a result of the economic nature of domestic transportation of clinker in comparison to bagged cement. However, as the export of clinker reduces profitability on a scale of 400,000 tonnes per day, profitability is impaired by the increase in clinker exports. Therefore, it is concluded that Case 3A has the optimum profitability.

2) Toliara is a better site for the Project than Mahajanga for a variety of reasons. However, construction of the Finishing Mill near to Toamasina, close to the main markets, is a more appropriate choice because of transportation costs

will be cheaper. As a result of the above considerations, a possible proposal would be to construct a Finishing Mill with an intake of imported clinker at Toamasina in anticipation of the construction of the Complete Plant which will follow later.

3) There is a strong possibility that the scale of project investment involved will be found too large for the economy of Madagascar to support. It seems that the main obstacle to realization of the project is Project Financing.

(8) Recommendations

In view of the fact that the present project is on an extremely large scale of investment for Madagascar, and in response to the various problems relating to the lack of Industrial Infrastructures in Madagascar, the following recommendations have been made.

1) Project Financing

As long as the the assumption of a Private Sector context of investment is maintained for the present project, the biggest problem to its realization will be in the funding of Equity Capital and Loan Capital for the project.

a. Funding of the equity capital portion relying only on the resources of Madagascar's entrepreneurs will be difficult. Further, in view of the necessity of participation of a technical partner and in order to facilitate the funding of project finances (loan capital) it is recommended to seek the participation of extra parties such as the following:

- Madagascar entrepreneurs

- Financing institutions of Madagascar
- Entrepreneurs of the IOC countries
- Public Financing institutions such as the IFC, etc.
- Cement manufacturers
- Entrepreneurs of the advanced countries

b. With regard to the funding of the loan capital, the key element affecting the financing conditions will be whether an acceptable security package can be formulated and presented to the Financier. Discussion should be carried out between Equity participants on the formation of the security package in order to elaborate the most advantageous terms which can be secured.

Also, it is advisable to sound the potential contractor on an acceptable security package and financing conditions and discuss these together.

In any case, the equity participation of reputable parties such as public bodies like to IFC or financial institutions will certainly do much to ensure an advantageous funding of the loan finance.

2) Market Development

Marketing of the finished product will have a decisive effect on the profitability of the present project. Of course the sales price of the product is an important factor, but even before considering this, the question of whether domestic demand actually increases in line with forecasts will be a determining factor. The reason for this, which has already been pointed out, is that the present project will not stand as an export orientated project. Therefore, in order to ensure the success of the project it is necessary to consider ways to increase domestic demand.

a. Whether there will be an expansion in domestic demand depends above all on an expansion of the economy of Madagascar. With a continued economic slowdown a large scale Cement Project will not be desirable. However, since the question of national economic expansion is itself outside of the scope of the project development capacity, this will depend entirely on the united efforts of the Government and people of Madagascar.

   An increase in the demand for cement results principally from development in the sectors of building (housing, administrative and office buildings, hotels, schools, hospitals, etc.), of social infrastructure (seaports, airports, roads, dams, overland and underground canals, etc.), of industry and industrial infrastructure (factories;, transport systems, storage systems, agricultural infrastructure, etc.), and therefore Governmental policies relating to promotion of investment in these sectors and for budgeting allocations is of great significance. It is necessary for the Project Promoter to undertake every possible effort to see to it that the government is encouraged to promote the above, and particularly to undertake public investment.

b. Another means to expand demand is to reduce the market price of cement. The current retail price on the market of about US 200 $/MT is excessive, and it is possible that there is little increase in demand because cement is unable to compete with available alternative materials. It is necessary to evaluate the following improvements as possible counter measures to this situation.

- improvement in tax rates
- rationalization of the distribution systems (bulk transport, possibility to apply for ready made concrete, etc.)
- survey on the competitive position vie a vie alternative materials (eg. bricks, wood, stone, asphalt, etc.)

3) Evaluation on a Phased Realization of the Project

The problems outlined above could arise in relation to the question of whether cement demand will increase in line with forecasts and whether financing for project implementation will be realized. It will require some time to overcome these problems and ensure that the desired context for project implementation is achieved.

However, the intervening time must not be wasted, and it is necessary to plan for an effective realization of the project in well ordered phases. That is, we recommend that firstly the construction of the finishing mill be carried out at Toamasina. The scale will be on a par with that shown for Case 3A (i.e. 150,000 T/Y of clinker volume) with clinker being imported. By realizing this part of the Project first the following merits can be anticipated.

- a saving on foreign currency of the difference in price between imported cement and imported linker
- the establishment of a marketing system and zone of commercial operations
- promotion of an expansion in demand through price reduction

- selection of partners who will invest in the integrated cement mill to form the next phase of the project
- training of engineers and nurture of cement production technology
- profit accumulation (to form capital resources for the next phase of investment)

It is recommended that the above implementation plan be promptly initiated. However, the following points will need to be confirmed.

- survey on site availability in the area around Toamasina harbour
- examination of the clinker handling methods possible in Toamasina harbour
- survey on the availability of clinker (very important) and evaluation of price trends
- selection of an experienced Technical Partner
- a detailed equipment plan and estimate calculations for construction costs
- implementation of a thorough Feasibility Study
- evaluation of Financing (including a security package).

# Chapter II

# PROJECT BACKGROUND AND HISTORY

## II. Project Background and History

### 1. Project History

Cement is an inexpensive commodity in terms of unit price per unit of eight. Moreover as the proportion of commodity cost accounted for by transport costs is high there are economic limits to its commodity status on international markets arising from distribution aspects.

In the past the IOC countries have imported cement from such distant supply points as Greece or Indonesia. Such imports, however, are esteemed to be largely attributable to the spot export of excess product and in general countries such as Kenya are better placed geographically to act as exporters to the IOC. In the long term countries on the east African coastline which are advantageously positioned to operate as export bases such as South Africa, Mozambique, Tanzania and Kenya, etc. represent potential suppliers.

Establishing a cement manufacturing plant in the Indian Ocean Committee countries is one of the most critical issues which has been discussed among the member countries since its official inauguration of the Committee. Total cement requirement in the region shown in statistical data of the mid 1980's was convincing enough to elaborate a possible IOC cooperation scheme to supply self-manufactured cement to each member country.

A project idea was put forward by the Mauritius Government to the IOC to produce portland cement using coral as a main raw material. This idea however did not materialize due to various constraints including the anticipated negative impact to the environment.

Madagascar is known as a possible supply source of lime stone. This fact coupled with supportive data on the forecasted demand of cement in the IOC region stimulated the

Malagasy government to initiate investigation on the commercial profitability of establishing a cement factory in Madagascar under the IOC cooperation scheme.

At the time of elaboration of the IOC cooperation scheme the only cement production facilities located in the IOC countries were the two small scale cement plants in Madagascar. Further, demand in Madagascar itself was still largely dependent on imports this situation remains unchanged at present. The IOC countries forecast that the overall demand for cement would reach a level of 1,000,000 tons in 1990 of which only about 60,000 tons could be met with autonomous sources (from the two Madagascar plants).

Against the above background, UNIDO conducted an opportunity study in March 1989 under DP/MAG/82/010. In order to investigate the commercial profitability of a portland cement project to be established in Madagascar. The conclusions of the study are as follows:

(1) The project should aim at supplying cement to Indian Ocean countries, i.e., Mauritius, the Reunion, Comoros, Seychelles, and Madagascar.

(2) In 1985, IOC used 346,900 tons of portland cement (type 35 - 45), 55,000 tons of special cement, and 19,900 tons of clinker cement. Cement demand projections ('000 tons) for 1990 and 2010 are as follows:

| | 1990 | 2010 |
|---|---|---|
| Madagascar | 500 | 900 |
| Reunion | 391 | 729 |
| Mauritius | 258 | 537 |
| Comoros | 45 | 112 |
| Seychelles | 20 | 47 |
| | 1217 | 2325 |

(3) To meet the growing demand for cement in the IOC countries and taking into consideration the necessity of satisfying the demand at prices reflecting the purchasing power of the countries in the region, a cement factory producing for regional customers is to be envisaged. The proposed plant capacity is estimated at 600,000 tons.

(4) Madagascar, with its raw material base for production of cement, is thought to be the best country for the construction of such a regional cement facility.

(5) The opportunity report reviewed two proposals:

- a 600,000 mt/y unit (400,000 mt of cement and 200,000 mt of clinker)

- a 400,000 mt/y unit (270,000 mt of cement and 130,000 mt of clinker).

(6) The main conclusion is that a 600,000 mt capacity should be installed (the main reason: being the fast growing demand for cement in IOC countries). Three options are possible for the future cement facility:

- a 600,000 mt/y unit
- a 400,000 mt/y and a 200,000 mt/y unit
- three units of 200,000 mt/y each.

A modular approach has some advantages (a better response to changes in demand; it takes into account the technical level of the IOC countries; the cash flows generated by earlier unit could finance construction of the next one).

(7) Two alternatives have been thoroughly reviewed: the CBMC proposal (PR China) and the F/ L/ Smidth proposal (Denmark). The study concludes that profitability is high and initial investment outlays lower than in the case of CBMC proposal.

(8) It is recommended that the unit use local coal (imported coal is twice as expensive).

(9) The new cement factory should enjoy all preferential treatment characteristic of utilities located within export processing zones.

(10) Taking into account price competitiveness of the factory's output, the investment project should not cover support costs such as electricity production or coal mining.

(11) The proposed output prices are:

- 450 FF/t (approximately US$80/t) for cement
- 230 FF/t (approximately US$40/t) for clinker.

(12) The study recommends that a feasibility study be undertaken in order to further prove the commercial profitability and economic viability. This decision is based on the relatively positive financial indicators in the opportunity study and the foreseen need to establish a cement factory in Madagascar to ensure a self-reliant supply of cement in the IOC region.

Following the recommendation of the opportunity study, the Government of Madagascar initiated the promotion of the project realization. At the same time, a group of Japanese companies started investigating the present status of this project and confirmed their preliminary interest for pursuing possibilities of technology transfer and equity participation, if feasible. The actual decision on whether or not further steps will be taken would depend on the result of this feasibility study.

2. Outline of the Project

(1) Project Idea

Shortly before conducting the study, the Government of Madagascar made clear that the project is to be implemented on initiatives from the private sector. This implied that the project would neither be implemented by a state-owned company nor by the IOC governments' equity participation.

The original project idea, i.e., a regional cooperation scheme has thus been modified. The project's commercial profitability would have to be investigated leaving aside any regional cooperation scheme incentives such as preferable import duties.

Since the main market for the present project is at a short distance and import duties afford the project advantageous sales on the domestic market it is obviously preferable in terms of commercial profitability to aim at the domestic market rather than at export markets where long distances would be costly and competition in terms of price and product quality would be severe.

Furthermore, the profitability of exports is generally low and would only be envisaged to realize some special aim such as the disposal of excess production, maintenance of operating rates or the acquisition of foreign exchange, etc.

Results of a preliminary local survey conducted in the IOC countries reveals that possible importers outside of Madagascar who were interested emphasized that a condition of their participation was that the product be of an internationally competitive price and quality.

These results confirm that the project could not be fully accounted for by the IOC's entire market. In order to ensure the project viability operating rates are to be maintained by balancing domestic and export markets. The main emphasis is to be placed on satisfying the domestic demand in Madagascar while selling excess product at a price above marginal cost in the case of exports to the IOC countries. Of course, Madagascar is favorably placed in comparison to the other export countries. It is especially well positioned in terms of access to Mauritius and the Reunion. There is therefore considerable potential for active export to these markets on a profitable basis.

This new project concept would easily challenge some recommendations of the opportunity study defining the proposed production capacity. These are (3), (5), (6) and (9). Furthermore, the technical selection would have to be made in light of possible Japanese enterprises' participation. This has forced the study to neglect recommendation (7). Other recommended items, such as the use of local coal, sales prices etc. would have to be re-investigated from a merely commercial aspect taking into account the above mentioned project concept i.e. "the domestic market as the primary market segment."

(2) Different Alternatives

The Government of Madagascar suggested two possible alternative sites for investigation. Both sites are located on the West coastline. These sites have been identified mainly in view of port facilities and raw materials available.

The major cement consumers are scattered in the highland area, e.g. around Antananarivo. Logistics and distribution channels for both the export and import markets are another critical factor influencing commercial profitability.

The investment decision-making in this case requires clear analysis of (1) what product mix is to be decided on (clinker and/or cement), (2) what portion is to be shared by each product,(3) the specific mode of transportation for the different markets, etc.. For instance, one alternative which was not envisaged before initiation of the study was to establish a finishing mill at the Toamasina port area. Under this assumption, the plant at either Toliara or Mahajanga will ship clinker to the finishing mill in Toamasina and the mill distribute the bagged cement to the major domestic as well as foreign markets. This alternative would enable the project to enjoy a comparative advantage stemming from the reduced transportation costs in light of the shorter distance to the major domestic markets.

Finally, the demand projection for the domestic market is one of the most influential factors for evaluating the plant capacity. The economic and statistical data available during the centrally planned economies in Madagascar may not provide a sound basis for selecting a specific level of production capacity. In other words, it may be too risky to come to a conclusion on the commercial profitability based on only one scenario for plant capacity.

Bearing the above in mind, the study has covered several different alternatives. They vary by:

1) location i.e. Toliara or Mahajanga,
2) product mix and logistics including an assumption to establishing a finishing mill in Toamasina, and
3) plant capacity, i.e. 50,000 t/y or 100,000 t/y.

3. Project Promoters and Financing Aspects

(1) Project Promoters.

Realization of the project may be further followed up by Malagasy or Japanese private enterprises, provided that the study shows a minimum level of commercial profitability. The composition of the project promoters has not yet been finalized. A Japanese technology holder and a trading company may constitute the core group of the Japanese investors. Names of local partners have been suggested by the government and UNIDO Antananarivo office. However, no final composition of the project proponents has been formalized at this stage on either the Japanese or Malagasy side.

(2) Financing Possibility

The Government has assured to the maximum extent possible its support for the sound inauguration of a cement plant in Madagascar. It is seen as a symbolic breakthrough for the IOC countries to have their own cement production facility in the region. The project promoters and proponents therefore expect substantive government support. For instance the project could benefit from a soft loan, if the Government arranges the sovereign guarantee. This in turn would greatly improve the project cash flow.

The study assumes a debt equity ratio of 70-30. This ratio has been tentatively established and does not necessarily reflect the actual capital budgeting of the potential investor(s).

The potential Japanese investors intend to arrange financing and wish to assess the total initial investment costs at 1997 valves, which is the start-up year. The equipment costs have therefore been adjusted using an escalation rate. Production costs (only foreign costs) and sales price have also been adjusted applying a different escalation rate. This noes not fully comply with the UNIDO financial analysis(COMFAR) method. It may be noted that the financial analysis compilation places priority on Japanese potential investors needs. This notion is evident in other the presentation of other financial indicators such as the working capital requirement calculation. A detailed explanation is given in Chapter X.

# Chapter III

# MARKET AND PLANT CAPACITY

## III. Market and Plant Capacity

### 1. Introduction

Cement is an inexpensive commodity in terms of unit price per unit of weight. Moreover as the proportion of commodity cost accounted for by transport costs is high there are economic limits to its commodity status on international markets arising from distribution aspects.

At present, the only cement production facilities located in the IOC countries are the two small scale cement plants in Madagascar. Further, demand in Madagascar itself is still largely dependent on imports. The IOC countries showed an overall demand for cement of about 1,000,000 tons in the year of 1990 of which only about 60,000 tons was met with autonomous sources (from the two Madagascar plants).

In the past the IOC countries have imported cement from such distant supply points as Greece or Indonesia. Such imports, however, are esteemed to be largely attributable to the spot export of excess product and in general countries such as Kenya are better placed geographically to act as exporters to the IOC. In the long term countries on the east African coastline which are advantageously positioned to operate as export bases such as South Africa, Mozambique, Tanzania and Kenya, etc. represent potential suppliers and so the products of the present project will need to be able to compete with these suppliers.

However, since the main market for the present project is at short distance and import duties afford the project advantageous sales on the domestic market it is obviously preferable in terms of economic viability to aim at the domestic market rather than at export markets where long distances would be costly and competition in terms of price and product quality would be severe. With the exception of cases of advantageous conditions such as preferential import duties the profitability of exports is generally low and would only be envisaged to realize some special aim such as the disposal of excess production, maintenance of operating rates or the acquisition of foreign exchange, etc.

Results of a local survey conducted in the IOC countries reveals that possible importers outside of Madagascar who showed interest in investing in the present project stipulated as a condition of their participation that the product be of an internationally competitive price and quality. Therefore, in order to ensure the economic viability of the project operating rates are to be maintained by balancing domestic and export markets. The main emphasis is to be placed on satisfying the domestic demand in Madagascar while selling excess product at a price above marginal cost in the case of exports to the IOC countries. Of course, Madagascar is favorably placed in terms of accessibility to the IOC countries in comparison to the other export countries. It is especially well positioned in terms of access to Mauritius and the Reunion. There is therefore considerable potential for active export to these markets on a profitable basis.

Further, it is noted that no agreements existed at the time of the present report between the IOC countries relating to preferential customs duties or taking back of products of the present project at certain favorable price.

2. International Market for Cement

(1) World Demand and supply trends for cement

Table III-1 shows past trends and growth rates for production, consumption, import, export, and per capital consumption of cement in the main countries worldwide. Further, in Table III-2 and III-3 the number of plants, equipment capacity, operating rates, export, import and domestic sales prices of the 10 major market countries worldwide are shown.

1) Production

The growth in cement production worldwide between 1977 and 1988 was 3.03%. Growth in production has been steadily increasing overall since 1985 though the equipment capacity and number of plants has been decreasing in the advanced industrial nations so that there has been an all round improvement of operating rates.

| Worldwide | | 10 Major Countries | | |
|---|---|---|---|---|
| Growth in production | | No. of plants | Production capacity (1985=100) | Operating rate |
| 1985 | 1.64% | 1,460 | 100.0 | 87.37% |
| 1986 | 4.82% | 1,432 | 100.4 | 86.45% |
| 1987 | 5.36% | 1,408 | 99.6 | 88.99% |
| 1988 | 5.85% | 1,412 | 99.3 | 95.59% |
| 1989 | n.a. | 1,420 | 96.2 | 101.34% |

2) Demand

The growth in world demand for cement between 1977 and 1988 was 3,13% and so exceeded the growth in production realized over the same period. Recent increases in demand show a similarly active movement observed in production trends.

| | Rate of increase in demand |
|---|---|
| 1985 | 1.76% |
| 1986 | 4.79% |
| 1987 | 5.36% |
| 1988 | 5.62% |

Looking at the major countries in detail we note that demand in the advanced industrial nations has reached a ceiling level with increases of around only 1% generally, and even minus growth rates in some cases (for example France or West Germany). In contrast the industrializing countries show high growth rates reflecting investment in industry and social infrastructures.

| Countries with high growth rates(77-88) | Growth rate (%) | Countries with low growth rates (1977-1988) | Growth rate (%) |
|---|---|---|---|
| China | 12.78% | West Germany | -1.55% |
| Indonesia | 11.21% | France | -0.99% |
| Korea S. | 8.02% | Italy | 0.58% |
| India | 7.56% | U.S.S.R. | 0.90% |
| Taiwan | 5.26% | Japan | 1.06% |
| | | U.S.A. | 1.46% |

3) Exports and Imports

countries

As can be seen from Table III-1, the growth rates for world imports and exports between 1977 and 1988 were 1.66% and 0.97% respectively. However, for the six year period between 1977 and 1983 the rates reached the considerably high levels of 6.39% for imports and 4.94% for exports. This makes evident the marked nature of the decrease which occurred after 1984.

Import and export statistics for the major trading countries between 1977 and 1988 indicate that imports recorded an extremely high increase rate of 16.91% while exports were at minus 1.91%. This state of affairs results from the recent increase in the quantity of cement imported by the major advanced industrial nations, a trend led by the USA which is the world's biggest cement importer and followed by Japan, West Germany, Great Britain, Italy, etc.

4) Trends and Forecasts of Demand-Supply Relations

The following observations can be made with regard to the situation outlined in the above.

a. The reduction in productive capacity due to the closing down and rationalization of plants in the advanced industrial nations is balanced and offset by the satisfactory growth in demand concentrated in the industrializing nations. This means that in overall terms although demand is increasing satisfactorily this is not accompanied by a sufficient growth in production. Generally the operating rates of plants have improved but the trend is towards an increasingly tight situation in terms of demand and supply balance.

b. Projects for construction of new cement plants in the advanced industrialized nations cannot be anticipated in the future. Reasons include environmental factors, the low value added nature of the product, the high consumption of energy involved as well as stagnation in demand consequent on reaching a near saturation point for social infrastructure investment and the stage of advanced industrialization. It is likely that investments be carried out in order to effect rationalizations such as labor saving or energy saving, to reinforce environmental protection and undertake other improvements but closures of superannuated or unprofitable facilities will also increase.

Therefore, the status of the advanced nations as importers of cement will be strengthened while the possession of raw materials and cheap energy will reinforce the trend towards increasing exports in the industrializing and developing nations where domestic demand increase in higher rate.

(2) World Trends of Cement Pricing

The international price of cement as with that of any international manufactured product fluctuates in response to the changes in demand-supply balance either worldwide or in a given region. In the case of cement, the unit price per weight is relatively low so the regional commodity aspect is reinforced and the quantity handled on the world circulation market represents only 5 to 8% of total production.

The increasingly tight situation in the world demand supply balance since 1985 has already been referred to in the analysis of demand-supply trends above and there is a consequent trend to gradual rise in international price. Of course, an increase in investment in plant and equipment in response to higher pricing is to be expected. However, new capital investment is not expected in the advanced countries given their present situation as outlined above. This means that facility expansion in other nations will be the key factor in easing the tight demand supply situation.

Table III-4 shows changes in quantities exported in relation to production output compared to changes in the import price in the USA. This indicates that with an export quantity representing 8% of output the world cement market situation is quite loose while at a level lower than 6% of output the market situation becomes tight.

(3) Forecast of Export Market Prices

The fluctuations in the price of cement on the export market and in the countries exporting large lots in the past are shown in Table III-5. As far as can be judged from this table the tight supply situation over the last 5 years has not had a clear influence. This is probably due to the fact that production has remained within the limits of the operating rates of facilities to date. However there has been a clear trend towards price rises evident from the end of 1990 to the present year. Currently trading on the European export market has reached a level of 80-90 US $/MT (bulk cement C and F). In the Far East Indonesia traditionally a nation exporting its excess production has taken measures to forbid the export of cement after the 3rd quarter of 1990 because of the increase in domestic demand. Only China retains an excess for export but there are product quality problems.

Since bagged cement normally involves extra costs in bagging and handling it is usually 6 to 7 US dollars more expensive than bulk cement. Further, as there are limits to the efficiency with which loading can be carried out lots tend to be kept down to a relatively small level. Also, as bulk cement forms the mainstream product for international handling the supply of bagged cement is insufficient and unstable and there are large discrepancies according to source supply.

Various methods have been adopted to forecast future trends in international pricing but despite prices have not reacted despite the trend to increasing operating rates. An extrapolation method of forecast is therefore difficult. On the one hand a clear rise has been evident in the market from the beginning of this current year of 1991 and it would seem that the buffer function of adjustments in operating rate is reaching a limit point so that a high level of pricing can be expected to continue for the next two or three years to come.

On the basis of the above remarks the following presents the assumed pricing of cement up to the end of 1996 in the region of the IOC countries.

| | Bulk cement (C&F US$/MT) | Bagged cement (C$F US$/MT) | Clinker (C$F US$/MT) |
|---|---|---|---|
| 1991 | 80 | 95 | 55 |
| 1992 | 86 | 102 | 59 |
| 1993 | 91 | 108 | 62 |
| 1994 | 95 | 113 | 66 |
| 1995 | 95 | 113 | 66 |
| 1996 | 95 | 113 | 66 |

## 3. Cement Market in the IOC Countries

Current status of the cement market in the IOC countries except Madagascar is as follows.

### (1) Mauritius

#### 1) Current Status

##### A. Market Size

The result for 1990 was of the order of 455 thousand tons.

##### B. Product Types

Historical cement demand in Mauritius and per capita consumption is as per table .

All orders are imported in bulk form. Selling of bagged cement is considered difficult in terms of both price competitiveness and purchasing systems. Standard specifications : BS-12.

##### C. Importer

State organizations (the State Trade Corporation STC) and the Mauritius Portland Cement Corporation (MPCC) account for half each of the total amount purchased. It is expected that the monopoly control over import of these two organizations will continue in the future.

D. Purchase Method

The STC decides by international tender on a supplier annually. The MPCC follows normal commercial purchasing procedures.

E. Delivery Conditions

The onshore bulk cement receiving terminal at Port Luis which is owned by MPCC does not provide with unloading driver, therefore, the cement bulk carrier must provide with pneumatic discharging system operating with closed and water tight hatches.

Conditions of the berth for bulk cement unloading are as follows.

Maximum draft : 10 m
Maximum cargo weight : 18,000 MT

F. Purchase Price

Tender Price : CIF Port Luis
Payment : 60 days after B/L date
Securities : Tender bond : 1 % of tender sum
Performance bond : 5 % of contract amount

G. Regarding Products of the Present Project

Will be purchased if pricing is internationally matched to product quality.

H. Other Relevant Topics

a. The STC initiated intervention on 50% of buying since 1984

b. Major recent purchasers of bulk cement are

Greece 1984-86

Indonesia 1989

Kenya 1990

Details of cement imports are as per Table .

c. STC buying ; in October every year Bid call (announcement) Award is granted in December

d. Tourism Program

To double the existing 3,500 hotel rooms now available within a five year period. Schedule to increase rooms by 1000 over a number of months. By 1995 it is planned to have more than 9000 rooms available.

2) Demand Projection

A. General Observation

It is unlikely that consumption above current level will continue hereafter, because, it is observed that domestic demand is likely to be almost as saturated as in the industrialized countries i.e. about 400 kg per capita.

Moreover, the country's potential industries (tourism, agriculture and light industries) are unlikely to be developed drastically further in the future, because of limitations of Island population and size.

However, demand exists and it is assumed that this represents a stable consumer market among the IOC countries.

B. Demand Projection

## (2) Comoros

### 1) Current Status

#### A. Market Size

The actual market size is around the 30,000 ton mark. Problems relating to purchase methods and fluctuations in governmental investment mean that there are considerable variations from one year to the next. The possibility of market expansion is linked to general economic expansion of the country. Historical cement demand in Comoros and per capita consumption is as per Table.

#### B. Product Types

All imports take the form of bagged cement. However importers are faced with extremely frequent cases of bag breakage and theft during unloading time at port. P.P. Bags are therefore preferred. Standard specification of imported cement is BS-12.

#### C. Importers

Cement for use in larger governmental construction projects can be imported directly by contractors, otherwise there are eight private importers carrying out other imports.

#### D. Method of Cement Import

The small size of the market for purchase lots of cement in the Comoros together with financial restrictions result in the small scale of imports amounting to 500-600 MT for a given importer per carrier. European agents therefore gather up orders from the small scale importers in the area surrounding their base and distribute supplies. This results in a certain instability of supply in response to demand. Further, as the import of cement requires approval from the government the following procedures are generally involved.

a. Provision of a supplier's quotation.

b. Acquisition of an Import Licence from the Ministry of External Commerce.

c. Submission of a copy of the Import Licence to the bank concerned.

d. Submission of the price and specification details to the Ministry of the Economy.

e. Completion of an Import Contract.

f. Provision of a Proforma Invoice.

g. Establishment of L/C (25% deposit).

E. Delivery Conditions

Bagged cement is unloaded directly from the main carrier in Moroni Port. However, unloading operations are clumsy and the crate of sack breakage is high (with a rate between 5-10% in the case of 6 ply paper sacks). In addition there is a high frequency of thefts. While the exact cost of underwriting (marine insurance) has not been verified it would seem to be in the region of 1.5 to 3.0%.

F. Conditions for Settlement of Counter Value

The usual conditions of settlement by Letter of Credit some 60-90 days after the bill of Lading are observed.

G. Pricing

The following fees are placed on the import price.

| | | |
|---|---|---|
| a. CIF | : | A |
| b. Customs Duty (D.D.) | : | A x 5% |
| c. Consumption Tax (T.C.) | : | A(1+0.05) x 18% |
| d. Freight Formality Duty (FFD) | : | A x 0.3% |
| e. Storage Fee (MAG) | : | A x 0.2% |
| f. Assurance (ASS) | : | A x 0.1% |
| g. Capital Gain Tax (TCA) | : | Σ a-f x 2% |
| h. Others (IBD) | : | Σ a-f x 1% |
| Total | : | Abt. A x 131% |

Further the Brokerage fee of SOCOMA is 6% of C&F price. The import price (C&F) is in the region of 83 US$ per MT. The domestic price is determined under governmental supervision. The following represent past domestic prices.

1978 : CF 50,000/MT

1982/3 : CF 45,000/MT (FF 900/MT)

1990 : CF 44,000/MT (157 US$)

The government guidelines set the maximum increment at 17% over the sales margin.

H. The New Cement Projects

The business sector in the Comoros (Chambers of Commerce) show a vivid interest in the Cement projects of Madagascar. There is a desire to realize domestic production of a cheap, stable supply of cement using imported clinker and domestic pozzolana involving construction of a Finishing Mill in the Comoros. Alternatively, it is desired to import bulk cement and provide bagging facilities locally.

I. Other Relevant Topics

a. One factor limiting the growth of cement demand in the Comoros is the insufficiency of financial structures and provisions towards private individual construction projects. Moreover, the inadequate supply of round bars has been indicated as another limit.

b. Demand for cement in the Comoros is significantly influenced by the level of large scale governmental construction plans and programs. In 1988 demand increased with the construction of a large number of hotels with resulted. An increased in demand is forecast for 1990 due to harbor constructions.

c. Cement supplying countries include Kenya, Tanzania and Poland among others.

2) Demand Projections

A. General Observations

The population of the nation is small in terms of economic scale and there are definite limits to the overall market scale. A future increase in the demand for cement in Comoros is possible but will depend largely on development in tourism, light industry and processing industries in the agricultural and marine sectors.

B. Demand Projection

Table III-13 shows the results of a demand projection conducted on a Regression model which was based on past figures for cement demand and GDP. The following is an outline of these results.

| Year | Cement Demand (MT) | Per Capita Demand (Kg/Capita) |
|---|---|---|
| 1990 | 29,236 | 62.7 |
| 1995 | 35,316 | 64.7 |
| 2000 | 42,281 | 66.1 |
| 2005 | 50,307 | 67.2 |
| 2010 | 59,593 | 67.9 |

(3) The Reunion

1) Current Status

A. Market Size

The Reunion possesses both Bulk Cement Silo and Finishing Mill facilities. Bulk cement and clinker are both imported from outside. The size of island demand is estimated at around 430,000 MT on the basis of the following import record for 1989:

Clinker 270,000 MT

Bulk Cement 77,397 MT

Table shows the import records for the Reunion for both Clinker and Bulk Cement.

B. Product Types

La C.R.I.C which imports bulk cement sells CPA-55 and CPA-45 Portland Cement in Bulk form. Macore mixes imported clinker with Pozzolana of local origin and sells cement in bulk and bag form to CPJ-35, CPJ-45 and CPA-55 standards. The Pozzolana content is up to a maximum level 35%. Further the ratio of bulk to bag sales in the case of Macore is a ratio of approximately 60 to 40 respectively. There is also a small amount of imported Bagged cement of around 5,000 tons. In addition to the ordinary Portland cement some 200 to 300 tons of special cement is imported annually.

C. Importers

Macore is the island's largest cement supplier and has a Finishing Mill with a production capacity of 400,000 tons. It also posses Bulk trucks, three distribution silos. La C.R.I.C a subsidiary of La Phage is equipped with both Bulk Cement Silo and Bagging plant facilities.

D. Purchase Method

Macore decides on a supplier for its Clinker imports once annually by tender. The main suppliers to date are South Africa, Kenya, Indonesia, France, Greece, etc. However, the cost of marine transport is an extremely important factor. Macore carries out a Charter Party Contract every two to three years by tender to choose a Clinker carrier. Generally 20,000 to 30,000 ton class carriers are employed (the harbor draft of 10.5 meters means that the maximum reception is for 30,000 ton class craft). Normal marine freight charges for clinker are 12 US$ per MT (Kenya), 14 US$ per MT per MT (South Africa), 17 US$ per MT (Europe), etc. The cost exceeds 20 US$ per MT for 8,000 tons class carriers. La C.R.I.C imports bulk cement which is unloaded into the Cement silo which is possesses in the harbor but as there is no land pump facility the unloading is done with pressure from the pump of the carrier itself.

E. Pricing

a. The Import Price in 1989 was as follows:
Clinker : C&F FF 300/MT
Bulk Cement (CPA-55) : C&F FF 564/MT

b. The ex-work price for 1989 :

| | | | |
|---|---|---|---|
| CPJ-35 | Bulk | : | FF 478.10/MT |
| CPJ-35 | Bag | : | FF 520.50/MT |
| CPJ-45 | Bulk | : | FF 504.40/MT |

Further, the FOB price of Clinker at Macore is currently about 30 US$/MT but this is estimated to be around 33-35 US$/MT in 1991.

F. Concerning New Projects

In principle Macore has expressed an interest in projects for Madagascar and depending on circumstances they will contemplates eventual investment. However, the scale of demand in Madagascar at present means that the time is not yet ripe. Further, the inadequacy of the various means of transportation between the constituent countries of the IOC is seen to make the realization of effective distribution unlikely.

G. Other Related Topics

a. Macore employs chemical gypsum imported from Europe.

b. Macore has a factory personnel of 58 employees.

2) Demand Projection

The current per capita consumption of cement in the Reunion has nearly reached a level of 600 kg which equals that fond among the advanced industrial nations with a high consumption. Incidentally, the per capita demand in France itself is rather low ranging between 400 and 440 kg. The high level is attributed to the accelerated increase in the island's population. However, in view of the present state of social infrastructures available unless industrialization progresses hereafter it is unlikely that any increase will be seen in the island's demand.

B. Demand Projection

A demand projection was carried out on the basis of the island's GDP, population, records of cement demand, etc. But the results achieved were unrealistic. Therefore it has been assumed that the per capita consumption of cement in the Reunion will be maintained at a level of 600 kg in the future.

(4) The Seychelles

The Seychelles have the fastest growing population of the IOC countries. Further, geographically this is the remotest location from Madagascar. Demand for cement in 1989 was approximately 20,000 tons making this the smallest market of the IOC countries.

In the case of this market the export of cement from the Madagascar plant would not be able to erode the geographical advantages enjoyed by exports from Kenya and in view of the small market size involved here the cornering of this market would rather represent a burden for the present project.
In view of the above therefore and given the basic assumption that the present project will be undertaken on a private enterprise footing it has been decided to abandon the Seychelles market for the time being.

The cement demand of the Seychelles is estimated to be in the region of 20,000 tons.

## 4. Cement Market in Madagascar

### (1) Current Status

#### 1) General Market Environment

As a result of structural improvements since 1986 the economy of the Republic of Madagascar has gradually recovered from the severe economic stagnation from which it suffered in the 1970s and early 1980s. During this period of stagnation the GDP per capita had sunk to a level around 200 US$. Reflecting this tight economic situation the per capita consumption of cement in the 1970s fell from a previous average level of 25 kg. to below 10 kg. (See Table III-10)

Generally speaking the demand for cement depends on the national economic development and so develops together in accordance with public government construction, investments in social infrastructure, industrial investment by the private sector, housing construction, etc. Further, cement production is itself an essential aspect to future economic development.

Demand for cement remains completely undeveloped at present in Madagascar but in view of the national potential for future economic development in the country a rapid development of demand is highly possible.

#### 2) Market Size

The current market size is for approximately 120,000 tons. The two existing plants supply the market with a total of 50,000 tons of domestically produced cement. Therefore imports account for about 70,000 tons. It is believed that there are considerable problems relating to the production cost and product quality, etc. of output of the existing plants. However, the current market size remains too small to permit the realization of a new large scale plant and the success of the economic development plan in progress in creating the desired economic expansion remains a crucial element to the outcome of this project. There is a considerable potential for national economic development in terms of territory, population and natural resources, etc. available.

3) Product Types

Cement commodities on the domestic market whether produced domestically or imported take the form of bagged cement (50 kg bags) in Madagascar. The imported products are to BS-12 specifications. Domestic products manufactured by Amboanio are to CPA-35 equivalent specifications while the specifications of Antsirabe Cement products remain unclear (CPA-30-35) though product quality is described as poor.

4) Purchase Price

Prices on the domestic market are extremely high ranging from $160 to $200 per MT. This hinders the expansion of cement demand. For reference the price on the Reunion market is $90 to $100 per MT.

(2) Cement Demand in Madagascar

Demand for cement in Madagascar over the last thirty years as shown in Table III-10 has continued to flounder at the low level of 100,000 tons per year. since this stagnation occurred parallel with increases in population over that period there has been a continuing tendency to decrease cr demand per capita. Especially in the 1980s there were several years during which this per capita demand fell below 10 kg.

On the other hand, as of 1987 the Madagascar government began to reorientate economic foundations on principles of market forces and a liberal economic system moving away from the system of internally focused state control which had been in force up to that time. Through cooperation between internal and external organizations an creditor nations a New Program (1989-91), still underway, was initiated and this has begun to produce considerable results. In general the demand for cement increases in proportion to economic activity though with a certain level of social development investment this growth begins to fall off and slow down. Of the IOC countries Mauritius and the Reunion both show signs of having entered this stage of stagnation in the growth of demand.

(3) Demand Forecast

Investment in social development is extremely belated in the case of Madagascar and so there is an extremely strong potential for an increase in demand in the event of an activation of the economy. In other words any forecast of cement demand for the country which is based on a simple extrapolation of demand figures to date is bound to produce an extremely pessimistic picture. However, if a more optimistic vision of the future is adopted in view of the economic development program now underway then the market can be said to offer considerable prospects. In particular the focus accorded to improvements in material handling systems (improvements in roads, harbors, airports, rail lines and transportation systems generally) in the economic program, together with the direct linkage with cement demand involved in the implementation of the tourism development programs are noteworthy. The improvements in material handling and transportation systems will contribute to a reduction of handling and distribution costs for cement and so in turn will reinforce an increase in cement demand.

A forecast of demand by the regression method on the basis of the above observations gives the following;

Variables : X1 = GDP per capita
X2 = Gross Domestic Investment

Regression Formular : $Y = 0.39576 + 0.009329\ X1 + 0.061190\ X2$

Cases assumed

Low case : a scenario in which the increases of the GDP growth rate and Gross Domestic Investment are set at low levels

Medium case : a scenario in which the GDP growth rate is set as an extrapolation of the economic development program now in progress and the Gross Domestic Investment is set at a medium level of 7%.
High case : a scenario in which the GDP growth rate and Gross Domestic Investment are set at a high level.

Other conditions :
It is assumed that population increase will continue at its present level of 3%. Further, due to data inadequacy the GDP has been converted at its current value to dollar terms. In any case cement demand is closely correlated to the Gross Domestic investment but has a low sensitivity to the GDP.

The following is an outline of the analysis results.

Table Forecast scenarios for Demand (growth rate in %)

| | LOW CASE | | MEDIUM CASE | | HIGH CASE | |
|---|---|---|---|---|---|---|
| | GDP | GDI | GDP | GDI | GDP | GDI |
| 1988 | 1.6 | 10.5 | 1.6 | 10.5 | 1.6 | 10.5 |
| 89 | 4.0 | 7.2 | 4.0 | 7.2 | 4.0 | 7.2 |
| 90 | 3.8* | 6.9* | 3.8* | 6.9* | 3.8* | 6.9* |
| 91 | 4.0 | 6.0 | 4.4 | 7.0 | 4.4 | 7.0 |
| 92 | 3.5 | 5.0 | 4.6 | 7.0 | 5.0 | 8.0 |
| 93 | 3.0 | 5.0 | 4.7 | 7.0 | 6.0 | 9.0 |
| 94 | 3.0 | 5.0 | 4.7 | 7.0 | 6.0 | 9.0 |
| 95 | 3.0 | 5.0 | 4.7 | 7.0 | 6.0 | 9.0 |

Note: *: Estimated

Table-3 Results of Demand Forecasts

(Unit: MT)

| | LOW CASE | MEDIUM CASE | HIGH CASE |
|---|---|---|---|
| 1990 | 120,186 | 120,186 | 120,186 |
| 1995 | 171,276 | 184,945 | 199,319 |
| 2000 | 243,931 | 287,927 | 339,187 |
| 2005 | 349,699 | 452,322 | 583,755 |
| 2010 | 504,142 | 715,826 | 1,013,512 |

Details of regression analysis and demand projections are as per Table III-11 through III-16.

(4) Forecast of Effective Demand

1) Suplyability of existing cemetn plant

There are two plants currently in operation in Madagascar with details as follows:

A. Ambaoanio Mill

a. location : Amboanio, Mahajanga

b. initiai operations : 1936

c. process employed : wet

d. design capacity : 60,000 MT/Y

e. product specification : CPA-35

f. current production scale : 20,000 T/Y

g. other information : The plant is superannuated and a remodeling of plant design capacity is not economically viable in terms of production scale. A renovation of the plant to include expansion of scale would be hindered by infrastructure conditions of the location and it is considered difficult to realize more than current production output.

B. Antsirabe Mill

a. location : Antsirabe (80 km south of Antananarivo)

b. initial operations : 1985

c. process employed : semi-dry (Shaft kiln)

d. design capacity : 120,000 MT/Y (350 MT/D)

e. product specification : CPA-30 to 35 (the market reputation is extremely low.)

f. current production scale : assumed under 30,000 T/Y

g. other information : The mill was acquired by the Prince Bassey group of Negeria in 1989. Operating rates are expectd to be raised to 100% in 1991 according to report but it is considered difficult to expand its market share against a modern large scale plant for the following reasons:

  * the raw material limestone used is of poor quality (Mg contents is as high as doromite) and product quality control is rendered difficult.

  * because of the inland location it is difficult or uneconomic to secure fuel coal (imported from South Africa) and gypsum.

  * past attempts by advisors did not improve operating rates.

  * the location is favorable for access to the capital but as shipments to other areas are by sea the site is disadvantaged.

  * the scale of production is small.

2) Approaches to a Forecast of Effective Demand

In the context of the estimates for total cement demand in Madagascar shown above in (3) it is necessary to consider how the market will be shared between the products of the existing mills and those to be produced under the present project. The following factors will need to be considered ;

a. Cement is a regional commodity by nature and so access to regions surrounding a production site means that site products are an advantage over those from other regions.

b. Does the product meet the market needs in terms of product quality?

c. The competing power of the product price.

d. The reliability of supply.

e. The scale of existing acquired markets (fixed customers)

In relation to a. and e. above the share of products sales of Antsirabe and Amboanio are focused of the Antananarivo and Mahajanga regions respectively. The breakdown of demand in these regions for the period 1983 to 1985 is as follows;

| | Antananarivo | Mahajanga | Others | Total |
|---|---|---|---|---|
| 1983 | 30.92% (22.74%) | 5.59% (1.79%) | 63.49% (17.21%) | 100.00% (41.74%) |
| 1984 | 37.08% (22.46%) | 11.36% (10.02%) | 51.56% (21.19%) | 100.00% (53.67%) |
| 1985 | 27.22% (8.91%) | 8.53% (6.85%) | 64.25% (15.28%) | 100.00% (31.04%) |

Note; figures in brackets represent the share of domestic products.

As can be seen from the above figures, the domestically manufactured products have no secured the demand of other areas. It would seem that this is because imports represent stiff competition in terms of pricing and quality. If the products of the present project can genuinely equal and match those of imports in terms of quality and price it should be possible to make inroads into the markets of the existing plants whose products would be seen to be manifestly inferior. Taking the shares of total demand accounted for by the Antsirabe and Mahajanga markets to be 35% and 15% respectively and the inroad made by the new project in each market to be a 30% share together with the total control of other regions this would give the following pattern;

| | Antananarivo | Mahajanga | Other regions | Total |
|---|---|---|---|---|
| Market share | 35% | 15% | 50% | 100% |
| Inroads made by new project | 10.5% | 4.5% | 50% | 65% |

## 5. Choice of Project Scale

### (1) Basic Thinking (Optimum Approach)

Since quantities demanded fluctuate it is necessary to develop a response which is flexible. To this end it is especially important to plan strategically exactly what supplying capacity is to be established for the production facilities and the sales approach to be adopted.

Especially in a case such as that of Madagascar which has shown a very slow development of demand to date but which could see a very rapid increase in the tempo of demand that establishment of such matters is extremely difficult. The following is a discussion of the main factors relating to this area of concern.

a. Economies of Scale for Plant

One effective means of reducing the production cost and increasing market competitiveness given the nature of cement plants is to establish a large scale of production. In addition to the fact that plant construction costs and fixed costs (labor costs, repairs, etc.) are rendered relatively cheaper per ton of output with the bigger scale this is also an effective measure with regard to variable costs or heat efficiency.

b. Operational Fluctuations

Demand of a market over a long period is to construct a plant of a scale considerably in excess of the scale demanded by the short term market conditions. The operating rate is then controlled to satisfy the demands of the market. However, this involves a heavy burden of fixed costs in the initial stage and this is obviously reflected in the production cost. It is therefore necessary to aim at overall economic viability whereby losses involved in operational excess or waste can be made up for by the economies of scale outlined in a above together with the maintenance of maximum operational levels using the export market as a buffer market.

c. Economic Viability of Expansion Projects

In terms of the economic return on production of plant a single train plant is inferior to a multiple train plant with regard to maintenance and operating rates. Therefore another method of responding to rapidly increasing demand is to undertake a series of expansions over a relatively short time period. such a response has the disadvantage of leaving plant scale on a small level and so increases the production cost. However advantages include the economic efficiency of maintenance, an easier implementation of technology, a reduction in production costs with the improvement of operating levels, the ease of introducing advanced technology, reduction of initial investment and an easier access to markets.

d. Production Flexibility of Existing Plants

Both the Antsirabe and Amboanio Plants are on a small scale. In particular the superannuation of the Amboanio Plant means that a large expansion of production in the future is very unlikely. Of course, an operational capacity in excess of 60,000 tons was achieved by this plant in the 1980s but unless considerable additional investment is carried out deficiencies of current maintenance will made it very difficult to regain such high operating levels and it is expected that production will be around 20,000 tons hereafter. On the other hand, the Antsirabe Plant is relatively new and its privatisation is expected to encourage improvements in the future. However, in terms of actual achievement the Amboanio Plant has a stabler production and technical improvements (in production control and quality control) are considered a necessary precondition to increased production at Antsirabe. The total output of the two plants during the period of operations from 1985 is indicated below.

| Year | Output (T/Y) | Avg. Operating Rate | Imports (T/Y) Content | Local Product's Share |
|---|---|---|---|---|
| 1985 | 28,383 | 15.8% | 68,940 | 29.2% |
| 1986 | 51,213 | 28.5% | 29,940 | 63.5% |
| 1987 | 44,490 | 24.7% | 24,591 | 64.4% |
| 1988 | 32,840 | 18.2% | 86,433 | 27.5% |
| 1989 | 26,111 | 14.5% | 83,951 | 23.7% |

According to certain sources improvements in production at the Antsirabe Plant since privatisation have been dramatic and it is said that it will be operating to full capacity sometime in 1990. However, there is no clear proof to this effect and such an improvement is difficult to imagine in view of past performance, the quality of raw materials and technology employed.

e. Export Market (Buffer Market) Conditions

Generally speaking, in investment intensive industries which rely principally on the economic viability of supplying the domestic market, a part of output is often exported in order to create a buffer element so that the industry can attain the necessary levels of large scale and high operating rates. In such cases, since the sales price meets much stronger competition on the export market that it does on the domestic scene the price is often held to extremely low levels. while such exports do no contribute to expand profits given that no long term contractual obligation applies, the freedom remains to suspend exports whenever supply conditions in the domestic market become tight.
So although exports on a spot basis render little benefit in production cost terms they can be expected to result in a reduction of the burden of fixed costs.

There are three products which could be exported in the case of the present project i.e. clinker, bulk cement and bagged cement. However clinker and bulk cement unlike bagged cement are not in a strong position in the case of spot trading and so these do not provide the freedom of control best suited to buffer strategies.
For shipping though bagged cement does not entail particular conditions as to the type or size of ship for transport in the case of bulk cement and clinker bulk carriers must be employed. Particularly in the

case of bulk cement the use of specialist carriers is necessary. Further, it is not easy to charter the bulk cement carriers on a CP basis so that in many cases fixed costs are incurred in the form of either a long term charter contract or in-house carriers with clinker dry bulk carriers for general use or, in the case of short distances, dry bulk barges can be uses. The eventual production scale is to be chosen in response to the demand forecast (conducted in section 2. above) taking into consideration the factors already discussed.

(2) Establishment and Comparison of Production Scale

1) Postulation of Production Scale

The fallowing scales of production based on the medium case outlined in the demand forecast of section 2 together with production output of existing plants have been evaluated below.

| Production Output of Existing Plant (Operating Rate) | Production Capacity of New Plant (1) 200,000 | (2) 300,000 | (3) 400,000 | (4) 500,000 | (5) 600,000 |
|---|---|---|---|---|---|
| A. 30,000 (17%) | A-(1) | A-(2) | A-(3) | A-(4) | A-(5) |
| B. 50,000 (28%) | B-(1) | B-(2) | B-(3) | B-(4) | B-(5) |
| C. 70,000 (39%) | C-(1) | C-(2) | C-( ) | C-(4) | C-(5) |
| D. 100,000 (56%) | D-(1) | D-(2) | D-(3) | D-(4) | D-(5) |
| E. 140,000 (78%) | E-(1) | E-(2) | E-(3) | E-(4) | E-(5) |

Note : The optimum market share of the products of existing plants is taken to be 35%.

On the basis of an evaluation of the results of the 25 cases shown above the following cases have been excluded.

a. Case A production of 30,000 tons/yr. for the exiting plants is too low and unrealistic.

b. Case E: 140,000 tons/yr. represents a 100% operating rate for the Antsirabe Mill but this has no precedent and is judged difficult to realize.

c. Case (1) : Represents a production capacity which is too small in response to the estimated domestic demand, dependence on imports would be too high.

d. Cases (4) and (5) : In both cases the production capacities are much too large for the demand forecast, there is a strong level of dependence on exports involved and profitability questionable.

Details of the studies are as per Table III-24 through III-29 and Appendix-III-1

The sensitivity analysis conducted as part of the financial analysis gave a positive result (for the risk range)for the fluctuations of production output (50,000 T/Y - 100,000 T/Y) of existing plants as postulated under the remaining seven cases. Considering the present operational situation and eventual competition with the new project, an output of 70,000 T/Y for the existing facilities is considered to have the highest probability of realization and so is used as the Base Case. Two postulate cases based on this will be examined in the following section.

These cases are:
Case A: Production Capacity 300,000 T/Y
Production of Existing Mills 70,000 T/Y

Case B: Production Capacity 400,000 T/Y
Production of Existing Mills 70,000 T/Y

Further, with regard to the scenario for economic growth employed during the projection of the forecast for domestic demand, an evaluation by sensitivity analysis will be conducted with the financial analysis.

2) Evaluation of the Postulate Cases

Case A

As can be seen from Table III-26 assuming that production starts 1997 excess production will occur for a six year period. The peak in this excess will be reached in the second year with 40% of output being exported (or 38% taking stored output into account). As a market for the export of bagged cement Comoros and Seychelles will only absorb some 70,000 tons. It is therefore necessary to focus on the export of clinker to the Reunion.

Also, in the present case there will be a shortage in supply of 125,000 tons in the tenth year of operations. If export to neighboring countries is to be considered then it will be necessary to undertake scheduling for an expansion plan to double the production starting in the seventh or eighth year of operations and have a second train mill in operation form around year 11.

Case B

As can be seen from Table III-27, there will be excess production for nine years from the first year of operations in 1997 and so export will be necessary. The peak excess will come in the second and third years of operations with 200,000 tons to be exported. Fortunately as the demand of the Reunion for Clinker is 250,000 tons a supply of 200,000 tons is considered feasible. In the present case a secondary expansion plan should be started in the tenth year after operations have commenced with a second plant beginning operations in the thirteenth year.

## 6. Marketing Plan

### (1) Transportation Situation and Costs in Madagascar

The present situation in Madagascar regarding transportation can not be described as good. Improvements can be expected however since the Economic development plan now underway includes considerable improvement of the road network.

#### A. Overland Transportation- Rail

The rail system is not very developed and the main lines in operation are as follows:

Toamasina to Moramanga- Ambatondrazaka - Ambastosoratra

Toamasina to Moramanga - Antananrivo - Antisarabe

There is also a line connecting Fianarantsoa to Manakara but the state of its operation remains unclear.

The tariffs applicable to the transportation of cement are as shown below.

| | Tariff (FMG/MT) | Estimated distance (km) | Unit Rate (FMG/MT-km) |
|---|---|---|---|
| Tanarivo-Ambatolampy | 6,700 | 68 | FMG 98.53 |
| Tanarivo-Antsirabe | 15,750 | 169 | 93.20 |
| Tanarivo-Moramanga | 12,600 | 115 | 109.57 |
| Tanarivo-Andasibe | 14,900 | 144 | 103.47 |
| Tanarivo-Toamasina | 36,200 | 369 | 98.10 |
| Tanarivo-Ambatondrazaka | 27,200 | 272 | 100.0 |
| (Average) | | | (FMG 100.48) |

As indicated above the average cost for transportation is FMG 100 per MT-km.

B. Overland Transportation - Truck

In the case of an island nation surrounded by sea such as Madagascar greater flexibility is gained by the use of coastal boats for transporting over sea around the coastal routes and using trucks for inland transportation (a similar pattern is evident in the Japanese case). In particular inland transport of goods by truck is superior in flexibility of response to rail in cases involving large transport quantities and an intricate distribution network. Trucks constitute an important means of transport in Madagascar but considerable problems are encountered in road maintenance, repairs and improvements. Nevertheless the best way of transporting cement inland remains by truck and improvements in the road system are expected in the future. Reciprocally the development of the cement project itself will have the effect of contributing and supporting the road improvements. (refer to Figure III-1).

Tariffs in the present year of 1990 for transport by truck are shown below.

| | Tariff (FMG/MT) | Distance (km) | Unit Rate (FMG/MT-Km) |
|---|---|---|---|
| Antananarivo-Fianarantsoa | 45,000 | 410 | FMG 109.76 |
| Antananarivo-Manakara | 90,000 | 646 | 139.32 |
| Antananarivo-Toliara | 95,650 | 1,305 | 73.30 |
| Antananarivo-Toamasina | 30,000 | 369 | 81.30 |
| Antananarivo-Mananjary | 60,000 | 571 | 105.08 |
| Antananarivo-Mahajanga | 30,000 | 947 | 31.68 |
| Antananarivo-Port-Berge | 50,000 | 591 | 84.60 |
| (Average) | | | (FMG 89.29) |

C. Marine Transportation

A major obstacle to the development of marine transportation in Madagascar despite the fact of being surrounded by sea is the undeveloped state of its harbors. The only harbors which are fully equipped at present besides the main harbor of Toamasina are Toliara, Mahajanga and Antsiranana. Moreover as the rail network for inland transportation is only developed in certain regions and future development is not anticipated and the future development of the inland road network needed for truck transportation will inevitably be influenced by the land conditions and development level of the regions there will be many areas where the installation of access routes will be uneconomic. Therefore, even if trucks come to play the main role in inland transportation the combination of this with marine transportation will provide the most economic organization of distribution. For distribution of the cement forming the object of the present study it is necessary to determine spheres of distribution around the major harbors by using a cost matching method applied to the various alternative routes. At present the average tariff for marine transportation is FMG 160/ cubic m per km which matches the high tariff for rail transport (FMG 100/cubic m per km). However if this rate is applied then it will cost FMG 140,000 per cubic meter for transport from Toliara to Toamasina (about 1400 km apart) while the tariff for clinker would be an unacceptable FMG 100,000/MT (66.67 US $/ MT). It seems advisable to adopt a policy of chartering foreign carriers on an exclusive basis as an exceptional measure. Incidentally, the rental fee paid by the Macore Cement Company of the Reunion for freight carriers to transport clinker is said to be 12 US $/T in Kenya, 14 US $/T in South Africa and 17 US $/T in the EC (in all cases 20,000-35,000 class carriers are employed).

(2) Transportation Strategy for the Project

A. The above completes the review of the various transport methods. Rail transport is both expensive and lacks flexibility of delivery to the destinations and loading, unloading and transfer wouid involve considerable further expense. These considerations mean that rail offers no merits as a means of transport.

Coastal boats could be used for the transport of bagged cement or clinker (case 3) but the present tariffs are too high and would prohibit employment. Therefore, if special contracts can be made with the CMN the renting of foreign craft on a long term charter base is to be carried out and operating conditions determined.

A rough estimate of the charter fees for coastal boats is provided below.

| | | |
|---|---|---|
| Bagged cement | FIO | 34-38 US $/MT |
| Clinker | FIO | 25-29 US $/MT |

Further, an ocean freight of 34-38 US $ for bagged cement matches the cost of overland transport by truck for 530-630 km so that from the Mahajanga site it would be possible to make delivery overland to the area around Antananrivo while in the case of the Toliara site it would be possible to deliver up to Fianarantsoa.

In any case provisional cost estimates for delivery up to terminal markets has not been undertaken in the present study and sales prices have been determined by matching against import articles on a C and F basis for the four main harbors in Madagascar.

The concepts for domestic distribution channels in the individual cases are shown in Figure III-2 and 3.

B. In principle exports to nearby countries will be in the form of either bagged cement or clinker. Although international distribution usually takes the form of bulk cement it has been decided to exclude this for the time being since handling is considered difficult for the following reasons.

- In the case of the Reunion and Mauritius there are no unloading facilities installed and so it would be necessary to use special carriers equipped with compression equipment.

- Even if charter of such specialist craft could be arranged it would still be necessary to reinforce the mobile equipment installed on land.

- For equipment with a 500-600 T/H loading capacity approximately 4000 kwh of electricity is consumed.

- It is possible that demand for cement in Madagascar will increase rapidly. This means that the quantity of surplus cement may vary considerably. Therefore the large variations in the annual amount exported would cause a reduction in the operating rates of equipment for product export, and if investment were made in specialist equipment for export purposes this could easily be rendered uneconomical as a consequence.

Further, because of the savings on transportation costs and paper sack expenses to be gained it will naturally become necessary to plan for the distribution of bulk cement in the long run. Nevertheless, it has been decided that the risks involved in the implementation of this are too great for the initial stages of the present project.

(3) Determining Sales Price

A. Price of Domestic Market Cement

The present price of cement which is distributed on the domestic market is 160 - 200 US $/MT (Bagged). The results for 1990 are as follows;

Sep. CIF FMG 16,000 / 50 kg Bag (213 US $/MT)
Dec. CIF FMG 12,000-13,000/ 50 kg Bag (160-173.33 US $/MT)

As mentioned in Chapter III, 2-(3) concerning recent price trends it is forecast that the trend to increased prices will continue for some years hereafter. In the case of Madagascar also the figures for 1990 prices are in a stronger position in comparison with the results for 1989 (refer to Table III-24).

The sales price structure of the Amboanio Cement Company of Mahajanga is as follows;

| | In FMG | In US $ |
|---|---|---|
| A. Ex-work Net | 225,000/MT | 150.00/MT |
| B. Loading Cost | 1,000 MT | |
| C. Sub total | 226,000 | 150.67 |
| D. TUT (A x 5%) | 11,250 | |
| E. Sales Tax (C. x 15%) | 33,900 | |
| TOTAL | 271,150/MT | 180.77/MT |

Note, product specifications are for CPA-35. From the above it is deduced that the market price for cement in Madagascar at the end of 1990 will be 180-190 US $ while the price for matching import products will be 160-170 US $/MT. However, since the above price for imported products is considered to be overpriced assumption of a Net CIF price of around 90-100 US $ is deemed appropriate. Taking the CIF price for 1991 to be 95.00 US $/MT the prices matching with import prices in each case are assumed to be as follows.

| | Ex-work Price 1991 | Ex-work Price 1997 |
|---|---|---|
| Case-1 (Toliara Mill) | | |
| Toliara : | US$ 151.40 | US$ 180.08 |
| Toamasina harbor : | US$ 121.80 | US$ 150.48 |
| Mahajanga harbor : | US$ 123.80 | US$ 152.48 |
| Antsiranana harbor: | US$ 118.80 | US$ 147.48 |
| Case-2 (Mahajanga Mill) | | |
| Mahajanga harbor : | US$ 151.40 | US$ 180.08 |
| Toamasina harbor : | US$ 121.80 | US$ 150.48 |
| Toliara harbor : | US$ 122.80 | US$ 151.48 |
| Antsiranana harbor: | US$ 126.80 | US$ 155.48 |

The breakdown of calculations is shown in Tables III-25 through III-32.

Further, the rough estimate price of plant shipments found using the relative share of manufactured product of each harbor and based on the estimated effective demand share for each plant is shown below.

| Area | Rough Estimate Demand Share |
|---|---|
| Antananarivo | 24% |
| Toamasina | 16% |
| Antsiranana | 17% |
| Fianarantsoa | 17% |
| Mahajanga | 4% |
| Toliara | 22% |
| Total | 100% |

Average ex-work estimate (1997)

A. Case-1

| | | | | |
|---|---|---|---|---|
| 180.08 | x 0.51 | = | 91.84 | |
| 150.48 | x 0.28 | = | 42.13 | |
| 152.48 | x 0.04 | = | 6.10 | |
| 147.48 | x 0.17 | = | 25.07 | |
| Total | | | US$ 165.14/MT | |

B. Case-2

| | | | |
|---|---|---|---|
| 180.08 | x 0.28 | = | 50.42 |
| 150.48 | x 0.16 | = | 24.08 |
| 151.48 | x 0.39 | = | 59.08 |
| 155.48 | x 0.17 | = | 26.43 |
| Total | | | US$ 160.01/MT |

C. Case-3 (this will vary according to the ratio of clinker)

| | | | |
|---|---|---|---|
| 180.09 | x 0.79 | = | 142.26 |
| 152.48 | x 0.04 | = | 6.10 |
| 147.48 | x 0.17 | = | 25.07 |
| Total | | | US$ 173.43/MT |

However, the transport charges for clinker are incorporated in the manufacturing cost.

B. Export Cost

Products assumed for export are clinker (only in Cases 1 and 3) and bagged cement. The market for clinker is confined to the Reunion. In principle the market for bagged cement is confined to the Comoros and the Seychelles but it is highly advisable to consider the export of bagged cement to the Reunion and Mauritius if negotiations make this feasible.

On the basis of the forecast price found in Chapter III,2-(3)the following export prices divided according to destinations have been projected in 1977.

| Bagged cement | Case 1/3<br>FOB Toliara | Case 2<br>FOB Mahajanga |
|---|---|---|
| To Comoros | US$87/MT | US$97/MT |
| To Seychelles | US$76/MT | US$81/MT |
| To the Reunion | US$80/MT | US$80/MT |
| To Mauritius | US$80/MT | US$80/MT |
| Average | US$80.75/MT | US$84.50/MT |

4) Other Marketing Conditions

A. Sales Credit

| | |
|---|---|
| Cement for Domestic Market | 30 days |
| Clinker for export | 60 days |
| Cement for export | 60 days |

B. Import Credit on Imported products 90 days

## 7. Choice of Production Plan

### (1) Quality and Specifications for Finished Product

The cement to be produced in the proposed plant will be the ordinary portland cement commonly used and must therefore meet with the cement standards set in individual countries such as France or Great Britain.

The following table indicates major international standards for ordinary portland cement.

Cement Standards

| Country | Standard | Product Name | Code | Class | Compression Strength N/mm$^2$ | | |
|---|---|---|---|---|---|---|---|
| U.S.A. | ASTM | Portland | I | | (3d) | (7d) | (28d) |
| | | | | | 12.4 | 19.3 | 27.6 |
| U.K. | BS-12 | Ordinary Portland | OP | | (3d) | | (28d) |
| | | | | | 23 | | 41 |
| France | AFNOR NF P-15 301 | Portland artificiel | CPA | | (2d) | (7d) | (28d) |
| | | | | 35 | | 10 | 35 |
| | | | | 45 | | 17.5 | 45 |
| | | | | 55 | 10 | | 55 |

Comparison of Mortar Compression Strengths (in%)
(strength conversion value N/mm$^2$)

| | 3 days | 7 days | 28 days | (28 days) |
|---|---|---|---|---|
| ASTM | 100 | 100 | 100 | (27.6) |
| BS-12 | 185 | 160 | 150 | (41.4) |
| AFNOR NF P-15 301 | 145 | 161 | 164 | (45.26) |

The above table shows a comparison of mortar compression strengths corresponding to those of the ASTM standard. A comparison of the strength on day 28 shows that cement product quality is roughly equivalent for the Type I ASTM and BS-12 OP as well as for CPA 45 of AFNOR NF P-15 301.

Appropriate standards for ordinary portland cement as a finished product are as follows:

- for export purposes production which meets CPA 55 and CPA 45 of the AFNOR (NF P-15 N301) standard for France and the bs-12 British Standard for Great Britain.

- for domestic purposes production which meets with CPA 45 of the French AFNOR (NF P-15 N301) standard.

(2) Study of Production Capacity

In view of demand estimates and results of market surveys the following two cases for a cement plant are to be evaluated:

Case A: 300,000 t/yr.
Case B: 400,000 t/yr.

As a cement supply plan for the Metropolitan area construction of a milling plant with a capacity of 150,000 tons per year (in clinker) is to be considered in view of demand estimates for the metropolitan area.

(3) Proposed Alternative Production Projects

The following three cases have been proposed in view of site conditions for plant location

Case 1: Toliara cement plant
Case 2: Mahajanga cement plant
Case 3: Toliara cement plant and Toamasina Milling Plant

| | Case 1 | Case 2 |
|---|---|---|
| Project Scheme | Complete Plant | Complete Plant |
| Project Site | TOLIARA | MAHAJANGA |
| Product | Bsgged Cement<br>Clinker | Bsgged Cement |
| Market | (Bsgged Cement)<br>Domestic Market<br>Comoros<br>Seychelles<br><br>(Clinker)<br>Reunion | (Bsgged Cement)<br>Domestic Market<br>Comoros<br>Seychelles |

| | Case 3 | |
|---|---|---|
| Project Scheme | Complete Plant | Finishing Mill Plant |
| Project Site | TOLIARA | TOAMASINA |
| Product | Bsgged Cement | Bsgged Cement |
| Market | (Bsgged Cement)<br>Domestic Market<br>Comoros<br>Seychelles<br><br>(Clinker)<br>Tamatave<br>Reunion | (Bsgged Cement)<br>Domestic Market<br>(Metropolitan Area)<br>(North East Area) |

8. Production Capacity Schedule

(Unit: 1,000 MT)

| | year 1 | year 2 | year 3 |
|---|---|---|---|
| Operation Rate | 70% | 95% | 100% |
| Case A | | | |
| Clinker production | 210 | 285 | 300 |
| Case B | | | |
| Clinker production | 280 | 380 | 400 |

Note: 300 operating days per year

Estimates for production capacity have been set a operating rates of 70% for year 1, 95% for year 2 and 100% for year 3. The actual productive output will be roughly the same as sales and operating rates will linked to market trends.

Table III-1

PRODUCTION AND SALES SCHEDULE

CASE: 1 A

PRODUCTION CAPACITY: 300000

| | UNIT | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EFFECTIVE DEMAND(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 342988 | 382322 | 425548 |
| PRODUCTION CAPACITY(CLK) | MT | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| CAPACITY UTILIZATION RATE | % | 70% | 95% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| PRODUCTION VOLUME(CLK) | MT | 210000 | 285000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| INCR. IN INVENTORY(CLK) | MT | 17500 | 6250 | 1250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL SALES VOLUME(CLK) | MT | 192500 | 278750 | 298750 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| DOMESTIC SALES VOLUME(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 312000 | 312000 | 312000 |
| EXPORT VOLUME (CMT) | MT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EXPORT VELUME (CLK) | MT | 47785 | 114405 | 112859 | 90455 | 64482 | 35958 | 4626 | 0 | 0 | 0 |
| SALES AMOUNT (DOM. CEMENT) | 1000$ | 24854 | 28226 | 31926 | 35988 | 40449 | 45348 | 50729 | 51524 | 51524 | 51524 |
| SALES AMOUNT (EXP. CEMENT) | 1000$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES AMOUNT (EXP. CLINKER) | 1000$ | 2103 | 5034 | 4966 | 3980 | 2837 | 1582 | 204 | 0 | 0 | 0 |
| TOTAL SALES AMOUNT | 1000$ | 26957 | 33259 | 36892 | 39968 | 43286 | 46930 | 50933 | 51524 | 51524 | 51524 |

Table III-2

PRODUCTION AND SALES SCHEDULE

CASE: 1 B

PRODUCTION CAPACITY: 400000

| | UNIT | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EFFECTIVE DEMAND(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 342988 | 382322 | 425548 |
| PRODUCTION CAPACITY(CLK) | MT | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| CAPACITY UTILIZATION RATE | % | 70% | 95% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| PRODUCTION VOLUME(CLK) | MT | 280000 | 380000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| INCR. IN INVENTORY(CLK) | MT | 23333 | 8333 | 1667 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL SALES VOLUME(CLK) | MT | 256667 | 371667 | 398333 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| DOMESTIC SALES VOLUME(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 342988 | 382322 | 416000 |
| EXPORT VOLUME (CMT) | MT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EXPORT VELUME (CLK) | MT | 111951 | 207321 | 212442 | 190455 | 164482 | 135958 | 104626 | 70204 | 32383 | 0 |
| SALES AMOUNT (DOM. CEMENT) | 1000$ | 24854 | 28226 | 31926 | 35988 | 40449 | 45348 | 50729 | 56641 | 63137 | 68698 |
| SALES AMOUNT (EXP. CEMENT) | 1000$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES AMOUNT (EXP. CLINKER) | 1000$ | 4926 | 9122 | 9347 | 8380 | 7237 | 5982 | 4604 | 3089 | 1425 | 0 |
| TOTAL SALES AMOUNT | 1000$ | 29780 | 37348 | 41273 | 44368 | 47686 | 51330 | 55333 | 59730 | 64561 | 68698 |

Table III-3

PRODUCTION AND SALES SCHEDULE
CASE: 2 A
PRODUCTION CAPACITY: $\boxed{300000}$

| | UNIT | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EFFECTIVE DEMAND(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 342988 | 382322 | 425548 |
| PRODUCTION CAPACITY(CLK) | MT | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| CAPACITY UTILIZATION RATE | % | 70% | 95% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| PRODUCTION VOLUME(CLK) | MT | 210000 | 285000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| INCR. IN INVENTORY(CLK) | MT | 17500 | 6250 | 1250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL SALES VOLUME(CLK) | MT | 192500 | 278750 | 298750 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| DOMESTIC SALES VOLUME(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 312000 | 312000 | 312000 |
| EXPORT VOLUME (CMT) | MT | 49696 | 118981 | 117373 | 94073 | 67061 | 37396 | 4811 | 0 | 0 | 0 |
| EXPORT VELUME (CLK) | MT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES AMOUNT (DOM. CEMENT) | 1000$ | 24082 | 27349 | 30934 | 34870 | 39193 | 43939 | 49153 | 49923 | 49923 | 49923 |
| SALES AMOUNT (EXP. CEMENT) | 1000$ | 4199 | 10054 | 9918 | 7949 | 5667 | 3160 | 407 | 0 | 0 | 0 |
| SALES AMOUNT (EXP. CLINKER) | 1000$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL SALES AMOUNT | 1000$ | 28281 | 37403 | 40852 | 42820 | 44859 | 47099 | 49560 | 49923 | 49923 | 49923 |

Table III-4

PRODUCTION AND SALES SCHEDULE

CASE: 2 B

PRODUCTION CAPACITY: 400000

| | UNIT | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EFFECTIVE DEMAND(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 342988 | 382322 | 425548 |
| PRODUCTION CAPACITY(CLK) | MT | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| CAPACITY UTILIZATION RATE | % | 70% | 95% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| PRODUCTION VOLUME(CLK) | MT | 280000 | 380000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| INCR. IN INVENTORY(CLK) | MT | 23333 | 8333 | 1667 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL SALES VOLUME(CLK) | MT | 256667 | 371667 | 398333 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| DOMESTIC SALES VOLUME(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 342988 | 382322 | 416000 |
| EXPORT VOLUME (CMT) | MT | 116429 | 215614 | 220940 | 198073 | 171061 | 141396 | 108811 | 73012 | 33678 | 0 |
| EXPORT VELUME (CLK) | MT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES AMOUNT (DOM. CEMENT) | 1000$ | 24082 | 27349 | 30934 | 34870 | 39193 | 43939 | 49153 | 54882 | 61175 | 66564 |
| SALES AMOUNT (EXP. CEMENT) | 1000$ | 9838 | 18219 | 18669 | 16737 | 14455 | 11948 | 9195 | 6170 | 2846 | 0 |
| SALES AMOUNT (EXP. CLINKER) | 1000$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL SALES AMOUNT | 1000$ | 33920 | 45568 | 49604 | 51608 | 53647 | 55887 | 58348 | 61051 | 64021 | 66564 |

Table III-5

PRODUCTION AND SALES SCHEDULE

CASE: 3 A

PRODUCTION CAPACITY: 300000

| | UNIT | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EFFECTIVE DEMAND(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 342988 | 382322 | 425548 |
| PRODUCTION CAPACITY(CLK) | MT | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| CAPACITY UTILIZATION RATE | % | 70% | 95% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| PRODUCTION VOLUME(CLK) | MT | 210000 | 285000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| INCR. IN INVENTORY(CLK) | MT | 17500 | 6250 | 1250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL SALES VOLUME(CLK) | MT | 192500 | 278750 | 298750 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| DOMESTIC SALES VOLUME(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 312000 | 312000 | 312000 |
| EXPORT VOLUME (CMT) | MT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EXPORT VELUME (CLK) | MT | 47785 | 114405 | 112859 | 90455 | 64482 | 35958 | 4626 | 0 | 0 | 0 |
| SALES AMOUNT (DOM. CEMENT) | 1000$ | 26102 | 29642 | 33529 | 37795 | 42480 | 47625 | 53276 | 54110 | 54110 | 54110 |
| SALES AMOUNT (EXP. CEMENT) | 1000$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES AMOUNT (EXP. CLINKER) | 1000$ | 2103 | 5034 | 4966 | 3980 | 2837 | 1582 | 204 | 0 | 0 | 0 |
| TOTAL SALES AMOUNT | 1000$ | 28204 | 34676 | 38494 | 41775 | 45317 | 49207 | 53479 | 54110 | 54110 | 54110 |

Table III-6

PRODUCTION AND SALES SCHEDULE

CASE: 3 B

PRODUCTION CAPACITY: 400000

| | UNIT | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EFFECTIVE DEMAND(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 342988 | 382322 | 425548 |
| PRODUCTION CAPACITY(CLK) | MT | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| CAPACITY UTILIZATION RATE | % | 70% | 95% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| PRODUCTION VOLUME(CLK) | MT | 280000 | 380000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| INCR. IN INVENTORY(CLK) | MT | 23333 | 8333 | 1667 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL SALES VOLUME(CLK) | MT | 256667 | 371667 | 398333 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| DOMESTIC SALES VOLUME(CMT) | MT | 150504 | 170919 | 193327 | 217927 | 244939 | 274604 | 307189 | 342988 | 382322 | 416000 |
| EXPORT VOLUME (CMT) | MT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EXPORT VELUME (CLK) | MT | 111951 | 207321 | 212442 | 190455 | 164482 | 135958 | 104626 | 70204 | 32383 | 0 |
| SALES AMOUNT (DOM. CEMENT) | 1000$ | 26102 | 29642 | 33529 | 37795 | 42480 | 47625 | 53276 | 59484 | 66306 | 72147 |
| SALES AMOUNT (EXP. CEMENT) | 1000$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES AMOUNT (EXP. CLINKER) | 1000$ | 4926 | 9122 | 9347 | 8380 | 7237 | 5982 | 4604 | 3089 | 1425 | 0 |
| TOTAL SALES AMOUNT | 1000$ | 31028 | 38765 | 42876 | 46175 | 49717 | 53607 | 57879 | 62573 | 67731 | 72147 |

CEMENT PRODUCTION, CONSUMPTION AND EXPORT IN THE MAJOR COUNTRIES (UNIT: 1,000 MT)

Table III - 7

| COUNTRY | ITEM | UNIT | 1977 | 1980 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CHINA | POPULATION | 1000 P'SON | 956650 | 996130 | 1033250 | 1046080 | 1059520 | 1073700 | 1088570 | 1104000 | 1119700 |
| | PRODUCTION | 1000 MT | 56000 | 73500 | 108250 | 121080 | 142221 | 161364 | 180000 | 204144 | |
| | CONSUMPTION | 1000 MT | 54450 | 72500 | 109300 | 122280 | 144221 | 163364 | 181800 | 204344 | |
| | DEMAND/CAPTA | Kg | 57 | 73 | 106 | 117 | 136 | 152 | 167 | 185 | 0 |
| | IMPORT | 1000 MT | 50 | 500 | 1500 | 1500 | 3000 | 3000 | 2000 | 1500 | |
| | EXPORT | 1000 MT | 1600 | 1500 | 450 | 300 | 1000 | 1000 | 200 | 300 | |
| U.S.S.R. | POPULATION | 1000 P'SON | 259030 | 265540 | 272540 | 275070 | 277540 | 280240 | 283100 | 283680 | 285860 |
| | PRODUCTION | 1000 MT | 127000 | 124800 | 128000 | 129850 | 131000 | 135108 | 136478 | 138100 | |
| | CONSUMPTION | 1000 MT | 124198 | 122100 | 126000 | 127900 | 129653 | 133447 | 134956 | 137000 | |
| | DEMAND/CAPTA | Kg | 479 | 460 | 462 | 465 | 467 | 476 | 477 | 483 | 0 |
| | IMPORT | 1000 MT | 636 | 400 | 250 | 550 | 989 | 1110 | 901 | 900 | |
| | EXPORT | 1000 MT | 3438 | 3100 | 2300 | 2550 | 2336 | 2771 | 2423 | 200 | |
| JAPAN | POPULATION | 1000 P'SON | 113860 | 116780 | 119310 | 120080 | 120840 | 121490 | 122090 | 122610 | 123120 |
| | PRODUCTION | 1000 MT | 75176 | 91154 | 84728 | 82288 | 76427 | 73191 | 72569 | 79084 | 81875 |
| | CONSUMPTION | 1000 MT | 69381 | 82425 | 70514 | 70657 | 67749 | 68881 | 71180 | 77518 | 78696 |
| | DEMAND/CAPTA | Kg | 609 | 706 | 591 | 588 | 561 | 567 | 583 | 632 | 639 |
| | IMPORT | 1000 MT | 0 | 0 | | 174 | 477 | 1196 | 2554 | 3601 | 3723 |
| | EXPORT | 1000 MT | 6411 | 8554 | 14183 | 11279 | 9097 | 5516 | 4283 | 4946 | 6589 |
| U.S.A. | POPULATION | 1000 P'SON | 220240 | 227700 | 234800 | 237000 | 239280 | 241620 | 243940 | 246310 | 248760 |
| | PRODUCTION | 1000 MT | 67973 | 68243 | 63885 | 70490 | 70666 | 71300 | 70941 | 69734 | 70565 |
| | CONSUMPTION | 1000 MT | 69243 | 68244 | 68529 | 76489 | 79543 | 82335 | 83404 | 84602 | 82394 |
| | DEMAND/CAPTA | Kg | 314 | 300 | 292 | 323 | 332 | 341 | 342 | 343 | 331 |
| | IMPORT | 1000 MT | 2693 | 4758 | 3868 | 7903 | 12846 | 14804 | 15946 | 15865 | 14966 |
| | EXPORT | 1000 MT | 239 | 169 | 107 | 73 | 89 | 90 | 50 | 92 | 454 |
| INDIA | POPULATION | 1000 P'SON | 625820 | 675000 | 720000 | 736000 | 750860 | 766140 | 781370 | 796600 | 811820 |
| | PRODUCTION | 1000 MT | 19084 | 17756 | 25356 | 29089 | 31750 | 33640 | 36970 | 42990 | |
| | CONSUMPTION | 1000 MT | 18277 | 19988 | 28326 | 29373 | 31250 | 33890 | 37070 | 40741 | |
| | DEMAND/CAPTA | Kg | 29 | 30 | 39 | 40 | 42 | 44 | 47 | 51 | 0 |
| | IMPORT | 1000 MT | | 2286 | 2970 | 460 | 400 | 300 | 150 | | |
| | EXPORT | 1000 MT | 807 | 54 | 0 | 30 | 30 | 50 | 50 | 31 | 0 |
| ITALY | POPULATION | 1000 P'SON | 56460 | 56430 | 56840 | 57000 | 57140 | 57250 | 57340 | 57440 | 57520 |
| | PRODUCTION | 1000 MT | 38439 | 41932 | 40175 | 38891 | 37361 | 35973 | 37008 | 38556 | |
| | CONSUMPTION | 1000 MT | 37800 | 41215 | 39730 | 38601 | 37336 | 36231 | 37392 | 40290 | |
| | DEMAND/CAPTA | Kg | 670 | 730 | 699 | 677 | 653 | 633 | 652 | 701 | 0 |
| | IMPORT | 1000 MT | 67 | 81 | 236 | 252 | 381 | 319 | 765 | 1889 | |
| | EXPORT | 1000 MT | 703 | 821 | 536 | 522 | 384 | 275 | 375 | 380 | 0 |
| KOREA | POPULATION | 1000 P'SON | 36410 | 38120 | 39910 | 40410 | 40810 | 41180 | 41570 | 41970 | 42380 |
| | PRODUCTION | 1000 MT | 14418 | 15573 | 22665 | 21829 | 21913 | 24734 | 27393 | 29955 | 31367 |
| | CONSUMPTION | 1000 MT | 11177 | 13172 | 17649 | 18506 | 18976 | 20387 | 22755 | 26202 | 28210 |
| | DEMAND/CAPTA | Kg | 307 | 346 | 442 | 458 | 465 | 495 | 547 | 624 | 666 |
| | IMPORT | 1000 MT | | 286 | | | | | | 177 | 416 |
| | EXPORT | 1000 MT | 4035 | 4351 | 5052 | 3177 | 2943 | 4405 | 4837 | 3597 | 3342 |
| FRANCE | POPULATION | 1000 P'SON | 53080 | 53880 | 54730 | 54950 | 55170 | 55390 | 55630 | 55880 | 56160 |
| | PRODUCTION | 1000 MT | 30403 | 30562 | 25817 | 24025 | 23546 | 23668 | 24121 | 26031 | 26827 |
| | CONSUMPTION | 1000 MT | 27893 | 28088 | 22859 | 21428 | 21024 | 21742 | 22359 | 24146 | 24764 |
| | DEMAND/CAPTA | Kg | 525 | 521 | 418 | 390 | 381 | 393 | 402 | 432 | 441 |
| | IMPORT | 1000 MT | 152 | 408 | 397 | 409 | 468 | 426 | 445 | 547 | 580 |
| | EXPORT | 1000 MT | 2182 | 2593 | 2946 | 2683 | 2591 | 2065 | 1945 | 2031 | 2144 |
| SPAIN | POPULATION | 1000 P'SON | 36350 | 37540 | 38180 | 38340 | 38490 | 38600 | 38700 | 38770 | 38810 |
| | PRODUCTION | 1000 MT | 29422 | 29630 | 31229 | 26643 | 24197 | 24042 | 24588 | 25776 | 28200 |
| | CONSUMPTION | 1000 MT | 21694 | 19751 | 17924 | 16186 | 16551 | 18297 | 20235 | 22671 | 26000 |
| | DEMAND/CAPTA | Kg | 597 | 526 | 469 | 422 | 430 | 474 | 523 | 585 | 670 |
| | IMPORT | 1000 MT | 77 | 191 | 30 | 55 | 6 | 68 | 457 | 1017 | 1450 |

CEMENT PRODUCTION, CONSUMPTION AND EXPORT IN THE MAJOR COUNTRIES (UNIT: 1,000 MT)

| COUNTRY | ITEM | UNIT | 1977 | 1980 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | EXPORT | 1000 MT | 7919 | 9938 | 13250 | 10439 | 7803 | 5771 | 4748 | 3970 | 4000 |
| W.GERMANY | POPULATION | 1000 P'SON | 61400 | 61540 | 61380 | 61130 | 60970 | 61010 | 61090 | 61420 | 61990 |
| | PRODUCTION | 1000 MT | 31871 | 33134 | 27874 | 26224 | 22944 | 24373 | 23081 | 24398 | 26505 |
| | CONSUMPTION | 1000 MT | 31022 | 32500 | 27712 | 26170 | 22802 | 24371 | 23183 | 24194 | 25727 |
| | DEMAND/CAPTA | Kg | 505 | 528 | 451 | 428 | 374 | 399 | 379 | 394 | 415 |
| | IMPORT | 1000 MT | 1184 | 1650 | 1920 | 1860 | 1767 | 1814 | 1830 | 2029 | 2200 |
| | EXPORT | 1000 MT | 2217 | 1763 | 1712 | 1623 | 1496 | 1380 | 1271 | 1708 | 2131 |
| TAIWAN | POPULATION | 1000 P'SON | 16793 | 17641 | 18603 | 18865 | 19132 | 19363 | 19558 | 19781 | 20008 |
| | PRODUCTION | 1000 MT | 10334 | 14062 | 15763 | 14279 | 14451 | 14808 | 15648 | 17281 | 18043 |
| | CONSUMPTION | 1000 MT | 8791 | 13326 | 10974 | 10662 | 10639 | 11329 | 12653 | 14028 | 16255 |
| | DEMAND/CAPTA | Kg | 523 | 755 | 590 | 565 | 556 | 585 | 647 | 709 | 812 |
| | IMPORT | 1000 MT | | | | | | | | 161 | 380 |
| | EXPORT | 1000 MT | 1561 | 638 | 3799 | 3559 | 3928 | 3599 | 3773 | 3400 | 2230 |
| ENGLAND | POPULATION | 1000 P'SON | 55850 | 56330 | 56350 | 56460 | 56620 | 56760 | 56930 | 57070 | 57200 |
| | PRODUCTION | 1000 MT | 16054 | 14916 | 13457 | 13552 | 13403 | 13465 | 14200 | 16506 | 17000 |
| | CONSUMPTION | 1000 MT | 14498 | 14287 | 13548 | 13855 | 13720 | 13829 | 15000 | 17738 | 19400 |
| | DEMAND/CAPTA | Kg | 260 | 254 | 240 | 245 | 242 | 244 | 263 | 311 | 339 |
| | IMPORT | 1000 MT | 54 | 73 | 401 | 481 | 582 | 511 | 850 | 2652 | 4700 |
| | EXPORT | 1000 MT | 1700 | 1050 | 340 | 193 | 153 | 86 | 100 | 80 | 0 |
| INDONESIA | POPULATION | 1000 P'SON | 140710 | 147490 | 158080 | 161580 | 164630 | 168350 | 172010 | 175590 | 179140 |
| | PRODUCTION | 1000 MT | 2678 | 5831 | 8102 | 8850 | 9905 | 11322 | 11395 | 13415 | 15659 |
| | CONSUMPTION | 1000 MT | 3188 | 5448 | 8455 | 8381 | 9174 | 9530 | 11500 | 10840 | 11412 |
| | DEMAND/CAPTA | Kg | 23 | 37 | 53 | 52 | 56 | 57 | 67 | 62 | 64 |
| | IMPORT | 1000 MT | 510 | 127 | 610 | 24 | | | | | 0 |
| | EXPORT | 1000 MT | 0 | 461 | 211 | 404 | 881 | 1743 | 1800 | 3136 | 4112 |
| GREECE | POPULATION | 1000 P'SON | 9270 | 9640 | 9850 | 9900 | 9930 | 9970 | 9980 | 10010 | 10020 |
| | PRODUCTION | 1000 MT | 10467 | 12560 | 14032 | 13460 | 13520 | 13159 | 12975 | 12902 | 12400 |
| | CONSUMPTION | 1000 MT | 5915 | 6731 | 6257 | 6118 | 5925 | 6126 | 6036 | 6515 | 6970 |
| | DEMAND/CAPTA | Kg | 638 | 698 | 635 | 618 | 597 | 614 | 605 | 651 | 696 |
| | IMPORT | 1000 MT | 1 | | 6 | | | | | | 0 |
| | EXPORT | 1000 MT | 4442 | 5833 | 7765 | 7332 | 7571 | 7025 | 7018 | 6248 | 5400 |
| TOTAL | POPULATION | 1000 P'SON | 2641923 | 2759761 | 2873823 | 2912865 | 2950932 | 2991063 | 3031878 | 3071131 | 3112488 |
| | PRODUCTION | 1000 MT | 529319 | 573653 | 609333 | 620550 | 633304 | 660147 | 687367 | 738872 | 328441 |
| | CONSUMPTION | 1000 MT | 497527 | 539775 | 567777 | 586606 | 608563 | 643759 | 679523 | 730829 | 319828 |
| | DEMAND/CAPTA | Kg | 188 | 196 | 198 | 201 | 206 | 215 | 224 | 238 | 103 |
| | IMPORT | 1000 MT | 5424 | 10760 | 12188 | 13668 | 20916 | 23548 | 25898 | 30338 | 28415 |
| | EXPORT | 1000 MT | 37254 | 40825 | 52651 | 44164 | 40302 | 35776 | 32873 | 30119 | 30402 |
| WORLD TOTAL | POPULATION | 1000 P'SON | | 4450000 | 4685000 | 4760000 | 4837000 | 4917000 | | 5112000 | |
| | PRODUCTION | 1000 MT | 801155 | 881123 | 917100 | 937150 | 952500 | 998450 | 1051043 | 1112550 | |
| | CONSUMPTION | 1000 MT | 790606 | 871775 | 918000 | 935250 | 951700 | 997300 | 1050795 | 1109800 | |
| | DEMAND/CAPTA | Kg | | 196 | 196 | 196 | 197 | 203 | | 217 | |
| | IMPORT | 1000 MT | 53664 | 65556 | 77800 | 72900 | 68200 | 64800 | 62221 | 64300 | |
| | EXPORT | 1000 MT | 58375 | 66507 | 77950 | 72300 | 68700 | 65500 | 61987 | 64900 | 0 |

Table III - 8

## OPERATIONAL RATE OF CEMENT MILLS IN MAJOR COUNTRIES

| COUNTRY | | | 1985 | 1986 | 1987 | 1988 | 1989 | GROWTH RATE |
|---|---|---|---|---|---|---|---|---|
| U.S.A. | NOS. OF MILL | | 124 | 122 | 121 | 122 | 125 | 0.20% |
| | CAPACITY(CLK) | MT | 80500 | 80500 | 78800 | 78000 | 78000 | -0.79% |
| | PRODUCTION | MT | 70651 | 71459 | 70926 | 69718 | 70565 | -0.03% |
| | OPERAT'L RATE | % | 87.77% | 88.77% | 90.01% | 89.38% | 90.47% | 0.76% |
| W. GERMANY | NOS. OF MILL | | 46 | 46 | 46 | 46 | 46 | 0.00% |
| | CAPACITY(CLK) | MT | 39600 | 39600 | 38800 | 38800 | 36700 | -1.88% |
| | PRODUCTION | MT | 22944 | 24373 | 23018 | 24398 | 26505 | 3.67% |
| | OPERAT'L RATE | % | 57.94% | 61.55% | 59.32% | 62.88% | 72.22% | 5.66% |
| FRANCE | NOS. OF MILL | | 39 | 39 | 36 | 36 | 35 | -2.67% |
| | CAPACITY(CLK) | MT | 23060 | 23000 | 23400 | 22360 | 23400 | 0.37% |
| | PRODUCTION | MT | 23546 | 23668 | 24121 | 26031 | 26827 | 3.32% |
| | OPERAT'L RATE | % | 102.11% | 102.90% | 103.08% | 116.42% | 114.65% | 2.94% |
| ENGLAND | NOS. OF MILL | | 20 | 20 | 21 | 21 | 21 | 1.23% |
| | CAPACITY(CLK) | MT | 14070 | 14350 | 14700 | 14700 | 14700 | 1.10% |
| | PRODUCTION | MT | 13403 | 13465 | 14311 | 16506 | 17000 | 6.12% |
| | OPERAT'L RATE | % | 95.26% | 93.83% | 97.35% | 112.29% | 115.65% | 4.97% |
| GREECE | NOS. OF MILL | | 8 | 8 | 8 | 8 | 8 | 0.00% |
| | CAPACITY(CLK) | MT | 16200 | 16200 | 16200 | 16200 | 15600 | -0.94% |
| | PRODUCTION | MT | 13520 | 13159 | 12975 | 12902 | 12400 | -2.14% |
| | OPERAT'L RATE | % | 83.46% | 81.23% | 80.09% | 79.64% | 79.49% | -1.21% |
| SPAIN | NOS. OF MILL | | 45 | 45 | 43 | 43 | 43 | -1.13% |
| | CAPACITY(CLK) | MT | 35870 | 35870 | 34600 | 34600 | 34600 | -0.90% |
| | PRODUCTION | MT | 24197 | 24042 | 24588 | 25776 | 28200 | 3.90% |
| | OPERAT'L RATE | % | 67.46% | 67.03% | 71.06% | 74.50% | 81.50% | 4.84% |
| KOREA | NOS. OF MILL | | 10 | 10 | 10 | 10 | 10 | 0.00% |
| | CAPACITY(CLK) | MT | 25400 | 29860 | 29860 | 30213 | 30553 | 4.73% |
| | PRODUCTION | MT | 21948 | 24734 | 27392 | 29955 | 31366 | 9.34% |
| | OPERAT'L RATE | % | 86.41% | 82.83% | 91.73% | 99.15% | 102.66% | 4.40% |
| TAIWAN | NOS. OF MILL | | 18 | 16 | 16 | 16 | 16 | -2.90% |
| | CAPACITY(CLK) | MT | 18680 | 21722 | 21892 | 22148 | 22148 | 4.35% |
| | PRODUCTION | MT | 14411 | 14770 | 15648 | 17281 | 18043 | 5.78% |
| | OPERAT'L RATE | % | 77.15% | 68.00% | 71.48% | 78.03% | 81.47% | 1.37% |
| INDONESIA | NOS. OF MILL | | 10 | 10 | 10 | 10 | 10 | 0.00% |
| | CAPACITY(CLK) | MT | 17410 | 17410 | 17410 | 17410 | 17410 | 0.00% |
| | PRODUCTION | MT | 9805 | 11322 | 12323 | 13212 | 15659 | 12.42% |
| | OPERAT'L RATE | % | 56.32% | 65.03% | 70.78% | 75.89% | 89.94% | 12.42% |
| JAPAN | NOS. OF MILL | | 45 | 42 | 41 | 41 | 41 | -2.30% |
| | CAPACITY(CLK) | MT | 104333 | 97981 | 97981 | 97880 | 87808 | -4.22% |
| | PRODUCTION | MT | 76428 | 73191 | 72569 | 79084 | 81875 | 1.74% |
| | OPERAT'L RATE | % | 73.25% | 74.70% | 74.06% | 80.80% | 93.24% | 6.22% |
| TOTAL | NOS. OF MILL | | 4015 | 3938 | 3872 | 3883 | 3905 | -0.69% |
| | CAPACITY(CLK) | MT | 4126353 | 4141423 | 4110073 | 4035421 | 3970109 | -0.96% |
| | PRODUCTION | MT | 3199383 | 3236013 | 3276581 | 3463493 | 3612840 | 3.09% |
| | OPERAT'L RATE | % | 77.54% | 78.14% | 79.72% | 84.57% | 91.00% | 4.08% |

Table III - 9

## CEMENT PRICES IN THE MAJOR COUNTRIES

| COUNTRY | 1985 (US$/MT) | 1986 (US$/MT) | 1987 (US$/MT) | 1988 (US$/MT) | 1989 (US$/MT) | GRADE | NOTE |
|---|---|---|---|---|---|---|---|
| U.S.A. | 70.44 | 70.46 | 70.54 | 74.97 | 73.21 | ORDINARY | Incl. imported cement |
| W. GERMANY | 57.27 | 74.13 | 91.21 | 83.83 | 72.96 | COMPOUND | |
| FRANCE | 45.23 | 55.31 | 69.48 | 62.50 | 58.58 | COMPOUND | Ex-factory price |
| ENGLAND | 65.91 | 67.27 | 99.16 | 92.98 | 76.92 | ORDINARY | |
| GREEK | 28.40 | 33.99 | 43.03 | 47.54 | 40.95 | ORDINARY | Ex-factory price |
| SPAIN | 51.90 | 59.44 | 74.77 | 86.56 | 81.97 | COMPOUND | Ex-factory price |
| KOREA | 50.78 | 52.12 | 56.54 | 64.70 | 66.05 | ORDINARY | |
| TAIWAN | 64.46 | 58.02 | 73.68 | 84.48 | 91.05 | ORDIANRY | |
| INDONESIA | 52.44 | 49.36 | 52.12 | 51.13 | 56.02 | ORDINARY | |
| JAPAN | 66.33 | 84.22 | 105.26 | 101.03 | 83.16 | ORDINARY | |
| AVERAGE | 55.32 | 60.43 | 73.58 | 74.97 | 70.09 | | |

Table III - 10

COUNTRY : MAURITIUS

| YEAR | POPULATION (1000) | GDP (MILL.RP) | GDP PER CAPITA (RP) | CEMENT DEMAND (MT) | DEMAND PER CAPITA (KG) |
|---|---|---|---|---|---|
| 1978 | 934 | 7,837 | 8,395 * | 294,644 | 315.6 |
| 1979 | 950 | 8,124 | 8,552 * | 294,538 | 310.1 |
| 1980 | 966 | 7,389 | 7,648 * | 292,317 | 302.6 |
| 1981 | 981 | 7,827 | 7,983 * | 198,195 | 202.1 |
| 1982 | 993 | 8,256 | 8,318 * | 210,466 | 212.1 |
| 1983 | 1,002 | 8,337 | 8,323 * | 224,417 | 224.0 |
| 1985 | 1,020 | 9,322 | 9,137 * | 221,503 | 217.1 |
| 1986 | 1,030 | 10,136 | 9,846 * | 260,815 | 253.3 |
| 1987 | 1,040 | 10,992 | 10,566 * | 292,920 | 281.6 |
| 1988 | 1,053 | 11,002 | 10,447 | 346,837 | 329.3 |
| 1989 | 1,064 | N.A. | N.A. | 388,789 | 365.5 |
| 1990 | 1,077 | N.A. | N.A. | 455,561 | 423.0 |

RESULT OF REGRESSION ANALYSIS

| | | |
|---|---|---|
| Y-INTERCEPT : | | 504.1277574 |
| Y-STANDARD ERROR : | | 34.68507789 |
| CORRERATION COEFFICIENT : | | 0.752684365 |
| NUMBER OF SAMPLES : | | 9 |
| DEGREE OF FREEDOM : | | 6 |
| | X1 | X2 |
| X-PARAMETER : | -0.04950660 | 0.071803105 |
| X-P/M STDRD ERROR | 0.022858104 | 0.025713191 |

Table III - 11

## CEMENT DEMAND PROJECTION : MAURITIUS

| | X1 GDP | X2 GDI | Y DEMAND PER CAPITA | POPULATION | DEMAND (MT) |
|---|---|---|---|---|---|
| 1978 | 8,395 | 2966 | 315.6 | 934 | 294644 |
| 1979 | 8,552 | 3108 | 310.1 | 950 | 294538 |
| 1980 | 7,648 | 1803 | 302.6 | 966 | 292317 |
| 1981 | 7,983 | 2207 | 202.1 | 981 | 198195 |
| 1982 | 8,318 | 1838 | 212.1 | 993 | 210466 |
| 1983 | 8,323 | 1810 | 224.0 | 1,002 | 224417 |
| 1984 | 9,137 | 2321 | 217.1 | 1,020 | 221503 |
| 1985 | 9,846 | 3076 | 253.3 | 1,030 | 260815 |
| 1986 | 10,566 | 4282 | 281.6 | 1,040 | 292920 |
| 1987 | 10,447 | 4483 | 329.3 | 1,053 | 346837 |
| 1988 | 10,704 | 4694 | 365.5 | 1,064 | 388789 |
| 1989 | 10,967 | 4914 | 423.0 | 1,077 | 455561 |
| 1990 | 11,237 | 5145 | 317.2 | 1,091 | 346137 |
| 1991 | 11,514 | 5387 | 320.9 | 1,105 | 354723 |
| 1992 | 11,797 | 5640 | 325.1 | 1,120 | 364010 |
| 1993 | 12,087 | 5905 | 329.7 | 1,134 | 374056 |
| 1994 | 12,384 | 6182 | 334.9 | 1,149 | 384924 |
| 1995 | 12,689 | 6472 | 340.7 | 1,164 | 396679 |
| 1996 | 13,001 | 6776 | 347.1 | 1,180 | 409395 |
| 1997 | 13,320 | 7095 | 354.1 | 1,195 | 423146 |
| 1998 | 13,648 | 7428 | 361.8 | 1,211 | 438015 |
| 1999 | 13,984 | 7777 | 370.2 | 1,227 | 454090 |
| 2000 | 14,328 | 8142 | 379.4 | 1,243 | 471465 |
| 2001 | 14,680 | 8524 | 389.4 | 1,259 | 490241 |
| 2002 | 15,041 | 8925 | 400.3 | 1,275 | 510525 |
| 2003 | 15,411 | 9344 | 412.1 | 1,292 | 532432 |
| 2004 | 15,790 | 9783 | 424.9 | 1,309 | 556087 |
| 2005 | 16,178 | 10242 | 438.6 | 1,326 | 581620 |
| 2006 | 16,576 | 10723 | 453.5 | 1,343 | 609173 |
| 2007 | 16,984 | 11227 | 469.5 | 1,361 | 638896 |
| 2008 | 17,402 | 11755 | 486.6 | 1,379 | 670950 |
| 2009 | 17,830 | 12307 | 505.1 | 1,397 | 705508 |
| 2010 | 18,268 | 12885 | 524.9 | 1,415 | 742752 |
| 2011 | 18,717 | 13490 | 546.1 | 1,434 | 782880 |

Table III - 12

COUNTRY : COMOROS

| YEAR | POPULATION (1000) | GNP (MILL.$) | GNP PER CAPITA ($) | CEMENT DEMAND (MT) | DEMAND PER CAPITA (KG) |
|---|---|---|---|---|---|
| 1978 | 319 | 67 | 210 | 799 | 2.5 |
| 1979 | 326 | 85 | 260 | 10020 | 30.7 |
| 1980 | 333 | 113 | 340 | 11130 | 33.4 |
| 1981 | 345 | 131 | 380 | 22250 | 64.5 |
| 1982 | 357 | 125 | 350 | 21530 | 60.3 |
| 1983 | 369 | 122 | 330 | 25070 | 67.9 |
| 1984 | 382 | 118 | 310 | 21690 | 56.8 |
| 1985 | 395 | 119 | 300 | 25900 | 65.6 |
| 1986 | 409 | 131 | 320 | 26565 | 65.0 |
| 1987 | 424 | 157 | 370 | 25745 | 60.7 |
| 1988 | N.A. | N.A. | N.A. | 37394 | N.A. |
| 1989 | N.A. | N.A. | N.A. | 13170 | N.A. |
| 1990 | N.A. | N.A. | N.A. | 30390 | N.A. |
| 1991 | | | | 31301 | |
| 1992 | | | | 32554 | |
| 1993 | | | | 33856 | |
| 1994 | | | | 35210 | |
| 1995 | | | | 36619 | |

NOTE: Cement demand from 1991 through 1995 are projected by the Ministry of Planning.

RESULT OF REGRESSION ANALYSIS

Y-INTERCEPT : -3252.75942

Y-STANDARD ERROR : 6867.547181

CORRERATION COEFFICIENT : 0.757341703

NUMBER OF SUMPLES : 18

DEGREE OF FREEDOM : 16

X-PARAMETER : 69.99216055

X-P/M STDRD ERROR 15.08770610

Table III - 13

## CEMENT DEMAND PROJECTION : COMOROS

| | X GNP PER CAPITA (US$) | Y DEMAND PER CAPITA (KG) | POPULATION (1000 PRSN) | CEMENT DEMAND (MT) |
|---|---|---|---|---|
| 1978 | 210 | 2.5 | 319 | 799 |
| 1979 | 260 | 30.7 | 326 | 10020 |
| 1980 | 340 | 33.4 | 333 | 11130 |
| 1981 | 380 | 64.5 | 345 | 22250 |
| 1982 | 350 | 60.3 | 357 | 21530 |
| 1983 | 330 | 67.9 | 369 | 25070 |
| 1984 | 310 | 56.8 | 382 | 21690 |
| 1985 | 300 | 65.6 | 395 | 25900 |
| 1986 | 320 | 65.0 | 409 | 26565 |
| 1987 | 370 | 60.7 | 424 | 25745 |
| 1988 | 394 | 61.7 | 438 | 27017 |
| 1989 | 420 | 62.2 | 452 | 28113 |
| 1990 | 447 | 62.7 | 466 | 29236 |
| 1991 | 476 | 63.2 | 481 | 30389 |
| 1992 | 507 | 63.6 | 497 | 31572 |
| 1993 | 540 | 64.0 | 513 | 32787 |
| 1994 | 575 | 64.3 | 529 | 34034 |
| 1995 | 612 | 64.7 | 546 | 35316 |
| 1996 | 652 | 65.0 | 564 | 36633 |
| 1997 | 694 | 65.3 | 582 | 37987 |
| 1998 | 739 | 65.6 | 600 | 39378 |
| 1999 | 787 | 65.9 | 620 | 40809 |
| 2000 | 839 | 66.1 | 640 | 42281 |
| 2001 | 893 | 66.3 | 660 | 43796 |
| 2002 | 951 | 66.6 | 681 | 45354 |
| 2003 | 1013 | 66.8 | 703 | 46957 |
| 2004 | 1079 | 67.0 | 726 | 48608 |
| 2005 | 1149 | 67.2 | 749 | 50307 |
| 2006 | 1223 | 67.3 | 773 | 52056 |
| 2007 | 1303 | 67.5 | 798 | 53858 |
| 2008 | 1387 | 67.6 | 824 | 55713 |
| 2009 | 1477 | 67.8 | 850 | 57624 |
| 2010 | 1573 | 67.9 | 877 | 59593 |
| 2011 | 1676 | 68.1 | 906 | 61622 |

Table III - 14

COUNTRY : REUNION

| YEAR | POPULATION | GDP (MILL.FF) | GDP PER CAPITA (FF) | CEMENT DEMAND (MT) | DEMAND PER CAPITA (KG) |
|---|---|---|---|---|---|
| 1978 | | | | 159583 | |
| 1979 | | | | 149581 | |
| 1980 | | | | 190619 | |
| 1981 | 512100 | 10128 | 19777 | 153281 | 299.3 |
| 1982 | 517100 | 12286 | 23759 | 190173 | 367.8 |
| 1983 | 523900 | 13675 | 26102 | 233151 | 445.0 |
| 1984 | 533800 | 15493 | 29024 | 187403 | 351.1 |
| 1985 | 542300 | 15782 | 29102 | 211583 | 390.2 |
| 1986 | 560000 | 17093 | 30523 | 216800 | 387.1 |
| 1987 | 569600 | 17454 | 30643 | 294988 | 517.9 |
| 1988 | 578500 | 19141 | 33087 | 308675 | 533.6 |
| 1989 | 588000 | | | 351382 | 597.6 |
| 1990 | | | | | |
| | 1.017425969 | 1.095195275 | 1.076285470 | *1.074392553 | 1.090268788 |

NOTE: Cement demand from 1982 through 1989 are calculated as 1.04 times of the imported clinker plus imported bulk cement.

RESULT OF REGRESSION ANALYSIS

| | |
|---|---|
| Y-INTERCEPT : | 92.16454672 |
| Y-STANDARD ERROR : | 56.74483519 |
| CORRERATION COERRICIENT : | 0.764787217 |
| NUMBER OF SAMPLES : | 8 |
| DEGREE OF FREEDOM : | 6 |

X-PARAMETER : 0.021103652

X-P/M STDRD ERROR 0.007258017

Table III - 15

COUNTRY : SEYCHELLES

| YEAR | POPULATION (1000) | GDP (MILL.$) | GDP PER CAPITA ($) | CEMENT DEMAND (MT) | DEMAND PER CAPITA (KG) |
|---|---|---|---|---|---|
| 1978 | 61 | 74 | 1208 | 15000 | 245.9 |
| 1979 | 62 | 108 | 1742 | 13000 | 209.7 |
| 1980 | 63 | 131 | 2086 | 16000 | 254.0 |
| 1981 | 63 | 146 | 2325 | | 0.0 |
| 1982 | 64 | 155 | 2426 | | 0.0 |
| 1983 | 64 | 157 | 2450 | | 0.0 |
| 1984 | 65 | 160 | 2455 | | 0.0 |
| 1985 | 65 | 172 | 2653 | | 0.0 |
| 1986 | 66 | 188 | 2854 | | 0.0 |
| 1987 | 66 | 221 | 3353 | 20000 | 303.0 |
| 1988 | N.A. | N.A. | N.A. | 21000 | N.A. |
| 1989 | N.A. | N.A. | N.A. | N.A. | N.A. |
| 1990 | N.A. | N.A. | N.A. | N.A. | N.A. |

III - 16 HISTORICAL CEMENT PRODUCTION AND DEMAND IN MADAGASCAR

| (1) YEAR | (2) PRODUCTION (MT) | (3) IMPORTATION (MT) | (4) TOTAL (MT) | (5) CONSUMPTION (MT) | (6) INVENTORY EXP.(MT) | (7) POPULATION (1000) | (8) CONSUMPTION PER CAPITA (Kg) |
|---|---|---|---|---|---|---|---|
| 1960 | 19100 | 81200 | 100300 | 100000 | 8120 | | N.A. |
| 1961 | 21300 | 80100 | 101400 | 101000 | 8520 | | N.A. |
| 1962 | 14800 | 100400 | 115200 | 119000 | 4720 | | N.A. |
| 1963 | 41500 | 84000 | 125500 | 126000 | 4220 | | N.A. |
| 1964 | 40300 | 71500 | 111800 | 112000 | 4020 | | N.A. |
| 1965 | 39491 | 79620 | 119111 | 119000 | 4131 | 6023 | 19.8 |
| 1966 | 50332 | 65970 | 116302 | 116000 | 4433 | | N.A. |
| 1967 | 60845 | 50245 | 111090 | 111000 | 4523 | 6307 | 17.6 |
| 1968 | 67743 | 60678 | 128421 | 128000 | 4944 | 6452 | 19.8 |
| 1969 | 75445 | 63545 | 138990 | 141000 | 2934 | 6600 | 21.4 |
| 1970 | 75216 | 72680 | 147896 | 148000 | 2830 | 6752 | 21.9 |
| 1971 | 76930 | 93206 | 170136 | 170000 | 2966 | 6909 | 24.6 |
| 1972 | 64178 | 61632 | 125810 | 126000 | 2776 | 7071 | 17.8 |
| 1973 | 69864 | 43496 | 113360 | 113000 | 3136 | 7240 | 15.6 |
| 1974 | 61447 | 26891 | 88338 | 88000 | 3474 | 7417 | 11.9 |
| 1975 | 58021 | 50986 | 109007 | 109000 | 3481 | 7604 | 14.3 |
| 1976 | 69904 | 23892 | 93796 | 94000 | 3277 | 7801 | 12.0 |
| 1977 | 52229 | 38473 | 90702 | 91000 | 2979 | 8010 | 11.4 |
| 1978 | 66044 | 48706 | 114750 | 115000 | 2729 | 8231 | 14.0 |
| 1979 | 63052 | 46565 | 109617 | 110000 | 2346 | 8465 | 13.0 |
| 1780 | 60050 | 73945 | 133995 | 134000 | 2341 | 8714 | 15.4 |
| 1981 | 35796 | 103557 | 139353 | 139000 | 2694 | 8978 | 15.5 |
| 1982 | 35921 | 84245 | 120166 | 120000 | 2860 | 9260 | 13.0 |
| 1983 | 36237 | 53343 | 89580 | 92000 | 440 | 9558 | 9.6 |
| 1984 | 36850 | 41822 | 78672 | 79000 | 112 | 9875 | 8.0 |
| 1985 | 28383 | 68940 | 97323 | 76000 | 21435 | 10212 | 7.4 |
| 1986 | 51213 | 29447 | 80660 | 80660 | 21435 | 10551 | 7.6 |
| 1987 | 44490 | 24591 | 69081 | 69081 | 21435 | 10894 | 6.3 |
| 1988 | 32820 | 86433 | 119253 | 119253 | 21435 | 11240 | 10.6 |
| 1989 | 26111 | 83951 | 110062 | 110062 | 21435 | 11600 | 9.5 |

III - 17 REGRESSION ANALYSIS FOR CEMENT DEMAND PROJECTION (SCENARIO-LO)

| | CEMENT CONSUMP'N (MT) | POPULATION (PERSON) | PERCAPITA CONSUMP'N Y (Kg) | GDP CURRENT (MILL. MFG) | EXCHANGE RATE (MFG/US$) | GDP IN US$ (1000 US$) | PERCAPITA GDP (US$) | GROSS DOMESTIC INVESTMENT (BILL. MFG) | Y-Ye | (Y-Ye) (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 109,617 | 8,465,000 | 12.9 | 595,100 | 201.00 | 2,960,697 | 350 | 170.65 | -1.15 | 91.84 |
| 1980 | 128,592 | 8,714,000 | 14.8 | 689,800 | 225.80 | 3,054,916 | 351 | 162.40 | 1.15 | 108.48 |
| 1982 | 77,839 | 9,260,000 | 8.4 | 996,100 | 367.71 | 2,708,928 | 293 | 92.75 | -0.39 | 95.52 |
| 1983 | 87,666 | 9,558,000 | 9.2 | 1,220,900 | 492.16 | 2,480,697 | 260 | 91.76 | 0.74 | 108.78 |
| 1984 | 78,672 | 9,875,000 | 8.0 | 1,369,100 | 658.02 | 2,080,636 | 211 | 96.38 | -0.29 | 96.46 |
| 1985 | 97,323 | 10,212,000 | 9.5 | 1,553,400 | 635.79 | 2,443,260 | 239 | 98.27 | 0.89 | 110.29 |
| 1986 | 80,660 | 10,551,000 | 7.6 | 1,817,000 | 769.81 | 2,360,323 | 224 | 97.60 | -0.81 | 90.42 |
| 1987 | 69,081 | 10,894,000 | 6.3 | 2,225,000 | 1,234.30 | 1,802,641 | 165 | 100.77 | -1.76 | 78.23 |
| 1988 | 119,253 | 11,240,000 | 10.6 | 2,722,000 | 1,526.40 | 1,783,281 | 159 | 111.32 | 1.92 | 122.13 |
| 1989 | 110,062 | 11,600,000 | 9.5 | 3,142,000 | 1,532.50 | 2,050,245 | 177 | 119.34 | 0.14 | 101.51 |
| 1990 | 115,000 | 11,948,000 | 9.6 | 3,611,000 | 1,518.76 | 2,377,598 | 199 | 127.59 | -0.43 | 95.68 |

RESULT OF REGRESSION ANALYSIS

| | | |
|---|---|---|
| Y- INTERCEPT : | | 0.39575772 |
| Y- STNADARD ERROR : | | 1.22008423 |
| CORRELATION COEFFICIENT : | | 0.89043811 |
| NUMBER OF SAMPLES : | | 11 |
| DEGREE OF FREEDOM : | | 8 |
| | X1 | X2 |
| X- PARAMETER : | 0.009329 | 0.06118965 |
| X- P/M STANDARD ERRO | 0.007014 | 0.01721472 |

III - 18 DEMAND PROJECTION
(LOW GROWTH SCENARIO)

| | PERCAPITA CONSUMPTION Ye (Kg) | TOTAL DEMAND (MT) | GDP G.RATE (%) | G.INV. G.RATE (%) |
|---|---|---|---|---|
| 1979 | 14.10 | 119,363 | | |
| 1980 | 13.60 | 118,542 | | -4.8% |
| 1982 | 8.80 | 81,491 | | -18.1% |
| 1983 | 8.43 | 80,592 | | -1.1% |
| 1984 | 8.26 | 81,556 | | 5.0% |
| 1985 | 8.64 | 88,241 | | 2.0% |
| 1986 | 8.45 | 89,207 | | -6.8% |
| 1987 | 8.11 | 88,302 | 1.7% | 3.3% |
| 1988 | 8.69 | 97,644 | 1.6% | 10.5% |
| 1989 | 9.35 | 108,426 | 4.0% | 7.2% |
| 1990 | 10.06 | 120,186 | 3.8% | 6.9% |
| 1991 | 10.55 | 129778 | 4.0% | 6.0% |
| 1992 | 10.97 | 139032 | 3.5% | 5.0% |
| 1993 | 11.41 | 148994 | 3.5% | 5.0% |
| 1994 | 11.88 | 159722 | 3.5% | 5.0% |
| 1995 | 12.37 | 171276 | 3.5% | 5.0% |
| 1996 | 12.88 | 183722 | 3.5% | 5.0% |
| 1997 | 13.42 | 197130 | 3.5% | 5.0% |
| 1998 | 13.98 | 211578 | 3.5% | 5.0% |
| 1999 | 14.57 | 227149 | 3.5% | 5.0% |
| 2000 | 15.19 | 243931 | 3.5% | 5.0% |
| 2001 | 15.84 | 262022 | 3.5% | 5.0% |
| 2002 | 16.53 | 281527 | 3.5% | 5.0% |
| 2003 | 17.24 | 302558 | 3.5% | 5.0% |
| 2004 | 18.00 | 325238 | 3.5% | 5.0% |
| 2005 | 18.79 | 349699 | 3.5% | 5.0% |
| 2006 | 19.62 | 376084 | 3.5% | 5.0% |
| 2007 | 20.49 | 404547 | 3.5% | 5.0% |
| 2008 | 21.40 | 435255 | 3.5% | 5.0% |
| 2009 | 22.36 | 468388 | 3.5% | 5.0% |
| 2010 | 23.36 | 504142 | 3.5% | 5.0% |
| 2011 | 24.42 | 542728 | 3.5% | 5.0% |

III - 19 REGRESSION ANALYSIS FOR CEMENT DEMAND PROJECTION (SCENARIO-MED)

| | CEMENT CONSUMP'N (MT) | POPULATION (PERSON) | PERCAPITA CONSUMP'N (Kg) | GDP CURRENT (MILL. MFG) | EXCHANGE RATE (MFG/US$) | GDP IN US$ (1000 US$) | PERCAPITA GDP (US$) | GROSS DOMESTIC INVESTMENT (BILL. MFG) | Y-Yc | (Y-Yc) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 109,617 | 8,465,000 | 12.9 | 595,100 | 201.00 | 2,960,697 | 350 | 170.65 | -1.15 | 91.84 |
| 1980 | 128,592 | 8,714,000 | 14.8 | 689,800 | 225.80 | 3,054,916 | 351 | 162.40 | 1.15 | 108.48 |
| 1982 | 77,839 | 9,260,000 | 8.4 | 996,100 | 367.71 | 2,708,928 | 293 | 92.75 | -0.39 | 95.52 |
| 1983 | 87,666 | 9,558,000 | 9.2 | 1,220,900 | 492.16 | 2,480,697 | 260 | 91.76 | 0.74 | 108.78 |
| 1984 | 78,672 | 9,875,000 | 8.0 | 1,369,100 | 658.02 | 2,080,636 | 211 | 96.38 | -0.29 | 96.46 |
| 1985 | 97,323 | 10,212,000 | 9.5 | 1,553,400 | 635.79 | 2,443,260 | 239 | 98.27 | 0.89 | 110.29 |
| 1986 | 80,660 | 10,551,000 | 7.6 | 1,817,000 | 769.81 | 2,360,323 | 224 | 97.60 | -0.81 | 90.42 |
| 1987 | 69,081 | 10,894,000 | 6.3 | 2,225,000 | 1,234.30 | 1,802,641 | 165 | 100.77 | -1.76 | 78.23 |
| 1988 | 119,253 | 11,240,000 | 10.6 | 2,722,000 | 1,526.40 | 1,783,281 | 159 | 111.32 | 1.92 | 122.13 |
| 1989 | 110,062 | 11,600,000 | 9.5 | 3,142,000 | 1,532.50 | 2,050,245 | 177 | 119.34 | 0.14 | 101.51 |
| 1990 | 115,000 | 11,948,000 | 9.6 | 3,611,000 | 1,518.76 | 2,377,598 | 199 | 127.59 | -0.43 | 95.68 |

RESULT OF REGRESSION ANALYSIS

| | | |
|---|---|---|
| Y- INTERCEPT : | | 0.39575772 |
| Y- STANDARD ERROR : | | 1.22008423 |
| CORRELATION COEFFICIENT : | | 0.89043811 |
| NUMBER OF SAMPLES : | | 11 |
| DEGREE OF FREEDOM : | | 8 |
| | X1 | X2 |
| X- PARAMETER : | 0.009329 | 0.06118965 |
| X- STANDARD ERROR : | 0.007014 | 0.01721472 |

III - 20 DEMAND PROJECTION
(MEDIUM GROWTH SCENARIO)

| | PERCAPITA CONSUMPTION (Kg) | TOTAL DEMAND (MT) | GDP G.RATE (%) | G.INV. G.RATE (%) |
|---|---|---|---|---|
| 1979 | 14.10 | 119,363 | | |
| 1980 | 13.60 | 118,542 | | |
| 1982 | 8.80 | 81,491 | | |
| 1983 | 8.43 | 80,592 | | |
| 1984 | 8.26 | 81,556 | | |
| 1985 | 8.64 | 88,241 | | |
| 1986 | 8.45 | 89,207 | | |
| 1987 | 8.11 | 88,302 | 1.7% | 3.3% |
| 1988 | 8.69 | 97,644 | 1.6% | 10.5% |
| 1989 | 9.35 | 108,426 | 4.0% | 7.2% |
| 1990 | 10.06 | 120,186 | 3.8% | 6.9% |
| 1991 | 10.63 | 130,828 | 4.4% | 7.0% |
| 1992 | 11.24 | 142,535 | 4.6% | 7.0% |
| 1993 | 11.90 | 155,392 | 4.7% | 7.0% |
| 1994 | 12.60 | 169,487 | 4.7% | 7.0% |
| 1995 | 13.35 | 184,945 | 4.7% | 7.0% |
| 1996 | 14.15 | 201,901 | 4.7% | 7.0% |
| 1997 | 15.01 | 220,504 | 4.7% | 7.0% |
| 1998 | 15.92 | 240,919 | 4.7% | 7.0% |
| 1999 | 16.89 | 263,327 | 4.7% | 7.0% |
| 2000 | 17.93 | 287,927 | 4.7% | 7.0% |
| 2001 | 19.04 | 314,939 | 4.7% | 7.0% |
| 2002 | 20.23 | 344,604 | 4.7% | 7.0% |
| 2003 | 21.50 | 377,189 | 4.7% | 7.0% |
| 2004 | 22.85 | 412,988 | 4.7% | 7.0% |
| 2005 | 24.30 | 452,322 | 4.7% | 7.0% |
| 2006 | 25.85 | 495,548 | 4.7% | 7.0% |
| 2007 | 27.50 | 543,058 | 4.7% | 7.0% |
| 2008 | 29.27 | 595,282 | 4.7% | 7.0% |
| 2009 | 31.15 | 652,697 | 4.7% | 7.0% |
| 2010 | 33.17 | 715,826 | 4.7% | 7.0% |
| 2011 | 35.33 | 785,245 | 4.7% | 7.0% |

III - 21 REGRESSION ANALYSIS FOR CEMENT DEMAND (SCENARIO-HI)

| | CEMENT CONSUMP'N (MT) | POPULATION (PERSON) | PERCAPITA CONSUMP'N (Kg) | GDP CURRENT (MILL. MFG) | EXCHANGE RATE (MFG/US$) | GDP IN US$ (1000 US$) | PERCAPITA GDP (US$) | GROSS DOMESTIC INVESTMENT (BILL. MFG) | Y-Ye | (Y-Ye) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1979 | 109,617 | 8,465,000 | 12.9 | 595,100 | 201.00 | 2,960,697 | 350 | 170.65 | -1.15 | 91.84 |
| 1980 | 128,592 | 8,714,000 | 14.8 | 689,800 | 225.80 | 3,054,916 | 351 | 162.40 | 1.15 | 108.48 |
| 1982 | 77,839 | 9,260,000 | 8.4 | 996,100 | 367.71 | 2,708,928 | 293 | 92.75 | -0.39 | 95.52 |
| 1983 | 87,666 | 9,558,000 | 9.2 | 1,220,900 | 492.16 | 2,480,697 | 260 | 91.76 | 0.74 | 108.78 |
| 198[illegible] | 78,672 | 9,875,000 | 8.0 | 1,369,100 | 658.02 | 2,080,636 | 211 | 96.38 | -0.29 | 96.46 |
| 1985 | 97,323 | 10,212,000 | 9.5 | 1,553,400 | 635.79 | 2,443,260 | 239 | 98.27 | 0.89 | 110.29 |
| 1986 | 80,660 | 10,551,000 | 7.6 | 1,817,000 | 769.81 | 2,360,323 | 224 | 97.60 | -0.81 | 90.[illegible] |
| 1987 | 69,081 | 10,894,000 | 6.3 | 2,225,000 | 1,234.30 | 1,802,641 | 165 | 100.77 | -1.76 | 78.23 |
| 1988 | 119,253 | 11,240,000 | 10.6 | 2,722,000 | 1,526.40 | 1,783,281 | 159 | 111.32 | 1.92 | 122.13 |
| 1989 | 110,062 | 11,600,000 | 9.5 | 3,142,000 | 1,532.50 | 2,050,245 | 177 | 119.34 | 0.14 | 101.51 |
| 1990 | 115,000 | 11,948,000 | 9.6 | 3,611,000 | 1,518.76 | 2,377,598 | 199 | 127.59 | -0.43 | 95.68 |

RESULT OF REGRESSION ANALYSIS

| | | |
|---|---|---|
| Y- INTERCEPT : | | 0.39575772 |
| Y- STANDARD ERROR : | | 1.22008423 |
| CORRELATION COEFFICIENT : | | 0.89043811 |
| NUMBER OF SAMPLES : | | 11 |
| DEGREE OF FREEDOM : | | 8 |
| | X1 | X2 |
| X- PARAMETER : | 0.009329 | 0.06118965 |
| X- P/M STANDARD ERRO | 0.007014 | 0.01721472 |

## III - 22 DEMAND PROJECTION (HIGH GROWTH SENARIO)

| | PERCAPITA CONSUMPTION (Kg) | TOTAL DEMAND (MT) | GDP G.RATE (%) | G.INV. G.RATE (%) |
|---|---|---|---|---|
| 1979 | 14.10 | 119,363 | | |
| 1980 | 13.60 | 118,542 | | |
| 1982 | 8.80 | 81,491 | | |
| 1983 | 8.43 | 80,592 | | |
| 1984 | 8.26 | 81,556 | | |
| 1985 | 8.64 | 88,241 | | |
| 1986 | 8.45 | 89,207 | | |
| 1987 | 8.11 | 88,302 | 1.7% | 3.3% |
| 1988 | 8.69 | 97,644 | 1.6% | 10.5% |
| 1989 | 9.35 | 108,426 | 4.0% | 7.2% |
| 1990 | 10.06 | 120,186 | 3.8% | 6.9% |
| 1991 | 10.71 | 131,811 | 4.5% | 8.0% |
| 1992 | 11.51 | 145,847 | 5.0% | 9.0% |
| 1993 | 12.39 | 161,752 | 6.0% | 9.0% |
| 1994 | 13.35 | 179,502 | 6.0% | 9.0% |
| 1995 | 14.39 | 199,319 | 6.0% | 9.0% |
| 1996 | 15.52 | 221,450 | 6.0% | 9.0% |
| 1997 | 16.75 | 246,172 | 6.0% | 9.0% |
| 1998 | 18.09 | 273,796 | 6.0% | 9.0% |
| 1999 | 19.54 | 304,670 | 6.0% | 9.0% |
| 2000 | 21.12 | 339,187 | 6.0% | 9.0% |
| 2001 | 22.84 | 377,784 | 6.0% | 9.0% |
| 2002 | 24.71 | 420,953 | 6.0% | 9.0% |
| 2003 | 26.74 | 469,246 | 6.0% | 9.0% |
| 2004 | 28.95 | 523,282 | 6.0% | 9.0% |
| 2005 | 31.36 | 583,755 | 6.0% | 9.0% |
| 2006 | 33.98 | 651,444 | 6.0% | 9.0% |
| 2007 | 36.82 | 727,223 | 6.0% | 9.0% |
| 2008 | 39.92 | 812,072 | 6.0% | 9.0% |
| 2009 | 43.30 | 907,090 | 6.0% | 9.0% |
| 2010 | 46.97 | 1,013,512 | 6.0% | 9.0% |
| 2011 | 50.96 | 1,132,722 | 6.0% | 9.0% |

## III - 23 CEMENT CONSUMPTION OF EACH PROVINCE IN 1983 - 1985

| | CONSUMPTION 1983 (MT) | SHARE (%) | CONSUMPTION 1984 (MT) | SHARE (%) | CONSUMPTION 1985 (MT) | SHARE (%) |
|---|---|---|---|---|---|---|
| ANTANANARIVO | | | | | | |
| LOCAL | 13,893 | | 11,828 | | 5,292 | |
| IMPORTED | 5,000 | | 7,695 | | 10,864 | |
| TOTAL | 18,893 | 30.9% | 19,523 | 37.1% | 16,156 | 27.2% |
| FIANARANTSOA | | | | | | |
| LOCAL | 2,536 | | 3,255 | | 1,932 | |
| IMPORTED | 0 | | 3,400 | | 9,869 | |
| TOTAL | 2,536 | 4.2% | 6,655 | 12.6% | 11,801 | 19.9% |
| TOAMASINA | | | | | | |
| LOCAL | 1,852 | | 3,082 | | 3,690 | |
| IMPORTED | 7,950 | | 3,900 | | 1,570 | |
| TOTAL | 9,802 | 16.0% | 6,982 | 13.3% | 5,260 | 8.9% |
| MAHAJANGA | | | | | | |
| LOCAL | 1,091 | | 5,275 | | 4,064 | |
| IMPORTED | 2,320 | | 705 | | 1,000 | |
| TOTAL | 3,411 | 5.6% | 5,980 | 11.4% | 5,064 | 8.5% |
| TOLIARY | | | | | | |
| LOCAL | 4,020 | | 1,875 | | 1,522 | |
| IMPORTED | 13,074 | | 4,500 | | 9,650 | |
| TOTAL | 17,094 | 28.0% | 6,375 | 12.1% | 11,172 | 18.8% |
| ANTSIRANANA | | | | | | |
| LOCAL | 2,109 | | 3,332 | | 1,936 | |
| IMPORTED | 7,250 | | 3,800 | | 8,000 | |
| TOTAL | 9,359 | 15.3% | 7,132 | 13.5% | 9,936 | 16.7% |
| TOTAL | | | | | | |
| LOCAL | 25,501 | | 28,647 | | 18,436 | |
| IMPORTED | 35,594 | | 24,000 | | 40,953 | |
| TOTAL | 61,095 | 100.0% | 52,647 | 100.0% | 59,389 | 100.0% |

SOURCE: Ministry of Commerce, Service and Distribution Department.

III - 24 PRODUCTION AND SALES SCHEDULE
CASE : LOW CASE
LOCAL SUPPLY : 70,000 MT/Y
PRODUCTION CAPACITY: 300,000 MT/Y

| | | TOTAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 197,130 | 68,996 | 128,135 | 210,000 | 81,866 | 81,866 | 38.98% |
| 2. | 1998 | 211,578 | 70,000 | 141,578 | 285,000 | 143,422 | 143,422 | 50.32% |
| 3. | 1999 | 227,149 | 70,000 | 157,149 | 300,000 | 142,851 | 142,851 | 47.62% |
| 4. | 2000 | 243,931 | 70,000 | 173,931 | 300,000 | 126,069 | 126,069 | 42.02% |
| 5. | 2001 | 262,022 | 70,000 | 192,022 | 300,000 | 107,978 | 107,978 | 35.99% |
| 6. | 2002 | 281,527 | 70,000 | 211,527 | 300,000 | 88,473 | 88,473 | 29.49% |
| 7. | 2003 | 302,558 | 70,000 | 232,558 | 300,000 | 67,442 | 67,442 | 22.48% |
| 8. | 2004 | 325,238 | 70,000 | 255,238 | 300,000 | 44,762 | 44,762 | 14.92% |
| 9. | 2005 | 349,699 | 70,000 | 279,699 | 300,000 | 20,301 | 20,301 | 6.77% |
| 10. | 2006 | 376,084 | 70,000 | 306,084 | 300,000 | -6,084 | 0 | 0.00% |
| 11. | 2007 | 404,547 | 70,000 | 334,547 | 300,000 | -34,547 | 0 | 0.00% |
| 12. | 2008 | 435,255 | 70,000 | 365,255 | 300,000 | -65,255 | 0 | 0.00% |
| 13. | 2009 | 468,388 | 70,000 | 398,388 | 300,000 | -98,388 | 0 | 0.00% |
| 14. | 2010 | 504,142 | 70,000 | 434,142 | 300,000 | -134,142 | 0 | 0.00% |
| 15. | 2011 | 542,728 | 70,000 | 472,728 | 300,000 | -172,728 | 0 | 0.00% |
| TOTAL | | 5131976 | 1048996 | 4082981 | 4395000 | 312020 | 823164 | 18.73% |

III - 25 PRODUCTION AND SALES SCHEDULE
CASE : LOW CASE
LOCAL SUPPLY : 70,000 MT/Y
PRODUCTION CAPACITY: 400,000 MT/Y

| | | TOTAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 197,130 | 68,996 | 128,135 | 280,000 | 151,866 | 151,366 | 54.24% |
| 2. | 1998 | 211,578 | 70,000 | 141,578 | 380,000 | 238,422 | 238,422 | 62.74% |
| 3. | 1999 | 227,149 | 70,000 | 157,149 | 400,000 | 242,851 | 242,851 | 60.71% |
| 4. | 2000 | 243,931 | 70,000 | 173,931 | 400,000 | 226,069 | 226,069 | 56.52% |
| 5. | 2001 | 262,022 | 70,000 | 192,022 | 400,000 | 207,978 | 207,978 | 51.99% |
| 6. | 2002 | 281,527 | 70,000 | 211,527 | 400,000 | 188,473 | 188,473 | 47.12% |
| 7. | 2003 | 302,558 | 70,000 | 232,558 | 400,000 | 167,442 | 167,442 | 41.86% |
| 8. | 2004 | 325,238 | 70,000 | 255,238 | 400,000 | 144,762 | 144,762 | 36.19% |
| 9. | 2005 | 349,699 | 70,000 | 279,699 | 400,000 | 120,301 | 120,301 | 30.08% |
| 10. | 2006 | 376,084 | 70,000 | 306,084 | 400,000 | 93,916 | 93,916 | 23.48% |
| 11. | 2007 | 404,547 | 70,000 | 334,547 | 400,000 | 65,453 | 65,453 | 16.36% |
| 12. | 2008 | 435,255 | 70,000 | 365,255 | 400,000 | 34,745 | 34,745 | 8.69% |
| 13. | 2009 | 468,388 | 70,000 | 398,388 | 400,000 | 1,612 | 1,612 | 0.40% |
| 14. | 2010 | 504,142 | 70,000 | 434,142 | 400,000 | -34,142 | 0 | 0.00% |
| 15. | 2011 | 542,728 | 70,000 | 472,728 | 400,000 | -72,728 | 0 | 0.00% |
| TOTAL | | 5131976 | 1048996 | 4082981 | 5860000 | 1777020 | 1883890 | 32.15% |

III - 26 PRODUCTION AND SALES SCHEDULE
CASE : MEDIUM CASE
LOCAL SUPPLY : 70,000 MT/Y
PRODUCTION CAPACITY: 300,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 70,000 | 150,504 | 210,000 | 59,496 | 59,496 | 28.33% |
| 2. | 1998 | 240,919 | 70,000 | 170,919 | 285,000 | 114,081 | 114,081 | 40.03% |
| 3. | 1999 | 263,327 | 70,000 | 193,327 | 300,000 | 106,673 | 106,673 | 35.56% |
| 4. | 2000 | 287,927 | 70,000 | 217,927 | 300,000 | 82,073 | 82,073 | 27.36% |
| 5. | 2001 | 314,939 | 70,000 | 244,939 | 300,000 | 55,061 | 55,061 | 18.35% |
| 6. | 2002 | 344,604 | 70,000 | 274,604 | 300,000 | 25,396 | 25,396 | 8.47% |
| 7. | 2003 | 377,189 | 70,000 | 307,189 | 300,000 | -7,189 | 0 | 0.00% |
| 8. | 2004 | 412,988 | 70,000 | 342,988 | 300,000 | -42,988 | 0 | 0.00% |
| 9. | 2005 | 452,322 | 70,000 | 382,322 | 300,000 | -82,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 70,000 | 425,548 | 300,000 | -125,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 70,000 | 473,058 | 300,000 | -173,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 70,000 | 525,282 | 300,000 | -225,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 70,000 | 582,697 | 300,000 | -282,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 70,000 | 645,826 | 300,000 | -345,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 70,000 | 715,245 | 300,000 | -415,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1050000 | 5652375 | 4395000 | -1257375 | 442780 | 10.07% |

III - 27 PRODUCTION AND SALES SCHEDULE
CASE : MEDIUM CASE
LOCAL SUPPLY : 70,000 MT/Y
PRODUCTION CAPACITY: 400,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 70,000 | 150,504 | 280,000 | 129,496 | 129,496 | 46.25% |
| 2. | 1998 | 240,919 | 70,000 | 170,919 | 380,000 | 209,081 | 209,081 | 55.02% |
| 3. | 1999 | 263,327 | 70,000 | 193,327 | 400,000 | 206,673 | 206,673 | 51.67% |
| 4. | 2000 | 287,927 | 70,000 | 217,927 | 400,000 | 182,073 | 182,073 | 45.52% |
| 5. | 2001 | 314,939 | 70,000 | 244,939 | 400,000 | 155,061 | 155,061 | 38.77% |
| 6. | 2002 | 344,604 | 70,000 | 274,604 | 400,000 | 125,396 | 125,396 | 31.35% |
| 7. | 2003 | 377,189 | 70,000 | 307,189 | 400,000 | 92,811 | 92,811 | 23.20% |
| 8. | 2004 | 412,988 | 70,000 | 342,988 | 400,000 | 57,012 | 57,012 | 14.25% |
| 9. | 2005 | 452,322 | 70,000 | 382,322 | 400,000 | 17,678 | 17,678 | 4.42% |
| 10. | 2006 | 495,548 | 70,000 | 425,548 | 400,000 | -25,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 70,000 | 473,058 | 400,000 | -73,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 70,000 | 525,282 | 400,000 | -125,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 70,000 | 582,697 | 400,000 | -182,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 70,000 | 645,826 | 400,000 | -245,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 70,000 | 715,245 | 400,000 | -315,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1050000 | 5652375 | 5860000 | 207625 | 1175281 | 20.06% |

III - 28 PRODUCTION AND SALES SCHEDULE
CASE : HIGH CASE
LOCAL SUPPLY : 70,000 MT/Y
PRODUCTION CAPACITY: 300,000 MT/Y

| | | TOTAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 246,172 | 70,000 | 176,172 | 210,000 | 33,828 | 33,828 | 16.11% |
| 2. | 1998 | 273,796 | 70,000 | 203,796 | 285,000 | 81,204 | 81,204 | 28.49% |
| 3. | 1999 | 304,670 | 70,000 | 234,670 | 300,000 | 65,330 | 65,330 | 21.78% |
| 4. | 2000 | 339,187 | 70,000 | 269,187 | 300,000 | 30,813 | 30,813 | 10.27% |
| 5. | 2001 | 377,784 | 70,000 | 307,784 | 300,000 | -7,784 | 0 | 0.00% |
| 6. | 2002 | 420,953 | 70,000 | 350,953 | 300,000 | -50,953 | 0 | 0.00% |
| 7. | 2003 | 469,246 | 70,000 | 399,246 | 300,000 | -99,246 | 0 | 0.00% |
| 8. | 2004 | 523,282 | 70,000 | 453,282 | 300,000 | -153,282 | 0 | 0.00% |
| 9. | 2005 | 583,755 | 70,000 | 513,755 | 300,000 | -213,755 | 0 | 0.00% |
| 10. | 2006 | 651,444 | 70,000 | 581,444 | 300,000 | -281,444 | 0 | 0.00% |
| 11. | 2007 | 727,223 | 70,000 | 657,223 | 300,000 | -357,223 | 0 | 0.00% |
| 12. | 2008 | 812,072 | 70,000 | 742,072 | 300,000 | -442,072 | 0 | 0.00% |
| 13. | 2009 | 907,090 | 70,000 | 837,090 | 300,000 | -537,090 | 0 | 0.00% |
| 14. | 2010 | 1,013,512 | 70,000 | 943,512 | 300,000 | -643,512 | 0 | 0.00% |
| 15. | 2011 | 1,132,722 | 70,000 | 1,062,722 | 300,000 | -762,722 | 0 | 0.00% |
| TOTAL | | 8782908 | 1050000 | 7732908 | 4395000 | -3337908 | 211175 | 4.80% |

III - 29 PRODUCTION AND SALES SCHEDULE

CASE : HIGH CASE

LOCAL SUPPLY : 70,000 MT/Y

PRODUCTION CAPACITY: 400,000 MT/Y

| | | TOTAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 246,172 | 70,000 | 176,172 | 280,000 | 103,828 | 103,828 | 37.08% |
| 2. | 1998 | 273,796 | 70,000 | 203,796 | 380,000 | 176,204 | 176,204 | 46.37% |
| 3. | 1999 | 304,670 | 70,000 | 234,670 | 400,000 | 165,330 | 165,330 | 41.33% |
| 4. | 2000 | 339,187 | 70,000 | 269,187 | 400,000 | 130,813 | 130,813 | 32.70% |
| 5. | 2001 | 377,784 | 70,000 | 307,784 | 400,000 | 92,216 | 92,216 | 23.05% |
| 6. | 2002 | 420,953 | 70,000 | 350,953 | 400,000 | 49,047 | 49,047 | 12.26% |
| 7. | 2003 | 469,246 | 70,000 | 399,246 | 400,000 | 754 | 754 | 0.19% |
| 8. | 2004 | 523,282 | 70,000 | 453,282 | 400,000 | -53,282 | 0 | 0.00% |
| 9. | 2005 | 583,755 | 70,000 | 513,755 | 400,000 | -113,755 | 0 | 0.00% |
| 10. | 2006 | 651,444 | 70,000 | 581,444 | 400,000 | -181,444 | 0 | 0.00% |
| 11. | 2007 | 727,223 | 70,000 | 657,223 | 400,000 | -257,223 | 0 | 0.00% |
| 12. | 2008 | 812,072 | 70,000 | 742,072 | 400,000 | -342,072 | 0 | 0.00% |
| 13. | 2009 | 907,090 | 70,000 | 837,090 | 400,000 | -437,090 | 0 | 0.00% |
| 14. | 2010 | 1,013,512 | 70,000 | 943,512 | 400,000 | -543,512 | 0 | 0.00% |
| 15. | 2011 | 1,132,722 | 70,000 | 1,062,722 | 400,000 | -662,722 | 0 | 0.00% |
| TOTAL | | 8782908 | 1050000 | 7732908 | 5860000 | -1872908 | 718192 | 12.26% |

III - 30

TABLE IMPORTED CEMENT PRICE IN MADAGASCAR
(C&F MADAGASCAR PORT)

| Exporter | Year | Price | | US$/MT | NOTE | |
|---|---|---|---|---|---|---|
| USSR | 1988 | FF | 747 | 115.72 | | |
| KENYA | 1986 | FF | 638 | 98.24 | | |
| INDONESIA | 1986 | FF | 849 | 131.53 | | |
| MOZAMBIQUE | 1986 | FF | 549 | 85.05 | | |
| NGWANE | 1986 | FF | 534 | 82.73 | FMG/FF | 100.28 |
| (AVE.) | 1986 | FF | 758 | 117.43 | TOTAL MT | 29447 |
| | | | | | | |
| NGWANE | 1987 | FF | 374 | 70.04 | | |
| MOZAMBIQUE | 1987 | FF | 351 | 65.73 | | |
| KENYA | 1987 | FF | 380 | 71.16 | | |
| INDONESIA | 1987 | FF | 448 | 83.9 | FMG/FF | 184.2 |
| (AVE.) | 1987 | FF | 493 | 92.32 | TOTAL MT | 24591 |
| | | | | | | |
| INDONESIA | 1988 | FF | 418 | 68.99 | | |
| MALAYSIA | 1988 | FF | 372 | 61.4 | | |
| TANZANIA | 1988 | FF | 381 | 62.88 | | |
| USSR | 1988 | FF | 570 | 94.07 | FMG/FF | 235.8 |
| (AVE.) | 1988 | FF | 488 | 80.54 | TOTAL MT | 74375 |
| | | | | | | |
| MOZAMBIQUE | 1989 | FF | 399 | 68.94 | | |
| TANZANIA | 1989 | FF | 430 | 74.29 | | |
| RDA | 1989 | FF | 575 | 99.34 | | |
| ALBANIA | 1989 | FF | 440 | 76.02 | | |
| IRAN | 1989 | FF | 411 | 71.01 | | |
| INDONESIA | 1989 | FF | 499 | 86.21 | | |
| HONGKONG | 1989 | FF | 403 | 69.63 | FMG/FF | 251.36 |
| (AVE.) | 1989 | FF | 470 | 81.2 | TOTAL MT | 79804 |
| | | | | | | |
| | SEP.'90 | FMG | 16000 | 213.33 | 50KG BAG | |
| | DEC.'90 | FMG | 13000 | 173.33 | 50KG BAG | |
| | | FMG | 12000 | 160.00 | 50KG BAG | |

## III-31 PRICE MECHANISM AND SELLING PRICE ESTIMATION

DESTINATION: TOLIARA (CASE:1 )

| IMPORTED PRICE | RATES OF COSTS | COSTS US$/MT | ACCUMURT'D PRICE US$/MT |
|---|---|---|---|
| (1) IMPORT PRICE (C&F) | | 113.00 | 113.00 |
| (2) UNLOADING/TRANSACTION | (1)x8% | 9.04 | 122.04 |
| (3) PORT TAX | (1)x15% | 16.95 | 138.99 |
| (4) MARINE INSUR'CE PREM'M | 0.3% | 0.37 | 139.36 |
| (5) TUT | 15% | 20.90 | 160.27 |
| (6) SUB-TOTAL | | 160.27 | 160.27 |
| (7) BANK CHARGE (L/C ETC.) | 3.0% | 3.39 | 163.66 |
| (8) IMPORTING EXPENSES | 10.0% | 16.37 | 180.02 |
| (9) IMPORTER'S MARGIN | 20.0% | 36.00 | 216.03 |
| (10) INVENTORY COST | 3.2% | 6.91 | 222.94 |
| (11) LOSS AND DAMAGE | 1.0% | 2.16 | 225.10 |
| **LOCAL PRODUCT PRICE** | | | |
| (12) EX-WORK PRICE | US$/MT | | 225.10 |
| (13) LOADING ON TRUCK | US$/MT | 0.00 | 225.10 |
| (14) TRUCKING TO PORT | US$/MT | 0.00 | 225.10 |
| (15) LOADING COST | US$/MT | 0.00 | 225.10 |
| (16) COASTAL FREIGHT | US$/MT | 0.00 | 225.10 |
| (17) UNLOADING COST | US$/MT | 0.00 | 225.10 |
| (18) SALES TAX | 15% | 33.77 | 191.34 |
| (19) TUT | 5% | 11.26 | 180.08 |

SALES PRICE : US$ 180.08 /MT
(EX-WORKS)

III-32 PRICE MECHANISM AND SELLING PRICE ESTIMATION

DESTINATION: MAHAJANGA (CASE: 1 )

| | IMPORTED PRICE | RATES OF COSTS | COSTS US$/MT | ACCUMURT'D PRICE US$/MT |
|---|---|---|---|---|
| (1) | IMPORT PRICE (C&F) | | 113.00 | 113.00 |
| (2) | UNLOADING/TRANSACTION | (1)x8% | 9.04 | 122.04 |
| (3) | PORT TAX | (1)x15% | 16.95 | 138.99 |
| (4) | MARINE INSUR'CE PREM'M | 0.3% | 0.37 | 139.36 |
| (5) | TUT | 15% | 20.90 | 160.27 |
| (6) | SUB-TOTAL | | 160.27 | 160.27 |
| (7) | BANK CHARGE (L/C ETC.) | 3.0% | 3.39 | 163.66 |
| (8) | IMPORTING EXPENSES | 10.0% | 16.37 | 180.02 |
| (9) | IMPORTER'S MARGIN | 20.0% | 36.00 | 216.03 |
| (10) | INVENTORY COST | 3.2% | 6.91 | 222.94 |
| (11) | LOSS AND DAMAGE | 1.0% | 2.16 | 225.10 |
| | LOCAL PRODUCT PRICE | | | |
| (12) | EX-WORK PRICE | US$/MT | | 225.10 |
| (13) | LOADING ON TRUCK | US$/MT | 1.00 | 224.10 |
| (14) | TRUCKING TO PORT | US$/MT | 0.00 | 224.10 |
| (15) | LOADING COST | US$/MT | 5.00 | 219.10 |
| (16) | COASTAL FREIGHT | US$/MT | 23.00 | 196.10 |
| (17) | UNLOADING COST | US$/MT | 6.00 | 190.10 |
| (18) | SALES TAX | 15% | 28.22 | 161.89 |
| (19) | TUT | 5% | 9.41 | 152.48 |

SALES PRICE : US$ 152.48 /MT

III-33 PRICE MECHANISM AND SELLING PRICE ESTIMATION

DESTINATION: TOAMASINA (CASE:1 )

| | IMPORTED PRICE | RATES OF COSTS | COSTS US$/MT | ACCUMURT'D PRICE US$/MT |
|---|---|---|---|---|
| (1) | IMPORT PRICE (C&F) | | 113.00 | 113.00 |
| (2) | UNLOADING/TRANSACTION | (1)x8% | 9.04 | 122.04 |
| (3) | PORT TAX | (1)x15% | 16.95 | 138.99 |
| (4) | MARINE INSUR'CE PREM'M | 0.3% | 0.37 | 139.36 |
| (5) | TUT | 15% | 20.90 | 160.27 |
| (6) | SUB-TOTAL | | 160.27 | 160.27 |
| (7) | BANK CHARGE (L/C ETC.) | 3.0% | 3.39 | 163.66 |
| (8) | IMPORTING EXPENSES | 10.0% | 16.37 | 180.02 |
| (9) | IMPORTER'S MARGIN | 20.0% | 36.00 | 216.03 |
| (10) | INVENTORY COST | 3.2% | 6.91 | 222.94 |
| (11) | LOSS AND DAMAGE | 1.0% | 2.16 | 225.10 |
| | LOCAL PRODUCT PRICE | | | |
| (12) | EX-WORK PRICE | US$/MT | | 225.10 |
| (13) | LOADING ON TRUCK | US$/MT | 1.00 | 224.10 |
| (14) | TRUCKING TO PORT | US$/MT | 0.00 | 224.10 |
| (15) | LOADING COST | US$/MT | 5.00 | 219.10 |
| (16) | COASTAL FREIGHT | US$/MT | 25.00 | 194.10 |
| (17) | UNLOADING COST | US$/MT | 6.00 | 188.10 |
| (18) | SALES TAX | 15% | 28.22 | 159.89 |
| (19) | TUT | 5% | 9.41 | 150.48 |

EX-WORK PRICE : US$ 150.48 /MT

## III-34 PRICE MECHANISM AND SELLING PRICE ESTIMATION

DESTINATION: ANTSIRANANA (CASE: 1 )

| IMPORTED PRICE | RATES OF COSTS | COSTS US$/MT | ACCUMURT'D PRICE US$/MT |
|---|---|---|---|
| (1) IMPORT PRICE (C&F) | | 113.00 | 113.00 |
| (2) UNLOADING/TRANSACTION | (1)x8% | 9.04 | 122.04 |
| (3) PORT TAX | (1)x15% | 16.95 | 138.99 |
| (4) MARINE INSUR'CE PREM'M | 0.3% | 0.37 | 139.36 |
| (5) TUT | 15% | 20.90 | 160.27 |
| (6) SUB-TOTAL | | 160.27 | 160.27 |
| (7) BANK CHARGE (L/C ETC.) | 3.0% | 3.39 | 163.66 |
| (8) IMPORTING EXPENSES | 10.0% | 16.37 | 180.02 |
| (9) IMPORTER'S MARGIN | 20.0% | 36.00 | 216.03 |
| (10) INVENTORY COST | 3.2% | 6.91 | 222.94 |
| (11) LOSS AND DAMAGE | 1.0% | 2.16 | 225.10 |
| LOCAL PRODUCT PRICE | | | |
| (12) EX-WORK PRICE | US$/MT | | 225.10 |
| (13) LOADING ON TRUCK | US$/MT | 1.00 | 224.10 |
| (14) TRUCKING TO PORT | US$/MT | 1.00 | 223.10 |
| (15) LOADING COST | US$/MT | 5.00 | 218.10 |
| (16) COASTAL FREIGHT | US$/MT | 27.00 | 191.10 |
| (17) UNLOADING COST | US$/MT | 6.00 | 185.10 |
| (18) SALES TAX | 15% | 28.22 | 156.89 |
| (19) TUT | 5% | 9.41 | 147.48 |

SALES PRICE : US$ 147.48 /MT

## III-35 PRICE MECHANISM AND SELLING PRICE ESTIMATION

DESTINATION: MAHAJANGA (CASE: 2 )

| IMPORTED PRICE | RATES OF COSTS | COSTS US$/MT | ACCUMURT'D PRICE US$/MT |
|---|---|---|---|
| (1) IMPORT PRICE (C&F) | | 113.00 | 113.00 |
| (2) UNLOADING/TRANSACTION | (1)x8% | 9.04 | 122.04 |
| (3) PORT TAX | (1)x15% | 16.95 | 138.99 |
| (4) MARINE INSUR'CE PREM'M | 0.3% | 0.37 | 139.36 |
| (5) TUT | 15% | 20.90 | 160.27 |
| (6) SUB-TOTAL | | 160.27 | 160.27 |
| (7) BANK CHARGE (L/C ETC.) | 3.0% | 3.39 | 163.66 |
| (8) IMPORTING EXPENSES | 10.0% | 16.37 | 180.02 |
| (9) IMPORTER'S MARGIN | 20.0% | 36.00 | 216.03 |
| (10) INVENTORY COST | 3.2% | 6.91 | 222.94 |
| (11) LOSS AND DAMAGE | 1.0% | 2.16 | 225.10 |
| LOCAL PRODUCT PRICE | | | |
| (12) EX-WORK PRICE | US$/MT | | 225.10 |
| (13) LOADING ON TRUCK | US$/MT | 0.00 | 225.10 |
| (14) TRUCKING TO PORT | US$/MT | 0.00 | 225.10 |
| (15) LOADING COST | US$/MT | 0.00 | 225.10 |
| (16) COASTAL FREIGHT | US$/MT | 0.00 | 225.10 |
| (17) UNLOADING COST | US$/MT | 0.00 | 225.10 |
| (18) SALES TAX | 15% | 33.77 | 191.34 |
| (19) TUT | 5% | 11.26 | 180.08 |

SALES PRICE : US$ 180.08 /MT
(EX-WORKS)

III-36 PRICE MECHANISM AND SELLING PRICE ESTIMATION

DESTINATION: TOLIARA (CASE: 2 )

| IMPORTED PRICE | RATES OF COSTS | COSTS US$/MT | ACCUMURT'D PRICE US$/MT |
|---|---|---|---|
| (1) IMPORT PRICE (C&F) | | 113.00 | 113.00 |
| (2) UNLOADING/TRANSACTION | (1)x8% | 9.04 | 122.04 |
| (3) PORT TAX | (1)x15% | 16.95 | 138.99 |
| (4) MARINE INSUR'CE PREM'M | 0.3% | 0.37 | 139.36 |
| (5) TUT | 15% | 20.90 | 160.27 |
| (6) SUB-TOTAL | | 160.27 | 160.27 |
| (7) BANK CHARGE (L/C ETC.) | 3.0% | 3.39 | 163.66 |
| (8) IMPORTING EXPENSES | 10.0% | 16.37 | 180.02 |
| (9) IMPORTER'S MARGIN | 20.0% | 36.00 | 216.03 |
| (10) INVENTORY COST | 3.2% | 6.91 | 222.94 |
| (11) LOSS AND DAMAGE | 1.0% | 2.16 | 225.10 |
| LOCAL PRODUCT PRICE | | | |
| (12) EX-WORK PRICE | US$/MT | | 225.10 |
| (13) LOADING ON TRUCK | US$/MT | 1.00 | 224.10 |
| (14) TRUCKING TO PORT | US$/MT | 1.00 | 223.10 |
| (15) LOADING COST | US$/MT | 5.00 | 218.10 |
| (16) COASTAL FREIGHT | US$/MT | 23.00 | 195.10 |
| (17) UNLOADING COST | US$/MT | 6.00 | 189.10 |
| (18) SALES TAX | 15% | 28.22 | 160.89 |
| (19) TUT | 5% | 9.41 | 151.48 |

SALES PRICE : US$ 151.48 /MT

## III-37 PRICE MECHANISM AND SELLING PRICE ESTIMATION

DESTINATION: TOAMASINA (CASE: 2 )

| IMPORTED PRICE | RATES OF COSTS | COSTS US$/MT | ACCUMURT'D PRICE US$/MT |
|---|---|---|---|
| (1) IMPORT PRICE (C&F) | | 113.00 | 113.00 |
| (2) UNLOADING/TRANSACTION | (1)x8% | 9.04 | 122.04 |
| (3) PORT TAX | (1)x15% | 16.95 | 138.99 |
| (4) MARINE INSUR'CE PREM'M | 0.3% | 0.37 | 139.36 |
| (5) TUT | 15% | 20.90 | 160.27 |
| (6) SUB-TOTAL | | 160.27 | 160.27 |
| (7) BANK CHARGE (L/C ETC.) | 3.0% | 3.39 | 163.66 |
| (8) IMPORTING EXPENSES | 10.0% | 16.37 | 180.02 |
| (9) IMPORTER'S MARGIN | 20.0% | 36.00 | 216.03 |
| (10) INVENTORY COST | 3.2% | 6.91 | 222.94 |
| (11) LOSS AND DAMAGE | 1.0% | 2.16 | 225.10 |
| LOCAL PRODUCT PRICE | | | |
| (12) EX-WORK PRICE | US$/MT | | 225.10 |
| (13) LOADING ON TRUCK | US$/MT | 1.00 | 224.10 |
| (14) TRUCKING TO PORT | US$/MT | 1.00 | 223.10 |
| (15) LOADING COST | US$/MT | 5.00 | 218.10 |
| (16) COASTAL FREIGHT | US$/MT | 24.00 | 194.10 |
| (17) UNLOADING COST | US$/MT | 6.00 | 188.10 |
| (18) SALES TAX | 15% | 28.22 | 159.89 |
| (19) TUT | 5% | 9.41 | 150.48 |

SALES PRICE : US$ 150.48 /MT

## III-38 PRICE MECHANISM AND SELLING PRICE ESTIMATION

DESTINATION: ANTSIRANANA (CASE: 2 )

| IMPORTED PRICE | RATES OF COSTS | COSTS US$/MT | ACCUMURT'D PRICE US$/MT |
|---|---|---|---|
| (1) IMPORT PRICE (C&F) | | 113.00 | 113.00 |
| (2) UNLOADING/TRANSACTION | (1)x8% | 9.04 | 122.04 |
| (3) PORT TAX | (1)x15% | 16.95 | 138.99 |
| (4) MARINE INSUR'CE PREM'M | 0.3% | 0.37 | 139.36 |
| (5) TUT | 15% | 20.90 | 160.27 |
| (6) SUB-TOTAL | | 160.27 | 160.27 |
| (7) BANK CHARGE (L/C ETC.) | 3.0% | 3.39 | 163.66 |
| (8) IMPORTING EXPENSES | 10.0% | 16.37 | 180.02 |
| (9) IMPORTER'S MARGIN | 20.0% | 36.00 | 216.03 |
| (10) INVENTORY COST | 3.2% | 6.91 | 222.94 |
| (11) LOSS AND DAMAGE | 1.0% | 2.16 | 225.10 |
| LOCAL PRODUCT PRICE | | | |
| (12) EX-WORK PRICE | US$/MT | | 225.10 |
| (13) LOADING ON TRUCK | US$/MT | 1.00 | 224.10 |
| (14) TRUCKING TO PORT | US$/MT | 1.00 | 223.10 |
| (15) LOADING COST | US$/MT | 5.00 | 218.10 |
| (16) COASTAL FREIGHT | US$/MT | 19.00 | 199.10 |
| (17) UNLOADING COST | US$/MT | 6.00 | 193.10 |
| (18) SALES TAX | 15% | 28.22 | 164.89 |
| (19) TUT | 5% | 9.41 | 155.48 |

SALES PRICE : US$ 155.48 /MT

Figure III-1 TRUNK LINE ROAD NET WORK

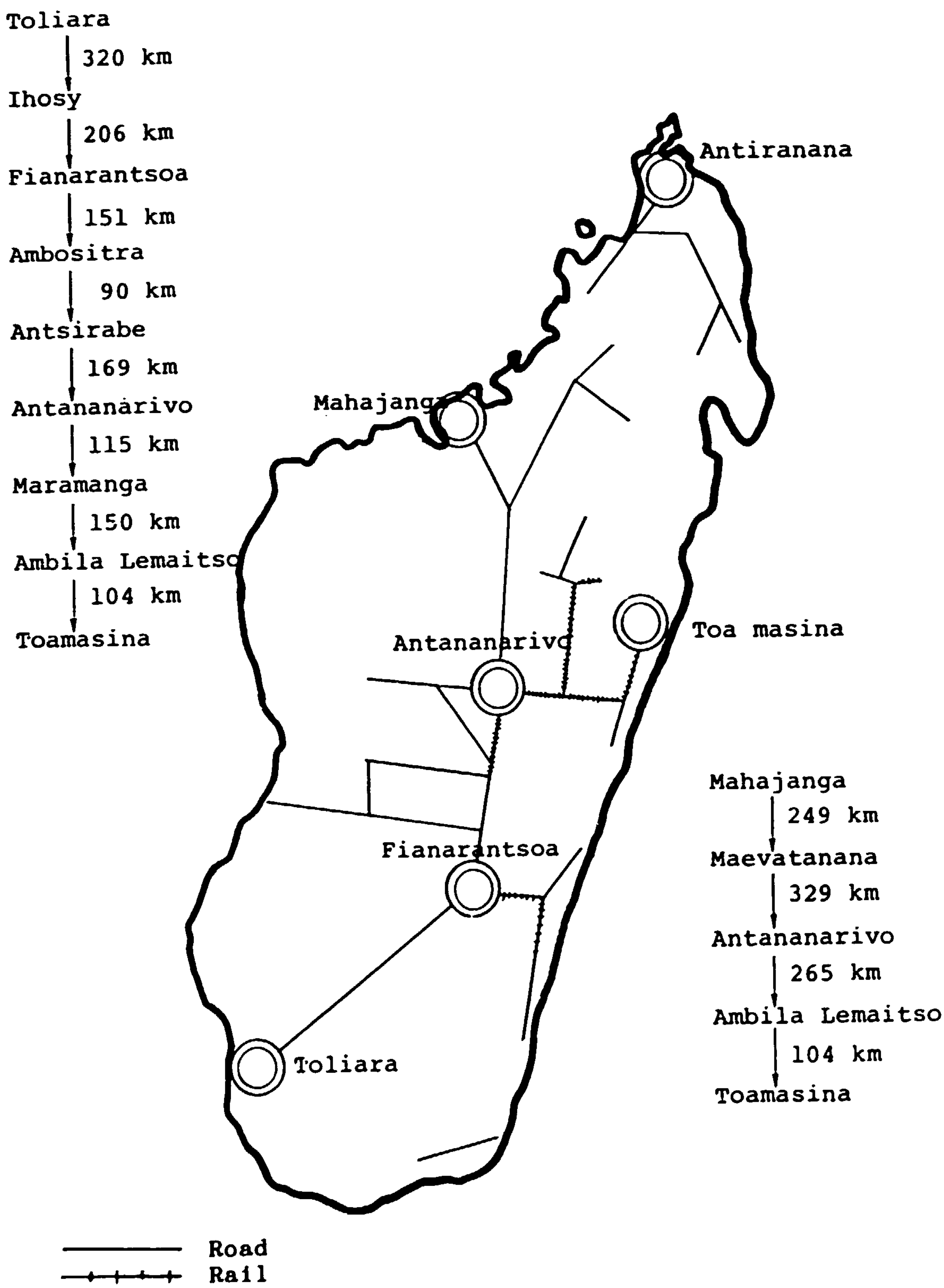


Figure III-2 PRODUCT FLOW

CASE 1 & 3

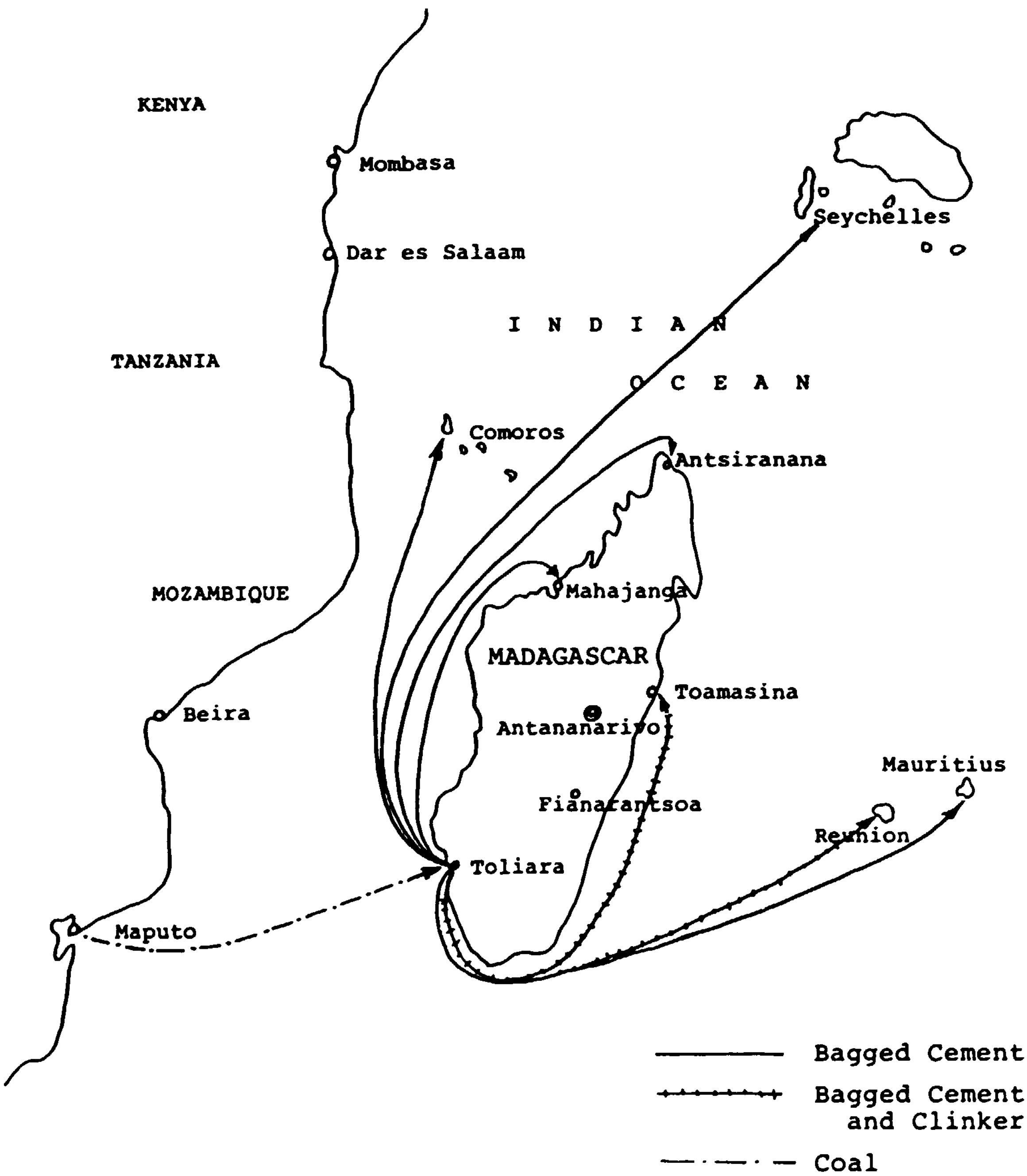


Figure III-3 PRODUCT FLOW

CASE 2

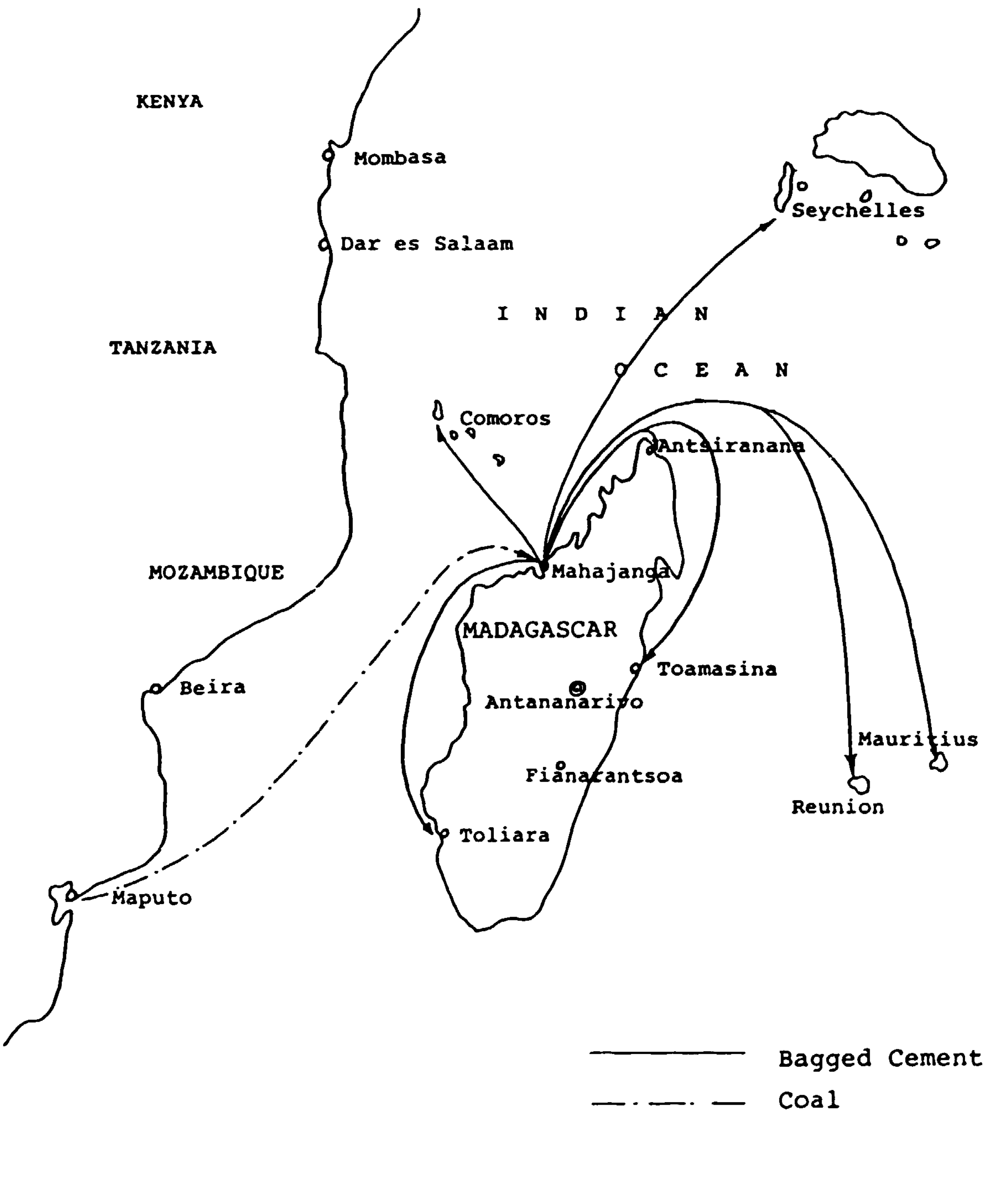
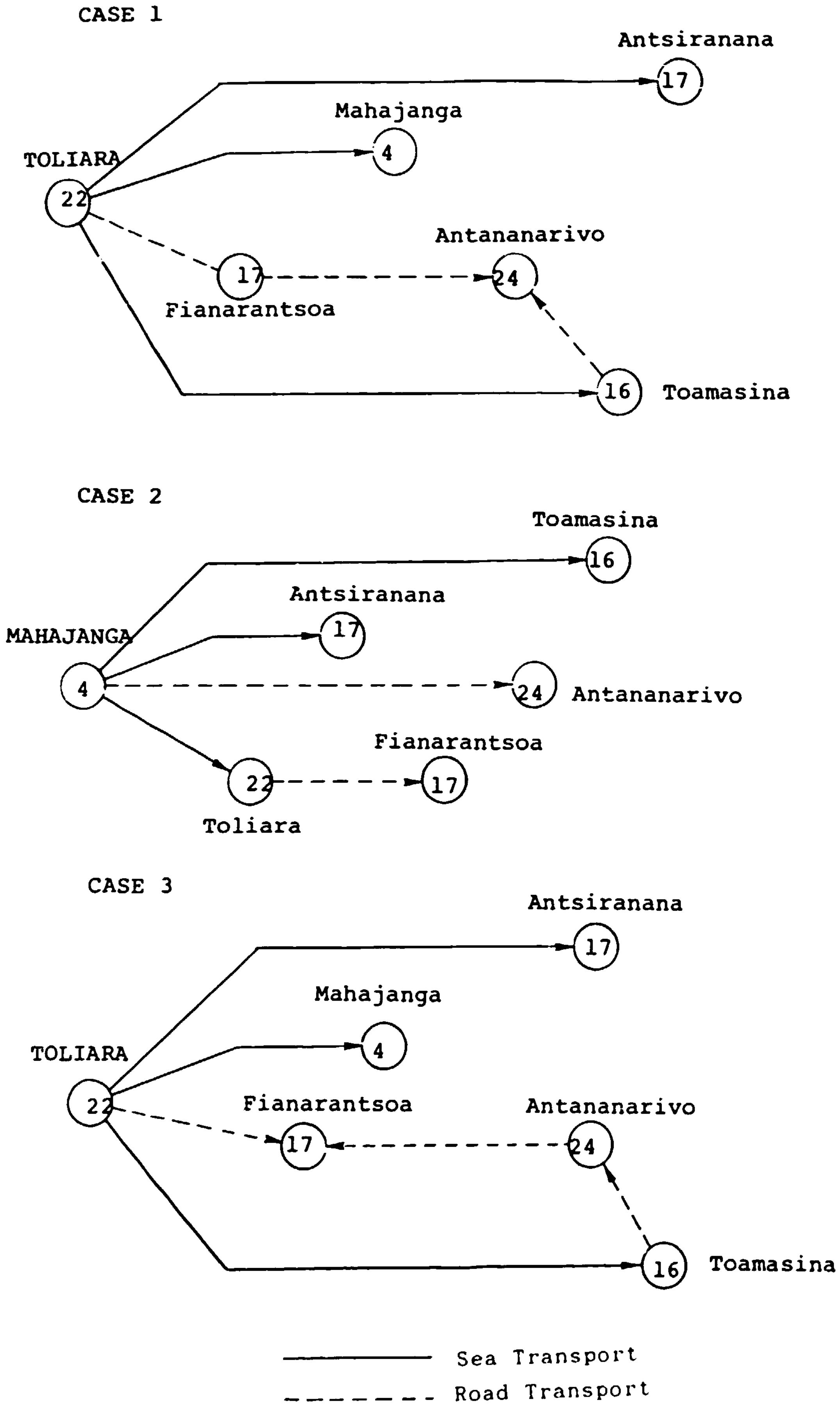


Figure III-4


CASE 1
Antsiranana
17
Mahajanga
4
TOLIARA
22
Antananarivo
17
24
Fianarantsoa
16
Toamasina
CASE 2
Toamasina
16
Antsiranana
MAHAJANGA
17
4
24
Antananarivo
Fianarantsoa
22
17
Toliara
CASE 3
Antsiranana
17
Mahajanga
4
TOLIARA
22
Fianarantsoa
Antananarivo
17
24
16
Toamasina
Sea Transport
Road Transport

# Chapter IV

## MATERIALS AND INPUTS

## IV. Materials and Inputs

### 1. Raw Materials and Inputs

#### (1) Case 1, Toliara Site

##### 1) Limestone

A new quarry is to be prepared in the hilly area located 15 km to the east from the Plant. Limestone from this quarry will be sufficient in terms of both quantity and quality. The limestone will be carried to the plant by truck.
Chemical composition of limestone

Moisture Contenet: 4% (%)

| | LOSS | SiO2 | Al2O3 | Fe2O3 | CaO | MgO |
|---|---|---|---|---|---|---|
| Limestone | 41.3 | 4.9 | 0.5 | 0.7 | 50.2 | 0.3 |

##### 2) Clay

Part of the clay supply will be quarried together with the limestone and there are sufficient supplies to be found in the clay strata surrounding Toliara. The clay will be transported by truck some 10 km to the Plant.
- Chemical composition of the clay

Moisture Contenet: 10% (%)

| | LOSS | SiO2 | Al2O3 | Fe2O3 | CaO | MgO |
|---|---|---|---|---|---|---|
| Clay | 26.5 | 42.1 | 15.8 | 5.7 | 2.7 | 2.3 |

3) Silica

Silica is not essential to low grade cement but in order to ensure that the product meets with standards for export it is necessary to undertake rigorous control of the silica content. A silica rich source is therefore necessary. Silica sand can be taken from the river bed of the Fiherenana river which runs some 5 km distance from Toliara on the north side. Trucks could be used to transport the sand for the 7 km or so to the Plant.
Chemical composition of the silica sand

Moisture Contenet: 4% (%)

| | LOSS | SiO2 | Al2O3 | Fe2O3 | CaO | MgO |
|---|---|---|---|---|---|---|
| Silica | 3.3 | 90.7 | 2.9 | 1.9 | 0.5 | 0.3 |

4) Iron Component

Possible iron sources found in Toliara state could be iron sand or bauxite. However, to ensure a reliable and economic supply for use the imports of pyrite cinder from South Africa are to be employed.
Chemical composition of pyrite cinder

Moisture Contenet: 12% (%)

| | LOSS | SiO2 | Al2O3 | Fe2O3 | CaO | MgO |
|---|---|---|---|---|---|---|
| Pyrite | 0.4 | 17.1 | 5.1 | 73.3 | 2.9 | 0.9 |

5) Gypsum

Gypsum is found in layers of a 2 to 4 cm thickness in the top soil of the hilly area in the outskirts of Mahaboka some 110 km east north-east of Toliara city. Given the thinness of the layer mechanization of recovery would be unprofitable and in case road conditions make the economic feasibility of such a development dubious.

For the present project gypsum supplies are assumed to be made from local source.
Chemical composition of gypsum

Moisture Contenet: 10% (%)

| | LOSS | CaO | SO3 |
|---|---|---|---|
| Gypsum | 20.5 | 31.5 | 46.2 |

6) Pozzolana

Pozzolana of superior quality is domestically found in the north areas of Nosy-be and Diego Suerets as well as at Sam Baina and Antsirabe close to the capital. However it would not be economically sound to transport pozzolana to Tulear for the production of Pozzolana cement and so the idea has been dropped for the present project. However, it would be worthwhile to evaluate the future possibility of bringing Pozzolana to Toliara from the Reunion or Toamasina with the return cargo of the clinker dispatches or in the event of case 3 (whereby finishing processes are located at Toamasina) of mixing the pozzolana found locally.

7) Coal

For some time to come imports of South African coal will be used. In the future a shift can be made to the use of domestic coal from the Sakoa coal mines located 219 km east south-east overland from Toliara once future development and road improvements have given this a competitive position against imported coal.
Chemical composition of Sakoa coal

Moisture Contenet: 9% (%)

| | LOSS | SiO2 | Al2O3 | Fe2O3 | CaO | MgO |
|---|---|---|---|---|---|---|
| Coal | 84.5 | 7.8 | 4.0 | 0.8 | 0.4 | 0.2 |

Heat generated by coal is 6.500 kcal per kg.

8) Electricity

Full self sufficiency is to be assured with an in house diesel generator. Diesel oil can be obtained without problem.

9) Water

A deep bore well is to be newly installed and underground water employed.

10) Bags

50 kg size bags are to be imported from China or Europe.

11) Others

As materials such as steel balls, fireproof bricks, etc. are not produced domestically these will have to be imported. It will also be necessary to ensure supplies of explosives, oils and fats, etc. and articles for maintenance purposes such as rubber items, steel materials and products, electrical parts, machine parts, etc.

(2) Case 2, Mahajanga Site

1) Limestone

A new quarry is to be prepared in the hilly area located near to the Plant. Limestone from this quarry will be sufficient in terms of both quantity and quality. The limestone will be carried to the plant by truck.
Chemical composition of limestone

Moisture Contenet: 4% (%)

| | LOSS | SiO2 | Al2O3 | Fe2O3 | CaO | MgO |
|---|---|---|---|---|---|---|
| Limestone | 39.2 | 5.6 | 2.5 | 1.0 | 51.0 | 0.6 |

2) Clay

Part of the clay supply will be quarried from the clay strata found with the limestone in the quarry. Chemical composition of the clay

Moisture Contenet: 4% (%)

| | LOSS | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | MgO |
|---|---|---|---|---|---|---|
| Clay | 27.2 | 33.1 | 5.5 | 1.8 | 29.1 | 1.0 |

3) Silica

Silica is not essential to low grade cement but in order to ensure that the product meets with standards for export it is necessary to undertake rigorous control of the silica content. A silica rich source is therefore necessary. Silica sand can be taken from the river bed of the Betsiboka river and trucks used to transport this sand for the 10 km or so to the Plant.
Chemical composition of the silica sand

Moisture Contenet: 5% (%)

| | LOSS | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | MgO |
|---|---|---|---|---|---|---|
| Silica | 4.1 | 88.6 | 3.6 | 2.1 | 0.6 | 0.3 |

4) Iron Component

Iron sand could be used as the iron component but to ensure a reliable and economic supply imports of pyrite cinder from South Africa are to be employed. The specifications of the pyrite cinders is the same as those noted in Case 1.

5) Gypsum

Gypsum is found in a region located about 170 km distance from Amboanio. However recovery of a sufficient quantity would be difficult and the economic feasability of such an undertaking is dubious.

Nevertheless, for the present project gypsum supplies are assumed to be made from current local source.

The specifications of the gypsum are the same as those noted in Case 1.

Details of sections 6) Pozzolana to 8) Electricity are the same as those already noted for Case 1.

6) Pozzolana

Although the development of superior quality Pozzolana in the vicinity of Sambaina may be considered at sometime in the future for the time being the production of Pozzolana is not envisaged in this project.

7) Coal

Irrelevant

8) Electricity

To be supplied by the Electric company.
Details of sections 9) Water to 11) Others are the same as those already noted for Case 1.

9) Water

Water utility facilities are to be installed and river water employed.
Details of sections 10) Bags and 11) Others are the same as those already noted for Case 1.

(3) Case 3, Toamasina site

This case assumes that clinker will be shipped on sea routes from the Toliara plant to Toamasina.
Details of sections 1) Limestone through 5) gypsum are the same as those already noted for Case 1.

## 2. Consumption of Raw Materials and Inputs

Raw materials to be fed into the cement kiln are first supplied into the raw material mill in appropriate ratios for each item and made up into powders. It is important to ensure the control of the quantities of each raw material powder fed in to ensure that these are within the specified ranges as to chemical composition.

As previously noted, the main constituents of clinker (that is the raw material for cement) are silica ($Si\ O_2$), aluminum ($Al_2O_3$), ferric oxide ($Fe_2\ O_3$), and coal (CaO). There is large quantity of ignition. loss component in the raw materials before burning ( Carbon dioxide which is released by pyrolosis of calcium carbonate which is a major component of limestone and from fuels together with water vapour occuring by the pyrolosis of the clay minerals). This loss margin varies considerably depending on the raw materials so the analytical values for the individual constituents are only absolute values. When investigating the actual chemical composition of the raw materials it is useful to employ the various ratios which coordinate these various values.

$$\text{Hydraulicity ratio H.M} = \frac{CaO}{SiO_2 + Al_2O_3 + Fe_2O_3} = (2.0 \quad 2.2)$$

$$\text{Silica ratio S.M} = \frac{SiO}{Al_2O_3 + Fe_2O_3} = (1.9 \quad 3.2)$$

$$\text{Iron ratio} \quad \text{I.M} = \frac{Al_2O_3}{Fe_2O_3} = (1.5 \quad 2.3)$$

(1) The Chemical Composition of Clinker (marker)

| Case | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | CaO | MgO | H.M: 2.1 |
|---|---|---|---|---|---|---|
| Case-1 | 22.3 | 5.4 | 3.2 | 64.7 | 1.02 | S.M: 2.6 |
| Case-2 | 22.9 | 5.6 | 3.3 | 66.7 | 1.08 | I.M: 1.7 |

(2) Unit Consumption of Raw Materials (t/t clinker wet base)

| Case | Limestone | Clay | Silica | Pylite |
|---|---|---|---|---|
| Case-1 | 1.252 | 0.267 | 0.043 | 0.009 |
| Case-2 | 1.079 | 0.359 | 0.037 | 0.019 |

(3) Unit consumption of Fuels

South African Coal: heat 6,500 kal/kg coal
water content 9%
Unit heat consumption: 900 kal/kg-clinker
Unit consumption of coal: 152 kg/t-clinker (wet base)

(4) Unit Consumption of Gypsum

Amount added: 0.045 t/t clinker
Water content: 9%
Therefore with 1 ton of clinker 1.04 tons of cement can be produced.

(5) Unit Consumption of Electricity (kwh/t cement)

| Raw materials | Calcining | Finishing | Shipping | Others | Total |
|---|---|---|---|---|---|
| 25 | 32 | 45 | 3 | 5 | 110 |

(6) Unit fuel consumption of in house electric generation

Rate of consumption of diesel oil: 240 g/kwh
Specific gravity of diesel oil: 0.87
Internal consumption of electricity by generator: 7%
Unit fuel consumption: 32 l/t-cement

(7) Industrial Water

Consumption: 700 l/t cement

(8) Bags

50 kg bags 20 bags per ton of cement
Breakage rate 3 % = 22.6 bags per ton of cement

(9) Other propotional unit consumptions

Fireproof bricks: 0.16 kg/t-clinker
Steel balls: 0.05 kg/t-cement
Oils and fats: 0.25 l/t-cement

3. Estimated Costs of Materials and Inputs

The following items are assumed to involve actual capital outlay during operations. Further, input materials which can be quarried and secured locally such as limestone, clay, silica sand, etc. are not included as items of expense under this heading.

(1) Pyrite Cinder

At present import from neighboring countries (e.g. South Africa) is envisaged but if a suitable local iron element can be secured then local supply would be feasible.

Import prices are as follows:

| | | | |
|---|---|---|---|
| Base price | : | FOB | US$ 17/MT |
| | | Freight | US$ 25/MT (Toliara) |
| | | | US$ 35/MT (Mahajanga) |
| 1997 Price | : | Toliara | US$ 53.26/MT |
| | | Mahajanga | US$ 76.07/MT |

(2) Gypsum

At present local gypsum is purchased on an ex factory basis from the Amboanio mill of Mahajanga. The price is cheaper than the international price. In the case of Toliara gypsum is found widely scattered in the hilly area of Mahaboboka, Vineta located some 100 km from the project site. The Toliara site has very attractive advantages since the distance involved at this site is shorter than that in the case of Amboanio and the gypsum strata at Toliara is quite thick so that the price is low. For the present project cost calculations have been carried out for the Toliara case on the assumption that in house trucks are used for delivery while the current purchasing price from the Amboanio plant has been applied in the Mahajanga case.

| | | | |
|---|---|---|---|
| Base price | : | Toliara: | 1-A US$ 32/MT |
| | | | 1-B US$ 30/MT |
| | | Mahajanga: | US$ 86.70/MT |
| 1997 Price | : | Same as the base price | |

(3) Coal

There is currently undeveloped potential for production of coal with a heat capacity of 5,500 kcal/ kg at an eastern inland area of Toliara. However if this mine is developed it would be necessary to give preference to utilizing the domestically produced coal. In the present analysis evaluation is conducted on the assumption that coal is purchased from South Africa.

South African coal (with a heat capacity of 6,500 kcal/kg) is widely distributed throughout the world and is cheap in price.There are large lot loading and shipping facilities at the port of Richards Bay and 100 ton class Carriers are used. For shipping of small lots Maputo port is popular and this is close to Madagascar. Recent pricing of South African coal is given below for reference.

FOB US$ 36-40 MT (to Amboanio plant)
FOB US$ 15-16 MT (coal for Japanese Power Company)
Freight differs considerably depending on the size of the carrier. In the case of the Amboanio plant it is about US$ 40 ton. A: estimate received from a credible shipper indicates that it would cost US$ 31 MT to carry freight with a 5,000 ton class craft from Richards Bay to Toamasina.

The Base prices in view of the above are assumed as follows.

| | To Toliara | To Amboanio |
|---|---|---|
| FOB Maputo | US$ 34/MT | US$ 34/MT |
| Fireght | US$ 20/MT | US$ 35/MT |
| CIF | US$ 54/MT | US$ 69/MT |
| 1997 | | |
| CIF | US$ 68.48/MT | US$ 87.50/MT |

(4) Diesel Oil

The current price of Solima is FMG 422/liter.
Base Cost : US$ 281.34/ Kl
1997 cost : US$ 355.98/ Kl

(5) Firebricks

Several types of fire resistant brick are used for the Cement kiln and prices vary by type. Estimates were carried out on the basis of the average price.

| | | |
|---|---|---|
| Current price 130 yen/kg: | FOB | US$ 1,000/MT |
| | Freight | US$ 100/FT |
| | C & F | US$ 1,100/MT |
| 1997 Price | CIF | US$ 1,395.65 |

(6) Steel Balls

High chrome balls of Belgium manufacture are excellent in terms of price and quality. These are about the same price as those of Japanese make.

| | | |
|---|---|---|
| Current price : | FOB Belgium | US$ 1,750/MT |
| | FOB Japan | US$ 1,741/MT |
| | Ocean Freight | US$ 100/FT |
| | CIF Madagascar | US$ 1,850/MT |
| 1977 Price | CIF Madagascar | US$ 2,345.90/MT |

(7) Lubeoil

| | | |
|---|---|---|
| The current price is 3.70 US$/l - | FOB | US$ 3,700/kl |
| | Freight | US$ 70/kl |
| | CIF Madagascar | US$ 3,770/kl |
| 1997 Price | CIF Madagascar | US$ 4,910.85/kl |

(8) Paper Sacks

Specifications differ according to type and employment also differs. The following indicates current prices by specification;

For purposes of the present study types 2 (for domestic or marine transport) and 3 (for domestic/ truck transport) are destined for the domestic market while type 5, the strong pp woven bags, are employed for exports

1997 Prices
KP 4-ply : CIF US$ 0.62/ bag
KP 3-ply : CIF US$ 0.5188/ bag
KP 1+PP-1 : CIF US$ 0.8098/ bag

(9) Electric Power

Electric power is only used for the Toamasina Finish Mill of Case 3. The current electricity charges of the Toamasina region are as follows.

Demand charge FMG 1,892/kva
Energy charge FMG 60/Kwh

On the basis of the estimated electric consumption of the Toamasina plant this results in US$ 40.20 on the current base which will be US$ 50.87 at 1997 prices.

Table IV-1 PRELIMINARY PRODUCTION COST

CASE : 1A

| | | | | | |
|---|---|---|---|---|---|
| | | | | CMT DOM T | 51.00% |
| PRODUCTION | : CLINKER | 300000 | MT/Y | CMT DOM B | 49.00% |
| | : CEMENT | 312000 | MT/Y | CMT EXP B | 0.00% |

| | UNIT | CONSUMPT'N | PRICE (CASE-1) $/UNIT | PRICE (CASE-2) $/UNIT | PRICE (CASE-3) $/UNIT | PRODUCTION COST (1000 $) | INVENTORY LEVEL | WORKING CAPITAL (1000$) | L | F |
|---|---|---|---|---|---|---|---|---|---|---|
| VARIABLE COST | | | | | | | | | | |
| PYRITE CINDER(1) | MT/T-CL | 0.009000 | 53.26 | 0 | 53.26 | 144 | 0.2000 | 20.1 | | 20.1 |
| PYRITE CINDER(2) | MT/T-CL | 0.019000 | 0 | 76.07 | 0 | 0 | 0.2000 | 0.0 | | 0.0 |
| GYPSUM(1-A) | MT/T-CL | 0.045000 | 32 | 0 | 0 | 432 | 0.1000 | 30.2 | 30.2 | |
| GYPSUM(1-B) | MT/T-CL | 0.045000 | 0 | 0 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(2-A/B) | MT/T-CL | 0.045000 | 0 | 86.7 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(3-A/B) | MT/T-CL | 0.045000 | 0 | 0 | 68.63 | 0 | 0.1000 | 0.0 | 0.0 | |
| FUEL COAL(1) | MT/T-CL | 0.152000 | 68.48 | 0 | 68.48 | 3123 | 0.2000 | 437.2 | | 437.2 |
| FUEL COAL(2) | MT/T-CL | 0.152000 | 0 | 87.5 | 0 | 0 | 0.2000 | 0.0 | | 0.0 |
| DIESEL OIL (CL) | KL/T-CL | 0.011950 | 0 | 0 | 355.98 | 0 | 0.0167 | 0.0 | 0.0 | |
| DIESEL OIL (CM) | KL/T-CM | 0.032470 | 355.98 | 355.98 | 355.98 | 3606 | 0.0167 | 42.1 | 42.1 | |
| FIRE BRICKS | MT/T-CL | 0.000160 | 1395.65 | 1395.65 | 1395.65 | 67 | 0.3000 | 14.1 | | 14.1 |
| STEEL BALL | MT/T-CM | 0.000050 | 2345.9 | 2345.9 | 2345.9 | 37 | 0.3000 | 7.7 | | 7.7 |
| LUBE OIL | KL/T-CM | 0.000025 | 4901.85 | 4901.85 | 4901.85 | 38 | 0.3000 | 8.0 | | 8.0 |
| EXPLOSIVES | $/T-CL | 0.218909 | 1 | 1 | 1 | 66 | 0.3000 | 13.8 | | 13.8 |
| (SUB-TOTAL) | | | | | | 7512 | | 0.0 | | 0.0 |
| PAPER SACK | P'CE/CM-DT | 20.6000 | 0.5188 | 0.5188 | 0.5188 | 1701 | 0.2000 | 238.1 | | 238.1 |
| | P'CE/CM-DB | 20.6000 | 0.62 | 0.62 | 0.62 | 1953 | 0.2000 | 273.4 | | 273.4 |
| | P'CE/CM-X | 20.6000 | 0.8098 | 0.8098 | 0.8098 | 0 | 0.2000 | 0.0 | | 0.0 |
| TRANSPORTATION | $/CL | 0.00% | | | | 0 | | | | |
| | $/CM | 100.00% | 17.9 | | | 5585 | | | | |
| TOTAL | | | | | | 16750 | | 1084.6 | 72.3 | 1012.3 |

NOTE: All product is assumed to be sold in ·gged cement.

Table IV - 2 PRELIMINARY PRODUCTION COST

CASE : 1B

| | | | | |
|---|---|---|---|---|
| PRODUCTION | : CLINKER | 400000 | MT/Y | CMT DOM T 51.00% |
| | : CEMENT | 416000 | MT/Y | CMT DOM B 49.00% |
| | | | | CMT EXP B 0.00% |

| VARIABLE COST | UNIT | CONSUMPT'N | PRICE (CASE-1) $/UNIT | PRICE (CASE-2) $/UNIT | PRICE (CASE-3) $/UNIT | PRODUCTION COST (1000 $) | INVENTORY LEVEL | WORKING CAPITAL (1000$) | L | F |
|---|---|---|---|---|---|---|---|---|---|---|
| PYRITE CINDER(1) | MT/T-CL | 0.009000 | 53.26 | 0 | 53.26 | 192 | 0.2000 | 26.8 | | 26.8 |
| PYRITE CINDER(2) | MT/T-CL | 0.019000 | 0 | 76.07 | 0 | 0 | 0.2000 | 0.0 | | 0.0 |
| GYPSUM(1-A) | MT/T-CL | 0.045000 | 0 | 0 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(1-B) | MT/T-CL | 0.045000 | 30 | 0 | 0 | 540 | 0.1000 | 37.8 | 37.8 | |
| GYPSUM(2-A/B) | MT/T-CL | 0.045000 | 0 | 86.7 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(3-A/B) | MT/T-CL | 0.045000 | 0 | 0 | 68.63 | 0 | 0.1000 | 0.0 | 0.0 | |
| FUEL COAL(1) | MT/T-CL | 0.152000 | 68.48 | 0 | 68.48 | 4164 | 0.2000 | 582.9 | | 582.9 |
| FUEL COAL(2) | MT/T-CL | 0.152000 | 0 | 87.5 | 0 | 0 | 0.2000 | 0.0 | | 0.0 |
| DIESEL OIL (CL) | KL/T-CL | 0.011950 | 0 | 0 | 355.98 | 0 | 0.0167 | 0.0 | 0.0 | |
| DIESEL OIL (CM) | KL/T-CM | 0.032470 | 355.98 | 355.98 | 355.98 | 4808 | 0.0167 | 56.1 | 56.1 | |
| FIRE BRICKS | MT/T-CL | 0.000160 | 1395.65 | 1395.65 | 1395.65 | 89 | 0.3000 | 18.8 | | 18.8 |
| STEEL BALL | MT/T-CM | 0.000050 | 2345.9 | 2345.9 | 2345.9 | 49 | 0.3000 | 10.2 | | 10.2 |
| LUBE OIL | KL/T-CM | 0.000025 | 4901.85 | 4901.85 | 4901.85 | 51 | 0.3000 | 10.7 | | 10.7 |
| EXPLOSIVES | $/T-CL | 0.218909 | 1 | 1 | 1 | 88 | 0.3000 | 18.4 | | 18.4 |
| (SUB-TOTAL) | | | | | | 9980 | | 0.0 | | 0.0 |
| PAPER SACK | P'CE/CM-DT | 20.6000 | 0.5188 | 0.5188 | 0.5188 | 2267 | 0.2000 | 317.4 | | 317.4 |
| | P'CE/CM-DB | 20.6000 | 0.62 | 0.62 | 0.62 | 2603 | 0.2000 | 364.5 | | 364.5 |
| | P'CE/CM-X | 20.6000 | 0.8098 | 0.8098 | 0.8098 | 0 | 0.2000 | 0.0 | | 0.0 |
| TRANSPORTATION | $/T-CL | 0.00% | | | | 0 | | | | |
| | $/T-CM | 100.00% | 17.9 | | | 7446 | | | | |
| TOTAL | | | | | | 22298 | | 1443.7 | 93.9 | 1349.8 |

NOTE: All product is assumed to be sold in bagged cement.

Table IV-3 PRELIMINARY PRODUCTION COST

CASE : 2A

| | | | | |
|---|---|---|---|---|
| | | | CMT DOM T | 28.00% |
| PRODUCTION | : CLINKER | 300000 MT/Y | CMT DOM B | 72.00% |
| | : CEMENT | 312000 MT/Y | CMT EXP B | |
| | | | CLK EXP B | |

| | UNIT | CONSUMPT'N | PRICE (CASE-1) $/UNIT | PRICE (CASE-2) $/UNIT | PRICE (CASE-3) $/UNIT | PRODUCTION COST (1000 $) | INVENTORY LEVEL | WORKING CAPITAL (1000$) | L | F |
|---|---|---|---|---|---|---|---|---|---|---|
| VARIABLE COST | | | | | | | | | | |
| PYRITE CINDER(1) | MT/T-CL | 0.009000 | 53.26 | 0 | 53.26 | 0 | 0.2000 | 0.0 | | 0.0 |
| PYRITE CINDER(2) | MT/T-CL | 0.019000 | 0 | 76.07 | 0 | 434 | 0.2000 | 60.7 | | 60.7 |
| GYPSUM(1-A) | MT/T-CL | 0.045000 | 32 | 0 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(1-B) | MT/T-CL | 0.045000 | 30 | 0 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(2-A/B) | MT/T-CL | 0.045000 | 0 | 86.7 | 0 | 1170 | 0.1000 | 81.9 | 81.9 | |
| GYPSUM(3-A/B) | MT/T-CL | 0.045000 | 0 | 0 | 68.63 | 0 | 0.1000 | 0.0 | 0.0 | |
| FUEL COAL(1) | MT/T-CL | 0.152000 | 68.48 | 0 | 68.48 | 0 | 0.2000 | 0.0 | | 0.0 |
| FUEL COAL(2) | MT/T-CL | 0.152000 | 0 | 87.5 | 0 | 3990 | 0.2000 | 558.6 | | 558.6 |
| DIESEL OIL (CL) | KL/T-CL | 0.011950 | 355.98 | 0 | 0 | 0 | 0.0167 | 0.0 | 0.0 | |
| DIESEL OIL (CM) | KL/T-CM | 0.032470 | 355.98 | 355.98 | 355.98 | 3606 | 0.0167 | 42.1 | 42.1 | |
| FIRE BRICKS | MT/T-CL | 0.000160 | 1395.65 | 1395.65 | 1395.65 | 67 | 0.3000 | 14.1 | | 14.1 |
| STEEL BALL | MT/T-CM | 0.000050 | 2345.9 | 2345.9 | 2345.9 | 37 | 0.3000 | 7.7 | | 7.7 |
| LUBE OIL | KL/T-CM | 0.000025 | 4901.85 | 4901.85 | 4901.85 | 38 | 0.3000 | 8.0 | | 8.0 |
| EXPLOSIVES | $/T-CL | 0.218909 | 1 | 1 | 1 | 66 | 0.3000 | 13.8 | | 13.8 |
| (SUB-TOTAL) | | | | | | 9408 | | 0.0 | | 0.0 |
| PAPER SACK | P'CE/CM-DT | 20.6000 | 0.5188 | 0.5188 | 0.5188 | 934 | 0.2000 | 130.7 | | 130.7 |
| | P'CE/CM-DB | 20.6000 | 0.62 | 0.62 | 0.62 | 2869 | 0.2000 | 401.7 | | 401.7 |
| | P'CE/CM-X | 20.6000 | 0.8098 | 0.8098 | 0.8098 | 0 | 0.2000 | 0.0 | | 0.0 |
| TRANSPORTATION | $/CL | 1 | | | | 0 | | | | |
| | $/CM | 100.00% | 24.68 | | | 7700 | | | | |
| TOTAL | | | | | | 20911 | | 1319.3 | 124.0 | 1195.3 |

NOTE: All product is assumed to be sold in bagged cement.

Table VI-4 PRELIMINARY PRODUCTION COST

CASE : 2B

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION | : CLINKER | 400000 | MT/Y | | CMT DOM T | 28.00% | | | | |
| | : CEMENT | 416000 | MT/Y | | CMT DOM B | 72.00% | | | | |
| | | | | | CMT EXP B | | | | | |
| | | | | | CLK EXP B | | | | | |
| | UNIT | CONSUMPT'N | PRICE (CASE-1) $/UNIT | PRICE (CASE-2) $/UNIT | PRICE (CASE-3) $/UNIT | PRODUCTION COST (1000 $) | INVENTORY LEVEL | WORKING CAPITAL (1000$) | L | F |
| VARIABLE COST | | | | | | | | | | |
| PYRITE CINDER(1) | MT/T-CL | 0.009000 | 53.26 | 0 | 53.26 | 0 | 0.2000 | 0.0 | | 0.0 |
| PYRITE CINDER(2) | MT/T-CL | 0.019000 | 0 | 76.07 | 0 | 578 | 0.2000 | 80.9 | | 80.9 |
| GYPSUM(1-A) | MT/T-CL | 0.045000 | 0 | 0 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(1-B) | MT/T-CL | 0.045000 | 0 | 0 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(2-A/B) | MT/T-CL | 0.045000 | 0 | 86.7 | 0 | 1561 | 0.1000 | 109.2 | 109.2 | |
| GYPSUM(3-A/B) | MT/T-CL | 0.045000 | 0 | 0 | 68.63 | 0 | 0.1000 | 0.0 | 0.0 | |
| FUEL COAL(1) | MT/T-CL | 0.152000 | 68.48 | 0 | 68.48 | 0 | 0.2000 | 0.0 | | 0.0 |
| FUEL COAL(2) | MT/T-CL | 0.152000 | 0 | 87.5 | 0 | 5320 | 0.2000 | 744.8 | | 744.8 |
| DIESEL OIL (CL) | KL/T-CL | 0.011950 | 0 | 0 | 0 | 0 | 0.0167 | 0.0 | 0.0 | |
| DIESEL OIL (CM) | KL/T-CM | 0.032470 | 355.98 | 355.98 | 355.98 | 4808 | 0.0167 | 56.1 | 56.1 | |
| FIRE BRICKS | MT/T-CL | 0.000160 | 1395.65 | 1395.65 | 1395.65 | 89 | 0.3000 | 18.8 | | 18.8 |
| STEEL BALL | MT/T-CM | 0.000050 | 2345.9 | 2345.9 | 2345.9 | 49 | 0.3000 | 10.2 | | 10.2 |
| LUBE OIL | KL/T-CM | 0.000025 | 4901.85 | 4901.85 | 4901.85 | 51 | 0.3000 | 10.7 | | 10.7 |
| EXPLOSIVES | $/T-CL | 0.218909 | 1 | 1 | 1 | 88 | 0.3000 | 18.4 | | 18.4 |
| (SUB-TOTAL) | | | | | | 12544 | | 0.0 | | 0.0 |
| PAPER SACK | P'CE/CM-DT | 20.6000 | 0.5188 | 0.5188 | 0.5188 | 1245 | 0.2000 | 174.3 | | 174.3 |
| | P'CE/CM-DB | 20.6000 | 0.62 | 0.62 | 0.62 | 3825 | 0.2000 | 535.6 | | 535.6 |
| | P'CE/CM-X | 20.6000 | 0.8098 | 0.8098 | 0.8098 | 0 | 0.2000 | 0.0 | | 0.0 |
| TRANSPORTATION | $/T-CL | 1 | | | | 0 | | | | |
| | $/T-CM | 100.00% | 24.68 | | | 10267 | | | | |
| | | | | | | 27881 | | 1759.0 | 165.3 | 1593.7 |

Table IV-5 PRELIMINARY PRODUCTION COST

CASE :3B

| | | | | | |
|---|---|---|---|---|---|
| PRODUCTION | : CLINKER | 400000 | MT/Y | CMT DOM T | 0.58 |
| | : CEMENT-1 | 260000 | MT/Y | CMT DOM B | 0.42 |
| | : CEMENT-2 | 416000 | MT/Y | CMT EXP B | 0 |
| | | | | CLK DOM B | 150000 |

| | UNIT | CONSUMPT'N | PRICE (CASE-1) $/UNIT | PRICE (CASE-2) $/UNIT | PRICE (CASE-3) $/UNIT | PRODUCTION COST (1000 $) | INVENTORY LEVEL | WORKING CAPITAL (1000$) | L | F |
|---|---|---|---|---|---|---|---|---|---|---|
| VARIABLE COST | | | | | | | | | | |
| PYRITE CINDER(1) | MT/T-CL | 0.009000 | 53.26 | 0 | 53.26 | 192 | 0.2000 | 26.8 | | 26.8 |
| PYRITE CINDER(2) | MT/T-CL | 0.019000 | 0 | 76.07 | 0 | 0 | 0.2000 | 0.0 | | 0.0 |
| GYPSUM(1-A) | MT/T-CL | 0.045000 | 32 | 0 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(1-B) | MT/T-CL | 0.045000 | 30 | 0 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(2-A/B) | MT/T-CL | 0.045000 | 0 | 86.7 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(3-A/B) | MT/T-CL | 0.045000 | 0 | 0 | 68.63 | 1235 | 0.1000 | 86.5 | 86.5 | |
| FUEL COAL(1) | MT/T-CL | 0.152000 | 68.48 | 0 | 68.48 | 4164 | 0.2000 | 582.9 | | 582.9 |
| ELECTRIC POWER | MWH/T-CL | 0.050927 | 0 | 0 | 40.2 | 307 | 0.2000 | 43.0 | | 43.0 |
| DIESEL OIL (CL) | KL/T-CL | 0.011950 | 355.98 | 0 | 355.98 | 638 | 0.0167 | 7.4 | 7.4 | |
| DIESEL OIL (CM) | KL/T-CM-1 | 0.032470 | 355.98 | 355.98 | 355.98 | 3005 | 0.0167 | 35.1 | 35.1 | |
| FIRE BRICKS | MT/T-CL | 0.000160 | 1395.65 | 1395.65 | 1395.65 | 89 | 0.3000 | 18.8 | | 18.8 |
| STEEL BALL | MT/T-CM-2 | 0.000050 | 2345.9 | 2345.9 | 2345.9 | 49 | 0.3000 | 10.2 | | 10.2 |
| LUBE OIL | KL/T-CM-2 | 0.000025 | 4901.85 | 4901.85 | 4901.85 | 51 | 0.3000 | 10.7 | | 10.7 |
| EXPLOSIVES | $/T-CL | 0.218909 | 1 | 1 | 1 | 88 | 0.3000 | 18.4 | | 18.4 |
| (SUB-TOTAL) | | | | | | 9818 | | 0.0 | | 0.0 |
| PAPER SACK | P'CE/CM-DT | 20.6000 | 0.5188 | 0.5188 | 0.5188 | 2579 | 0.2000 | 361.0 | | 361.0 |
| | P'CE/CM-DB | 20.6000 | 0.62 | 0.62 | 0.62 | 2232 | 0.2000 | 312.4 | | 312.4 |
| | P'CE/CM-X | 20.6000 | 0.8098 | 0.8098 | 0.8098 | 0 | 0.2000 | 0.0 | | 0.0 |
| TRANSPORTATION | $/T-CL | 150000 | 25 | | | 3750 | | | | |
| | $/T-CM | 100.00% | 15.64 | | | 4066 | | | | |
| TOTAL | | | | | | 22444 | | 1513.2 | 129.0 | 1384.3 |

NOTE: All product is assumed to be sold in bagged cement.

Table IV-6 PRELIMINARY PRODUCTION COST

CASE :3A

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | CMT DOM T | 58.00% | | | | | |
| PRODUCTION | : CLINKER | 300000 | MT/Y | CMT DOM B | 42.00% | | | | | |
| | : CEMENT-1 | 312000 | MT/Y | CMT EXP B | 0 | | | | | |
| | : CEMENT-2 | 156000 | MT/Y | CLK DOM B | 150000 | | | | | |
| VARIABLE COST | UNIT | CONSUMPT'N | PRICE (CASE-1) $/UNIT | PRICE (CASE-2) $/UNIT | PRICE (CASE-3) $/UNIT | PRODUCTION COST (1000 $) | INVENTORY LEVEL | WORKING CAPITAL (1000$) | L | F |
| PYRITE CINDER(1) | MT/T-CL | 0.009000 | 53.26 | 0 | 53.26 | 144 | 0.2000 | 20.1 | | 20.1 |
| PYRITE CINDER(2) | MT/T-CL | 0.019000 | 0 | 76.07 | 0 | 0 | 0.2000 | 0.0 | | 0.0 |
| GYPSUM(1-A) | MT/T-CL | 0.045000 | 32 | 0 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(1-B) | MT/T-CL | 0.045000 | 30 | 0 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(2-A/B) | MT/T-CL | 0.045000 | 0 | 86.7 | 0 | 0 | 0.1000 | 0.0 | 0.0 | |
| GYPSUM(3-A/B) | MT/T-CL | 0.045000 | 0 | 0 | 68.63 | 927 | 0.1000 | 64.9 | 64.9 | |
| FUEL COAL(1) | MT/T-CL | 0.152000 | 68.48 | 0 | 68.48 | 3123 | 0.2000 | 437.2 | | 437.2 |
| ELECTRIC POWER | MWH/T-CLD | 0.050927 | 0 | 0 | 40.2 | 307 | 0.2000 | 43.0 | | 43.0 |
| DIESEL OIL (CL) | KL/T-CL | 0.011950 | 0 | 0 | 355.98 | 638 | 0.0167 | 7.4 | 7.4 | |
| DIESEL OIL (CM) | KL/T-CM-2 | 0.032470 | 355.98 | 355.98 | 355.98 | 1803 | 0.0167 | 21.0 | 21.0 | |
| FIRE BRICKS | MT/T-CL | 0.000160 | 1395.65 | 1395.65 | 1395.65 | 67 | 0.3000 | 14.1 | | 14.1 |
| STEEL BALL | MT/T-CM | 0.000050 | 2345.9 | 2345.9 | 2345.9 | 37 | 0.3000 | 7.7 | | 7.7 |
| LUBE OIL | KL/T-CM | 0.000025 | 4901.85 | 4901.85 | 4901.85 | 38 | 0.3000 | 8.0 | | 8.0 |
| EXPLOSIVES | $/T-CL | 0.218909 | 1 | 1 | 1 | 66 | 0.3000 | 13.8 | | 13.8 |
| (SUB-TOTAL) | | | | | | 7149 | | 0.0 | | 0.0 |
| PAPER SACK | P'CE/CM-DT | 20.6000 | 0.5188 | 0.5188 | 0.5188 | 1934 | 0.2000 | 270.8 | | 270.8 |
| | P'CE/CM-DB | 20.6000 | 0.62 | 0.62 | 0.62 | 1674 | 0.2000 | 234.3 | | 234.3 |
| | P'CE/CM-X | 20.6000 | 0.8098 | 0.8098 | 0.8098 | 0 | 0.2000 | 0.0 | | 0.0 |
| TRANSPORTATION | $/CL | 150000 | 25 | | | 3750 | | | | |
| | $/CM | 100.00% | 15.64 | | | 2440 | | | | |
| TOTAL | | | | | | 16946 | | 1142.3 | 93.3 | 1048.9 |

NOTE: All product is assumed to be sold in bagged cement.

Figure IV-1 PROJECT SCHEDULE

| ITEM \ YEAR | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|
| 1 FEASIBILITY STUDY | 01——07 | | | | | | |
| 2 FEASIBILITY STUDY REVIEW | 08—10 | | | | | | |
| 3 DECISION ON PROJECT IMPLEMENTATION | 08——12 | | | | | | |
| 4 COMPANY FOUNDATION | | 01——04 | | | | | |
| 5 DETAILED PROJECT PLAN | | 03——06 | | | | | |
| 6 FUND RAISING | | 05——12 | | | | | |
| 7 PREPARATION OF IMPLEMENTATION | | 07——12 | | | | | |
| 8 SITE ACQUISITION | | 09——12 | | | | | |
| 9 BASIC DESIGN | | | 01—03 | | | | |
| 10 PREPARATION OF TENDER | | | 01——04 | | | | |
| 11 TENDER | | | 05——08 | | | | |
| 12 BID.EVALUATION. AWARD.EPC CONTRACT | | | 09——12 | | | | |
| 13 CONSTRUCTION WORK | | | | 01—— | ——— | ——10 | |
| DETAILED DESIGN AND ENGINEERING | | | | 01——10 | | | |
| SHOP WORK | | | | 03—— | ——03 | | |
| DELIVERY AND TRANSPORTATION | | | | 08—— | ——08 | | |
| PREPARATION OF SITE WORK | | | | 04——08 | | | |
| LAND LEVELLING | | | | 08—— | ——09 | | |
| MECHANICAL AND ELECTRICAL WORK | | | | | 09—— | ——09 | |
| INSTALLATION | | | | | 10—— | ——10 | |
| 14 TEST RUN.PLANT TAKE OVER | | | | | | 09——12 | |
| 15 COMMERCIAL OPERATIONS | | | | | | | 01——— |

Chapter V

# LOCATION AND SITE

V. Location and Site

In order to produce one ton of cement approximately 1.2 tons of limestone and about 0.2 tons of clay together with 0.2 tons of lime are required. As clay is a raw material readily found in any location most cement plants are located in proximity to limestone quarries which provide the main raw material for such plants. Moreover coastal regions are usually selected to facilitate transport to consumer destinations.

This project aims to satisfy the entire domestic demand in Madagascar and make possible exports to the IOC countries. In view of raw material delivery costs and finished product shipping costs it is essential that the plant be located close to a limestone quarry and near to a harbor. The importance of proximity to a harbor is accentuated by the fact that Madagascar is an island whose internal road network is inadequate so that internal transportation presents difficulties. Two sites have been selected in Madagascar which fulfill these plant site conditions, i.e. the environs of Mahajanga in the north west and the environs of Toliara in the south west of the island.

Further in order to supply the metropolitan area and consumer markets in the north east a project for a milling plant to be located in the outskirts of Toamasina has been added to the present study.

1. Toliara Site

(1) Site Conditions for Cement Plant

A. Harbor Conditions

a. Outline

At Toliara harbor a natural breakwater is formed by a long coral reef running north to south out at sea to the west some 3.5 km from shore. A waterway some 10 meters in depth extends from the sea front to the coral reef and a wharf 1.5 km in length to its jetty runs in a north south line from the sea front to the edge of the waterway. There is little rain and the sea is calm excepting 3 or 4 days of rough sea annually.

b. Pier Specifications

Water depth : at full tide 11 m
at low tide 8 m
Wharf length: 160 m
Class of craft accommodated: 16,000 DWT
Jetty : 1500 m

c. Dockyard conditions

There is an area 160 m by 60 m at the end of the jetty on which a warehouse 80 m by 27 m has been constructed. The area is cramped for loading purposes and it is desirable to secure an area for clinker loading equipment by extension of the wharf.

d. Vacant land near Harbor

There is no vacant land in the dockyard area but less than 100 meters from the entrance of the seafront jetty on the south side there is a vacant area of 10 hectares.

e. Harbor access

The road to the jetty is sufficiently wide and connects with the south of the town. If an access road can be made connecting with the road extending from the town to the airport then raw materials could be transported to the harbor without having to pass through the urban area (refer to Figure V-2).

E. Conditions of Candidate Site for Plant Construction

a. Candidate sites

There is a marshy area of some 10 hectares vacant located approximately 20 meters from the entrance to the jetty entrance of Toliara harbor. The area is used for grazing by nearby inhabitants since it is covered with grass. The upper sediment seems to be organic sludge. However, the area could be made to fulfill site conditions at extremely economical cost if improvement of soil quality and driving piles at necessary spots were undertaken. The intake tank and warehouse of Solima have been constructed at the same jetty entrance. Further delivery of raw materials and plant equipment to the site would be possible without any passing through the urban area and so the site would not pose any problems to the social environment. However provision of sufficient compensation and alternative settlements for the inhabitants illegally installed on the surrounding area need to be considered.

In addition to the above site consideration was given to a salt field site located further south and a candidate site located further inland along the national highway to the south but these were found to be inferior in economic terms to the site in question because of their position relative to the harbor.

b. Delivery of Raw materials and Fuels

Limestone is found in a lime stratum virtually untopped by soil of an internal alluvial hilly area some 30 meters in height and running north south some 10 km inland from the coastal line. As the components of this limestone are 51-53% CaO and low in MgO it is of sufficient quality for use as cement raw material.

Clay is extracted from the clay strata distributed in the areas around Toliara. Imports of a part of remaining raw materials and fuels will be required but delivery problems are not envisaged.

c. Required Surface Area for Plant Site

Some 8 hectares.

d. Distance from Plant to Quarry and Harbor

Distance between quarry and plant overland approx. 15 km.
Distance between wharf and plant overland approx. 1.6 km.

e. Electricity

6 to 8 megawatts are required, however since the generating capacity of Toliara is 9.5 MW the maximum excess of supply available is 5.3 MW. However, in view of the present supply capacity and frequency of power cuts it is necessary to adopt an autonomous system of complete self sufficiency through diesel generation facilities.

f. Water Utilities

Between 700 and 1,000 tons will be required daily. A deep bore well is to be newly installed and employed.

g. Labor

The population of Toliara is 125,000, and it will be possible to meet labor requirements locally with the exception of administration and engineers.

C. Shipping Method for Finished Products

a. Loading on Ship of Clinker

A belt conveyor is to be installed from the pier head to the clinker silo and loading equipment is to be installed at the pier head for loading onto open barges.

b. Loading on Ship of Cement (Bulk)

Loading equipment is not envisaged at the present time but in the future compression pipes will be installed from the cement silo to the pier head and loading equipment installed for loading onto cement tankers.

c. Loading on Ship of Cement (Bagged)

After loading on truck at the plant the product will be transported to the pier head. Loading on ship will take place using the deck cranes of the ships though mobile cranes will be used for loading small craft.

d. Loading on Trucks

Both bulk and bagged cement supplies to surrounding markets will be delivered by truck.

(2) Installation Plan for Cement Plant

A. Limestone Quarry Plan

To ensure that transportation is economical the quarry for the present project is to be located close to the harbor and a rudimentary surfaced road to be built connecting this to the national highway. Further a cliffside quarry face is to be prepared to render quarrying costs economical. Limestone has a low metamorphic level and is soft in nature so that special equipment will not be required. Breaking the stone is relatively easy and can be carried out at little cost.

B. Cement Plant Plan

The best location for installation of the cement plant is close to the harbor pier entrance. A surfaced road some dozen meters in length will be made from the plant to the access road. As the site is marshy it is necessary to consult results of a survey on ground firmness in order to devise the optimal economic layout of equipment.

Equipment includes one kiln with attached low unit heat consumption dry suspension preheater, and an integrated line of equipment to include that for the intake, storage, and milling of raw materials, burning equipment, clinker storage facilities, for storage of finished and milled cement, for cement bagging, and for dispatch of finished products. Particular attention is to be given to the selection of specialist equipment.

With regard to electricity it is desirable that an entirely self sufficient system of diesel generation be installed in order to ensure a reliable supply. Due to the nature of the geological strata in this area it is not possible to obtain river water and so a deep well is to be bored and underground water tapped for utility purposes.

C. Plan for Dispatch of Finished Products

Bagged cement for domestic markets will constitute the major part of dispatches and where overland transportation to neighboring areas is economical products will be sent by truck. Dispatch to other major domestic demand sites will take place by ship. Transportation from the plant to the pier head will be done by truck.

For excess production, since possible markets for bagged cement are confined to Comoros and the Seychelles and only limited demand is expected it is advisable to consider shipping of clinker to the Reunion. For export of freight to the Reunion it will be necessary to export using large craft. In order to reduce loading costs and shorten time involved a ship loader should be installed to make possible direct loading on ship of large quantities coming from a conveyor belt linked to the plant clinker silo. However as the existing pier head of the harbor is too narrow to accommodate such installations widening work will need to be carried out.

On the basis of market survey results it was decided not to undertake the dispatch of bulk cement initially. Should this become [illegible] lly realistic at some stage in the future then it would be possible to effect loading on ship under pressure through the installation of compression pipes from the plant's cement silo to the harbor.

2. Mahajanga Site

(1) Site Conditions for Cement Plant

A. Harbor Conditions

a. Outline

Mahajanga harbor is located at the mouth of the Betsiboka river. Silting of soil has made the water depth shallow. The harbor at the river mouth is equipped with a number of piers and constitutes the second important harbor town in Madagascar. The harbor is extremely active with a large number of ships always waiting in the offing. Waves are high on the open sea and construction of a harbor on a commercial base is impossible there.

b. Pier Specifications

Water depth

| | | |
|---|---|---|
| Pier No.1 | at full tide 4 m | at low tide 2 m |
| Pier No.2 | at full tide 4 m | at low tide 2 m |
| Pier No.3 | at full tide 2 m | at low tide 0 m |
| Pier No.4 | at full tide 4 m | at low tide 2 m |

Wharf length

| | | |
|---|---|---|
| Pier No. 1 | length | 160 m. |
| Pier No. 2 | length | 114 m. |
| Pier No. 3 | length | 121 m. |
| Pier No. 4 | length | 115 m. |

Class of craft accommodated 6,000 DWT (at full tide)

c. Dockyard conditions

The area is a base for fishing and material handling and there is a dense concentration of buildings such as warehouses, offices, etc. It adjoins an industrial estate.

d. Vacant land near Harbor

There is a vacant area of some 10,000 sq. meters near to the end of pier no. 4 but there is not sufficient space for a plant site.

e. Harbor access

The city area roads are wide and the urban area is not bad as an access route to the harbor. At present a bazaar is held on the east side of the road and so this is blocked but a detour route is used and so the blockage has little detrimental effect.

B. Conditions of Candidate Site for Plant Construction

a. Candidate sites

As there is no vacant land for a plant site near to the Mahajanga harbor the Amboanio area has been proposed as an alternative given the availability of limestone. There is a vacant area on the river side close to the existing cement plant at Amboanio. A limestone quarry is located close behind this area. If a jetty were constructed facing the river mouth then lighters (barges) could moor at this spot. If an access road of about 1 km were made to link this area then Mahajanga harbor and the urban district could be reached in 40 minutes.

A possible arrangement for the plant and its material handling would be to use the company jetty for the bulk cargo import of lime, gypsum, iron component, etc. while Mahajanga harbor could be used for the dispatch of finished (bagged) products, the import of parts or paper bags, etc.

b. Delivery of Raw materials and Fuels

Limestone is found in a 20 meter thick stratum with thin top soil in an alluvial hilly area some 40 meters in height located in the north part of the Amboanio area 30 km overland from the south side of Mahajanga city. As limestone and clay strata alternate the components of this limestone are more than 52% CaO and low in MgO so that it is of sufficient quality for use as cement raw material. The clay which is also extracted from the quarry can be used.

c. Required Surface Area for Plant Site

Some 8 hectares.

d. Distance from Plant to Quarry and Harbor

Distance between quarry and plant nearby (only a few km).
Distance between Mahajanga harbor and cement plant overland approx. 30 km.

e. Electricity

As the supply of electricity presents problems river water is to be used for power generation.

f. Water Utilities

River water is to be used and facilities for water intake are to be installed.

g. Labor

The population of Mahajanga is 105,000, and it will be possible to meet labor requirements locally with the exception of administration and engineers. However as the possible area for commuting is small company housing will be required.

C. Shipping Method for Finished Products

a. Loading on Ship of Clinker

It is necessary to extend a jetty from the river bank close to the plant and install a new barge pier. Further, it will be necessary to secure a warehouse for bagged products in the dockyard at Mahajanga to serve as a base for both internal and export cement (bagged form).

b. Loading on Ship of Clinker

Transport is to be effected by truck up to the plant jetty where loading on barges will be carried out and transshipping take place to the main ship offshore. From the point of dispatch efficiency and demurrage loading onto large tanker craft is considered economically unrealistic and unfeasible.

c. Loading on Ship of Bulk Cement

Transport is to be effected by truck up to the plant jetty where loading on barges will be carried out and transshipping take place to the main ship offshore. Further, for ships which can moor in Mahajanga docks products will be transported from tne plant the ships and loaded directly using a mobile crane.

(2) Installation Plan for Cement Plant

A. Limestone Quarry Plan

To ensure that transportation is economical the quarry for the present project is to be located close to the plant and a rudimentary surfaced road to be built connecting the quarry to the plant. The quarry is to be basically the same in nature as that proposed for Toliara however, since the limestone and clay are found in strata together it is necessary to take measures for quality control at the quarry to ensure that mixing of clay and limestone is avoided.

B. Plan for Dispatch of Finished Products

For the dispatch of bagged cement details are similar to those already outlined for the Toliara site.

The main difference with the Toliara site is the practical impossibility for economic reasons of dispatch of cement bulk and clinker due to the shallow water depth of Mahajanga bay. This is the major weak point of the Mahajanga site. Although present material handling is concentrated on bagged cement the experience of other countries shows that in the future this will inevitably shift to the large scale export of bulk cement.

## 3. Toamasina Site

(an alternative case in the event of installation of a cement plant at the Toliara site)

### (1) Site Conditions for a Milling Plant

#### A. Harbor Conditions

a. Outline

Toamasina port is the major harbor town of Madagascar and is the base for freight shipping to the metropolitan area being connected to this by rail.

b. Pier Specifications

There are a number of wharves beginning with the pier head having a water depth of 10 meters at low tide. There are excellent harbor facilities available.

c. Vacant land near Harbor

The actual site has not been verified but from maps and other data available it would seem that there is no vacant land in the vicinity.

#### B. Conditions of Candidate Site for Plant Construction

a. Candidate sites

As there is no vacant land near to Toamasina harbor it is necessary to identify a site in the outskirts of Toamasina city which is as near as possible to the port and moreover which is suitably placed for convenient use of the rail network.

b. Delivery of Raw materials and Fuels

Gypsum is to be imported but no problems are envisaged in its delivery.

c. Required Surface Area for Plant Site

About two hectares.

d. Electricity

As the electricity requirements are not large the supply can be provided by the local Electric company.

C. Shipping Method for Finished Products

a. Loading on Ship of Bagged Cement

This will be carried by truck from the plant to Toamasina harbor and loaded on ship there.

b. Loading on Freight Trains of Bagged Cement

The product will be carried by truck from the plant to the freight train station and loaded on the freight trains.

(2) Installation Plan for the Milling Plant

A. Background

If a complete plant is established at the Toliara or Mahajanga sites then bagged cement will be dispatched to the internal markets from these sites.

In view of the loss which would result from transportation costs and damaged bags an alternative case was evaluated for a Project center involving processes from finishing onwards which would be separated from the cement plant.

As dispatch of clinker can be carried out at the Toliara site the clinker would be carried to Toamasina. As it is presumed that the supply of cement manufactured there to the metropolitan and surrounding area would result in a reduction of materials handling costs a plan for location of a milling plant at Toamasina was proposed.

B. Cement Milling Plant Plan

An area of about 20,000 square meters will be required for a Milling Plant. A site close to the Toamasina harbor and also conveniently placed for use of the rail network is to be selected. The actual site has not yet been verified but available data indicates that there is no vacant space in the vicinity of the harbor so it will be necessary to search for an appropriate site in the city outskirts.

The raw material clinker and gypsum will be unloaded at port and transported by truck to the Milling plant. As the gypsum is to be imported cost will be the same as in the case of Toamasina.

A clinker silo, gypsum tank, finishing mill, cement silo and packaging and dispatch equipment are to be installed at the Milling Plant.

C. Plan for the Dispatch of Finished Goods

The supply of bagged cement can be carried out by freight train to the metropolitan area, by truck to the neighboring areas and by ship to the north east part of the internal domestic market. Material handling costs for the above are of course lower when compared to the delivery of bagged cement from Toliara by ship and moreover this plan would ensure a much more reliable and improved supply of cement to the north east and metropolitan areas. Such advantages in turn would increase the competitive edge over imports.

## 1. Land Acquisition Cost

The estimated cost of land acquisition based on local surveys of the sites is shown below. Further, the laws of Madagascar do not allow non nationals or foreign incorporations to acquire ownership rights on land.

(1) Toliara

A. Cost of Land

The general cost of land in the area surrounding Toliara city is shown below.

- Government owned land: FMG 500 / 3,000 sq.m.
- Privately owned land : FMG 1,000/ 1,500 sq. m.
- City suburbs : FMG 80,000 / hectare

Land prices are inexpensive in the area in all of the above cases. Moreover the likeliest candidate site for the present project is one located near to the quay entrance and since this is a marshy government owned area it does not enjoy a strong selling point. This means that the average land cost per square meter including estimates for the necessary suburban sites are estimated to be of the order of 0.5 US $ dollars or FMG 750 per square meter.

B. Required Surface Area

| | |
|---|---|
| Plant site | : 8 hectares |
| Quarry site | : 10 hectares |
| Private road | : 5 hectares |
| Site for rehousing displaced residents | : 2 hectares |
| TOTAL | :25 hectares |

There are about 100 dwellings presently situated in the vicinity of the planned access route for limestone deliveries to the projected plant. It is estimated that some 10 or so houses will actually need to be displaced but to avoid friction the provision of alternative housing and compensation for displacement should be effected. Further, it is noted that these residents are illegally occupying government owned land.

C. Land Acquisition Cost

US$ 0.50/sq. m. x 250,000 sq. m. = US$ 125,000

(2) Mahajanga

A. Cost of Land

In the case of Mahajanga, it will be necessary to secure sites for both a quarry and Plant in the suburban area. The cost of sites outside the urban area are as follows.

Agricultural land : FMG 50,000- 100,000/hectare
Cattle Field land : FMG 30,000- 60,000/hectare

According to the Land Office of the area concerned it is possible to apply for the diversion of cattle fields for use as plant sites.

B. Required Surface Area

| | |
|---|---|
| Plant site | : 8 hectares |
| Quarry site | :10 hectares |
| Private road and company pier site | : 2 hectares |
| TOTAL | :20 hectares |

Further, there is a vacant space of approximately 1 hectare next to quay No.4(QUAI BARRIQUAND)in Mahajanga harbor which will be required for shipping bagged cement and leasing this is possible.

C. Land Acquisition Cost

Approx. US$ 40 hectare x 20 hectares = US$ 800

(3) Toamasina

The candidate site for location of the Finishing and bagging plant at Toamasina is undecided as yet. However it is necessary to choose a site close to the rail freight station and the harbor facilities. The following conditions are assumed for the purposes of the present study.

Cost of land : US$ 1/sq. meter
(FMG 1,500/sq. m.)
Required surface area : 2 hectares
Cost of land acquisition : US$ 20,000

Figure V-1 M A D A G A S C A R

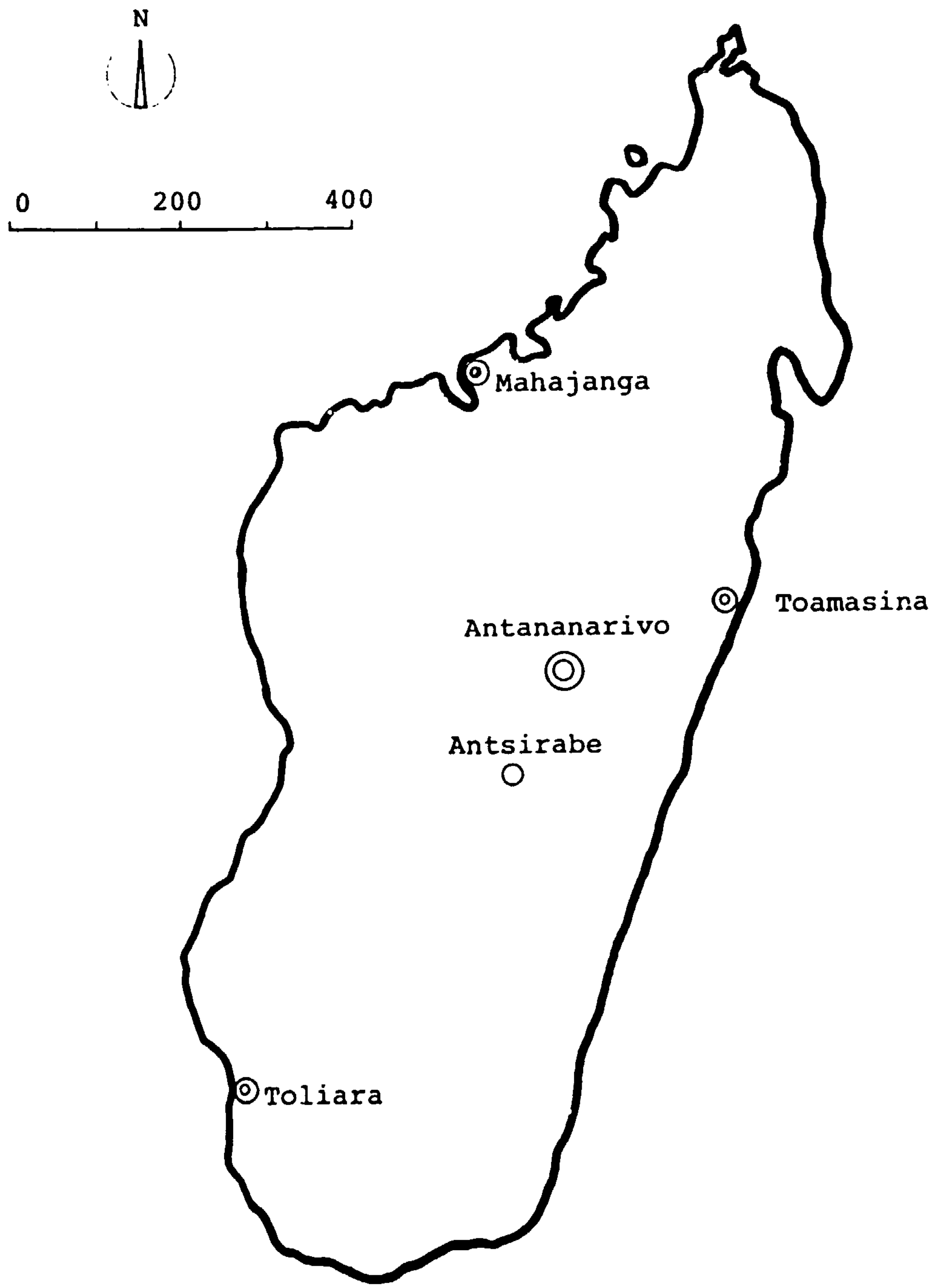
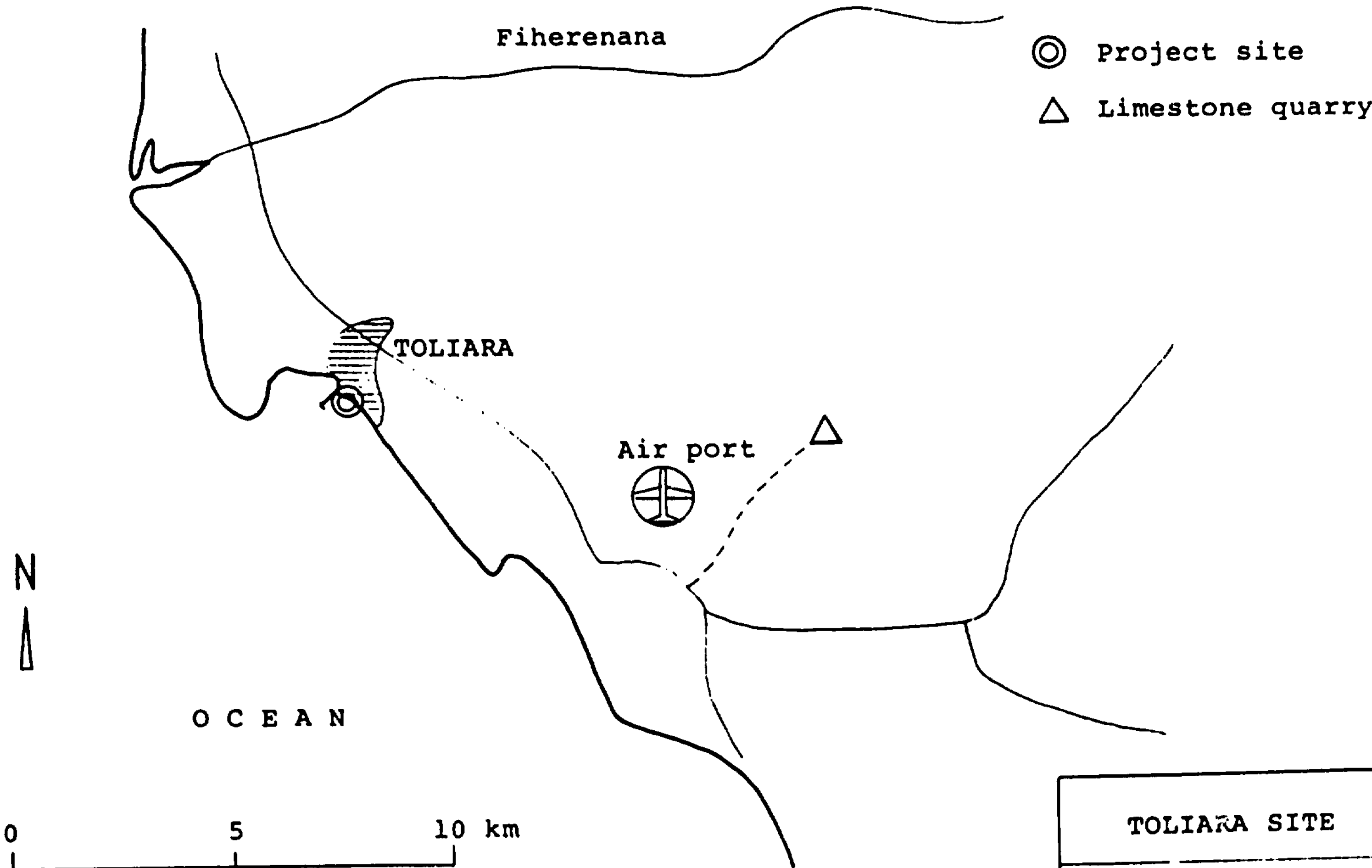


Figure V-2




TOLIARA SITE

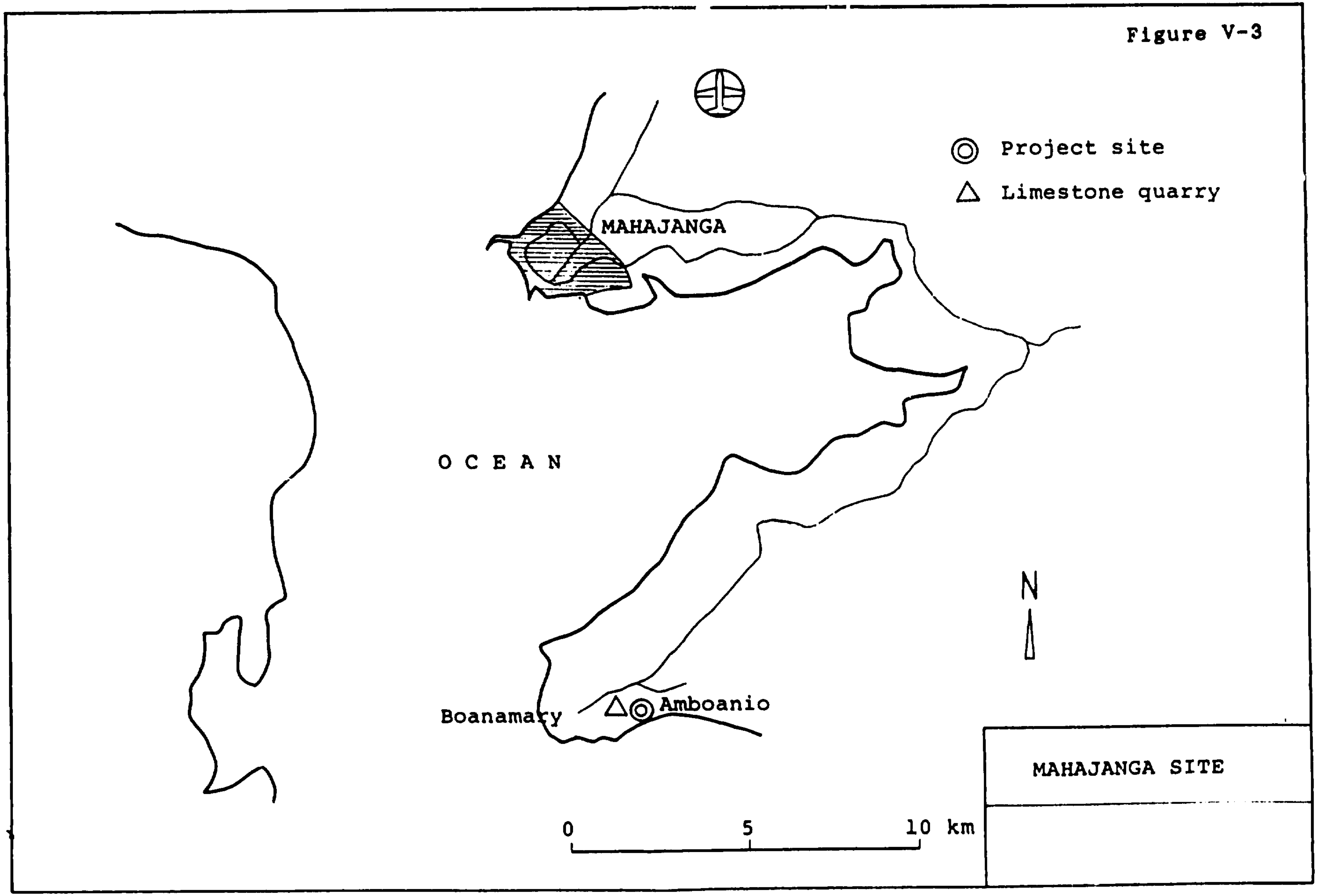
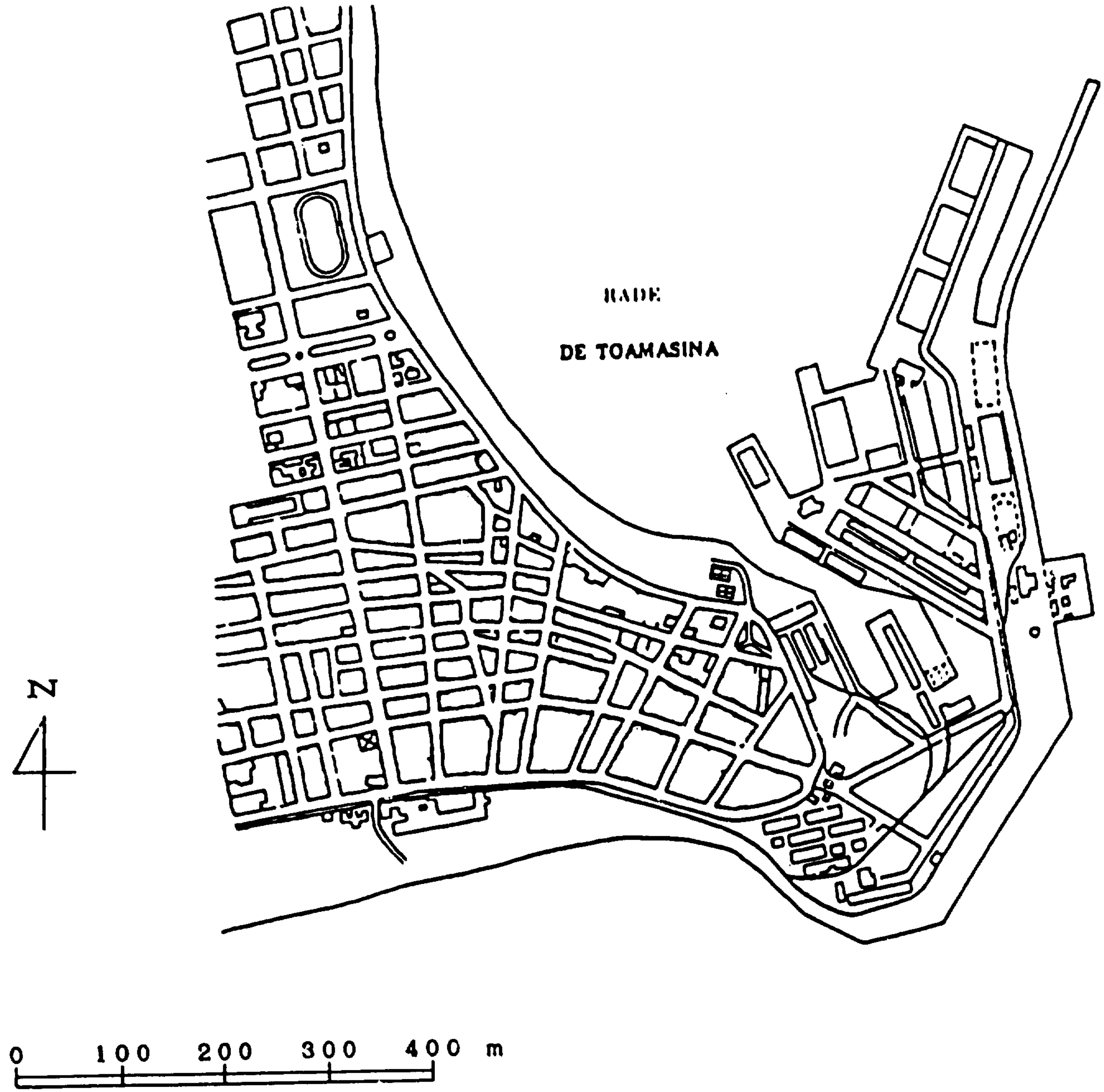


Figure V-3

MAHAJANGA SITE

Figure V-4




TOAMASINA SITE

# Chapter VI

# PROJECT ENGINEERING

## VI. Project Engineering

### 1. Outline of Cement Production Methods

#### (1) General

In general cement means hydraulic cement and refers to portland cement and mixed cements based on this. The main constituents of Portland cement are three calcium silicate C3S, two calcium silicate CS2, three calcium aluminate C3A,and four calcium ferroaluminate C4AF. These four minerals undergo hydration when mixed with water and gradually harden. Hydraulicity constitutes the particular property of cement. The specific characteristics of the different types of Portland cement result from the quantity of major substances in the composition of each type.

At present Portland cement is produced by the addition of gypsum, which is used to adjust cement congelation, to clinker when these are crushed and milled to an extremely fine condition. Cement products which are produced with other mixed additives besides clinker and gypsum are known as mixed cement.

In France the AFNOR standards for Portland cement (CPA) and for mixed cements (CPJ) are determined by the ratio of ingredients. Further, the grades of cement strength are indicated as figures following the above standard abbreviations. Such figures, for example CPA 45 or CPJ 35 define the compression strength in terms of Newtons per square millimeter.

Clinker is obtained when calcic and argillaceous materials are mixed together in appropriate ratios and this calcinated at 1450 degrees c. until partially fused. Portland cement is produced by adding gypsum in extremely finely powdered form.

Limestone of superior quality with a $CaCO_3$ constituent exceeding 90% is generally used as the calcic component. Clay is used as the argillaceous material and has a composition of 60 to 75% $SiO_2$, 10 to 25% AI2O3, and 5 to 10% Fe2O3 for its main constituents. Soft silica and silica sand are used to reinforce the SiPO2 constituent when this is lacking in the argillaceous material. Ferrous minerals, bauxite or iron sand are used to reinforce the iron component if this is insufficient.

The production method of Portland cement is divided into the dry and wet methods defined in relation to the raw material processing involved. Recently almost all production is carried out with the dry method.

With the dry method appropriate quantities of limestone, clay, silica and iron component are mixed after drying and then milled in a Raw material Mill. The mixture which has been uniformly mixed in an air blending silo is fed into a kiln. Cement production processes can be divided roughly into raw material processing, calcination and finishing processes.

(2) Raw Materials Processing

Raw material processing involves stages for quarrying, adjustment, milling and standardization. Quarrying of raw materials such as limestone and clay can be carried out with either mining equipment or by dynamiting and the material is then transported to the Plant. It is necessary to adapt the methods of quarrying and transport to ensure that the necessary quantity for production is secured. The control of raw material composition is the most important aspect of regulation of the raw materials stored in the materials yard. Exact and precise mixing is ensured by the employment of fluorescent x-ray analysis and computer control systems.

With the dry method the water content of crushed raw materials is dried to a level below 1% and then the mixture is finely powdered. Further, with the wet method the water content is then brought up to 20% level and the mixture crushed to a slullery condition.

With the dry method standardization of powdered material is commonly carried out with the air blending method. With the dry method air blending involves mixing a flow of non-uniform impalpable powder particles which are passed through the blender. This method has the advantage of being able to handle a large quantity of powder as well as being faster than in the case of a uniform flow. With the wet method regulation of material composition is effected in a number of slullery tanks. Uniformity of the slullery is achieved either with high air pressure or through mechanical mixing. Recent technical innovations have resulted in an increased efficiency for the dry blending method which is now as good as the wet method for uniform mixing of materials.

(3) Calcination

For calcination the milled prepared raw material issuing from the above processing is fed into a cement kiln. The material is heated in the kiln and dried at 250 degrees c. and pyrolosis of limestone effected at 900 degrees c. The unslaked lime CaO which results from pyrolosis reacts with the clay, silica and iron component to produce clinker at a temperature of 1450 degrees c. Technical innovation has been remarkable in this stage with the development of the wet method, Lepol, SP, and NSP technology. Recently,large SP and NSP kilns are used separately to calcinating systems operating at temperatures of 900 to 1000 degrees c.

Heat convertors are used in the clinker coolers to cool clinker at 1200 degrees c. by air and then heat a secondary air current for calcination in order to improve calcination efficiency. With these the temperature is reduced to 1000 degrees c. and clinker sent to storage.

(4) Finishing Process

In the finishing process a 3 to 4% ratio of gypsum is added to clinker and this is finely milled to produce cement which is stored in the cement silos. Further,for Pozzolana cement a 15 to 35% proportion of pozzolana is added during the finishing process to produce a mixed cement. This causes a reduction in the strength of the cement but as pozzolana itself has hydraulicity and the strength reduction is small mixed cement production is carried out where pozzolana is available.

(5) Bagging and Shipment

Cement taken from the cement silo is bagged. Bagged cement or bulk cement is then loaded on trucks, freight cars or ships for shipment. In some cases the semi-manufactured form Clinker is forwarded to a separate Milling Plant for final processing.

(6) Anti Pollution Measures

The production processing for cement involves the movement of large quantities of powdered materials and as the burning of large amounts of fine coal powder is also involved in the calcination process this easily gives rise to sulfur oxides, soot,smoke and dust. Efforts to prevent pollution are therefore demanded from the cement industry. In particular as there is always a large amount of lime present in the cement calcination process the sulfur oxides which are produced from the fuels and raw materials unite with the lime to become sulfuric chloride compounds. These sulfuric chlorides leave the kiln inside the clinker. Thus the production process itself works as an effective desulfurizing device. Finally, to eliminate dust, etc. various types of dust collector are installed.

## 2. Evaluation of Production Processing

### (1) Applicable Processes

The categories of kilns employed in the production of Portland cement include vertical shaft kilns of a packed bed type, horizontal rotary kilns and rotary kilns which revolve at a 3 to 4.5 % angle of inclination. Shaft kilns have the advantage of a low equipment cost and they only occupy a small surface area. However they are not readily adapted to large scales of production above a 100,000 ton per year level. Moreover, they have a fuel consumption some 15 to 20% greater than that of SP kilns.

Production methods for portland cement can be roughly divided into the dry, semi wet and wet methods defined by the different processing of raw materials involved Recent production is almost completely done by the dry method.

The reason for this is the decisive difference in fuel cost consequent on the amount of heat required for cement production since 1300 kcals are required for the production of one ton of clinker in the case of the wet method while the dry method only takes 800 kcal for the same production.

Technical progress has resulted in the development and widespread application of the rotary kiln equipped with an attached suspension preheater. The suspension preheater suspends the powdered raw material in the exhaust gas issuing from the rotary kiln and preheats the raw material to a temperature balanced calorifically with the exhaust gas. The intake raw material is submitted to heat conversion while being gradually collected with a 4 to 5 stage cyclone and heated to approximately 850 degrees centigrade. Part of the heated raw material is calcinated and sent to the rotary kiln. The temperature of the exhaust gas of the rotary kiln is between 1000 and 1100 degrees c. while the temperature of exhaust gas in the preheater is about 300 to 350 degrees c.

Recently kilns attached with suspension preheaters have a calcinating furnace installed between the cyclone and kiln which improves the rate of decarbonation of the raw materials sent into the kiln and vastly increases the calcination capacity of the same size SP kiln (such kilns are referred to as NSP or New Suspension Preheater Kilns).

Traditionally calcination fuels were blown into the kiln at 100% but with the use of NSP fuel can be apportioned and the apportioning ratio of kiln and calcinating furnace varies anywhere from 90:10 to 35:65.

Types of Kiln

| Production method | Type | Abbreviation |
|---|---|---|
| Wet | long kiln | W |
| Semi wet | Lepol kiln | L |
| | shaft kiln | S |
| Dry | kiln with suspension preheater | SP |
| | SP kiln with calcinating furnace | NSP |

A Comparison of the Efficiency of Kilns by Type

| Type | Ratio of Kiln Volume to to Calcination capacity | Power per Unit kwh/t. of cement | Heat per Unit kcal/kg of clinker |
|---|---|---|---|
| W | 20 - 25 | 120 - 130 | 1300 - 1400 |
| L | 55 - 65 | 110 - 120 | 1000 - 1100 |
| S | 110 - 130 | 100 - 120 | 950 - 1000 |
| SP | 55 - 80 | 95 - 110 | 750 - 1000 |
| NSP | 120 - 160 | 95 - 110 | 700 - 1000 |

Recent trends evident in new kiln installations show that the shaft kiln is preferred for an annual production below 100,000 tons while the SP kiln is chosen for an annual production below 500,000 tons and above this level the NSP kiln is considered the most appropriate type. However, in order to make a economically sound selection the choice of kiln type should be made after a thorough evaluation of all aspects including such items as construction and installation costs, running costs, etc.

(2) Outline of Recommended Processing

1) The advantages of the SP kiln are as follows;

a. the quantity of heat required per unit of production is low

b. the amount of electricity required per unit of production is low.

c. high productivity

d. operation is simple and product quality stable and reliable

e. maintenance is simple

f. no toxic gases e.g. Sox or Nox are generated.

2) Disadvantages are:

Alkali and volatile substances (chlorine, etc.) found in the raw materials and fuels are concentrated during the circulation between the kiln and preheater and once these pass the critical level for constituent content the cyclone becomes blocked and this renders operation of the kiln troublesome. However, for purposes of the present report no such problems are involved with the raw materials and fuels in question.

a. production method : Dry method Kiln with 5 stage suspension preheater (SP)

b. Nominal capacity

Case 1. Clinker 300,000 tons per year, with 300 operating days annually.

Case 2. Cement 312,000 tons per year (CPA-55 or CPA-45)

Clinker 400,000 tons per year, with 300 operating days annually

Cement 416,000 tons per year (CPA-55 or CPA-45)

c. Rate of Energy Consumption

Amount of heat per unit : 900 kcal/kg clinker
Electric energy per unit : 110 kWh/t cement

d. Operating hours of Equipment

| PROCESS | OPERATING TIME PER DAY | NO. OF OPERATING DAYS PER WEEK |
|---|---|---|
| Intake of raw materials and fuels | 8 | 6 |
| Raw material processing | 24 | 7 |
| Calcination processing | 24 | 7 |
| Finishing processing | 24 | 7 |
| Dispatch | 8 | 6 |

e. Details of Production Equipment

Amounts indicated below are given for a plant with an annual production of 300,000 tons per year. However figures in brackets indicate amounts for a plant with a 400,000 ton per year output.

(i) Intake and Milling of Raw materials and fuels

Raw materials and fuels such as limestone, clays and coal, etc. are delivered to the plant by dump truck. After crushing to less than 25 mm size the raw materials are stored in the indoor raw materials yard.

| | | |
|---|---|---|
| Crushing capacity: | For limestone: | 250 t/hr.(300 t/hr.) |
| | For clays : | 200 t/hr. (250 t/hr.) |

(ii) Storage Facilities for Raw Materials and Fuels

Limestone is stored in a rectangular covered storage area. A belt conveyor with tripper is used for piling and a reclaimer with a foil bucket for scooping out and a belt conveyor used to send materials to the hopper.

For other materials an indoor storage area equipped with an overhead mobile crane with attached grab bucket is to be used. Belt conveyors will be used to send and store the various raw materials and fuels in their individual sections and a grab bucket used for piling these. Materials are also scooped out with the grab bucket and sent to their individual hoppers.

Storage capacity

| | | |
|---|---|---|
| Limestone | 10,000 tons | (13,000 tons) |
| Clay | 3,000 tons | (4,000 tons) |
| Lime | 5,000 tons | (6,500 tons) |
| Gypsum | 1,000 tons | (1,500 tons) |
| Silica | 1,000 tons | (1,500 tons) |

(iii) Raw Material Dry Milling Equipment

The raw materials are sent out of the individual hoppers mixed to a specified ratio and are dry milled in a vertical roller miller. The exhaust gas of the kiln is used as the heat source for drying.

milling capacity : raw materials 75 tons per hour (100 t/hr)

(iv) Equipment for Mixing of Powdered Raw Materials and their storage

One continuous blending silo and one storage silo are to be installed.

<u>Silo Volume</u>

Blending silo:1,600 cubic m.(2,000 cubic m.)

Stirage silo :1,600 cubic m.(2,000 cubic m.)

(v) Calcination Equipment

A rotary kiln with 5 stage preheater and air quenching cooler are to be used.

Calcination capacity: 1,000 tons per day

Heat consumption per unit: 900 kcal per kg of clinker

(vi) Dust collector equipment for kiln exhaust gas

The exhaust gas of the cyclone preheater is used for drying raw materials or for cooling with a stabilizer. Dust is then collected using an electric dust collector.

Intake gas content: 100 g/$Nm^3$
Exhaust gas content: less than 100 mg/$Nm^3$

(vii) Coal drying Equipment

A vertical roller miller is to be installed for dry milling. The exhaust gas of the cooler is to be used as the dry heat source.

Milling capacity: maximum 10 tons per hr.

(viii) Clinker Storage Facilities

Four cylindrical concrete silos are to be constructed and loading in done with a bucket conveyor.

Storage capacity: 5,000 t x 4 silos =
20,000 t

(ix) Cement Milling Equipment

Milling capacity: 25 t/hr x 2 millers =
50 t/hr
(33 t/hr x 2 millers =
66 t/hr)

Amount of gypsum additive : 4.5%

(x) Cement Storage Facilities

Four storage silos will be constructed.
Storage capacity:2,500 x 4 silos = 10,000 t

(xi) Cement Shipping Equipment

As the cement is almost all bagged it can be forwarded using trucks. As shipment of bulk clinker may also be undertaken in some cases this is to be given consideration.

Bagging capacity : 50 t/hr x three trucks =
150 t/hr
(50 t/hr x four trucks =
200 t/hr)

(xii) Electric Generating Facilities

A diesel generator is to be installed.
Generating capacity: 5500 V three phase 50 Hz
3.5 MW x two generators = 7.0 MW
(4.7 MW x two generators = 9.4 MW)

(xiii) Management Facilities

* Plant offices and laboratories
* Warehouses
* Repairs Shop
* Garage

3. Layout of Plant area

(1) For Case 1 refer to Figure VI-1.

1) Cement Plant

The candidate site for location of the cement plant is situated close to the jetty entrance of Toliara harbor.

2) Limestone Quarry

The location of the limestone quarry is situated some 10 km to the east of the proposed cement plant site at approximately 15 km distance by road.

3) Shipping facilities

A shiploading area for shipping of clinker and bagged cement is to be secured at the jetty end located about 1.5 km on the west side of the harbor.

(2) For Case 2 refer to Figure VI-1.

1) Cement Plant

The candidate site for location of the cement plant is situated on a site facing the Bombetoka river of the Amboanio area at 13 km distance south of Mahajanga (approximately 30 km distance by road).

2) Limestone Quarry

Limestone can be quarried in the area adjoining the proposed cement plant site.

3) Shipping facilities

A bagged cement warehouse is to constructed at Mahajanga harbor to accommodate supplies from the plant which will then be loaded from the harbor wharf.

(3) For Case 3 refer to Figure VI- .

1) Cement Plant

Same as for Case 1.

2) Limestone Quarry

Same as for Case 1.

3) Shipping facilities

Same as for Case 1.

4) Secondary Processing and Delivery Center

A vacant lot some 20,000 square meters in size is to be secured close to Toamasina harbor to serve as a base for secondary processing and deliveries to the metropolitan area. As verifications have not been effected on site only areas which have been recommended are indicated.

## 4. Estimation of Construction Cost

### (1) Quarry Facilities (Base Estimate)

Costs for mining equipment, transport vehicles and administration equipment are included in estimates for the limestone and clay quarries. Rough milling equipment as required by the nature of the limestone is to be installed in the Cement Plant.

Case-1 and 3 Quarry Facilities (Unit: 1,000 US$)

| | Case 1-A/3-A (300,000 t/y) | | | Case 1-B/3-B (400,000 t/y) | | |
|---|---|---|---|---|---|---|
| | F | L | Total | F | L | Total |
| Mining Equipment | 932 | 0 | 932 | 963 | 0 | 963 |
| Transport Vehicles | 1,870 | 0 | 1,870 | 2,328 | 0 | 2,328 |
| Administration Building | 28 | 122 | 150 | 28 | 122 | 150 |
| TOTAL | 2,830 | 122 | 2,952 | 3,319 | 122 | 3,441 |

Case-2 Quarry Facilities (Unit: 1,000 US$)

| | Case 2-A (300,000 t/y) | | | Case 2-B (400,000 t/y) | | |
|---|---|---|---|---|---|---|
| | F | L | Total | F | L | Total |
| Mining Equipment | 932 | 0 | 932 | 963 | 0 | 963 |
| Transport Vehicles | 1,412 | 0 | 1,412 | 1,870 | 0 | 1,870 |
| Administration Equipment | 28 | 122 | 150 | 28 | 122 | 150 |
| TOTAL | 2,372 | 122 | 2,494 | 2,861 | 122 | 2,983 |

(2) Cement Plant (Base Estimate)

Calculations are for the complete plant and include the full range of facilities from those for intake and storage of raw materials, dry milling equipment for raw materials, finishing equipment down to bagging/dispatch facilities.

Case-1 Cement Plant (Unit: 1,000 US$)

| | Case 1-A (300,000 t/y) | | | Case 1-B (400,000 t/y) | | |
|---|---|---|---|---|---|---|
| | F | L | Total | F | L | Total |
| Raw Materials Intake | 4,725 | 533 | 5,258 | 5,433 | 617 | 6,050 |
| Raw Materials Milling | 8,858 | 1,333 | 10,191 | 10,275 | 1,133 | 11,408 |
| Calcination Equipment | 30,167 | 3,358 | 33,525 | 34,100 | 3,783 | 37,883 |
| Finishing Equipment | 10,417 | 583 | 11,000 | 11,992 | 642 | 12,634 |
| Packing and Delivery | 758 | 358 | 1,116 | 875 | 417 | 1,292 |
| TOTAL | 54,925 | 6,165 | 61,090 | 62,675 | 6,592 | 69,267 |

| Case-2 | Cement Plant | | | | | (Unit: 1,000 US$) |
|---|---|---|---|---|---|---|
| | Case 2-A (300,000 t/y) | | | Case 2-B (400,000 t/y) | | |
| | F | L | Total | F | L | Total |
| Raw Materials Intake | 4,908 | 533 | 5,441 | 5,650 | 617 | 6,267 |
| Raw Materials Milling | 9,208 | 1,333 | 10,541 | 10,683 | 1,133 | 11,816 |
| Calcination Equipment | 31,367 | 3,358 | 34,725 | 35,467 | 3,783 | 39,250 |
| Finishing Equipment | 10,833 | 583 | 11,416 | 12,467 | 642 | 13,109 |
| Packing and Delivery | 783 | 358 | 1,141 | 908 | 417 | 1,325 |
| TOTAL | 54,099 | 6,165 | 63,264 | 65,175 | 6,592 | 71,767 |

(3) Utility Facilities (Base Estimate)

Including facilities for diesel electric generation, the substation, fuel oil storage and water supply facilities.

| Case-1/3 | | | | | | (Unit: 1,000 US$) |
|---|---|---|---|---|---|---|
| | Case 1-A/3-A (300,000 t/y) | | | Case 1-B/3-B (400,000 t/y) | | |
| | F | L | Total | F | L | Total |
| Power Generation Facilities | 6,683 | 683 | 7,366 | 7,871 | 788 | 8,659 |
| Sub-station | 479 | 21 | 500 | 542 | 25 | 567 |
| Fuel oil storage | 92 | 8 | 100 | 107 | 10 | 117 |
| Water Supply Facilities | 317 | 258 | 575 | 338 | 283 | 621 |
| TOTAL | 7,571 | 970 | 8,541 | 8,858 | 1,106 | 9,964 |

Case-2 (Unit: 1,000 US$)

| | Case 2-A (300,000 t/y) | | | Case 2-B (400,000 t/y) | | |
|---|---|---|---|---|---|---|
| | F | L | Total | F | L | Total |
| Power Generation Facilities | 6,683 | 683 | 7,366 | 7,871 | 788 | 8,659 |
| Sub-station | 479 | 21 | 500 | 542 | 25 | 567 |
| Fuel oil storage | 92 | 8 | 100 | 107 | 10 | 117 |
| Water Supply Facilities | 263 | 350 | 613 | 283 | 375 | 658 |
| TOTAL | 7,517 | 1,062 | 8,579 | 8,803 | 1,198 | 10,001 |

(4) Auxiliary Facilities (Base Estimate)

Including the Laboratory, Warehouse, Repairs Shop, Administration Office, etc.

All Cases (Unit: 1,000 US$)

| | Foreign | Local | Total |
|---|---|---|---|
| Laboratory | 183 | 175 | 358 |
| Warehouse | 33 | 300 | 333 |
| Repairsshop | 308 | 317 | 625 |
| Administration Office | 317 | 850 | 1,167 |
| Others | 0 | 142 | 142 |
| TOTAL | 841 | 1,784 | 2,625 |

(5) Secondary Processing Facilities (Base Estimate)

Including storage facilities for clinker and gypsum, finishing equipment, bagging and delivery facilities, finished product warehouse and administrative office and facilities.

Cases 3 (Unit: 1,000 US$)

| | Foreign | Local | Total |
|---|---|---|---|
| Clinker and Gypsum | 1,233 | 117 | 1,350 |
| Finishing Equipment | 3,000 | 408 | 3,408 |
| Bagging and Delivery | 217 | 67 | 284 |
| Product Warehouse | 0 | 333 | 333 |
| Administration Office | 117 | 208 | 325 |
| TOTAL | 4,567 | 1,133 | 5,700 |

(6) Shipping and Transportation Facilities (Base Estimate)

Case 1/3
Including the conveyor equipment for shiploading of clinker and the freight cars used for the shiploading of bagged cement. However, the calculations do not include costs for extension of the pier.

Cases 1/3 (Unit: 1 000 US$)

| | Foreign | Local | Total |
|---|---|---|---|
| Clinker Shiploading Equipment | 3,708 | 492 | 4,200 |
| Freight Cars for Shiploading | 422 | 333 | 775 |
| TOTAL | 4,150 | 852 | 4,975 |

Case 2
Including bagged cement warehouse facilities on Mahajanga harbor premises, freight cars for shiploading, and the freight cars used for transport between the plant and the warehouse.

Cases 2 (Unit: 1,000 US$)

| | Foreign | Local | Total |
|---|---|---|---|
| Cement Warehouse at Port | 0 | 917 | 917 |
| Freight Cars for Shiploading | 3,982 | 0 | 3,982 |
| TOTAL | 3,982 | 917 | 4,899 |

(7) Spare parts

Spare parts equivalent to one year use are included in the above estimated equipment costs.

(8) Summary Sheet for Construction Costs (Base Estimate)

Case-1 TOLIARA

(Unit: 1,000 US$)

| | Case 1-A (300,000 t/y) | | | Case 1-B (400,000 t/y) | | |
|---|---|---|---|---|---|---|
| | F | L | Total | F | L | Total |
| Quarry | 2,830 | 122 | 2,952 | 3,319 | 122 | 3,441 |
| Cement Plant | 54,925 | 6,165 | 61,090 | 62,675 | 6,592 | 69,267 |
| Utility | 7,571 | 970 | 8,541 | 8,858 | 1,106 | 9,964 |
| Auxiliary | 841 | 1,784 | 2,625 | 841 | 1,784 | 2,625 |
| Shipping | 4,150 | 825 | 4,975 | 4,150 | 825 | 4,975 |
| Total | 70,317 | 9,866 | 80,183 | 79,843 | 10,429 | 90,272 |

Case-2 MAHAJANGA

(Unit: 1,000 US$)

| | Case 2-A (300,000 t/y) | | | Case 2-B (400,000 t/y) | | |
|---|---|---|---|---|---|---|
| | F | L | Total | F | L | Total |
| Quarry | 2,372 | 122 | 2,494 | 2,861 | 122 | 2,983 |
| Cement Plant | 57,099 | 6,165 | 63,264 | 65,175 | 6,592 | 71,767 |
| Utility | 7,517 | 1,062 | 8,579 | 8,803 | 1,198 | 10,001 |
| Auxiliary | 841 | 1,784 | 2,625 | 841 | 1,784 | 2,625 |
| Shipping | 3,982 | 917 | 4,899 | 3,982 | 917 | 4,899 |
| Total | 71,811 | 10,050 | 81,861 | 81,662 | 10,613 | 92,275 |

Case-3 TOLIARA/TOAMASINA

(Unit: 1,000 US$)

| | Case 3-A (300,000 t/y) | | | Case 3-B (400,000 t/y) | | |
|---|---|---|---|---|---|---|
| | F | L | Total | F | L | Total |
| Quarry | 2,830 | 122 | 2,952 | 3,319 | 122 | 3,441 |
| Cement Plant | 54,925 | 6,165 | 61,090 | 62,675 | 6,592 | 69,267 |
| Utility | 7,571 | 970 | 8,541 | 8,858 | 1,106 | 9,964 |
| Auxiliary | 841 | 1,784 | 2,625 | 841 | 1,784 | 2,625 |
| Shipping | 4,150 | 825 | 4,975 | 4,150 | 825 | 4,975 |
| Secondary Processing | 5,292 | 1,241 | 6,533 | 5,292 | 1,241 | 6,533 |
| Total | 75,609 | 11,107 | 86,716 | 85,135 | 11,670 | 96,805 |

(9) Plant Construction Cost (Budget)

The estimated Plant construction budget was calculated as follows using the Base estimate shown in above and assuming that work begins in 1994 and will be completed in 1996. Further, the Physical Contingency is included in the Base Estimate. For details refer to Table VI-1 through 6.

| | F | L | Total |
|---|---|---|---|
| Case 1-A | 80,255 | 9,744 | 89,999 |
| Case 1-B | 90,923 | 10,307 | 101,290 |
| Case 2-A | 22,567 | 9,928 | 92,495 |
| Case 2-B | 93,681 | 10,491 | 104,172 |
| Case 3-A | 86,645 | 10,985 | 97,630 |
| Case 3-B | 97,373 | 11,548 | 108,921 |

Table VI-1(1) Major Equipment List (300,000t/y)

| M/C No. | Machine | Major specifications |
|---|---|---|
| 1 | Impact crusher | Capacity: 250t/h<br>Particle size: inlet 100mm or less<br>outlet 40mm or less<br>Electric motor: 150kW |
| 2 | Impact crusher | Capacity: 200t/h<br>Particle size: inlet 200mm or less<br>outlet 40mm or less<br>Electric motor: 150kW |
| 3 | Raw material mill | Virtical mill roller type<br>Capacity: 75t/h<br>Dimensions: Table 2.3mφ<br>Electric motor: 580kW<br>Motor for separator: 37kW |
| 4 | Blending storage silos | Continuos blending silo (concrete)<br>Volume: 1600 $m^3$ = 1200t<br>Storage silo (concrete)<br>Volume: 1600 $m^3$ = 1600t |
| 5 | Kiln | Totally welded steel construction<br>Capacity: 41.7t/h (clinker)<br>Dimensions: 3.8mφ ×60m<br>Number of revolutions: 2.2 rpm<br>Electric motor: DC 150kW |
| 6 | Kiln main exhaust fan | Double-suction turbo fan<br>Suction quantity: 1250$Nm^3$ /min<br>2850$Bm^3$ /min<br>Static pressure: 800mmAq<br>Temperature: 350℃<br>Electric motor: DC 800kW |
| 7 | Electrostatic precipitator | Inlet gas rate: 1850$Nm^3$ /min<br>2600$Bm^3$ /min<br>Gas temperature: 110℃<br>Dust content: Inlet 100 g/$Nm^3$<br>Outlet 100mg/$Nm^3$ |

Table VI-1(2)

| M/C No. | Machine | Major specifications |
|---|---|---|
| 8 | Coal mill | Virtical mill roller type<br>Capacity: 10t/h<br>Dimensions: Table 1.4m$\phi$<br>Electric motor: 150kW |
| 9 | Air quenching cooler | 1-Stage holizontal grate cooler<br>Capacity: 41.7t/h<br>Dimensions: 3m×13.6mL<br>Electric motor: 11kW<br>Cooling gas rate: 2200Nm$^3$ /min<br>2440Bm$^3$ /min<br>Temperature: 30℃<br>Fan motor (total): 200kW |
| 10 | Clinker silos | Cylindrical concrete silos<br>Volume: 3600 m$^3$ (5000 t)×4 |
| 11 | Cement mill | Horizontal dual ball mill<br>Capacity: 25t/h ×2<br>Dimensions: 2.75m$\phi$ ×10.7mL<br>Electric motor: 950kW |
| 12 | Cement silos | Cylindrical concrete silos<br>Volume: 2000 m$^3$ (2500 t)×4 |
| 13 | Cement packing machine | 4-Tube type packer<br>Capacity: 50t/h ×3 |

Table VI-2(1) Major Equipment List (400,000t/y)

| M/C No. | Machine | Major specifications |
|---|---|---|
| 1 | Impact crusher | Capacity: 300t/h<br>Particle size: inlet 100mm or less<br>outlet 40mm or less<br>Electric motor: 180kW |
| 2 | Impact crusher | Capacity: 250t/h<br>Particle size: inlet 200mm or less<br>outlet 40mm or less<br>Electric motor: 180kW |
| 3 | Raw material mill | Virtical mill roller type<br>Capacity: 100t/h<br>Dimensions: Table 2.5m$\phi$<br>Electric motor: 800kW<br>Motor for separator: 55kW |
| 4 | Blending storage silos | Continuos blending silo (concrete)<br>Volume: 2000 $m^3$ = 1500t<br>Storage silo (concrete)<br>Volume: 2000 $m^3$ = 2000t |
| 5 | Kiln | Totally welded steel construction<br>Capacity: 55.6t/h (clinker)<br>Dimensions: 4.1m$\phi$ $\times$68m<br>Number of revolutions: 2.2 rpm<br>Electric motor: DC 150kW |
| 6 | Kiln main exhaust fan | Double-suction turbo fan<br>Suction quantity: 1660N$m^3$ /min<br>3790B$m^3$ /min<br>Static pressure: 800mmAq<br>Temperature: 350℃<br>Electric motor: DC 1100kW |
| 7 | Electrostatic precipitator | Inlet gas rate: 2460N$m^3$ /min<br>3450B$m^3$ /min<br>Gas temperature: 110℃<br>Dust content: Inlet 100 g/N$m^3$<br>Outlet 100mg/N$m^3$ |

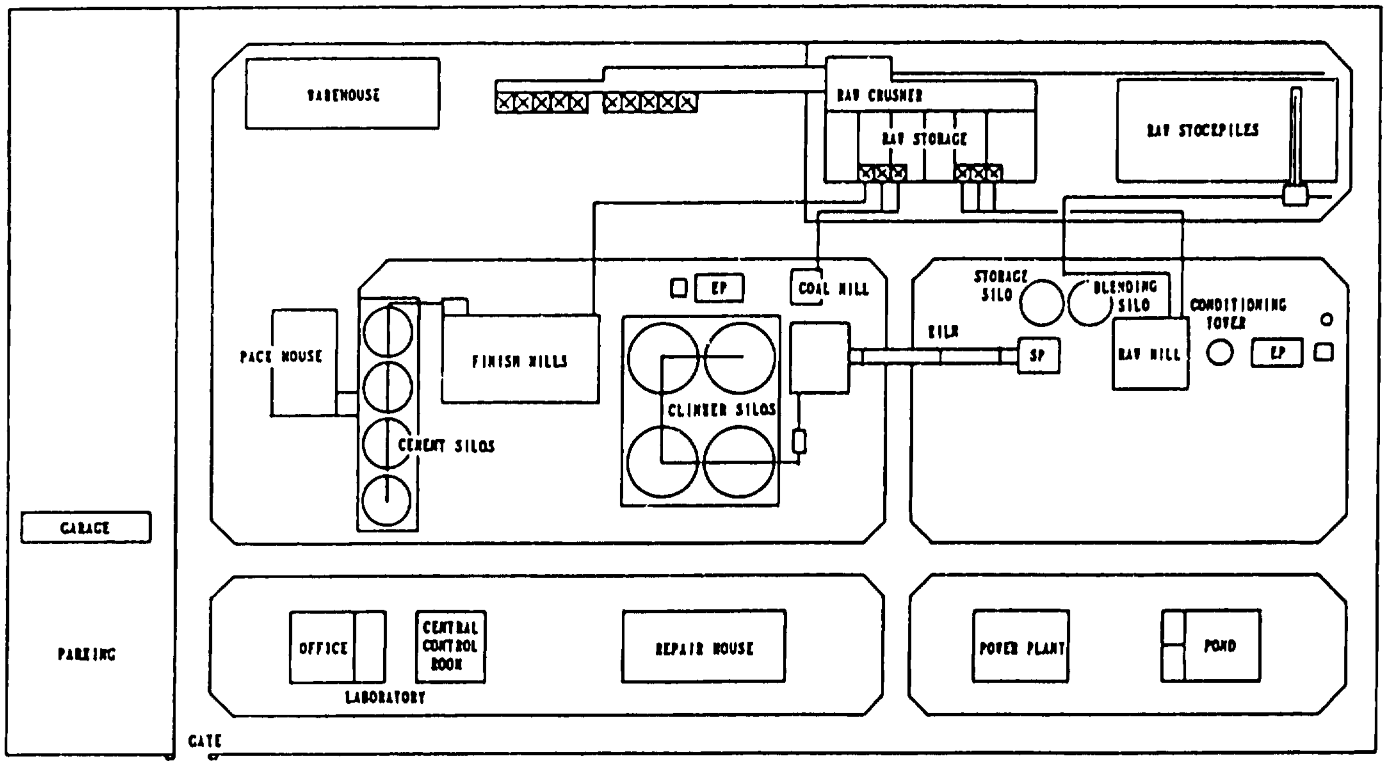
Table VI-2(2)

| M/C No. | Machine | Major specifications |
|---|---|---|
| 8 | Coal mill | Virtical mill roller type<br>Capacity: 10t/h<br>Dimensions: Table 1.4m$\phi$<br>Electric motor: 150kW |
| 9 | Air quenching cooler | 1-Stage holizontal grate cooler<br>Capacity: 55.6t/h<br>Dimensions: 3m×18mL<br>Electric motor: 15kW<br>Cooling gas rate: 2930N$m^3$ /min<br>3250B$m^3$ /min<br>Temperature: 30℃<br>Fan motor (total): 270kW |
| 10 | Clinker silos | Cylindrical concrete silos<br>Volume: 3600 $m^3$ (5000 t)×4 |
| 11 | Cement mill | Horizontal dual ball mill<br>Capacity: 33t/h ×2<br>Dimensions: 3.2m$\phi$ ×10.2mL<br>Electric motor: 1300kW |
| 12 | Cement silos | Cylindrical concrete silos<br>Volume: 2000 $m^3$ (2500 t)×4 |
| 13 | Cement packing machine | 4-Tube type packer<br>Capacity: 50t/h ×4 |

Table VI-3 Major Equipment List (150,000t/y)
[Secondary processing center in Toamasina]

| M/C No. | Machine | Major specifications |
|---|---|---|
| 1 | Clinker silo | Cylindrical concrete silo<br>Volume: 3600 $m^3$ (5000 t) |
| 2 | Cement mill | Horizontal dual ball mill<br>Capacity: 20t/h<br>Dimensions: 2.6m$\phi$ × 10.2mL<br>Electric motor: 800kW |
| 3 | Cement silos | Cylindrical concrete silos<br>Volume: 800$m^3$ (1000 t) × 2 |
| 4 | Cement packing machine | 4-Tube type packer<br>Capacity: 50t/h |

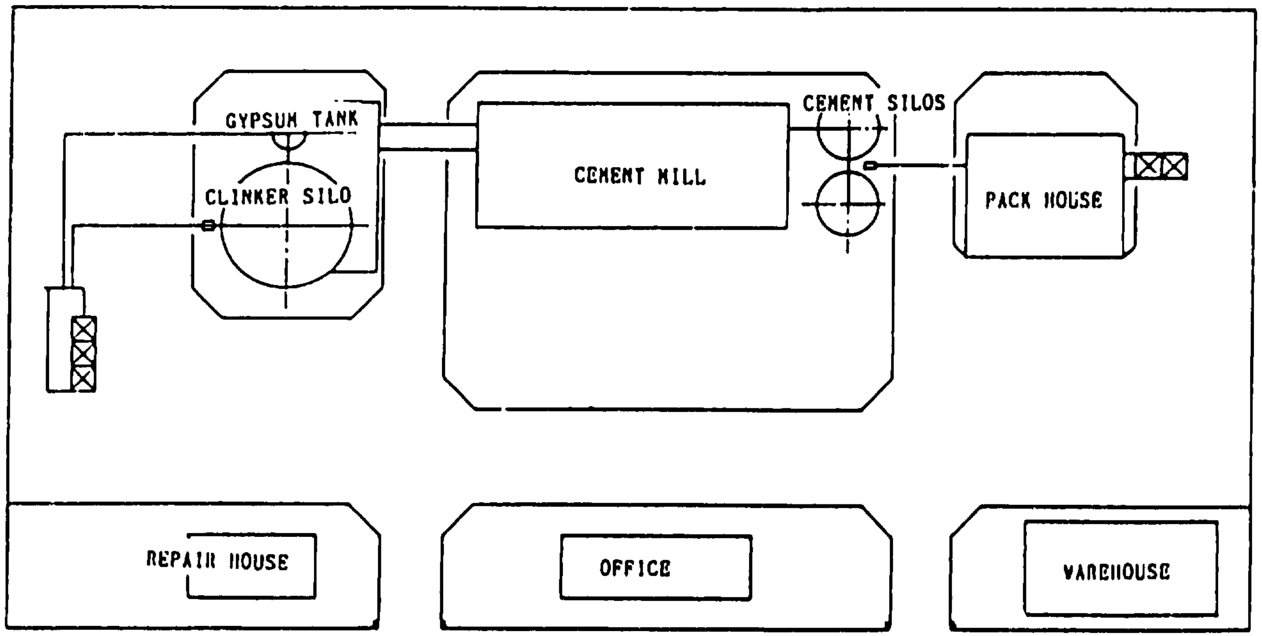
Figure VI-1




MADAGASCAR CEMENT PROJECT

GENERAL LAYOUT

Figure VI-2

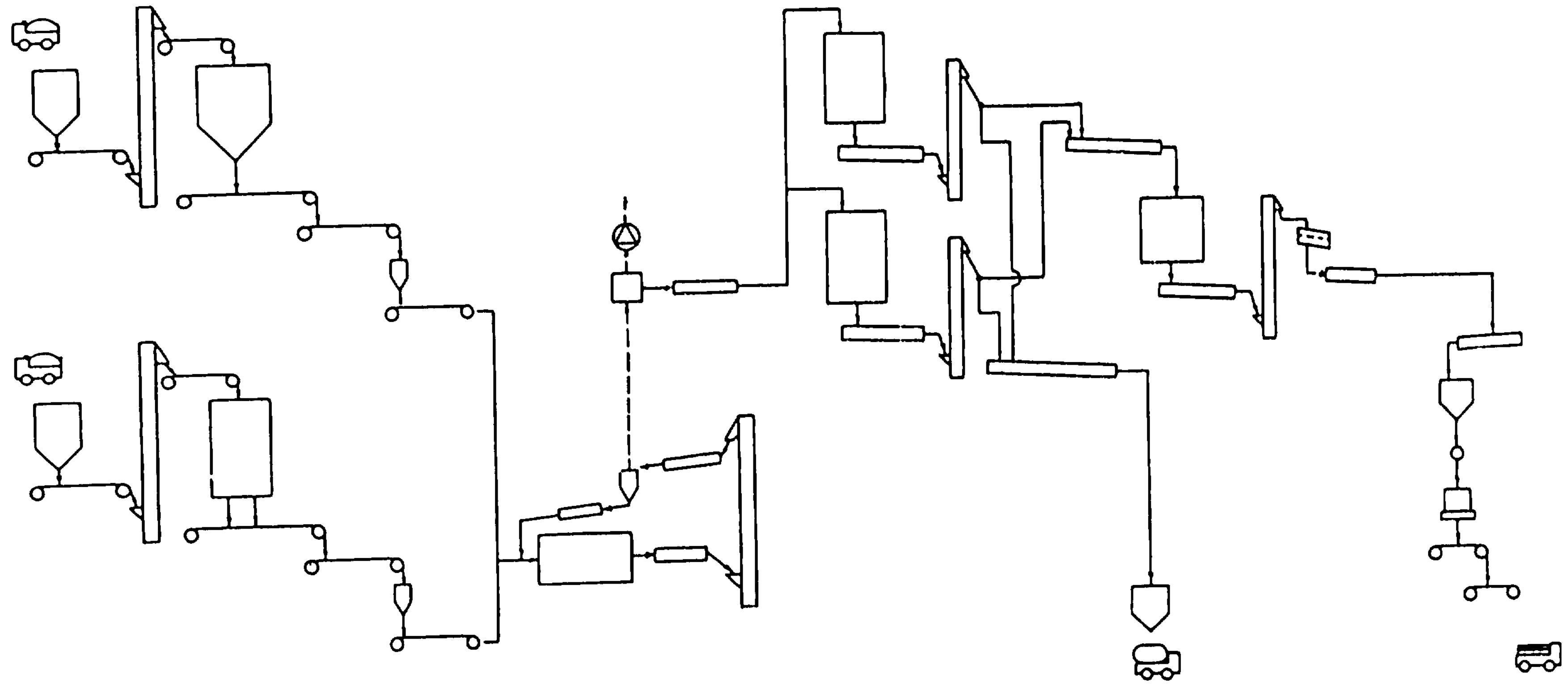



MADAGASCAR CEMENT PROJECT

SECONDARY PROCESSING CENTER

GENERAL LAYOUT

Figure VI-3

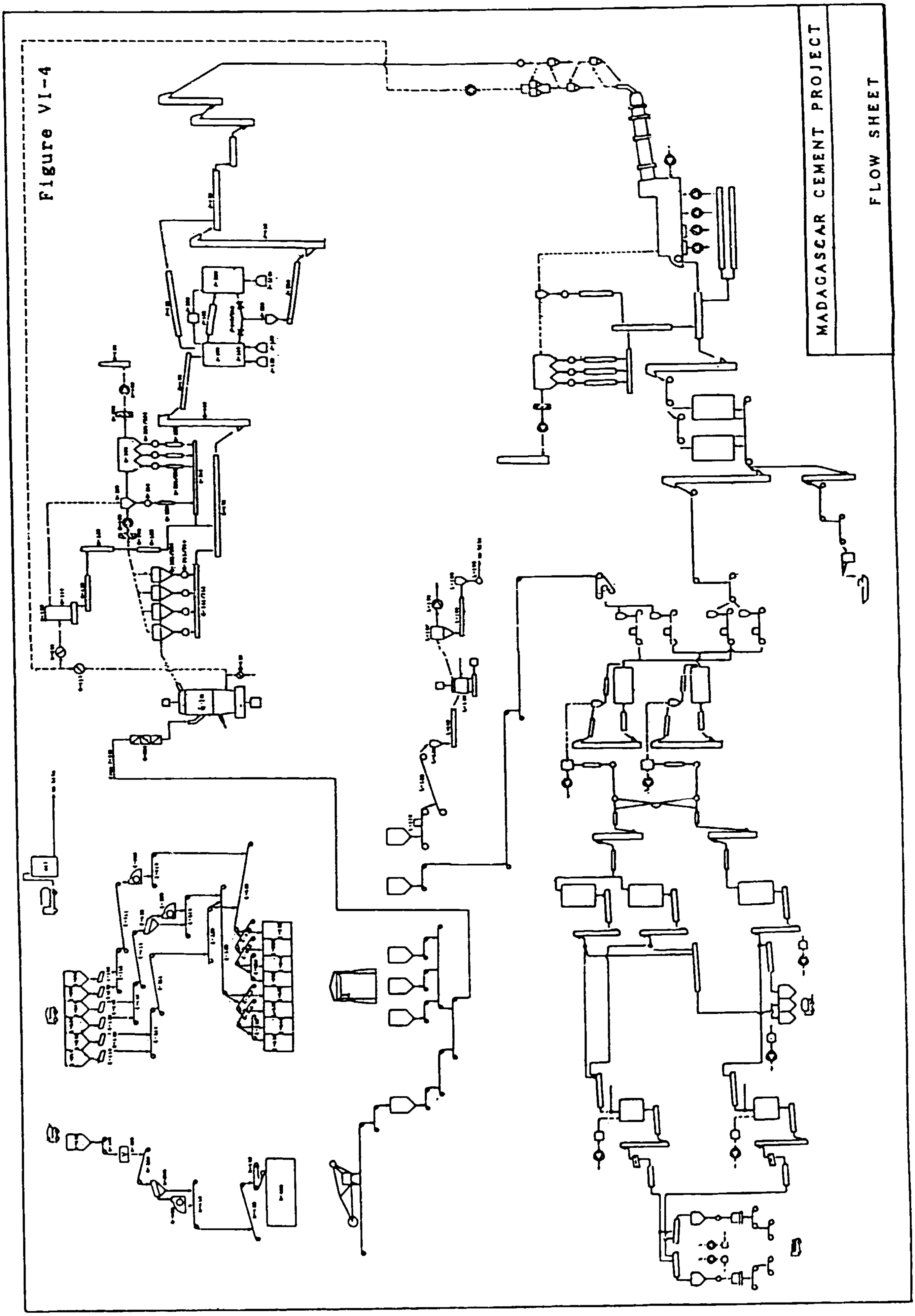


MADAGASCAR CEMENT PROJECT

SECONDARY PROCESSING CENTER

150,000 T/Y FLOW SHEET

Figure VI-4



# Chapter VII

# PLANT ORGANIZATION AND OVERHEAD COSTS

# VII. Plant Organization and Overhead Costs

## 1. Personnel Organization

Personnel organization will vary according to the automation level and productive capacity of machinery together with local labor conditions. As the present project is for a medium size plant with an annual productive capacity of 300,000 to 400,000 tons of clinker a level of labor productivity exceeding 1,500 tons per capita is to be aimed for. Consequently 183 personnel are to be posted in the Cement Plant, 32 in the quarry giving a total workforce of 215 personnel.

Further, for Case 3 in the event of construction of a milling plant at Toamasina it is planned to post 19 personnel so that the grand total for personnel would be 234.

Figure VII-1 and 2 show details of organization charts.

## 2. Administrative Overhead

These costs are expenditures for rent/lease of Project administration offices, administrative expenses, personnel fringe benefits, and other indirect allowances of the project. The budget is set at 60% of the recruitment and salary expenses.

Figure VII-1

Plant Organization Chart (Total:234 persons)

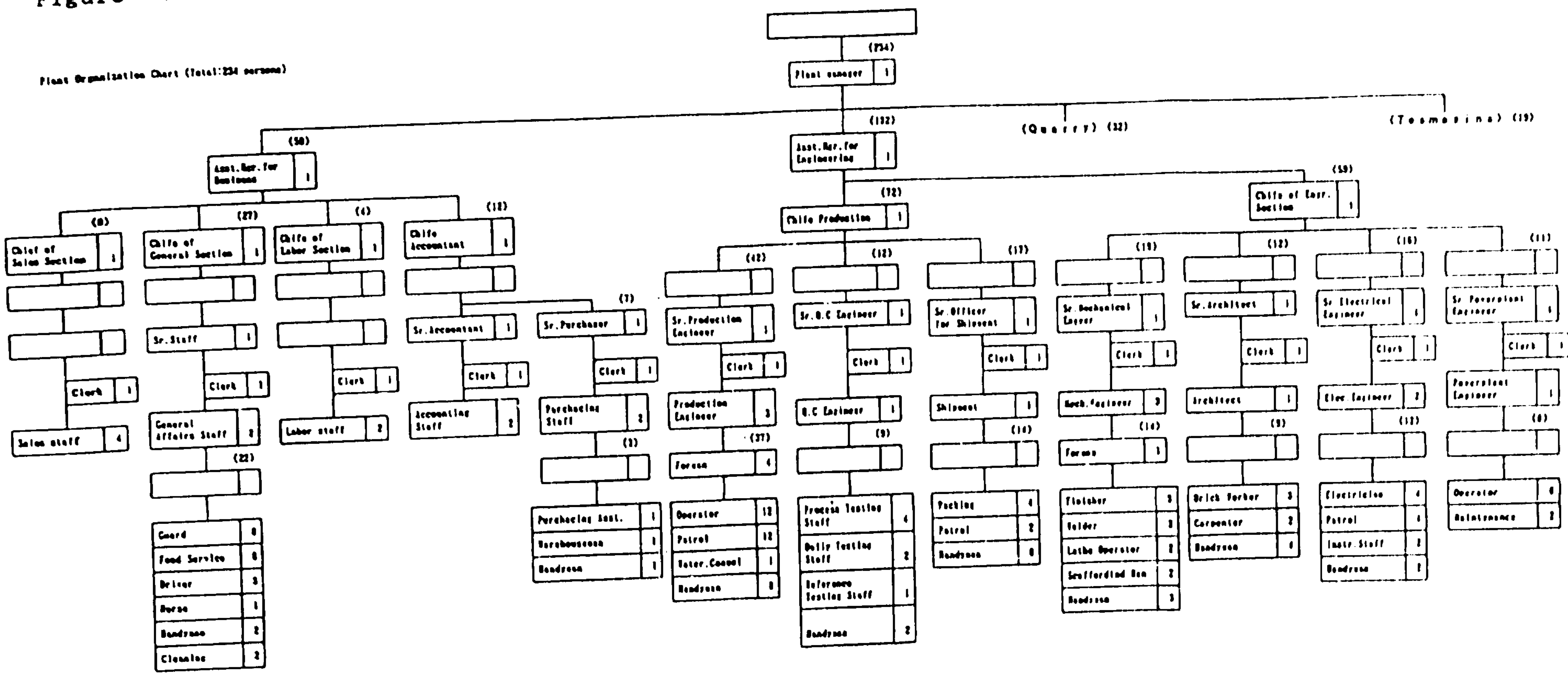
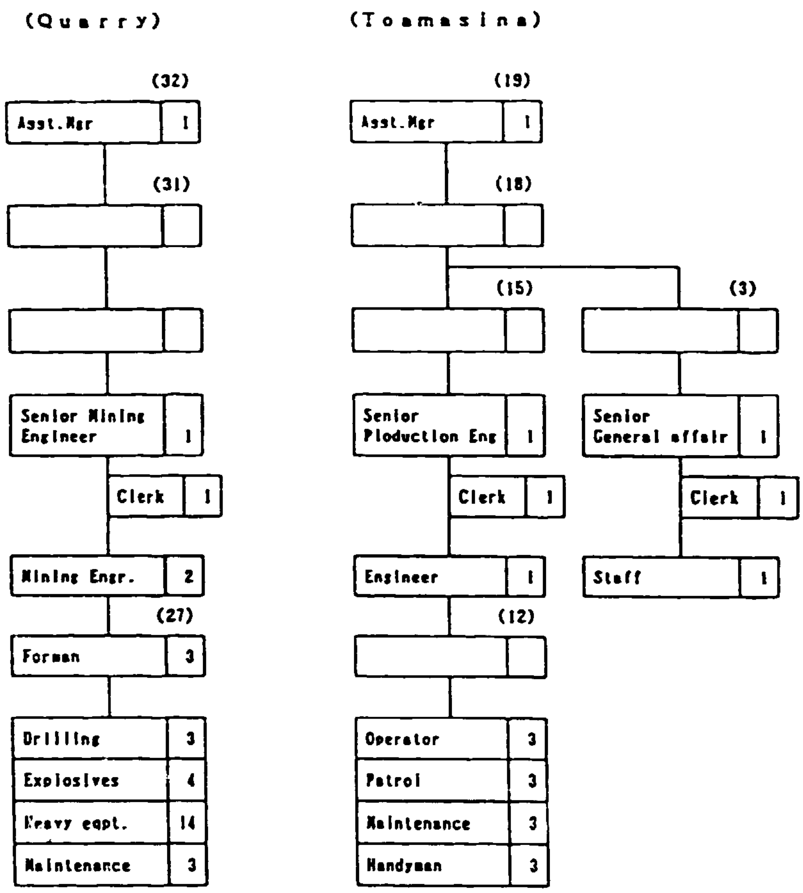


Figure VII-2


(Quarry)
(Toamasina)
(32)
Asst.Mgr
1
(31)
Senior Mining Engineer
1
Clerk
1
Mining Engr.
2
(27)
Forman
3
Drilling
3
Explosives
4
Heavy eqpt.
14
Maintenance
3
(19)
Asst.Mgr
1
(18)
(15)
(3)
Senior Ploduction Eng
1
Senior General affair
1
Clerk
1
Clerk
1
Engineer
1
Staff
1
(12)
Operator
3
Patrol
3
Maintenance
3
Handyman
3

# Chapter VIII

## MANPOWER

# VIII. Manpower

## 1. Manpower Required

The manpower required for operation of the present project has already been outlined in Chapter VII. The following represents a breakdown of the personnel details of the individual cases being considered.

(Unit: Person)

| | Case-1 | Case-2 | Case-3 |
|---|---|---|---|
| General Manager | 1 | 1 | 1 |
| Manager | 4 | 4 | 5 |
| Superintendent | 6 | 6 | 6 |
| Engineer | 22 | 22 | 24 |
| Foreman | 8 | 8 | 8 |
| Clark | 28 | 28 | 32 |
| Skilled Labor | 115 | 135 | 124 |
| Unskilled Labor | 31 | 31 | 34 |
| Total | 215 | 235 | 234 |

## 2. Operating System

a. Operating shift : 3 shift operation
b. Annual operating days : 300 days

## 3. Labor Cost

Labor costs are expressed in dollar terms and will be held at the levels indicated here in the future also. Annual salaries determined by rank (with one month bonus included) are as indicated below.

| | |
|---|---|
| General Manager | : US$ 6,000/Y |
| Manager | : US$ 3,500/Y |
| Superintendent | : US$ 2,500/Y |
| Engineer | : US$ 1,800/Y |
| Foreman | : US$ 1,200/Y |
| Clark | : US$ 1,000/Y |
| Skilled Labor | : US$ 800/Y |
| Unskilled Labor | : US$ 320/Y |

# Chapter IX

# IMPLEMENTATION SCHEDULING

## IX. Implementation Scheduling

### 1. Project Implementation Schedule

It is estimated that between 36 and 42 months will be necessary for the following stages of implementation from works contract to completion involved in the construction of the Cement Plant.

(1) Completion of Feasibility Study

* Review of Project and Amendments
* Completion of Necessary Preliminaries (Site, Scale of Production)
* Detail Study of Quarry and Plant Site

(2) Acquisition of sites for Cement Plant and Quarry

(3) Securing of Approval from the Government Authorities concerned.

(4) Basic Engineering

* Determination of plant specifications
* Preparation of Tender Documents
* Determination of Project Organization
* Preparation of Engineering Contractors/Suppliers List

(5) Tender

* Evaluation of Tender documents
* Negotiations for Contract

(6) Contract

(7) Detail Design and Engineering

Detail Design Study of Plant and Authorization of this Report and Approval of Contractors' Conditions of Work

(8) Construction and Installation Work

* Supervision of construction and installation works
* Approval of pay schedule
* Examination of Progress of Work
* Adjustments in Progress of Work

(9) Personnel Recruitment

Training

(10) Commissioning

Final adjustments to Construction and installation work Adjustments to Start up Schedule and Delivery of Raw Materials Trial Run

(11) Delivery of Plant

However, the Milling Plant at Toamasina indicated in the process schedule will not necessarily be ready at the same time as the cement plant. It is perhaps preferable that a feasibility study for this be conducted after the lapse of a few years.

2. Time Schedule

The following implementation schedule is assumed for the present project.

| Implementation aspect | Period | Scheduled implementation |
| --- | --- | --- |
| a. Feasibility study | 7 months | Dec., '90 - Jul., '91 |
| b. Decision on project implementation | 5 months | Aug., '91 - Dec., '92 |
| c. Company foundation detailed project plan | 6 months | Jan., '92 - Jun., '92 |
| d. Fund raising, preparation of implementation, site acquisition | 8 months | May, '92 - Dec., '92 |
| e. Basic design, preparation of tender | 4 months | Jan., '93 - Apr., '93 |
| f. Tender, evaluation, EPC Contract | 8 months | May, '93 - Dec., '93 |
| g. Construction work | 34 months | Jan., '94 - Oct., '96 |
| h. Trial run, transfer | 4 months | Sep., '96 - Dec., '96 |
| i. Commercial operations | | from Jan., '97. |

Details of time schedule is as per Figure IX-1.

3. Total Investment Cost

In addition to the land acquisition cost and the plant construction cost in Chapter V and VI, other investment costs are esfimated as follows.

(1) Site Preparation Cost

The preparation costs for the different candidate sites, taking into account the particularities involved in each case, are estimated as follows.

Case 1 : US$ 1,400,000
Case 2 : US$ 880,000
Case 3 : US$ 1,500,000

(2) Preoperational Expenses

These expenses are earmarked as costs of the Project owner to be paid once project implementation is actually initiated and include the following items.

1) Project Promotion Expenses

These are expenses required once the decision to invest in the project has been made and include those relating to company foundation, registration, acquisition of various permits and approvals (including those for quarrying rights for limestone, clay, river sand,etc.), for negotiating long term foreign funding, overseas technical inspections, and the various other negotiating activities concerned.

Foreign currency portion (F) : US$ 250,000
Local currency portion (L) : US$ 250,000

2) Technical Advisory Service (F)

US$ 1,590,000 is to be earmarked as the total expense for employment of overseas technical advisors and specialists. These specialists will assist the project owner as engineers from the beginning of the project to completion and plant delivery. A total of about 100 man months will be secured.

3) Recruitment and Personnel Expenses (L)

This represents the salaries paid to workers employed by the owner during the stages of project implementation. The following shows the schedule for the increases in the total recruited personnel to be effected over the years involved.

(Unit: Persons)

| | Case-1 | Case-2 | Case-3 |
|---|---|---|---|
| 1992 | 14 | 14 | 14 |
| 1993 | 24 | 24 | 24 |
| 1994 | 44 | 44 | 48 |
| 1995 | 107 | 107 | 118 |
| 1996 | 216 | 236 | 235 |

The budgets for the individual cases is calculated as follows:

(L)

Case 1 : US$ 468,920
Case 2 : US$ 484,920
Case 3 : US$ 504,020

4) Training Expenses (F)

OJT forms the basic form of technical training. However, for top level executives OJT will be preceded by training at overseas sites. It is assumed that training of 5 engineers from each department and of the Plant Manager will be concerned. The budget for this is estimated at US$ 135,500 in each case.

5) Loss in the Test Run

This expense covers costs incurred by utilities used in the no load test after Mechanical completion together with costs for raw materials, auxiliary materials and utilities used in the load test runs as well as costs for parts and expendables, etc. However, the value of the saleable product which is manufactured during the load test shall be deducted from these expenses. A variable expense equaling 48 hours has been calculated and is presented for reference here.

(US$)

| | F | L | Total |
|---|---|---|---|
| Case 1A | 23,000 | 27,000 | 50,000 |
| Case 1B | 31,000 | 36,000 | 67,000 |
| Case 2A | 31,000 | 32,000 | 63,000 |
| Case 2B | 31,000 | 42,000 | 73,000 |
| Case 3A | 23,000 | 24,000 | 47,000 |
| Case 3B | 31,000 | 34,000 | 65,000 |

6) Miscellaneous Expenses

A sum of US$10,000 per annum has been earmarked (total US$50,000) as the allowance for other expenses not included in the above categories such as Tax and public imposition costs, etc.

7) Contingencies

Ten percent of each cost estimated above has been earmarked as the physical contingency for the budget.

The tables IX-8, 10, 12, 14, 16 and IX-18 summarize the above information for the individual cases proposed.

(3) Interest During Construction

The interest during construction is calculated on the capital borrowed for the individual expenses during the period from the year of their outlay to the project completion date in 1996. Borrowed capital is assumed to represent 70 % of the individual outlay expenditures. Further, the capital outlay schedule used for purposes of calculating interest (shown in Tables IX-2 to IX-7) presents figures based on the Base Cost Estimate to which a price contingency (escalation) has been added for the period of capital outlay involved in each case. The interest during construction as calculated in line with the above principles is as follows:

| | |
|---|---|
| Case 1-A | : US$ 19,638,000 |
| Case 1-B | : US$ 21,998,000 |
| Case 2-A | : US$ 19,936,000 |
| Case 2-B | : US$ 22,369,000 |
| Case 3-A | : US$ 21,368,000 |

(4) Initial Working Capital

Estimated intinial working capital is as follows. (Details are table IX-20 through IX-25.)

| | F | L | Total |
|---|---|---|---|
| Case 1A | 1,012 | 73 | 1,085 |
| Case 1B | 1,350 | 94 | 1,444 |
| Case 2A | 1,195 | 124 | 1,319 |
| Case 2B | 1,594 | 165 | 1,759 |
| Case 3A | 1,049 | 93 | 1,142 |
| Case 3B | 1,384 | 129 | 1,513 |

(5) Total Capital Requirement

Table below summarized the total capital requirement obtained from the above analysis.

(Unit : 100 US$)

| | F | L | Total |
|---|---|---|---|
| Case 1A | 105,907 | 12,576 | 118,483 |
| Case 1B | 119,600 | 13,149 | 132,749 |
| Case 2A | 107,970 | 12,158 | 120,128 |
| Case 2B | 122,111 | 12,732 | 134,843 |
| Case 3A | 114,027 | 13,995 | 128,022 |
| Case 3B | 127,720 | 14,569 | 142,290 |

Detailes of calculation data on the above investment costs are as per Table IX-1 through IX-19.

(6) Financing Plan

The total capital requirement as shown in the previous section is to be funded under the following conditions.

1) Debt Equity Ratio

A debt equity ratio of 70-30 is assumed in the funding of capital and it is also assumed that borrowed capital will be obtained from overseas financial institutions in the form of long term deferred payment basis financing. The paying up of equity capital and the borrowing schedule for long term capital loans are to organized in accordance with the respective ratios of 30% and 70% in accordance with the capital outlay schedule (Table IX-2 to 7).

2) Conditions of Long Term Capital Loan Finance

The financial institution to provide a long term capital loan is still undecided, and the conditions assumed below are based on the conditions of Suppliers' credit of the Japan Import Export Bank.

a. Conditions of Repayment

The principal of the loan is to be repaid in 20 equal semi-annual installments with the first repayment being made in the middle of the first year of commercial operations.

c. Interest

Annual interest is calculated to be 7.5%. Further as security on the finance from the Japan Import Export Bank a sovereignty guarantee is to be requested of the relevant government.

3) Conditions of the Short Term Loan

Capital interest for a short term loan in Madagascar is between 17 and 20% (BNI). As the present analysis is conducted in terms of US dollars it is necessary to take into account the deflator effect of Madagascar over the past. Since the GDP deflator in Madagascar has been between 15 and 18% to date in the recent past the current interest can be judged as rather low. For present purposes an annual interest rate of 7.5% equal to that for the long term loan has been employed.

Table IX - 1

DISBURSEMENT SCHEDULE

| | 1992(F) | 1992(L) | 1993(F) | 1993(L) | 1994(F) | 1994(L) | 1995(F) | 1995(L) | 1996(F) | 1996(L) | TOTAL(F) | TOTAL(L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAND AQUISITION | 0.0% | 0.0% | 0.0% | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 100.0% |
| SITE PREPARATION | 0.0% | 0.0% | 0.0% | 50.0% | 0.0% | 50.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 100.0% |
| QUARRY EXPLOITATION | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 50.0% | 30.0% | 50.0% | 70.0% | 100.0% | 100.0% |
| PLANT CONSTRUCTION | 0.0% | 0.0% | 0.0% | 0.0% | 40.0% | 30.0% | 34.0% | 40.0% | 26.0% | 30.0% | 100.0% | 100.0% |
| UTILITY FACILITIES | 0.0% | 0.0% | 0.0% | 0.0% | 40.0% | 30.0% | 34.0% | 40.0% | 26.0% | 30.0% | 100.0% | 100.0% |
| AUXILIARY FACILITIES | 0.0% | 0.0% | 0.0% | 0.0% | 40.0% | 30.0% | 34.0% | 40.0% | 26.0% | 30.0% | 100.0% | 100.0% |
| SHIPPING FACILITIES | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 40.0% | 40.0% | 60.0% | 60.0% | 100.0% | 100.0% |
| 2-NDERY PROCESSING | 0.0% | 0.0% | 0.0% | 0.0% | 10.0% | 10.0% | 50.0% | 50.0% | 40.0% | 40.0% | 100.0% | 100.0% |
| PREOPERATIONAL EXP. | 6.3% | 7.5% | 25.2% | 11.5% | 17.6% | 15.4% | 23.0% | 24.8% | 27.9% | 40.8% | 100.0% | 100.0% |
| INITIAL WORK'G CAPTL | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Table IX-2 TOTAL CAPITAL REQUIREMENT ES CASE 1-A

(UNIT : 1,000 US$)

| | 1992 (F) | 1992 (L) | 1992 TOTAL | 1993 (F) | 1993 (L) | 1993 TOTAL | 1994 (F) | 1994 (L) | 1994 TOTAL | 1995 (F) | 1995 (L) | 1995 TOTAL | 1996 (F) | 1996 (L) | 1996 TOTAL | TOTAL (F) | TOTAL (L) | TOTAL TOTAL | BASE BUDGET CASE 1-A (F) (1000$) | BASE BUDGET CASE 1-A (L) (1000$) | BASE BUDGET CASE 1-A TOTAL (1000$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAND AQUISITION | 0 | 0 | 0 | 0 | 125 | 125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 125 | 125 | 0 | 125 | 125 |
| SITE PREPARATION | 0 | 0 | 0 | 0 | 700 | 700 | 0 | 700 | 700 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1400 | 1400 | 0 | 1,400 | 1,400 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| QUARRY EXPLOITATION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1688 | 37 | 1725 | 1756 | 85 | 1841 | 3444 | 122 | 3566 | 2,830 | 122 | 2,952 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 25203 | 1850 | 27052 | 22279 | 2466 | 24745 | 17718 | 1850 | 19568 | 65200 | 6165 | 71365 | 54,925 | 6,165 | 61,090 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 3474 | 291 | 3765 | 3071 | 388 | 3459 | 2442 | 291 | 2733 | 8987 | 970 | 9957 | 7,571 | 970 | 8,541 |
| AUXILIARY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 386 | 535 | 921 | 341 | 714 | 1055 | 271 | 535 | 807 | 998 | 1784 | 2782 | 841 | 1,781 | 2,625 |
| SHIPPING FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1980 | 330 | 2310 | 3089 | 495 | 3584 | 5070 | 825 | 5895 | 1,150 | 825 | 1,975 |
| 2-NDERY PROCESSING | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| PREOPERATIONAL EXP. | 134 | 86 | 221 | 607 | 133 | 740 | 442 | 178 | 619 | 600 | 287 | 887 | 786 | 501 | 1287 | 2569 | 1185 | 3754 | 2,198 | 1,185 | 3,383 |
| SUB-TOTAL | 134 | 86 | 221 | 607 | 958 | 1565 | 29504 | 3553 | 33058 | 29960 | 4221 | 34181 | 26063 | 3757 | 29820 | 86269 | 12576 | 98845 | 72,515 | 12,576 | 85,091 |
| INT ST DUR G CONST N | 6 | | 6 | 126 | | 126 | 4586 | | 4586 | 6892 | | 6892 | 8029 | | 8029 | 19638 | 0 | 19638 | | | |
| TOTAL | 140 | 86 | 226 | 732 | 958 | 1691 | 34090 | 3553 | 37644 | 36852 | 4221 | 41073 | 34093 | 3757 | 37849 | 105907 | 12576 | 118483 | | | |
| INITIAL WORK G CAPTL | | | | | | | | | | | | | 1013 | 72 | 1085 | 1013 | 72 | 1085 | | | |
| TOTAL CAPTL REQUIR T | 140 | 86 | 226 | 732 | 958 | 1691 | 34090 | 3553 | 37644 | 36852 | 4221 | 41073 | 35106 | 3829 | 38934 | 106920 | 12648 | 119568 | | | |

TABLE IX - 3

TOTAL CAPITAL REQUIREMENT CASE 1-B

(UNIT : 1,000 US$)

| | 1992 (F) | 1992 (L) | 1992 TOTAL | 1993 (F) | 1993 (L) | 1993 TOTAL | 1994 (F) | 1994 (L) | 1994 TOTAL | 1995 (F) | 1995 (L) | 1995 TOTAL | 1996 (F) | 1996 (L) | 1996 TOTAL | TOTAL (F) | TOTAL (L) | TOTAL TOTAL | BASE BUDGET CASE : 1-B (F) (1000$) | BASE BUDGET CASE : 1-B (L) (1000$) | BASE BUDGET CASE : 1-B TOTAL (1000$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAND AQUISITION | 0 | 0 | 0 | 0 | 125 | 125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 125 | 125 | 0 | 125 | 125 |
| SITE PREPARATION | 0 | 0 | 0 | 0 | 700 | 700 | 0 | 700 | 700 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1100 | 1400 | 0 | 1,400 | 1,400 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| QUARRY EXPLOITATION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1980 | 37 | 2016 | 2059 | 85 | 2144 | 4039 | 122 | 4161 | 3,319 | 122 | 3,441 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 28759 | 1978 | 30736 | 25423 | 2637 | 28060 | 20219 | 1978 | 22196 | 74400 | 6592 | 80992 | 62,675 | 6,592 | 69,267 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 4065 | 332 | 4396 | 3593 | 442 | 4035 | 2858 | 332 | 3189 | 10515 | 1106 | 11621 | 8,858 | 1,106 | 9,964 |
| AUXILIARY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 386 | 535 | 921 | 341 | 714 | 1055 | 271 | 535 | 807 | 998 | 1784 | 2782 | 841 | 1,784 | 2,625 |
| SHIPPING FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1980 | 330 | 2310 | 3089 | 495 | 3584 | 5070 | 825 | 5895 | 1,150 | 825 | 1,975 |
| 2-NDERY PROCESSING | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| PREOPERATIONAL EXP. | 134 | 86 | 221 | 607 | 133 | 740 | 442 | 178 | 619 | 600 | 287 | 887 | 797 | 511 | 1308 | 2580 | 1195 | 3775 | 2,207 | 1,195 | 3,402 |
| SUB-TOTAL | 134 | 86 | 221 | 607 | 958 | 1565 | 33651 | 3722 | 37373 | 33918 | 4446 | 38364 | 29293 | 3936 | 33228 | 97602 | 13149 | 110751 | 82,050 | 13,149 | 95,199 |
| INT'ST DUR'G CONST'N | 6 | | 6 | 126 | | 126 | 5185 | | 5185 | 7735 | | 7735 | 8947 | | 8947 | 21998 | 0 | 21998 | | | |
| TOTAL | 140 | 86 | 226 | 732 | 958 | 1691 | 38835 | 3722 | 42558 | 41653 | 4446 | 46099 | 38240 | 3936 | 42175 | 119600 | 13149 | 132749 | | | |
| INITIAL WORK'G CAPTL | | | | | | | | | | | | | 1350 | 94 | 1444 | 1350 | 94 | 1444 | | | |
| TOTAL CAPTL REQUIR'T | 140 | 86 | 226 | 732 | 958 | 1691 | 38835 | 3722 | 42558 | 41653 | 4446 | 46099 | 39590 | 4030 | 43619 | 120950 | 13243 | 134193 | | | |

TABLE IX - 4

TOTAL CAPITAL REQUIREMENT CASE 2-A

(UNIT : 1,000 US$)

| | 1992 | | | 1993 | | | 1994 | | | 1995 | | | 1996 | | | TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (F) | (L) | TOTAL | (F) | (L) | TOTAL | (F) | (L) | TOTAL | (F) | (L) | TOTAL | (F) | (L) | TOTAL | (F) | (L) | TOTAL |
| LAND AQUISITION | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| SITE PREPARATION | 0 | 0 | 0 | 0 | 444 | 444 | 0 | 444 | 444 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 888 | 888 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| QUARRY EXPLOITATION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1415 | 37 | 1452 | 1472 | 85 | 1557 | 2886 | 122 | 3008 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 26200 | 1850 | 28050 | 23161 | 2466 | 25627 | 18420 | 1850 | 20269 | 67781 | 6165 | 73946 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 3449 | 319 | 3768 | 3049 | 425 | 3474 | 2425 | 319 | 2744 | 8923 | 1062 | 9985 |
| AUXILIARY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 386 | 535 | 921 | 341 | 714 | 1055 | 271 | 535 | 807 | 998 | 1781 | 2782 |
| SHIPPING FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1900 | 367 | 2267 | 2964 | 550 | 3515 | 4865 | 917 | 5782 |
| 2-NDERY PROCESSING | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXP. | 134 | 86 | 221 | 607 | 133 | 740 | 442 | 178 | 619 | 600 | 287 | 887 | 797 | 531 | 1331 | 2580 | 1219 | 3799 |
| SUB-TOTAL | 134 | 86 | 221 | 607 | 578 | 1185 | 30477 | 3325 | 33802 | 30467 | 4295 | 34761 | 28349 | 3873 | 30222 | 88031 | 12158 | 100191 |
| INT'ST DUR'G CONST'N | 6 | | 6 | 95 | | 95 | 4689 | | 4689 | 7009 | | 7009 | 8137 | | 8137 | 19936 | 0 | 19936 |
| TOTAL | 140 | 86 | 226 | 702 | 578 | 1280 | 35166 | 3325 | 38491 | 37476 | 4295 | 41770 | 34486 | 3873 | 38360 | 107970 | 12158 | 120128 |
| INITIAL WORK'G CAPTL | | | | | | | | | | | | | 1195 | 124 | 1319 | 1195 | 124 | 1319 |
| TOTAL CAPTL REQUIR'T | 140 | 86 | 226 | 702 | 578 | 1280 | 35166 | 3325 | 38491 | 37476 | 4295 | 41770 | 35681 | 3997 | 39679 | 109165 | 12282 | 121447 |

BASE BUDGET
CASE : 2-A

| (F) (1000$) | (L) (1000$) | TOTAL (1000$) |
|---|---|---|
| 0 | 1 | 1 |
| 0 | 888 | 888 |
| | | 0 |
| 2372 | 122 | 2191 |
| | | 0 |
| 57099 | 6165 | 63261 |
| 7517 | 1062 | 8579 |
| 811 | 1781 | 2625 |
| 3982 | 917 | 1899 |
| 0 | 0 | 0 |
| | | 0 |
| 2207 | 1219 | 3126 |
| 74018 | 12158 | 86176 |

TABLE IX - 5

TOTAL CAPITAL REQUIREMENT CASE 2-B

(UNIT : 1,000 US$)

| | 1992 (F) | 1992 (L) | 1992 TOTAL | 1993 (F) | 1993 (L) | 1993 TOTAL | 1994 (F) | 1994 (L) | 1994 TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| LAND AQUISITION | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| SITE PREPARATION | 0 | 0 | 0 | 0 | 444 | 444 | 0 | 444 | 444 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| QUARRY EXPLOITATION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 29906 | 1978 | 31884 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 4039 | 359 | 4399 |
| AUXILIARY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 386 | 535 | 921 |
| SHIPPING FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-NDERY PROCESSING | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXP. | 134 | 86 | 221 | 607 | 133 | 740 | 442 | 178 | 619 |
| SUB-TOTAL | 134 | 86 | 221 | 607 | 578 | 1185 | 34773 | 3494 | 38267 |
| INT'ST DUR'G CONST'N | 6 | | 6 | 95 | | 35 | 5309 | | 5309 |
| TOTAL | 140 | 86 | 226 | 702 | 578 | 1280 | 40081 | 3494 | 43575 |
| INITIAL WORK'G CAPTL | | | | | | | | | |
| TOTAL CAPTL REQUIR'T | 140 | 86 | 226 | 702 | 578 | 1280 | 40081 | 3494 | 43575 |

| | 1995 (F) | 1995 (L) | 1995 TOTAL | 1996 (F) | 1996 (L) | 1996 TOTAL | TOTAL (F) | TOTAL (L) | TOTAL TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| LAND AQUISITION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| SITE PREPARATION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 888 | 888 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| QUARRY EXPLOITATION | 1707 | 37 | 1743 | 1775 | 85 | 1860 | 3482 | 122 | 3604 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PLANT CONSTRUCTION | 26437 | 2637 | 29074 | 21025 | 1978 | 23003 | 77368 | 6592 | 83960 |
| UTILITY FACILITIES | 3571 | 479 | 4050 | 2840 | 359 | 3199 | 10450 | 1198 | 11648 |
| AUXILIARY FACILITIES | 341 | 714 | 1055 | 271 | 535 | 807 | 998 | 1784 | 2782 |
| SHIPPING FACILITIES | 1900 | 367 | 2267 | 2964 | 550 | 3515 | 4865 | 917 | 5782 |
| 2-NDERY PROCESSING | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXP. | 600 | 287 | 887 | 797 | 545 | 1342 | 2580 | 1230 | 3810 |
| SUB-TOTAL | 34556 | 4520 | 39076 | 29673 | 4053 | 33726 | 99742 | 12732 | 112474 |
| INT'ST DUR'G CONST'N | 7879 | | 7879 | 9081 | | 9081 | 22369 | 0 | 22369 |
| TOTAL | 42435 | 4520 | 46955 | 38753 | 4053 | 42806 | 122111 | 12732 | 134843 |
| INITIAL WORK'G CAPTL | | | | 1594 | 165 | 1759 | 1594 | 165 | 1759 |
| TOTAL CAPTL REQUIR'T | 42435 | 4520 | 46955 | 40347 | 4218 | 44565 | 123705 | 12897 | 136602 |

BASE BUDGET
CASE : 2-B

| | (F) (1000$) | (L) (1000$) | TOTAL (1000$) |
|---|---|---|---|
| LAND AQUISITION | 0 | 1 | 1 |
| SITE PREPARATION | 0 | 888 | 888 |
| | | | 0 |
| QUARRY EXPLOITATION | 2861 | 122 | 2983 |
| | | | 0 |
| PLANT CONSTRUCTION | 65175 | 6592 | 71767 |
| UTILITY FACILITIES | 8803 | 1198 | 10001 |
| AUXILIARY FACILITIES | 841 | 1781 | 2625 |
| SHIPPING FACILITIES | 3982 | 917 | 1899 |
| 2-NDERY PROCESSING | 0 | 0 | 0 |
| | | | 0 |
| PREOPERATIONAL EXP. | 2207 | 1230 | 3437 |
| SUB-TOTAL | 83869 | 12732 | 96601 |

TABLE IX - 6

TOTAL CAPITAL REQUIREMENT CASE 3-A

(UNIT : 1,000 US$)

| | 1992 (F) | 1992 (L) | 1992 TOTAL | 1993 (F) | 1993 (L) | 1993 TOTAL | 1994 (F) | 1994 (L) | 1994 TOTAL | 1995 (F) | 1995 (L) | 1995 TOTAL | 1996 (F) | 1996 (L) | 1996 TOTAL | TOTAL (F) | TOTAL (L) | TOTAL TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAND AQUISITION | 0 | 0 | 0 | 0 | 145 | 145 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 145 | 145 |
| SITE PREPARATION | 0 | 0 | 0 | 0 | 750 | 750 | 0 | 750 | 750 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1500 | 1500 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| QUARRY EXPLOITATION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1688 | 37 | 1725 | 1756 | 85 | 1841 | 3441 | 122 | 3566 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 25203 | 1850 | 27052 | 22279 | 2466 | 24745 | 17718 | 1850 | 19568 | 65200 | 6165 | 71365 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 3474 | 291 | 3765 | 3071 | 388 | 3459 | 2442 | 291 | 2733 | 8987 | 970 | 9957 |
| AUXILIARY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 386 | 535 | 921 | 341 | 714 | 1055 | 271 | 535 | 807 | 998 | 1784 | 2782 |
| SHIPPING FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1980 | 330 | 2310 | 3089 | 495 | 3584 | 5070 | 825 | 5895 |
| 2-NDERY PROCESSING | 0 | 0 | 0 | 0 | 0 | 0 | 607 | 124 | 731 | 3157 | 621 | 3777 | 2626 | 496 | 3123 | 6390 | 1241 | 7631 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXP. | 134 | 86 | 221 | 607 | 133 | 740 | 442 | 188 | 629 | 600 | 305 | 905 | 786 | 531 | 1317 | 2569 | 1243 | 3812 |
| SUB-TOTAL | 134 | 86 | 221 | 607 | 1028 | 1635 | 30111 | 3737 | 33849 | 33117 | 4860 | 37977 | 28690 | 4284 | 32974 | 92659 | 13995 | 106654 |
| INT'ST DUR'G CONST'N | 6 | | 6 | 131 | | 131 | 4696 | | 4696 | 7657 | | 7657 | 8878 | | 8878 | 21368 | 0 | 21368 |
| TOTAL | 140 | 86 | 226 | 738 | 1028 | 1766 | 34807 | 3737 | 38544 | 40774 | 4860 | 45634 | 37568 | 4284 | 41852 | 114027 | 13995 | 128022 |
| INITIAL WORK'G CAPTL | | | | | | | | | | | | | 1049 | 93 | 1142 | 1049 | 93 | 1142 |
| TOTAL CAPTL REQUIR'T | 140 | 86 | 226 | 738 | 1028 | 1766 | 34807 | 3737 | 38544 | 40774 | 4860 | 45634 | 38617 | 4377 | 42994 | 115076 | 14088 | 129164 |

BASE BUDGET CASE : 3-A

| (F) (1000$) | (L) (1000$) | TOTAL (1000$) |
|---|---|---|
| 0 | 145 | 145 |
| 0 | 1500 | 1500 |
| | | 0 |
| 2830 | 122 | 2952 |
| | | 0 |
| 51925 | 6165 | 61090 |
| 7571 | 970 | 8541 |
| 841 | 1784 | 2625 |
| 4150 | 825 | 1975 |
| 5292 | 1241 | 6533 |
| | | 0 |
| 2198 | 1213 | 3112 |
| 77807 | 13995 | 91803 |

TABLE IX - 7

TOTAL CAPITAL REQUIREMENT CASE 3-B

(UNIT : 1,000 US$)

| | 1992 (F) | 1992 (L) | 1992 TOTAL | 1993 (F) | 1993 (L) | 1993 TOTAL | 1994 (F) | 1994 (L) | 1994 TOTAL | 1995 (F) | 1995 (L) | 1995 TOTAL | 1996 (F) | 1996 (L) | 1996 TOTAL | TOTAL (F) | TOTAL (L) | TOTAL | BASE BUDGET CASE : 3 B (F) (1000$) | BASE BUDGET CASE : 3 B (L) (1000$) | BASE BUDGET CASE : 3 B TOTAL (1000$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAND AQUISITION | 0 | 0 | 0 | 0 | 145 | 145 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 145 | 145 | 0 | 145 | 145 |
| SITE PREPARATION | 0 | 0 | 0 | 0 | 750 | 750 | 0 | 750 | 750 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1500 | 1500 | 0 | 1500 | 1500 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | 0 |
| QUARRY EXPLOITATION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1980 | 37 | 2016 | 2059 | 85 | 2144 | 4039 | 122 | 4161 | 3319 | 122 | 3441 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | 0 |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 28759 | 1978 | 30736 | 25423 | 2637 | 28060 | 20219 | 1978 | 22196 | 74400 | 6592 | 80992 | 62675 | 6592 | 69267 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 4065 | 332 | 4396 | 3593 | 442 | 4035 | 2858 | 332 | 3189 | 10515 | 1106 | 11621 | 8858 | 1106 | 9964 |
| AUXILIARY FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 386 | 535 | 921 | 341 | 714 | 1055 | 271 | 535 | 807 | 998 | 1784 | 2782 | 841 | 1784 | 2625 |
| SHIPPING FACILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1980 | 330 | 2310 | 3089 | 495 | 3584 | 5070 | 825 | 5895 | 1150 | 825 | 1975 |
| 2-NDERY PROCESSING | 0 | 0 | 0 | 0 | 0 | 0 | 607 | 124 | 731 | 3157 | 621 | 3777 | 2626 | 496 | 3123 | 6390 | 1241 | 7631 | 5292 | 1241 | 6533 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | 0 |
| PREOPERATIONAL EXP. | 134 | 86 | 221 | 607 | 133 | 740 | 442 | 188 | 629 | 600 | 305 | 905 | 797 | 542 | 1339 | 2580 | 1254 | 3834 | 2207 | 1254 | 3462 |
| SUB-TOTAL | 134 | 86 | 221 | 607 | 1028 | 1635 | 34258 | 3906 | 38164 | 37074 | 5085 | 42159 | 31919 | 4464 | 36383 | 103993 | 14569 | 118562 | 87342 | 14569 | 101912 |
| INT'ST DUR'G CONST'N | 6 | | 6 | 131 | | 131 | 5294 | | 5294 | 8500 | | 8500 | 9796 | | 9796 | 23728 | 0 | 23728 | | | |
| TOTAL | 140 | 86 | 226 | 738 | 1028 | 1766 | 39552 | 3906 | 43459 | 45575 | 5085 | 50660 | 41716 | 4464 | 46179 | 127720 | 14569 | 142290 | | | |
| INITIAL WORK'G CAPTL | | | | | | | | | | | | | 1384 | 129 | 1513 | 1384 | 129 | 1513 | | | |
| TOTAL CAPTL REQUIR'T | 140 | 86 | 226 | 738 | 1028 | 1766 | 39552 | 3906 | 43459 | 45575 | 5085 | 50660 | 43100 | 4593 | 47692 | 129104 | 14698 | 143803 | | | |

Table IX - 8

PREOPERATIONAL EXPENCES (CASE 1-A)

| | TOTAL AMOUNT($) | 1992(F) | 1992(L) | 1993(F) | 1993(L) | 1994(F) | 1994(L) | 1995(F) | 1995(L) | 1996(F) | 1996(L) | TOTAL(F) | TOTAL(L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 0 | 0 |
| PROJECT PROMOTION | 500000 | 25000 | 25000 | 50000 | 50000 | 50000 | 50000 | 50000 | 50000 | 75000 | 75000 | 250000 | 250000 |
| TECH'L ADV'RY SRVICE | 1590000 | 90000 | 0 | 450000 | 0 | 300000 | 0 | 300000 | 0 | 450000 | 0 | 1590000 | 0 |
| RECRUT'T & PERSON'L | 468920 | | 27240 | | 38280 | | 63500 | | 125460 | | 214110 | 0 | 468920 |
| ADMINISTRATIVE O.H. | 281352 | 0 | 16344 | 0 | 22968 | 0 | 38100 | 0 | 75276 | 0 | 128661 | 0 | 281352 |
| TRAINING | 135500 | 0 | 0 | 0 | 0 | 0 | 0 | 107500 | 0 | 28000 | 0 | 135500 | 0 |
| LOSS IN TEST RUN | 50000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23000 | 27000 | 23000 | 27000 |
| MISCELLANEOUS | 50000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 50000 |
| CONTINGENCIES | 307577.2 | 11500 | 7858.4 | 50000 | 12124. | 35000 | 16160 | 45750 | 26073. | 57600 | 45510. | 199850 | 107727. |
| TOTAL | 3383349.2 | 126500 | 86442. | 550000 | 133372 | 385000 | 177760 | 503250 | 286809 | 633600 | 500611 | 2198350 | 1181999 |

## BASE PERSONNEL COST(CASE 1-A)

| | NUMBER CEMENT MILL | QUARRY | FIN'G MI | TOTAL | ANNUAL SALARY | TOTAL COST($) |
|---|---|---|---|---|---|---|
| GENERAL MANAGER | 1 | 0 | 0 | 1 | 6,000 | 6,000 |
| MANAGER | 3 | 1 | 0 | 4 | 3,500 | 14,000 |
| SUPERINTENDENT | 6 | 0 | 0 | 6 | 2,500 | 15,000 |
| ENGINEER | 19 | 3 | 0 | 22 | 1,800 | 39,600 |
| FOREMAN | 5 | 3 | 0 | 8 | 1,200 | 9,600 |
| CLARK | 27 | 1 | 0 | 28 | 1,000 | 28,000 |
| SKILLED LABOR | 91 | 24 | 0 | 115 | 800 | 92,000 |
| UNSKILLED LABOR | 32 | 0 | 0 | 32 | 320 | 10,240 |
| TOTAL | 181 | 32 | 0 | 216 | 17,120 | 214,440 |

## IX - 9 RECRUITEMENT SCHEDULE / SALARY COST SCHEDULE

(UNIT:US$)

| | RECRUITEMENT 1992 | 1993 | 1994 | 1995 | 1996 | SALARY COST 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|---|---|---|---|---|
| GENERAL MANAGER | 1 | 1 | 1 | 1 | 1 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| MANAGER | 2 | 2 | 3 | 4 | 4 | 7,000 | 7,000 | 10,500 | 14,000 | 14,000 |
| SUPERINTENDENT | 2 | 2 | 2 | 5 | 6 | 5,000 | 5,000 | 5,000 | 12,500 | 15,000 |
| ENGINEER | 2 | 5 | 13 | 18 | 22 | 3,600 | 9,000 | 23,400 | 32,400 | 39,600 |
| FOREMAN | 0 | 0 | 2 | 4 | 8 | 0 | 0 | 2,400 | 4,800 | 9,600 |
| CLARK | 5 | 10 | 13 | 22 | 28 | 5,000 | 10,000 | 13,000 | 22,000 | 28,000 |
| SKILLED LABOR | 0 | 0 | 0 | 35 | 115 | 0 | 0 | 0 | 28,000 | 92,000 |
| UNSKILLED LABOR | 2 | 4 | 10 | 18 | 32 | 640 | 1,280 | 3,200 | 5,760 | 10,240 |
| TOTAL | 14 | 24 | 44 | 107 | 216 | 27,240 | 38,280 | 63,500 | 125,160 | 214,440 |

## TECHNICAL ADVISORY SERVICE

| | RATE/M-M($) | M-M | AMOUNT($) |
|---|---|---|---|
| 1992 | 15000 | 6 | 90000 |
| 1993 | 15000 | 30 | 450000 |
| 1994 | 15000 | 20 | 300000 |
| 1995 | 15000 | 20 | 300000 |
| 1996 | 15000 | 30 | 450000 |
| TOTAL | | 106 | 1590000 |

Table IX - 10 PREOPERATIONAL EXPENCES CASE: 1-B

| | TOTAL AMOUNT($) | 1992(F) | 1992(L) | 1993(F) | 1993(L) | 1994(F) | 1994(L) | 1995(F) | 1995(L) | 1996(F) | 1996(L) | TOTAL(F) | TOTAL(L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 0 | 0 |
| PROJECT PROMOTION | 500000 | 25000 | 25000 | 50000 | 50000 | 50000 | 50000 | 50000 | 50000 | 75000 | 75000 | 250000 | 250000 |
| TECH'L ADV'RY SRVICE | 1590000 | 90000 | 0 | 450000 | 0 | 300000 | 0 | 300000 | 0 | 450000 | 0 | 1590000 | 0 |
| RECRUT'T & PERSON'L | 468920 | | 27240 | | 38280 | | 63500 | | 125460 | | 214440 | 0 | 468920 |
| ADMINISTRATIVE O.H. | 281352 | 0 | 16344 | 0 | 22968 | 0 | 38100 | 0 | 75276 | 0 | 128664 | 0 | 281352 |
| TRAINING | 135500 | 0 | 0 | 0 | 0 | 0 | 0 | 107500 | 0 | 28000 | 0 | 135500 | 0 |
| LOSS IN TEST RUN | 67000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31000 | 36000 | 31000 | 36000 |
| MISCELLANEOUS | 50000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 50000 |
| CONTINGENCIES | 309277.2 | 11500 | 7858.4 | 50000 | 12124. | 35000 | 16160 | 45750 | 26073. | 58400 | 46110. | 200650 | 108627. |
| TOTAL | 3402049.2 | 126500 | 86442. | 550000 | 133372 | 335000 | 177760 | 503250 | 286809 | 642100 | 510514 | 2207150 | 1194899 |

BASE PERSONNEL COST CASE: 1-B

IX - 11 RECRUITEMENT SCHEDULE

SALARY COST SCHEDULE (UNIT:US$)

| | NUMBER | | | | ANNUAL | TOTAL | RECRUITEMENT SCHEDULE | | | | | SALARY COST SCHEDULE (UNIT:US$) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CEMENT MILL | QUARRY | FIN'G MI | TOTAL | SALARY | (COST($) | 1992 | 1993 | 1994 | 1995 | 1996 | 1992 | 1993 | 1994 | 1995 | 1996 |
| GENERAL MANAGER | 1 | 0 | 0 | 1 | 6,000 | 6,000 | 1 | 1 | 1 | 1 | 1 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| MANAGER | 3 | 1 | 0 | 4 | 3,500 | 14,000 | 2 | 2 | 3 | 4 | 4 | 7,000 | 7,000 | 10,500 | 14,000 | 14,000 |
| SUPERINTENDENT | 6 | 0 | 0 | 6 | 2,500 | 15,000 | 2 | 2 | 2 | 5 | 6 | 5,000 | 5,000 | 5,000 | 12,500 | 15,000 |
| ENGINEER | 19 | 3 | 0 | 22 | 1,800 | 39,600 | 2 | 5 | 13 | 18 | 22 | 3,600 | 9,000 | 23,400 | 32,400 | 39,600 |
| FOREMAN | 5 | 3 | 0 | 8 | 1,200 | 9,600 | 0 | 0 | 2 | 4 | 8 | 0 | 0 | 2,400 | 4,800 | 9,600 |
| CLARK | 27 | 1 | 0 | 28 | 1,000 | 28,000 | 5 | 10 | 13 | 22 | 28 | 5,000 | 10,000 | 13,000 | 22,000 | 28,000 |
| SKILLED LABOR | 91 | 24 | 0 | 115 | 800 | 92,000 | 0 | 0 | 0 | 35 | 115 | 0 | 0 | 0 | 28,000 | 92,000 |
| UNSKILLED LABOR | 32 | 0 | 0 | 32 | 320 | 10,240 | 2 | 4 | 10 | 18 | 32 | 640 | 1,280 | 3,200 | 5,760 | 10,240 |
| TOTAL | 184 | 32 | 0 | 216 | 17,120 | 214,440 | 14 | 24 | 44 | 107 | 216 | 27,240 | 38,280 | 63,500 | 125,460 | 214,440 |

TECHNICAL ADVISORY SERVICE

| | RATE/M-M($) | M-M | AMOUNT($) |
|---|---|---|---|
| 1992 | 15000 | 6 | 90000 |
| 1993 | 15000 | 30 | 450000 |
| 1994 | 15000 | 20 | 300000 |
| 1995 | 15000 | 20 | 300000 |
| 1996 | 15000 | 30 | 450000 |
| TOTAL | | 106 | 1590000 |

Table IX - 12 PREOPERATIONAL EXPENCES CASE : 2-A

| | TOTAL AMOUNT($) | 1992(F) | 1992(L) | 1993(F) | 1993(L) | 1994(F) | 1994(L) | 1995(F) | 1995(L) | 1996(F) | 1996(L) | TOTAL(F) 0 | TOTAL(L) 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROJECT PROMOTION | 500000 | 25000 | 25000 | 50000 | 50000 | 50000 | 50000 | 50000 | 50000 | 75000 | 75000 | 250000 | 250000 |
| TECH'L ADV'RY SRVICE | 1590000 | 90000 | 0 | 450000 | 0 | 300000 | 0 | 300000 | 0 | 450000 | 0 | 1590000 | 0 |
| RECRUT'T & PERSON'L | 484920 | | 27240 | | 38280 | | 63500 | | 125460 | | 230440 | 0 | 484920 |
| ADMINISTRATIVE O.H. | 290952 | 0 | 16344 | 0 | 22968 | 0 | 38100 | 0 | 75276 | 0 | 138264 | 0 | 290952 |
| TRAINING | 135500 | 0 | 0 | 0 | 0 | 0 | 0 | 107500 | 0 | 28000 | 0 | 135500 | 0 |
| LOSS IN TEST RUN | 63000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31000 | 32000 | 31000 | 32000 |
| MISCELLANEOUS | 50000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 50000 |
| CONTINGENCIES | 311437.2 | 11500 | 7858.4 | 50000 | 12124. | 35000 | 16160 | 45750 | 26073. | 58400 | 48570. | 200650 | 110787. |
| TOTAL | 3425809.2 | 126500 | 86442. | 550000 | 133372 | 385000 | 177760 | 503250 | 286809 | 642400 | 531274 | 2207150 | 1218659 |

BASE PERSONNEL COST CASE: 2-A

| | NUMBER CEMENT MILL | QUARRY | FIN'G MI | TOTAL | ANNUAL SALARY | TOTAL COST($) |
|---|---|---|---|---|---|---|
| GENERAL MANAGER | 1 | 0 | 0 | 1 | 6,000 | 6,000 |
| MANAGER | 3 | 1 | 0 | 4 | 3,500 | 14,000 |
| SUPERINTENDENT | 6 | 0 | 0 | 6 | 2,500 | 15,000 |
| ENGINEER | 19 | 3 | 0 | 22 | 1,800 | 39,600 |
| FOREMAN | 5 | 3 | 0 | 8 | 1,200 | 9,600 |
| CLARK | 27 | 1 | 0 | 28 | 1,000 | 28,000 |
| SKILLED LABOR | 91 | 24 | 20 | 135 | 800 | 108,000 |
| UNSKILLED LABOR | 32 | 0 | 0 | 32 | 320 | 10,240 |
| TOTAL | 184 | 32 | 20 | 236 | 17,120 | 230,440 |

IX - 13 RECRUITEMENT SCHEDULE

| | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|
| GENERAL MANAGER | 1 | 1 | 1 | 1 | 1 |
| MANAGER | 2 | 2 | 3 | 4 | 4 |
| SUPERINTENDENT | 2 | 2 | 2 | 5 | 6 |
| ENGINEER | 2 | 5 | 13 | 18 | 22 |
| FOREMAN | 0 | 0 | 2 | 4 | 8 |
| CLARK | 5 | 10 | 13 | 22 | 28 |
| SKILLED LABOR | 0 | 0 | 0 | 35 | 135 |
| UNSKILLED LABOR | 2 | 4 | 10 | 18 | 32 |
| TOTAL | 14 | 21 | 44 | 107 | 236 |

SALARY COST SCHEDULE
(UNIT:US$)

| | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|
| GENERAL MANAGER | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| MANAGER | 7,000 | 7,000 | 10,500 | 11,000 | 11,000 |
| SUPERINTENDENT | 5,000 | 5,000 | 5,000 | 12,500 | 15,000 |
| ENGINEER | 3,600 | 9,000 | 23,400 | 32,400 | 39,600 |
| FOREMAN | 0 | 0 | 2,400 | 4,800 | 9,600 |
| CLARK | 5,000 | 10,000 | 13,000 | 22,000 | 28,000 |
| SKILLED LABOR | 0 | 0 | 0 | 28,000 | 108,000 |
| UNSKILLED LABOR | 640 | 1,280 | 3,200 | 5,760 | 10,240 |
| TOTAL | 27,240 | 38,280 | 63,500 | 125,460 | 230,440 |

TECHNICAL ADVISORY SERVICE

| | RATE/M-M($) | M-M | AMOUNT($) |
|---|---|---|---|
| 1992 | 15000 | 6 | 90000 |
| 1993 | 15000 | 30 | 450000 |
| 1994 | 15000 | 20 | 300000 |
| 1995 | 15000 | 20 | 300000 |
| 1996 | 15000 | 30 | 450000 |
| TOTAL | | 106 | 1590000 |

Table IX - 14 PREOPERATIONAL EXPENCES CASE : 2-B

| | TOTAL AMOUNT($) | 1992(F) | 1992(L) | 1993(F) | 1993(L) | 1994(F) | 1994(L) | 1995(F) | 1995(L) | 1996(F) | 1996(L) | TOTAL(F) | TOTAL(L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 0 | 0 |
| PROJECT PROMOTION | 500000 | 25000 | 25000 | 50000 | 50000 | 50000 | 50000 | 50000 | 50000 | 75000 | 75000 | 250000 | 250000 |
| TECH'L ADV'RY SRVICE | 1590000 | 90000 | 0 | 450000 | 0 | 300000 | 0 | 300000 | 0 | 450000 | 0 | 1590000 | 0 |
| RECRUT'T & PERSON'L | 484920 | | 27240 | | 38280 | | 63500 | | 125460 | | 230440 | 0 | 484920 |
| ADMINISTRATIVE O.H. | 290952 | 0 | 16344 | 0 | 22968 | 0 | 38100 | 0 | 75276 | 0 | 138264 | 0 | 290952 |
| TRAINING | 135500 | 0 | 0 | 0 | 0 | 0 | 0 | 107500 | 0 | 28000 | 0 | 135500 | 0 |
| LOSS IN TEST RUN | 73000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31000 | 42000 | 31000 | 42000 |
| MISCELLANEOUS | 50000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 50000 |
| CONTINGENCIES | 312437.2 | 11500 | 7858.4 | 50000 | 12124. | 35000 | 16160 | 45750 | 26073. | 58400 | 49570. | 200650 | 111787. |
| TOTAL | 3436809.2 | 126500 | 86442. | 550000 | 133372 | 385000 | 177760 | 503250 | 286809 | 642400 | 545271 | 2207150 | 1229659 |

BASE PERSONNEL COST CASE : 2-B

IX - 15 RECRUITEMENT SCHEDULE

SALARY COST SCHEDULE
(UNIT:US$)

| | NUMBER | | | | ANNUAL | TOTAL | RECRUITEMENT SCHEDULE | | | | | SALARY COST SCHEDULE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CEMENT MILL | QUARRY | FIN'G MI | TOTAL | SALARY | (COST($) | 1992 | 1993 | 1994 | 1995 | 1996 | 1992 | 1993 | 1994 | 1995 | 1996 |
| GENERAL MANAGER | 1 | 0 | 0 | 1 | 6,000 | 6,000 | 1 | 1 | 1 | 1 | 1 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| MANAGER | 3 | 1 | 0 | 4 | 3,500 | 14,000 | 2 | 2 | 3 | 4 | 1 | 7,000 | 7,000 | 10,500 | 11,000 | 14,000 |
| SUPERINTENDENT | 6 | 0 | 0 | 6 | 2,500 | 15,000 | 2 | 2 | 2 | 5 | 6 | 5,000 | 5,000 | 5,000 | 12,500 | 15,000 |
| ENGINEER | 19 | 3 | 0 | 22 | 1,800 | 39,600 | 2 | 5 | 13 | 18 | 22 | 3,600 | 9,000 | 23,400 | 32,400 | 39,600 |
| FOREMAN | 5 | 3 | 0 | 8 | 1,200 | 9,600 | 0 | 0 | 2 | 4 | 8 | 0 | 0 | 2,400 | 4,800 | 9,600 |
| CLARK | 27 | 1 | 0 | 28 | 1,000 | 28,000 | 5 | 10 | 13 | 22 | 28 | 5,000 | 10,000 | 13,000 | 22,000 | 28,000 |
| SKILLED LABOR | 91 | 24 | 20 | 135 | 800 | 108,000 | 0 | 0 | 0 | 35 | 135 | 0 | 0 | 0 | 28,000 | 108,000 |
| UNSKILLED LABOR | 32 | 0 | 0 | 32 | 320 | 10,240 | 2 | 4 | 10 | 18 | 32 | 640 | 1,280 | 3,200 | 5,760 | 10,240 |
| TOTAL | 184 | 32 | 20 | 236 | 17,120 | 230,440 | 14 | 24 | 44 | 107 | 236 | 27,240 | 38,280 | 63,500 | 125,460 | 230,440 |

NOTE: TWENTY PERSON IN THE FINISHING MILL IS FOR DELIVERY MEN (DRIVER).

TECHNICAL ADVISORY SERVICE

| | RATE/M-M($) | M-M | AMOUNT($) |
|---|---|---|---|
| 1992 | 15000 | 6 | 90000 |
| 1993 | 15000 | 30 | 450000 |
| 1994 | 15000 | 20 | 300000 |
| 1995 | 15000 | 20 | 300000 |
| 1996 | 15000 | 30 | 450000 |
| TOTAL | | 106 | 1590000 |

Table IX - 16 PREOPERATIONAL EXPENCES CASE : 3-A

| | TOTAL AMOUNT($) | 1992(F) | 1992(L) | 1993(F) | 1993(L) | 1994(F) | 1994(L) | 1995(F) | 1995(L) | 1996(F) | 1996(L) | TOTAL(F) | TOTAL(L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 0 | 0 |
| PROJECT PROMOTION | 500000 | 25000 | 25000 | 50000 | 50000 | 50000 | 50000 | 50000 | 50000 | 75000 | 75000 | 250000 | 250000 |
| TECH'L ADV'RY SRVICE | 1590000 | 90000 | 0 | 450000 | 0 | 300000 | 0 | 300000 | 0 | 450000 | 0 | 1590000 | 0 |
| RECRUT'T & PERSON'L | 501020 | | 27240 | | 38280 | | 69100 | | 135700 | | 233700 | 0 | 501020 |
| ADMINISTRATIVE O.H. | 302412 | 0 | 16344 | 0 | 22968 | 0 | 41460 | 0 | 81420 | 0 | 140220 | 0 | 302412 |
| TRAINING | 135500 | 0 | 0 | 0 | 0 | 0 | 0 | 107500 | 0 | 28000 | 0 | 135500 | 0 |
| LOSS IN TEST RUN | 47000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23000 | 24000 | 23000 | 24000 |
| MISCELLANEOUS | 50000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 50000 |
| CONTINGENCIES | 312893.2 | 11500 | 7858.4 | 50000 | 12124. | 35000 | 17056 | 45750 | 27712 | 57600 | 48292 | 199850 | 113043. |
| TOTAL | 3441825.2 | 126500 | 86442. | 550000 | 133372 | 385000 | 187616 | 503250 | 301832 | 633600 | 531212 | 2198350 | 1243175 |

BASE PERSONNEL COST CASE : 3-A

| | NUMBER CEMENT MILL | QUARRY | FIN'G MIL | TOTAL | ANNUAL SALARY | TOTAL (COST($) |
|---|---|---|---|---|---|---|
| GENERAL MANAGER | 1 | 0 | 0 | 1 | 6,000 | 6,000 |
| MANAGER | 3 | 1 | 1 | 5 | 3,500 | 17,500 |
| SUPERINTENDENT | 6 | 0 | 0 | 6 | 2,500 | 15,000 |
| ENGINEER | 19 | 3 | 2 | 24 | 1,800 | 43,200 |
| FOREMAN | 5 | 3 | 0 | 8 | 1,200 | 9,600 |
| CLARK | 27 | 1 | 4 | 32 | 1,000 | 32,000 |
| SKILLED LABOR | 91 | 24 | 9 | 124 | 800 | 99,200 |
| UNSKILLED LABOR | 32 | 0 | 3 | 35 | 320 | 11,200 |
| TOTAL | 184 | 32 | 19 | 235 | 17,120 | 233,700 |

IX - 17 RECRUITEMENT SCHEDULE

| 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 |
| 2 | 2 | 3 | 4 | 5 |
| 2 | 2 | 2 | 5 | 6 |
| 2 | 5 | 15 | 20 | 24 |
| 0 | 0 | 2 | 4 | 8 |
| 5 | 10 | 15 | 24 | 32 |
| 0 | 0 | 0 | 40 | 124 |
| 2 | 4 | 10 | 20 | 35 |
| 14 | 24 | 48 | 118 | 235 |

SALARY COST SCHEDULE
(UNIT:US$)

| 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|
| 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| 7,000 | 7,000 | 10,500 | 14,000 | 17,500 |
| 5,000 | 5,000 | 5,000 | 12,500 | 15,000 |
| 3,600 | 9,000 | 27,000 | 36,000 | 43,200 |
| 0 | 0 | 2,400 | 4,800 | 9,600 |
| 5,000 | 10,000 | 15,000 | 24,000 | 32,000 |
| 0 | 0 | 0 | 32,000 | 99,200 |
| 640 | 1,280 | 3,200 | 6,400 | 11,200 |
| 27,240 | 38,280 | 69,100 | 135,700 | 233,700 |

TECHNICAL ADVISORY SERVICE

| | RATE/M-M($) | M-M | AMOUNT($) |
|---|---|---|---|
| 1992 | 15000 | 6 | 90000 |
| 1993 | 15000 | 30 | 450000 |
| 1994 | 15000 | 20 | 300000 |
| 1995 | 15000 | 20 | 300000 |
| 1996 | 15000 | 30 | 450000 |
| TOTAL | | 106 | 1590000 |

Table IX - 18 PREOPERATIONAL EXPENCES CASE : 3-B

| | TOTAL AMOUNT($) | 1992(F) | 1992(L) | 1993(F) | 1993(L) | 1994(F) | 1994(L) | 1995(F) | 1995(L) | 1996(F) | 1996(L) | TOTAL(F) | TOTAL(L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 0 | 0 |
| PROJECT PROMOTION | 500000 | 25000 | 25000 | 50000 | 50000 | 50000 | 50000 | 50000 | 50000 | 75000 | 75000 | 250000 | 250000 |
| TECH'L ADV'RY SRVICE | 1590000 | 90000 | 0 | 450000 | 0 | 300000 | 0 | 300000 | 0 | 450000 | 0 | 1590000 | 0 |
| RECRUT'T & PERSON'L | 504020 | | 27240 | | 38280 | | 69100 | | 135700 | | 233700 | 0 | 504020 |
| ADMINISTRATIVE O.H. | 302412 | 0 | 16344 | 0 | 22968 | 0 | 41460 | 0 | 81420 | 0 | 140220 | 0 | 302412 |
| TRAINING | 135500 | 0 | 0 | 0 | 0 | 0 | 0 | 107500 | 0 | 28000 | 0 | 135500 | 0 |
| LOSS IN TEST RUN | 65000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31000 | 34000 | 31000 | 34000 |
| MISCELLANEOUS | 50000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 10000 | 0 | 50000 |
| CONTINGENCIES | 314693.2 | 11500 | 7858.4 | 50000 | 12124.8 | 35000 | 17056 | 45750 | 27712 | 58400 | 49292 | 200650 | 114043. |
| TOTAL | 3461625.2 | 126500 | 86442.4 | 550000 | 133372. | 385000 | 187616 | 503250 | 304832 | 642400 | 542212 | 2207150 | 1251175 |

Table IX - 19 BASE PERSONNEL COST CASE : 3-B

| | NUMBER | | | | ANNUAL | TOTAL | RECRUITEMENT SCHEDULE | | | | | SALARY COST SCHEDULE (UNIT:US$) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CEMENT MILL | QUARRY | FIN'G MI | TOTAL | SALARY($ | COST($) | 1992 | 1993 | 1994 | 1995 | 1996 | 1992 | 1993 | 1994 | 1995 | 1996 |
| GENERAL MANAGER | 1 | 0 | 0 | 1 | 6,000 | 6,000 | 1 | 1 | 1 | 1 | 1 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| MANAGER | 3 | 1 | 1 | 5 | 3,500 | 17,500 | 2 | 2 | 3 | 4 | 5 | 7,000 | 7,000 | 10,500 | 14,000 | 17,500 |
| SUPERINTENDENT | 6 | 0 | 0 | 6 | 2,500 | 15,000 | 2 | 2 | 2 | 5 | 6 | 5,000 | 5,000 | 5,000 | 12,500 | 15,000 |
| ENGINEER | 19 | 3 | 2 | 24 | 1,800 | 43,200 | 2 | 5 | 15 | 20 | 24 | 3,600 | 9,000 | 27,000 | 36,000 | 43,200 |
| FOREMAN | 5 | 3 | 0 | 8 | 1,200 | 9,600 | 0 | 0 | 2 | 4 | 8 | 0 | 0 | 2,400 | 4,800 | 9,600 |
| CLARK | 27 | 1 | 4 | 32 | 1,000 | 32,000 | 5 | 10 | 15 | 24 | 32 | 5,000 | 10,000 | 15,000 | 24,000 | 32,000 |
| SKILLED LABOR | 91 | 24 | 9 | 124 | 800 | 99,200 | 0 | 0 | 0 | 40 | 124 | 0 | 0 | 0 | 32,000 | 99,200 |
| UNSKILLED LABOR | 32 | 0 | 3 | 35 | 320 | 11,200 | 2 | 4 | 10 | 20 | 35 | 640 | 1,280 | 3,200 | 6,400 | 11,200 |
| TOTAL | 181 | 32 | 19 | 235 | 17,120 | 233,700 | 14 | 24 | 48 | 118 | 235 | 27,240 | 38,280 | 69,100 | 135,700 | 233,700 |

TECHNICAL ADVISORY SERVICE

| | RATE/M-M($) | M-M | AMOUNT($) |
|---|---|---|---|
| 1992 | 15000 | 6 | 90000 |
| 1993 | 15000 | 30 | 450000 |
| 1994 | 15000 | 20 | 300000 |
| 1995 | 15000 | 20 | 300000 |
| 1996 | 15000 | 30 | 450000 |
| TOTAL | | 106 | 1590000 |

# Chapter X

# FINANCIAL ANALYSIS

# X. Financial Analysis

## 1. General

In the present chapter a financial analysis will be carried out on the alternative cases proposed for the scheduled project previously selected on the basis of the results of the Market Study and Technical Study contained in chapters III through IX. An evaluation of the financial viability of each alternative project scheme will be conducted. Further a sensitivity analysis is conducted to establish the margins of variation of the major conditions which are assumed.

## 2. Alternative Cases Studied

The following eight cases form the object of the present evaluation.

| Case | Clinker | Location | Goods shipped |
|---|---|---|---|
| Case 1-A | 300,000 T/Y | Toliara | Bagged Cement<br>Clinker |
| Case 1-B | 400,000 T/Y | Toliara | Bagged Cement<br>Clinker |
| Case 2-A | 300,000 T/Y | Mahajanga | Bagged Cement |
| Case 2-B | 400,000 T/Y | Mahajanga | Bagged Cement |
| Case 3-A | 300,000 T/Y | Toliara<br>Toamasina | Bagged Cement<br>Clinker |
| Case 3-B | 400,000 T/Y | Toliara<br>Toamasina | Bagged Cement<br>Clinker |

## 3. Basic Conditions of the Financial Analysis

### (1) Base date for costs and prices

All of the base costs and prices used in the present study have been adjusted using December 15, 1990 (or mid December 1990) as the Base date.

### (2) Escalation rule

a. The following escalation rates have been applied using the above base date to establish the escalation of commodity prices.

foreign exchange cost: annual escalation 4%
local currency cost : no escalation of dollar to be used as basic currency.
Note the relation between the Madagascar's GDP deflator and Exchange rate in the past is shown below.

| | (1) GDP Deflator**1 (1980=100) | (2) Exchange rate***2 (FMG/US$) | (3) (1)/(2) | (4) 1981=100 |
|---|---|---|---|---|
| 1981 | 125.9 | 287.40 | 0.4381 | 100.0 |
| 1982 | 160.9 | 367.71 | 0.4376 | 99.9 |
| 1983 | 195.0 | 492.16 | 0.3962 | 90.4 |
| 1984 | 214.6 | 657.02 | 0.3261 | 74.4 |
| 1985 | 238.1 | 635.79 | 0.3745 | 85.5 |
| 1986 | 274.1 | 769.81 | 0.3561 | 81.3 |
| 1987 | 328.0 | 1,234.30 | 0.2657 | 60.6 |

1 World Bank, World Tables

[illegible]

The above indicates that for the period between 1981 and 1987 commodity prices in Madagascar fell in terms of the dollar. However the forecast adopted by the present study envisages a gradual recovery of the Madagascar economy hereafter and it is assumed that at the very least commodity prices will stay level on a dollar basis.

b. Commodity price escalation was applied to the base costs and prices from the beginning of 1990 to the scheduled project completion at the end of 1996.

(3) Currency Assumed and Exchange Rate

Since the Madagascar Franc is relatively unstable it was decided for the purposes of evaluation in the present study to convert all costs, prices and expenses to dollar terms using the base exchange rate shown below.

1 US $ = FMG 1,500
= J. Yen 135
= FF 5.09

(4) Economic Life Span of the Project

The economic life span of the present project is taken to be 15 years for purposes of the present evaluation.

(5) Project Implementation Schedule

The following implementation schedule is assumed for the present project.

| implementation aspect | period | scheduled implementation |
|---|---|---|
| a. Feasibility study | 7 months | Dec., '90 - Jul., '91 |
| b. Decision on project implementation | 5 months | Aug., '91 - Dec., '92 |
| c. Company foundation detailed project plan | 6 months | Jan., '92 - Jun., '92 |
| d. Fund raising, preparation of implementation, site acquisition | 8 months | May, '92 - Dec., '92 |
| e. Basic design, preparation of tender | 4 months | Jan., '93 - Apr., '93 |
| f. Tender, evaluation, EPC Contract | 8 months | May, '93 - Dec., '93 |
| g. Construction work | 34 months | Jan., '94 - Oct., '96 |
| h. Trial run, transfer | 4 months | Sep., '96 - Dec., '96 |
| i. Commercial operations | | from Jan., '97. |

4. Total Capital Requirement

(1) Land Acquisition Cost

The estimated cost of land acquisition based on local surveys of the sites is shown below. Further, the laws of Madagascar do not allow non nationals or foreign incorporations to acquire ownership rights on land.

A. Toliara

a. Cost of Land

The general cost of land in the area surrounding Toliara city is shown below.

- Government owned land: FMG 500 / 3,000 sq.m.

- Privately owned land : FMG 1,000/ 1,500 sq. m.
- City suburbs : FMG 80,000 / hectare

Land prices are inexpensive in the area in all of the above cases. Moreover the likeliest candidate site for the present project is one located near to the quay entrance and since this is a marshy government owned area it does not enjoy a strong selling point. This means that the average land cost per square meter including estimates for the necessary suburban sites are estimated to be of the order of 0.5 US $ dollars or FMG 750 per square meter.

b. Required Surface Area

| | | |
|---|---|---|
| Plant site | : | 8 Ha |
| Quarry site | : | 10 Ha |
| Private road | : | 5 Ha |
| Site for rehousing displaced residents | : | 2 Ha |
| TOTAL | : | 25 Ha |

There are about 100 dwellings presently situated in the vicinity of the planned access route for limestone deliveries to the projected plant. It is estimated that some 10 or so houses will actually need to be displaced but to avoid friction the provision of alternative housing and compensation for displacement should be effected. Further, it is noted that these residents are illegally occupying government owned land.

c. Land Acquisition Cost

US$ 0.50/sq. m. x 250,000 sq. m. = US$ 125,000

B. Mahajanga

a. Cost of Land

In the case of Mahajanga, it will be necessary to secure sites for both a quarry and Plant in the suburban area. The cost of sites outside the urban area are as follows.

Agricultural land : FMG 50,000- 100,000/hectare
Cattle Field land : FMG 30,000- 60,000/hectare

According to the Land Office of the area concerned it is possible to apply for the diversion of cattle fields for use as plant sites.

b. Required Surface Area

| | |
|---|---|
| Plant site | : 8 hectares |
| Quarry site | :10 hectares |
| Private road and company pier site | : 2 hectares |
| TOTAL | :20 hectares |

Further, there is a vacant space of approximately 1 hectare next to quay No.4(QUAI BARRIQUAND)in Mahajanga harbor which will be required for shipping bagged cement and leasing this is possible.

c. Land Acquisition Cost

Approx. US$ 40 hectare x 20 hectares = US$ 800

C. Teamasina

The candidate site for location of the Finishing and bagging plant at Toamasina is undecided as yet. However it is necessary to choose a site close to the rail freight station and the harbor facilities. The following conditions are assumed for the purposes of the present study.

Cost of land : US$ 1/sq. meter
(FMG 1,500/sq. m.)
Required surface area : 2 hectares
Cost of land acquisition : US$ 20,000

(2) Site Preparation Cost (L)

The preparation costs for the different candidate sites, taking into account the particularities involved in each case, are estimated as follows.

Case 1 : US$ 1,400,000
Case 2 : US$ 888,000
Case 3 : US$ 1,500,000

(3) Plant Construction Cost (F/L)

The estimated Plant construction cost was calculated as follows using the Base estimate shown in above and assuming that work begins in 1994 and will be completed in 1996. Further, the Physical Contingency is included in the Base Estimate. For details refer to Table IX-2 - IX-7.

| | F | L | Total |
|---|---|---|---|
| Case 1-A | 83,699 | 9,866 | 93,565 |
| Case 1-B | 95,022 | 10,429 | 105,451 |
| Case 2-A | 85,454 | 10,050 | 95,504 |
| Case 2-B | 97,162 | 10,613 | 107,775 |
| Case 3-A | 90,090 | 11,107 | 101,197 |
| Case 3-B | 101,413 | 11,670 | 113,083 |

(4) Pre-operational Expenses

These expenses are earmarked as costs of the Project owner to be paid once project implementation is actually initiated and include the following items.

a. Project Promotion Expenses

These are expenses required once the decision to invest in the project has been made and include those relating to company foundation, registration, acquisition of various permits and approvals (including those for quarrying rights for limestone, clay, river sand,etc.), for negotiating long term foreign funding, overseas technical inspections, and the various other negotiating activities concerned.

Foreign currency portion (F) : US$ 250,000
Local currency portion (L) : US$ 250,000

b. Technical Advisory Service (F)

US$ 1,350,000 is to be earmarked as the total expense for employment of overseas technical advisors and specialists. These specialists will assist the project owner as engineers from the beginning of the project to completion and plant delivery. A total of about 100 man months will be secured.

c. Recruitment and Personnel Expenses (L)

This represents the salaries paid to workers employed by the owner during the stages of project implementation. The following shows the schedule for the increases in the total recruited personnel to be effected over the years involved.

(Unit: Persons)

| | Case 1 | Case 2 | Case 3 |
|---|---|---|---|
| 1992 | 11 | 11 | 11 |
| 1993 | 21 | 21 | 21 |
| 1994 | 11 | 11 | 48 |
| 1995 | 107 | 107 | 118 |
| 1996 | 216 | 236 | 235 |

The budgets for the individual cases is calculated as follows:

(L)
Case 1 : US$ 468,920
Case 2 : US$ 484,920
Case 3 : US$ 504,020

d. Administrative Overheads (L)

These costs are expenditures for rent/lease of Project administration offices, administrative expenses, personnel fringe benefits, and other indirect allowances of the project. The budget is set at 60% of the recruitment and salary expenses.

(L)
Case 1 : US$ 281,352
Case 2 : US$ 290,952
Case 3 : US$ 302,412

e. Training Expenses (F)

OJT forms the basic form of technical training. However, for top level executives OJT will be preceded by training at overseas sites. It is assumed that training of 5 engineers from each department and of the Plant Manager will be concerned. The budget for this is estimated at US$ 135,500 in each case.

f. Loss in the Test Run

This expense covers costs incurred by utilities used in the no load test after Mechanical completion together with costs for raw materials, auxiliary materials and utilities used in the load test runs as well as costs for parts and expendables, etc. However, the value of the saleable product which is manufactured during the load test shall be deducted from these expenses. A variable expense equaling 48 hours has been calculated and is presented for reference here.

| | | | (US$) |
|---|---|---|---|
| | F | L | Total |
| Case 1A | 23,000 | 27,000 | 50,000 |
| Case 1B | 31,000 | 36,000 | 67,000 |
| Case 2A | 31,000 | 32,000 | 63,000 |
| Case 2B | 31,000 | 42,000 | 73,000 |
| Case 3A | 23,000 | 24,000 | 47,000 |
| Case 3B | 31,000 | 34,000 | 65,000 |

g. Miscellaneous Expenses

A sum of 10,000 US $ has been earmarked as the allowance for other expenses not included in the above categories such as Tax and public imposition costs, etc.

h. Contingencies

Ten percent of each cost estimated above has been earmarked as the physical contingency for the budget.

(5) Interest During Construction

The interest during construction is calculated on the capital borrowed for the individual expenses during the period from the year of their outlay to the project completion date in 1996. Borrowed capital is assumed to represent 70 % of the individual outlay expenditures. Further, the capital outlay schedule used for purposes of calculating interest presents figures based on the Base Cost Estimate to which a price contingency (escalation) has been added for the period of capital outlay involved in each case. The interest during construction as calculated in line with the above principles is as follows:

| | |
|---|---|
| Case 1-A | : US$ 19,638,000 |
| Case 1-B | : US$ 21,998,000 |
| Case 2-A | : US$ 19,936,000 |
| Case 2-B | : US$ 22,369,000 |
| Case 3-A | : US$ 21,368,000 |
| Case 3-B | : US$ 23,728,000 |

(6) Initial Working Capital

Estimated intial working capital is as follow.
(Details are Table - .)

| | F | L | Total |
|---|---|---|---|
| Case 1A | 1,013 | 72 | 1,085 |
| Case 1B | 1,350 | 94 | 1,444 |
| Case 2A | 1,195 | 124 | 1,319 |
| Case 2B | 1,594 | 165 | 1,759 |
| Case 3A | 1,049 | 93 | 1,142 |
| Case 3B | 1,384 | 129 | 1,513 |

(7) Total Capital Requirement

Table below summarizes the total capital requirement obtained from the above analysis.

(Unit:1000 US$)

| | F | L | Total |
|---|---|---|---|
| Case 1A | 106,920 | 12,648 | 119,568 |
| Case 1B | 120,950 | 13,243 | 134,193 |
| Case 2A | 109,165 | 12,282 | 121,447 |
| Case 2B | 123,705 | 12,897 | 136,602 |
| Case 3A | 115,076 | 14,088 | 129,164 |
| Case 3B | 129,104 | 14,698 | 143,803 |

## 5. Financing Plan

The total capital requirement as shown in the previous section is to be funded under the following conditions.

### (1) Debt Equity Ratio

A debt equity ratio of 70-30 is assumed in the funding of capital and it is also assumed that borrowed capital will be obtained from overseas financial institutions in the form of long term deferred payment basis financing. The paying up of equity capital and the borrowing schedule for long term capital loans are to organized in accordance with the respective ratios of 30% and 70% in accordance with the capital outlay schedule.

### (2) Conditions of Long Term Capital Loan Finance

The financial institution to provide a long term capital loan is still undecided, and the conditions assumed below are based on the conditions of Suppliers' credit of The Export-Import Bank of Japan.

a. Conditions of Repayment

The principal of the loan is to be repaid in 20 equal semi-annual installments with the first repayment being made in the middle of the first year of commercial operations.

b. Interest

Annual interest is calculated to be 7.5%. Further as security on the finance from the Japan Import Export Bank a sovereignty guarantee is to be requested of the relevant government.

(3) Conditions of the Short Term Loan

Capital interest for a short term loan in Madagascar is between 17 and 20% (BNI). As the present analysis is conducted in terms of US dollars it is necessary to take into account the deflator effect of Madagascar over the past. Since the GDP deflator in Madagascar has been between 15 and 18% to date in the recent past the current interest can be judged as rather low. For present purposes an annual interest rate of 7.5% equai to that for the long term loan has been employed.

6. Operating Plan

(1) Organization

The organization required for operation of the present project has already been outlined in Chapter VII. The following represents a breakdown of the personnel details of the individual cases being considered.

(Unit: Person)

| | Case-1 | Case-2 | Case-3 |
|---|---|---|---|
| General Manager | 1 | 1 | 1 |
| Manager | 4 | 4 | 5 |
| Superintendent | 6 | 6 | 6 |
| Engineer | 22 | 22 | 24 |
| Foreman | 8 | 8 | 8 |
| Clark | 28 | 28 | 32 |
| Skilled Labor | 115 | 135 | 124 |
| Unskilled Labor | 32 | 32 | 35 |
| Total | 216 | 236 | 235 |

(2) Operating System

a. Operating shift : 3 shift operation
b. Annual operating days : 300 days

(3) Operating Schedule

a. Production capacity (MT/Y)

(Unit: MT/Y)

| | Clinker | Cement | *Cement (2) |
|---|---|---|---|
| Case 1A | 300,000 | 312,000 | - |
| Case 1B | 400,000 | 416,000 | - |
| Case 2A | 300,000 | 312,000 | - |
| Case 2B | 400,000 | 416,000 | - |
| Case 3A | 300,000 | 312,000 | 156,000 |
| Case 3B | 400,000 | 400,000 | 156,000 |

Note: * Cement (2) - Toamasina milling plant

b. Capacity utilization schedule

| | |
|---|---|
| First Year | 70% |
| Second Year | 95% |
| Third Year | 100% |

(4) Inventory Schedule

The following shows the assumed stock on hand for the main raw materials, auxiliary materials, utilities, expendables and manufactured products.

| | | |
|---|---|---|
| a. Limestone | : | 15 days |
| b. Clay | : | 15 days |
| c. Silica sand | : | 15 days |
| d. Pyrite cinder | : | 60 days |
| e. Gypsum | : | 30 days |
| f. Coal | : | 60 days |
| g. Diesel oil | : | 5 days |
| h. Fire bricks | : | 90 days |
| i. Steel balls | : | 90 days |
| j. Lube oil | : | 90 days |
| k. Paper sack | : | 60 days |
| l. Explosives | : | 90 days |
| m. Clinker | : | 30 days |
| n. Cement | : | 30 days |
| o. Spare parts | : | 1 year |

(5) Operating Cost

The following items are assumed to involve actual capital outlay during operations. Further, input materials which can be quarried and secured locally such as limestone, clay, silica sand, etc. are not included as items of expense under this heading.

1) Variable Costs

a. Pyrite Cinder

At present import from neighboring countries (e.g. South Africa) is envisaged but if a suitable local iron element can be secured then local supply would be feasible.

Import prices are as follows:

| | | | |
|---|---|---|---|
| Base price | : | FOB | US$ 17/MT |
| | | Freight | US$ 25/MT (Toliara) |
| | | | US$ 35/MT (Mahajanga) |
| 1997 Price | : | Toliara | US$ 53.26/MT |
| | | Mahajanga | US$ 76.07/MT |

b. Gypsum

At present local gypsum is purchased on an ex factory basis from the Amboanio mill of Mahajanga. The price is cheaper than the international price. In the case of Toliara gypsum is found widely scattered in the hilly area of Mahaboboka, Vineta located some 100 km from the project site. The Toliara site has very attractive advantages since the distance involved at this site is shorter than that in the case of Amboanio and the gypsum strata at Toliara is quite thick so that the price is low. For the present project cost calculations have been carried out for the Toliara case on the assumption that in house trucks are used for delivery while the current purchasing price from the Amboanio plant has been applied in the Mahajanga case.

Base price : Toliara: 1-A US$ 32/MT
1-B US$ 30/MT
Mahajanga: US$ 86.70/MT
1997 Price : Same as the base price

e. Coal

There is currently undeveloped potential for production of coal with a heat capacity of 5,500 kcal/ kg at an eastern inland area of Toliara. However if this mine is developed it would be necessary to give preference to utilizing the domestically produced coal. In the present analysis evaluation is conducted on the assumption that coal is purchased from South Africa.

South African coal (with a heat capacity of 6,500 kcal/kg) is widely distributed throughout the world and is cheap in price.There are large lot loading and shipping facilities at the port of Richards Bay and 100 ton class Carriers are used. For shipping of small lots Maputo port is popular and this is close to Madagascar. Recent pricing of South African coal is given below for reference.

FOB US$ 36-40 MT (to Amboanio plant)
FOB US$ 15-16 MT (coal for Japanese Power Company)

Freight differs considerably depending on the size of the carrier. In the case of the Amboanio plant it is about US$ 10 ton. An estimate received from a credible shipper indicates that it would cost US$ 31 MT to carry freight with a 5,000 ton class craft from Richards Bay to Toamasina.

The Base prices in view of the above are assumed as follows.

| | To Toliara | To Amboanio |
|---|---|---|
| FOB Maputo | US$ 34/MT | US$ 34/MT |
| Fireght | US$ 20/MT | US$ 35/MT |
| CIF | US$ 54/MT | US$ 69/MT |
| 1997 | | |
| CIF | US$ 68.48/MT | US$ 87.50/MT |

d. Diesel Oil

The current price of Solima is FMG 422/liter.
Base Cost : US$ 281.34/ Kl
1997 cost : US$ 355.98/ Kl

e. Firebricks

Several types of fire resistant brick are used for the Cement kiln and prices vary by type. Estimates were carried out on the basis of the average price.

| | | |
|---|---|---|
| Current price 130 yen/kg: | FOB | US$ 1,000/MT |
| | Freight | US$ 100/FT |
| | C & F | US$ 1,100/MT |
| 1997 Price | CIF | US$ 1,395.65 |

f. Steel Balls

High chrome balls of Belgium manufacture are excellent in terms of price and quality. These are about the same price as those of Japanese make.

| | | |
|---|---|---|
| Current price : | FOB Belgium | US$ 1,750/MT |
| | FOB Japan | US$ 1,741/MT |
| | Ocean Freight | US$ 100/FT |
| | CIF Madagascar | US$ 1,850/MT |
| 1977 Price | CIF Madagascar | US$ 2,345.90/MT |

g. Lubeoil

| | | |
|---|---|---|
| The current price is 3.70 US$/l - | FOB | US$ 3,700/kl |
| | Freight | US$ 70/kl |
| | CIF Madagascar | US$ 3,770/kl |
| 1997 Price | CIF Madagascar | US$ 4,910.85/kl |

h. Paper Sacks

Specifications differ according to type and employment also differs. The following indicates current prices by specification;

For purposes of the present study types 2 (for domestic or marine transport) and 3 (for domestic/truck transport) are destined for the domestic market while type 5, the strong pp woven bags, are employed for exports

1997 Prices
KP 4-ply : CIF US$ 0.62/ bag
KP 3-ply : CIF US$ 0.5188/ bag
KP 1+PP-1 : CIF US$ 0.8098/ bag

i. Electric Power

Electric power is only used for the Toamasina Finish Mill of Case 3. The current electricity charges of the Toamasina region are as follows.

Demand charge FMG 1,892/kva
Energy charge FMG 60/Kwh

On the basis of the estimated electric consumption of the Toamasina plant this results in US$ 40.20 on the current base which will be US$ 50.87 at 1997 prices.

2) Fixed Costs

j. Labor Costs

Labor costs are expressed in dollar terms and will be held at the levels indicated here in the future also. Annual salaries determined by rank (with one month bonus included) are as indicated below.

| | |
|---|---|
| General Manager | : US$ 6,000/Y |
| Manager | : US$ 3,500/Y |
| Superintendent | : US$ 2,500/Y |
| Engineer | : US$ 1,800/Y |
| Foreman | : US$ 1,200/Y |
| Clark | : US$ 1,000/Y |
| Skilled Labor | : US$ 800/Y |
| Unskilled Labor | : US$ 320/Y |

k. General Overheads

Are assumed at 60% of direct labor costs as indicated in the previous section.

l. Maintenance costs

Are calculated at 3% of Plant construction costs and Quarry development costs. The breakdown of maintenance costs is assumed to be on the following basis.

Maintenance parts (F) : 80% (2.4%)
Maintenance services (L): 20% (0.6%)

m. Tax and Insurance

1% of initial fixed investment is earmarked for Municipal property tax, other regional taxes and Plant Indemnity insurance charges.

n. Depreciation

The depreciation schedule obtained using the fixed sum method for equipment investment is shown below.

| Assets | Depreciation period | Salvage value |
|---|---|---|
| Land, Preparation Costs: | not depreciated | 100% |
| Quarry Development | | |
| Equipment | 5 years | 0 |
| Plant Equipment | 10 years | 10% |
| Utility Equipment | 10 years | 10% |
| Offsite Facilities | 20 years | 10% |
| Finish Mill (Toamasina) | 10 years | 10% |

o. Amortization

Amortization for the pre-operational expenses and interest during construction is made for five years period.

Depreciation and amortization schedules are as per Table X-1 through 6.

Other Costs

p. Sales expenses

0.5% of sales are to be earmarked.

q. Corporate Income Tax

A tax holiday is to be enjoyed for a five year period from start of operations in accordance with the Investment Promotion law. After this period a 30% income tax will be applied to taxable income.

r. Dividends

No dividends are envisaged.

s. Transportation Costs

The domestic transportation costs for cement and clinker calculated according to the transportation program (to be outlined hereafter) are as follows.

Case 1 average of all manufactured products x 17.90 US \$/MT
Case 2 average of all manufactured products x 24.68 US \$/MT
Case 3 average of all manufactured products x 20.32 US \$/MT

7. Sales Plan

(1) Sales Price

The following represents estimates of the average ex-work sales price for the individual cases postulated.

| | | |
|---|---|---|
| Case 1 | Bagged cement for domestic market | :US\$165.14/MT |
| | Bagged cement for export | :US\$ 80.75/MT |
| | Clinker for export | :US\$ 44.00/MT |

| | | |
|---|---|---|
| Case 2 | Bagged cement for domestic market | :US$160.01/MT |
| | Bagged cement for export | :US$ 81.50/MT |
| Case 3 | Bagged cement for domestic market | :US$173.43/MT |
| | Bagged cement for export | :US$ 80.50/MT |
| | Clinker for export | :US$ 44.00/MT |

(2) Accounts payable and Accounts receivable

The following are the conditions for the accounts receivable and accounts payable.

| | |
|---|---|
| Accounts receivable (domestic sales) | : 30 days |
| Accounts receivable (export) | : 60 days |
| Accounts payable (export) | : 90 days |

(3) Sales Schedule

Schedules for production, inventory, sales amounts and sales revenues are shown in Table X-7 through 14.

8. Financial Projections

Projections were carried out for the following financial indicators and parameters.

a. Productions and Sales Plan
b. Production Cost Statements
c. Working Capital Statements
d. Income Statements
e. Fund Flow Statements
f. Balance
g. Long term Debt Repayment Schedule

Tables X-15 to X-21 for Case 1A are shown as a representative example of the projected financial papers. For other cases refer to the attached appendix.

9. Financial Viability Analysis

1) Various Financial Indicators

Results of financial analysis for the following topics are shown in Table X-22 to X-27.

a. Ratio of After Tax Profit to Sales Revenue
b. Ratio of After Tax Profit to Shareholders Equity
c. Ratio of Before Tad Profit to Total Investment
d. Ratio of After Tax Profit to Shared Capital
e. Current Ratio
f. Quick Ratio
g. Debt-Service Ratio
h. Long Term debt : Shareholders Equity
i. Profit Break-even Point on Capacity Utilization Rate
j. Cash Break-even Point on Unit Sales Price
k. Cash Break-even Point on Capacity Utilization Rate

2) Financial Internal Rate of Return

The following shows the results on calculation of the financial internal rate of return on total investment.

Calculation of FIRR

| | FIRR Before Tax | FIRR After Tax |
|---|---|---|
| Case 1A | 17.49% | 15.47% |
| 1B | 18.07% | 15.97% |
| 2A | 14.55% | 12.72% |
| 2B | 15.81% | 13.80% |
| 3A | 19.71% | 17.68% |
| 3B | 18.13% | 16.02% |

3) Sensitivity Analysis

Results of an analysis of FIRR sensitivity to the variables indicated below for cases 1-A and 1-B are shown in Table X-34.

a. Product sales price
b. Price of coal
c. Price of paper sacks
d. Cost of domestic carriage
e. Amount of investment

## 10. Conclusion and Recommendation

### (1) Case Study

1) In general terms the Toliara site (Case 1) is more favorably situated in terms of profitability in comparison to the Mahajanga site (Case 2).

2) In general terms Case B (400,000 tons per year) is more profitable than Case A (300,000 tons per year), but with regard to Case 3 (the Toliara-Toamasina case) it was found that Case A is better.

3) The optimum case of all postulated proves to be Case 3A followed in order of excellence by Case 3B, Case 1B, Case 1A, Case 2B and Case 2A.

4) The superiority of Case 3A in terms of profitability over that of Case 3B shows that 1. the profitability of a Finishing Mill located in the market is nigh and 2. The importing of clinker is a factor which detracts from profitability.

(2) Sensitivity Analysis

1) The sensitivity of profits to price fluctuations is most observable in the case the sales price of finished products. After this the investment amount is the factor showing the highest sensitivity. It follows from the above that it is important to consider methods to reduce the construction costs involved.

2) The sensitivity of variable costs and domestic transport costs is low.

(3) Project Site

The Toliara location enjoys the following particular advantages for a domestic project site:
- Excellent harbor conditions
- The availability of an ideal plant site directly linked to the harbor
- The possibility of using domestic coal resources exploitable in the future
- The abundant deposits of lime stone
- Relative proximity to the important export markets of the Reunion and Mauritius

(4) Profitability of the Finishing Mill

As is assumed that the profitability of a Finishing Mill aimed at the domestic market is extremely high it is desirable to carry out the construction of a finishing mill using imported clinker as raw material before beginning construction of a complete plant. Once marketing has been stabilized and an appropriate juncture reached the construction of the complete plant could be begun. However, in this case it is important to establish the availability of clinker and obtain a plant site in the neighborhood of the Toamasina harbor.

(5) Possession of in House Carriers

An important factor limiting economic activities in Madagascar is the insufficient provision of transportation facilities (including road facilities). In particular, the transportation costs involved in supplying and linking the main markets involved in the present project are quite high. This means that little advantage will be gained over competing countries because of the relative costliness of transport costs. One possible solution to this problematic situation is to consider the construction of in-house dry bulk carriers which could be used for the domestic and export transport of clinker. However, if this method is adopted there will be an increased burden of initial investment and so a key factor will be the reliable effective operation of such transport facilities.

(6) Conclusions

The following conclusions are drawn from the conditions assumed in the present study report.

1) In terms of profitability, Case 3 is the optimum proposal as a result of the economic nature of domestic transportation of clinker in comparison to bagged cement. However, as the export of clinker reduces profitability on a scale of 400,000 tonnes per day, profitability is impaired by the increase in clinker exports. Therefore, it is concluded that Case 3A has the optimum profitability.

2) Toliara is a better site for the Project than Mahajanga for a variety of reasons. However, construction of the Finishing Mill near to Toamasina, close to the main markets, is a more appropriate choice because of transportation costs

will be cheaper. As a result of the above considerations, a possible proposal would be to construct a Finishing Mill with an intake of imported clinker at Toamasina in anticipation of the construction of the Complete Plant which will follow later.

3) There is a strong possibility that the scale of project investment involved will be found too large for the economy of Madagascar to support. It seems that the main obstacle to realization of the project is Project Financing.

(7) Recommendations

In view of the fact that the present project is on an extremely large scale of investment for Madagascar, and in response to the various problems relating to the lack of Industrial Infrastructures in Madagascar, the following recommendations have been made.

1) Project Financing

As long as the the assumption of a Private Sector context of investment is maintained for the present project, the biggest problem to its realization will be in the funding of Equity Capital and Loan Capital for the project.

a. Funding of the equity capital portion relying only on the resources of Madagascar's entrepreneurs will be difficult. Further, in view of the necessity of participation of a technical partner and in order to facilitate the funding of project finances (loan capital) it is recommended to seek the participation of extra parties such as the following:

- Madagascar entrepreneurs

- Financing institutions of Madagascar
- Entrepreneurs of the IOC countries
- Public Financing institutions such as the IFC, etc.
- Cement manufacturers
- Entrepreneurs of the advanced countries

b. With regard to the funding of the loan capital, the key element affecting the financing conditions will be whether an acceptable security package can be formulated and presented to the Financier. Discussion should be carried out between Equity participants on the formation of the security package in order to elaborate the most advantageous terms which can be secured.

   Also, it is advisable to sound the potential contractor on an acceptable security package and financing conditions and discuss these together.

   In any case, the equity participation of reputable parties such as public bodies like to IFC or financial institutions will certainly do much to ensure an advantageous funding of the loan finance.

2) Market Development

Marketing of the finished product will have a decisive effect on the profitability of the present project. Of course the sales price of the product is an important factor, but even before considering this, the question of whether domestic demand actually increases in line with forecasts will be a determining factor. The reason for this, which has already been pointed out, is that the present project will not stand as an export orientated project. Therefore, in order to ensure the success of the project it is necessary to consider ways to increase domestic demand.

a. Whether there will be an expansion in domestic demand depends above all on an expansion of the economy of Madagascar. With a continued economic slowdown a large scale Cement Project will not be desirable. However, since the question of national economic expansion is itself outside of the scope of the project development capacity, this will depend entirely on the united efforts of the Government and people of Madagascar.

   An increase in the demand for cement results principally from development in the sectors of building (housing, administrative and office buildings, hotels, schools, hospitals, etc.), of social infrastructure (seaports, airports, roads, dams, overland and underground canals, etc.), of industry and industrial infrastructure (factories;, transport systems, storage systems, agricultural infrastructure, etc.), and therefore Governmental policies relating to promotion of investment in these sectors and for budgeting allocations is of great significance. It is necessary for the Project Promoter to undertake every possible effort to see to it that the government is encouraged to promote the above, and particularly to undertake public investment.

b. Another means to expand demand is to reduce the market price of cement. The current retail price on the market of about US 200 $/MT is excessive, and it is possible that there is little increase in demand because cement is unable to compete with available alternative materials. It is necessary to evaluate the following improvements as possible counter measures to this situation.

- improvement in tax rates
- rationalization of the distribution systems (bulk transport, possibility to apply for ready made concrete, etc.)
- survey on the competitive position vie a vie alternative materials (eg. bricks, wood, stone, asphalt, etc.)

3) Evaluation on a Phased Realization of the Project

The problems outlined above could arise in relation to the question of whether cement demand will increase in line with forecasts and whether financing for project implementation will be realized. It will require some time to overcome these problems and ensure that the desired context for project implementation is achieved.

However, the intervening time must not be wasted, and it is necessary to plan for an effective realization of the project in well ordered phases. That is, we recommend that firstly the construction of the finishing mill be carried out at Toamasina. The scale will be on a par with that shown for Case 3A (i.e. 150,000 T/Y of clinker volume) with clinker being imported. By realizing this part of the Project first the following merits can be anticipated.

- a saving on foreign currency of the difference in price between imported cement and imported linker
- the establishment of a marketing system and zone of commercial operations
- promotion of an expansion in demand through price reduction

- selection of partners who will invest in the integrated cement mill to form the next phase of the project
- training of engineers and nurture of cement production technology
- profit accumulation (to form capital resources for the next phase of investment)

It is recommended that the above implementation plan be promptly initiated. However, the following points will need to be confirmed.

- survey on site availability in the area around Toamasina harbour
- examination of the clinker handling methods possible in Toamasina harbour
- survey on the availability of clinker (very important) and evaluation of price trends
- selection of an experienced Technical Partner
- a detailed equipment plan and estimate calculations for construction costs
- implementation of a thorough Feasibility Study
- evaluation of Financing (including a security package).

## II. Economic Evaluation

### (1) Economic Internal Rate of Return (EIRR)

EIRR was calculated for the Case 1-A with adjustments on the costs and prices as follows.

#### 1) Shadow Exchange Rate

A shadow exchange rate to be applied on the local costs and prices is assumed to be 125 percent or FMG 1,875 per one U.S. dollar in stead of FMG 1,500/US$.

2) Investment Cost

Local currency portion of the investment cost is recalculated after elimination of transferable costs (i.e. sales taxes, TUT and corporate/individual income tax) which are estimated to be 26.5 percent of the local currency portion.

3) Tradable Items

Tradable items are adjusted on the border price basis (CIF).

| | |
|---|---|
| Gypsum | : US$ 40/MT |
| Diesel Oil | : US$367/MT |
| Cement | : US$154.48/MT |

4) Labor Cost

Due to lack of experienced industrial labor in the country, opportunity cost of the employees is left as it is except unskilled labor which is assumed to be sixty percent of an estimated rate.

5) Other Costs

* Taxed and Insurance:

Taxes portions are eliminated as transferable cost.

* Sale Expenses:

Twenty five percent of the expenses are eliminated as transferable costs.

6) EIRR

Calculated EIRR is 18.23 percent.

(2) Foreign Exchange Balance

Effect of foreign exchange earring and saving by the project is calculated as per Table X-37 and 38.

Table X-1 DEPRECIATION AND AMORTIZATION SCHEDULE

CASE: 1-A

| ASSET | INITIAL VALUE (1000$) | DEPREC'N PERIOD(Y) (Y) | SALVAGE VALUE (%) | DEPREC'N STAND'D YR (1000$) |
|---|---|---|---|---|
| LAND/SITE PREPART'N | 1525 | N.A. | 100% | 0 |
| QUARRY DEVELOP'T | 3566 | 5 | 0% | 713 |
| PLANT FACILITIES | 71365 | 10 | 10% | 6423 |
| UTILITY FACILITIES | 9957 | 10 | 10% | 896 |
| OFFSITE FACILITIES | 8677 | 20 | 10% | 390 |
| FINISHING MILL | 0 | 10 | 10% | 0 |
| PREOPERAT'L EXP'CES | 3754 | 5 | 0% | 751 |
| INT'ST DRG. CONST'N | 19638 | 5 | 0% | 3928 |
| TOTAL | 118482 | | | 13101 |

Table X-2 DEPRECIATION AND AMORTIZATION SCHEDULE

CASE: 1-B

| ASSET | INITIAL VALUE (1000$) | DEPREC'N PERIOD(Y) (Y) | SALVAGE VALUE (%) | DEPREC'N STAND'D YR (1000$) |
|---|---|---|---|---|
| LAND/SITE PREPART'N | 1525 | N.A. | 100% | 0 |
| QUARRY DEVELOP'T | 4161 | 5 | 0% | 832 |
| PLANT FACILITIES | 80992 | 10 | 10% | 7289 |
| UTILITY FACILITIES | 11621 | 10 | 10% | 1046 |
| OFFSITE FACILITIES | 8677 | 20 | 10% | 390 |
| FINISHING MILL | 0 | 10 | 10% | 0 |
| PREOPERAT'L EXP'CES | 3775 | 5 | 0% | 755 |
| INT'ST DRG. CONST'N | 21998 | 5 | 0% | 4400 |
| TOTAL | 132749 | | | 14712 |

Table X-3 DEPRECIATION AND AMORTIZATION SCHEDULE
CASE: 2-A

| ASSET | INITIAL VALUE (1000$) | DEPREC'N PERIOD(Y) (Y) | SALVAGE VALUE (%) | DEPREC'N STAND'D YR (1000$) |
|---|---|---|---|---|
| LAND/SITE PREPART'N | 889 | N.A. | 100% | 0 |
| QUARRY DEVELOP'T | 3008 | 5 | 0% | 602 |
| PLANT FACILITIES | 73946 | 10 | 10% | 6655 |
| UTILITY FACILITIES | 9985 | 10 | 10% | 899 |
| OFFSITE FACILITIES | 8564 | 20 | 10% | 385 |
| FINISHING MILL | 0 | 10 | 10% | 0 |
| PREOPERAT'L EXP'CES | 3799 | [illegible] | 0% | 760 |
| INT'ST DRG. CONST'N | 19936 | 5 | 0% | 3987 |
| TOTAL | 120127 | | | 13288 |

Table X-4 DEPRECIATION AND AMORTIZATION SCHEDULE
CASE: 2-B

| ASSET | INITIAL VALUE (1000$) | DEPREC'N PERIOD(Y) (Y) | SALVAGE VALUE (%) | DEPREC'N STAND'D YR (1000$) |
|---|---|---|---|---|
| LAND/SITE PREPART'N | 889 | N.A. | 100% | 0 |
| QUARRY DEVELOP'T | 3604 | 5 | 0% | 721 |
| PLANT FACILITIES | 83960 | 10 | 10% | 7556 |
| UTILITY FACILITIES | 11648 | 10 | 10% | 1048 |
| OFFSITE FACILITIES | 8564 | 20 | 10% | 385 |
| FINISHING MILL | 0 | 10 | 10% | 0 |
| PREOPERAT'L EXP'CES | 3810 | 5 | 0% | 762 |
| INT'ST DRG. CONST'N | 22369 | 5 | 0% | 4474 |
| TOTAL | 134844 | | | 14947 |

Table X-5 DEPRECIATION AND AMORTIZATION SCHEDULE
CASE: 3-A

| ASSET | INITIAL VALUE (1000$) | DEPREC'N PERIOD(Y) (Y) | SALVAGE VALUE (%) | DEPREC'N STAND'D YR (1000$) |
|---|---|---|---|---|
| LAND/SITE PREPART'N | 1645 | N.A. | 100% | 0 |
| QUARRY DEVELOP'T | 3566 | 5 | 0% | 713 |
| PLANT FACILITIES | 71365 | 10 | 10% | 6423 |
| UTILITY FACILITIES | 9957 | 10 | 10% | 896 |
| OFFSITE FACILITIES | 8677 | 20 | 10% | 390 |
| FINISHING MILL | 7631 | 10 | 10% | 687 |
| PREOPERAT'L EXP'CES | 3812 | 5 | 0% | 762 |
| INT'ST DRG. CONST'N | 21368 | 5 | 0% | 4274 |
| TOTAL | 128021 | | | 14145 |

Table -6 DEPRECIATION AND AMORTIZATION SCHEDULE
CASE: 3-B

| ASSET | INITIAL VALUE (1000$) | DEPREC'N PERIOD(Y) (Y) | SALVAGE VALUE (%) | DEPREC'N STAND'D YR (1000$) |
|---|---|---|---|---|
| LAND/SITE PREPART'N | 1645 | N.A. | 100% | 0 |
| QUARRY DEVELOP'T | 4161 | 5 | 0% | 832 |
| PLANT FACILITIES | 80992 | 10 | 10% | 7289 |
| UTILITY FACILITIES | 11621 | 10 | 10% | 1046 |
| OFFSITE FACILITIES | 8677 | 20 | 10% | 390 |
| FINISHING MILL | 7631 | 10 | 10% | 687 |
| PREOPERAT'L EXP'CES | 3834 | 5 | 0% | 767 |
| INT'ST DRG. CONST'N | 23728 | 5 | 0% | 4746 |
| TOTAL | 142289 | | | 15757 |

Table X-7 (1)



*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

PRODUCTION AND SALES PLAN

CASE 1-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 199' | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 0. | 0. | 0. | 0. | 0. | 300000. | 300000. | 300000. | 300000. | 300000. |
| CAPACITY UTILIZATION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.700 | 0.950 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 0. | 0. | 0. | 0. | 0. | 210000. | 285000. | 300000. | 300000. | 300000. |
| INCREASE IN INVENTORY | 0. | 0. | 0. | 0. | 0. | 17262. | 6165. | 1233. | 0. | 0. |
| SALES VOLUME (DOMESTIC CEMENT) | 0. | 0. | 0. | 0. | 0. | 150504. | 170919. | 193327. | 217927. | 244939. |
| UNIT SALES PRICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 |
| SALES REVENUE | 0. | 0. | 0. | 0. | 0. | 24854. | 28226. | 31926. | 35988. | 40449. |
| SALES VOLUME (EXPORT CLINKER) | 0. | 0. | 0. | 0. | 0. | 48023. | 114490. | 112876. | 90455. | 64482. |
| UNIT SALES PRICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 |
| SALES REVENUE | 0. | 0. | 0. | 0. | 0. | 2113. | 5038. | 4967. | 3980. | 2837. |
| TOTAL SALES REVENUE | 0. | 0. | 0. | 0. | 0. | 26967. | 33263. | 36893. | 39968. | 43286. |

Table X-7 (2)



*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PRODUCTION AND SALES PLAN
CASE 1-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. |
| CAPACITY UTILIZATION | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. |
| INCREASE IN INVENTORY | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| SALES VOLUME (DOMESTIC CEMENT) | 274604. | 312000. | 312000 | 312000. | 312000. | 312000. | 312000. | 312000. | 312000. | 312000. |
| UNIT SALES PRICE | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 |
| SALES REVENUE | 45348. | 51524. | 51524. | 51524. | 51524. | 51524. | 51524. | 51524. | 51524. | 51524. |
| SALES VOLUME (EXPORT CLINKER) | 35958. | -0. | -0. | -0. | -0. | -0. | -0. | -0. | -0. | -0. |
| UNIT SALES PRICE | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 |
| SALES REVENUE | 1582. | -0. | -0. | -0. | -0. | -0. | -0. | -0. | -0. | -0. |
| TOTAL SALES REVENUE | 46930. | 51524. | 51524. | 51524. | 51524. | 51524. | 51524 | 51524 | 51524. | 51524. |

PRODUCTION COST STATEMENTS

Table X-8 (1)          CASE 1-A          - BASE CASE -          (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 0. | 0. | 0. | 0. | 0. | 210000. | 285000. | 300000. | 300000. | 300000. |
| RAW MATERIALS | 0. | 0. | 0. | 0. | 0. | 403. | 547. | 576. | 576. | 576. |
| PYRITE CINDER | 0. | 0. | 0. | 0. | 0. | 101. | 137. | 144. | 144. | 144. |
| GYPSUM | 0. | 0. | 0. | 0. | 0. | 302. | 410. | 432. | 432. | 432. |
| UTILITIES | 0. | 0. | 0. | 0. | 0. | 4203. | 5455. | 5843. | 6026. | 6228. |
| FUEL (COAL) | 0. | 0. | 0. | 0. | 0. | 2186. | 2967. | 3123. | 3123. | 3123. |
| DIESEL OIL (CLINKER) | 0. | 0. | 0. | 0. | 0. | 278. | 513. | 485. | 385. | 274. |
| DIESEL OIL (CEMENT) | 0. | 0. | 0. | 0. | 0. | 1740. | 1976. | 2235. | 2519. | 2831. |
| CONSUMBLES | 0. | 0. | 0. | 0. | 0. | 129. | 167. | 179. | 185. | 191. |
| FIRE BRICKS | 0. | 0. | 0. | 0. | 0. | 47. | 64. | 67. | 67. | 67. |
| STEEL BALL | 0. | 0. | 0. | 0. | 0. | 18. | 20. | 23. | 26. | 29. |
| LUBE OIL | 0. | 0. | 0. | 0. | 0. | 18. | 21. | 24. | 27. | 30. |
| EXPLOSIVES | 0. | 0. | 0. | 0. | 0. | 46. | 62. | 66. | 66. | 66. |
| KRAFT PAPER SACK | 0. | 0. | 0. | 0. | 0. | 1763. | 2002. | 2264. | 2552. | 2868. |
| KRAFT PAPER SACK (TRUCK) | 0. | 0. | 0. | 0. | 0. | 821. | 932. | 1054. | 1188. | 1336. |
| KRAFT PAPER SACK (BOAT) | 0. | 0. | 0. | 0. | 0. | 942. | 1070. | 1210. | 1364. | 1533. |
| VARIABLE COST | 0. | 0. | 0. | 0. | 0 | 6498. | 8171. | 8862. | 9339 | 9864 |
| EMPLOYMENT COST | 0. | 0. | 0. | 0. | 0. | 343. | 343. | 343. | 343. | 343. |
| MAINTENANCE COST | 0. | 0 | 0. | 0. | 0. | 2920. | 2920 | 2920 | 2920. | 2920. |
| INSURANCE | 0. | 0. | 0. | 0. | 0. | 1185. | 1185. | 1185. | 1185. | 1185 |
| DIRECT FIXED COST | 0. | 0. | 0. | 0. | 0. | 4448. | 4448. | 4448. | 4448. | 4448. |
| CASH FACTORY COST | 0. | 0. | 0. | 0. | 0. | 10945. | 12619. | 13309. | 13787. | 14311. |
| PLANT CONSTRUCTION | 0. | 0. | 0. | 0. | 0. | 6423. | 6423. | 6423. | 6423. | 6423. |
| QUARRY DEVELOPEMENT | 0. | 0. | 0. | 0. | 0. | 713. | 713. | 713. | 713. | 713. |
| UTILITY FACILITIES | 0. | 0. | 0. | 0. | 0. | 896. | 896. | 896. | 896. | 896. |
| OFFSITE FACILITIES | 0. | 0. | 0. | 0. | 0. | 390. | 390. | 390. | 390. | 390. |
| FINISHING MILL | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| PREOPERATIONAL EXPEXSES | 0. | 0. | 0. | 0. | 0. | 751. | 751. | 751. | 751 | 751. |
| INTEREST DURING CONSTRUCTION | 0. | 0. | 0. | 0. | 0. | 3928. | 3928. | 3928. | 3928. | 3928. |
| DEPRECIATION AND AMORTIZATION | 0. | 0. | 0. | 0. | 0. | 13101. | 13101. | 13101. | 13101. | 13101. |
| TOTAL FACTORY COST | 0. | 0. | 0. | 0. | 0. | 24047. | 25720. | 26410. | 26888. | 27413. |
| UNIT FACTORY COST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1145 | 0.0902 | 0.0880 | 0.0896 | 0.0914 |
| SALES EXPENSES | 0. | 0. | 0. | 0. | 0. | 135. | 166. | 184. | 200. | 216. |
| TRANSPORTATION COST | 0. | 0. | 0. | 0. | 0. | 2694. | 3059 | 3461. | 3901. | 4384. |
| SALES EXPENSES/ADMINISTRATION | 0. | 0. | 0. | 0. | 0. | 2829. | 3226. | 3645. | 4101. | 4601. |
| INTEREST ON LONG TERM DEBT | 0. | 0. | 0. | 0. | 0. | 6065. | 5443 | 4821. | 4199. | 3577. |
| INTEREST ON SHORT TERM DEBT | 0. | 0. | 0. | 0. | 0. | 81. | 195. | 0. | 0. | 0. |
| TOTAL PRODUCTION COST | 0. | 0. | 0. | 0 | 0 | 33022. | 34583. | 34876. | 35188. | 35590. |
| UNIT PRODUCTION COST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1572 | 0.1213 | 0.1163 | 0.1173 | 0.1186 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PRODUCTION COST STATEMENTS

Table X-8 (2) CASE 1-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. | 300000. |
| RAW MATERIALS | 576. | 576. | 576. | 576. | 576. | 576. | 576. | 576. | 576. | 576. |
| PYRITE CINDER | 144. | 144. | 144. | 144. | 144. | 144. | 144. | 144. | 144. | 144. |
| GYPSUM | 432. | 432. | 432. | 432. | 432. | 432. | 432. | 432. | 432. | 432. |
| UTILITIES | 6450. | 6729. | 6729. | 6729. | 6729. | 6729. | 6729. | 6729. | 6729. | 6729. |
| FUEL (COAL) | 3123. | 3123. | 3123. | 3123. | 3123. | 3123. | 3123. | 3123. | 3123. | 3123. |
| DIESEL OIL (CLINKER) | 153. | -0. | -0. | -0. | -0. | -0. | -0. | -0. | -0. | -0. |
| DIESEL OIL (CEMENT) | 3174. | 3606. | 3606. | 3606. | 3606. | 3606. | 3606. | 3606. | 3606. | 3606. |
| CONSUMBLES | 199. | 207. | 207. | 207. | 207. | 207. | 207. | 207. | 207. | 207. |
| FIRE BRICKS | 67. | 67. | 67. | 67. | 67. | 67. | 67. | 67. | 67. | 67. |
| STEEL BALL | 32. | 37. | 37. | 37. | 37. | 37. | 37. | 37. | 37. | 37. |
| LUBE OIL | 34. | 38. | 38. | 38. | 38. | 38. | 38. | 38. | 38. | 38. |
| EXPLOSIVES | 66. | 66. | 66. | 66. | 66. | 66. | 66. | 66. | 66. | 66. |
| KRAFT PAPER SACK | 3216. | 3654. | 3654. | 3654. | 3654. | 3654. | 3654. | 3654. | 3654. | 3654. |
| KRAFT PAPER SACK (TRUCK) | 1497. | 1701. | 1701. | 1701. | 1701. | 1701. | 1701. | 1701. | 1701. | 1701. |
| KRAFT PAPER SACK (BOAT) | 1719. | 1953. | 1953. | 1953. | 1953. | 1953. | 1953. | 1953. | 1953. | 1953. |
| VARIABLE COST | 10440. | 11166. | 11166. | 11166. | 11166. | 11166. | 11166. | 11166. | 11166. | 11166. |
| EMPLOYMENT COST | 343. | 343. | 343. | 343. | 343. | 343. | 343. | 343. | 343. | 343. |
| MAINTENANCE COST | 2920. | 2920. | 2920. | 2920. | 2920. | 2920. | 2920. | 2920. | 2920. | 2920. |
| INSURANCE | 1185. | 1185. | 1185. | 1185. | 1185. | 1185. | 1185. | 1185. | 1185. | 1185. |
| DIRECT FIXED COST | 4448. | 4448. | 4448. | 4448. | 4448. | 4448. | 4448. | 4448. | 4448. | 4448. |
| CASH FACTORY COST | 14887. | 15614. | 15614. | 15614. | 15614. | 15614. | 15614. | 15614. | 15614. | 15614. |
| PLANT CONSTRUCTION | 6423. | 6423. | 6423. | 6423. | 6423. | 0. | 0. | 0. | 0. | 0. |
| QUARRY DEVELOPEMENT | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| UTILITY FACILITIES | 896. | 896. | 896. | 896. | 896. | 0. | 0. | 0. | 0. | 0. |
| OFFSITE FACILITIES | 390. | 390. | 390. | 390. | 390. | 390. | 390. | 390. | 390. | 390. |
| FINISHING MILL | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| PREOPERATIONAL EXPEXSES | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| INTEREST DURING CONSTRUCTION | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| DEPRECIATION AND AMORTIZATION | 7709. | 7709. | 7709. | 7709. | 7709. | 390. | 390. | 390. | 390. | 390. |
| TOTAL FACTORY COST | 22597. | 23323. | 23323. | 23323. | 23323. | 16004. | 16004. | 16004. | 16004. | 16004. |
| UNIT FACTORY COST | 0.0753 | 0.0777 | 0.0777 | 0.0777 | 0.0777 | 0.0533 | 0.0533 | 0.0533 | 0.0533 | 0.0533 |
| SALES EXPENSES | 235. | 258. | 258. | 258. | 258. | 258. | 258. | 258. | 258. | 258. |
| TRANSPORTATION COST | 4915. | 5585. | 5585. | 5585. | 5585. | 5585. | 5585. | 5585. | 5585. | 5585. |
| SALES EXPENSES/ADMINISTRATION | 5150. | 5842. | 5842. | 5842. | 5842. | 5842. | 5842. | 5842. | 5842. | 5842. |
| INTEREST ON LONG TERM DEBT | 2955. | 2333. | 1711. | 1089. | 467. | 0. | 0. | 0. | 0. | 0. |
| INTEREST ON SHORT TERM DEBT | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| TOTAL PRODUCTION COST | 30702. | 31498. | 30876. | 30254. | 29632. | 21846. | 21846. | 21846. | 21846. | 21846. |
| UNIT PRODUCTION COST | 0.1023 | 0.1050 | 0.1029 | 0.1008 | 0.0988 | 0.0728 | 0.0728 | 0.0728 | 0.0728 | 0.0728 |

Table X-9 (1)

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



WORKING CAPITAL STATEMENTS

CASE 1-A — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 0. | 0. | 0. | 0. | 0. | 5279. | 6416. | 6860. | 7134. | 7424. |
| ACCOUNT RECEIVABLE | 0. | 0. | 0. | 0. | 0. | 2390. | 3148. | 3441. | 3613. | 3791. |
| ACCOUNT RECEIVABLE (DOMESTIC) | 0. | 0. | 0. | 0. | 0. | 2043. | 2320 | 2624. | 2958. | 3325. |
| ACCOUNT RECEIVABLE (EXPORT) | 0. | 0. | 0. | 0. | 0. | 347. | 828. | 816. | 654. | 466. |
| INVENTORIES | 0. | 0. | 0. | 0. | 0. | 2889. | 3268. | 3419. | 3521. | 3633. |
| PRODUCT INVENTORY | 0. | 0. | 0. | 0. | 0. | 1977. | 2114. | 2171. | 2210. | 2253 |
| MATERIAL INV. (PAPER SACK) | 0. | 0. | 0. | 0. | 0. | 353. | 400. | 453 | 510. | 574. |
| MATERIAL INV. (PYRITE.COAL) | 0. | 0. | 0. | 0. | 0. | 457. | 621. | 653. | 653. | 653 |
| MATERIAL INV. (GYPSUM) | 0. | 0. | 0. | 0. | 0. | 30. | 41. | 43. | 43. | 43. |
| MATERIAL INV. (DIESEL) | 0. | 0. | 0. | 0. | 0. | 34. | 42 | 45. | 48. | 52. |
| MATERIAL INV. (CONSUMABLES) | 0. | 0. | 0. | 0. | 0. | 39. | 50. | 54. | 55. | 57. |
| OPERATING CASH | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| CURRENT LIABILITIES W/O DEBT | 0. | 0. | 0. | 0. | 0. | 1949. | 2451. | 2658. | 2802. | 2959. |
| ACCOUNT PAYABLE | 0. | 0. | 0. | 0. | 0. | 1949. | 2451. | 2658. | 2802. | 2959. |
| OTHER LIABILITIES | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| PERMANENT WORKING CAPITAL | 0. | 0. | 0. | 0. | 0. | 3330. | 3965. | 4202. | 4332. | 4465. |
| CHANGE IN WORKING CAPITAL | 0. | 0. | 0. | 0. | 0. | 3330. | 635. | 237. | 130. | 133. |

Table X-9 (2)

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
WORKING CAPITAL STATEMENTS



CASE 1-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 7300. | 7702. | 7702. | 7702. | 7702. | 7101. | 7101. | 7101. | 7101. | 7101. |
| ACCOUNT RECEIVABLE | 3988. | 4235. | 4235. | 4235. | 4235. | 4235. | 4235. | 4235. | 4235. | 4235 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 3728 | 4235. | 4235. | 4235. | 4235. | 4235. | 4235. | 4235. | 4235 | 4235 |
| ACCOUNT RECEIVABLE (EXPORT) | 260 | -0 | -0 | -0. | -0. | -0. | -0. | -0. | -0 | -0. |
| INVENTORIES | 3312. | 3467. | 3467. | 3467. | 3467. | 2865. | 2865. | 2865. | 2865. | 2865. |
| PRODUCT INVENTORY | 1857. | 1917. | 1917. | 1917. | 1917. | 1316. | 1316. | 1316. | 1316. | 1316. |
| MATERIAL INV. (PAPER SACK) | 643. | 731 | 731. | 731. | 731. | 731. | 731. | 731. | 731 | 731. |
| MATERIAL INV. (PYRITE.COAL) | 653 | 653. | 653. | 653. | 653. | 653. | 653. | 653. | 653. | 653. |
| MATERIAL INV. (GYPSUM) | 43. | 43. | 43. | 43. | 43. | 43. | 43. | 43 | 43. | 43 |
| MATERIAL INV. (DIESEL) | 56. | 60. | 60. | 60. | 60. | 60. | 60. | 60. | 60. | 60. |
| MATERIAL INV. (CONSUMABLES) | 60. | 62. | 62. | 62. | 62. | 62. | 62. | 62 | 62. | 62 |
| OPERATING CASH | 0. | 0 | 0 | 0. | 0. | 0. | 0. | 0. | 0. | 0 |
| CURRENT LIABILITIES W/O DEBT | 3132 | 3350 | 3350. | 3350. | 3350. | 3350. | 3350. | 3350 | 3350. | 3350. |
| ACCOUNT PAYABLE | 3132. | 3350. | 3350. | 3350. | 3350. | 3350. | 3350. | 3350. | 3350. | 3350. |
| OTHER LIABILITIES | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| PERMANENT WORKING CAPITAL | 4168. | 4352. | 4352. | 4352. | 4352. | 3751. | 3751. | 3751. | 3751. | 3751. |
| CHANGE IN WORKING CAPITAL | -297. | 184. | 0. | 0. | 0. | -602. | 0. | 0. | 0. | 0. |

Table X-10 (1)

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



INCOME STATEMENTS

CASE 1-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 0. | 0. | 0. | 0. | 0. | 26967. | 33263. | 36893. | 39968. | 43286. |
| TOTAL SALES REVENUE | 0. | 0. | 0. | 0. | 0. | 26967. | 33263. | 36893. | 39968. | 43286. |
| COST OF SALES | 0. | 0. | 0. | 0. | 0. | 22070. | 25582. | 26354. | 26849. | 27370. |
| VARIABLE COST | 0. | 0. | 0. | 0. | 0. | 6498. | 8171. | 8862. | 9339. | 9864. |
| DIRECT FIXED COST | 0. | 0. | 0. | 0. | 0. | 4448. | 4448. | 4448. | 4448. | 4448. |
| DEPRECIATION AND AMORTIZATION | 0. | 0. | 0. | 0. | 0. | 13101. | 13101. | 13101. | 13101. | 13101. |
| INC. IN PRODUCT INVENTORY | 0. | 0. | 0. | 0. | 0. | 1977. | 138. | 57. | 39. | 43. |
| GROSS PROFIT ON SALES | 0. | 0. | 0. | 0. | 0. | 4897. | 7681. | 10539. | 13120. | 15917. |
| SALES EXPENSES/ADMINISTRATION | 0. | 0. | 0. | 0. | 0. | 2829. | 3226. | 3645. | 4101. | 4601. |
| OPERATING PROFIT | 0. | 0. | 0. | 0. | 0. | 2068. | 4455. | 6894. | 9019. | 11316. |
| NON-OPERATING EXPENSES | 0. | 0. | 0. | 0. | 0. | 6146. | 5638. | 4821. | 4199. | 3577. |
| INTEREST ON LONG TERM DEBT | 0. | 0. | 0. | 0. | 0. | 6065. | 5443. | 4821. | 4199. | 3577. |
| INTEREST ON SHORT TERM DEBT | 0. | 0. | 0. | 0. | 0. | 81. | 195. | 0. | 0. | 0. |
| NET PROFIT OR (LOSS) BEFORE TAX | 0. | 0. | -0. | -0. | 0. | -4078. | -1183. | 2073. | 4820. | 7739. |
| INCOME TAX | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| NET PROFIT OR (LOSS) AFTER TAX | 0. | 0. | -0. | -0. | 0. | -4078. | -1183. | 2073. | 4820. | 7739. |
| DIVIDENDS | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| RETAINED EARNINGS | 0. | 0. | -0. | -0. | 0. | -4078. | -1183. | 2073. | 4820. | 7739. |

Table X-10 (2)

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



INCOME STATEMENTS

CASE 1-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 46930. | 51524. | 51524. | 51524. | 51524. | 51524. | 51524. | 51524 | 51524 | 51524. |
| TOTAL SALES REVENUE | 46930. | 51524. | 51524. | 51524. | 51524. | 51524. | 51524. | 51524 | 51524. | 51524. |
| COST OF SALES | 22993. | 23263. | 23323. | 23323. | 23323. | 16606. | 16004. | 16004. | 16004. | 16004. |
| VARIABLE COST | 10440. | 11166. | 11166. | 11166. | 11166 | 11166. | 11166. | 11166 | 11166. | 11166. |
| DIRECT FIXED COST | 4448. | 4448. | 4448. | 4448. | 4448 | 4448. | 4448. | 4448 | 4448. | 4448. |
| DEPRECIATION AND AMORTIZATION | 7709. | 7709. | 7709. | 7709. | 7709. | 390. | 390. | 390 | 390. | 390 |
| INC. IN PRODUCT INVENTORY | -396. | 60. | 0. | 0. | 0. | -602. | 0 | 0 | 0. | 0. |
| GROSS PROFIT ON SALES | 23937. | 28260. | 28201. | 28201. | 28201. | 34918. | 35520. | 35520. | 35520 | 35520 |
| SALES EXPENSES/ADMINISTRATION | 5150. | 5842. | 5842. | 5842. | 5842. | 5842. | 5842. | 5842. | 5842 | 5842. |
| OPERATING PROFIT | 18787. | 22418. | 22358. | 22358. | 22358. | 29076. | 29677. | 29677. | 29677. | 29677. |
| NON-OPERATING EXPENSES | 2955. | 2333. | 1711. | 1089. | 467. | 0. | 0. | 0. | 0. | 0. |
| INTEREST ON LONG TERM DEBT | 2955. | 2333. | 1711. | 1089. | 467. | 0. | 0. | 0. | 0. | 0. |
| INTEREST ON SHORT TERM DEBT | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| NET PROFIT OR (LOSS) BEFORE TAX | 15833. | 20085. | 20648. | 21270. | 21892. | 29076. | 29677. | 29677. | 29677. | 29677. |
| INCOME TAX | 4750. | 6026. | 6194. | 6381. | 6567. | 8723. | 8903. | 8903. | 8903. | 8903. |
| NET PROFIT OR (LOSS) AFTER TAX | 11083. | 14060. | 14453. | 14889. | 15324. | 20353. | 20774. | 20774. | 20774. | 20774. |
| DIVIDENDS | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| RETAINED EARNINGS | 11083. | 14060. | 14453. | 14889. | 15324. | 20353. | 20774. | 20774. | 20774. | 20774. |

FUNDS FLOW STATEMENTS

Table X-11 (1) CASE 1-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 226. | 1691. | 37645. | 41073. | 38933. | 17770. | 17556. | 19995. | 22120. | 24417 |
| CASH GENERATED | 0. | 0. | 0. | 0. | 0. | 15170. | 17556. | 19995. | 22120. | 24417. |
| PROFIT AFT. TAX. BFR INT. | 0. | 0. | 0. | 0. | 0. | 2068. | 4455. | 6894. | 9019. | 11316 |
| DEPRECIATION AND AMORTIZATION | 0. | 0. | 0. | 0. | 0. | 13101. | 13101. | 13101 | 13101. | 13101. |
| FINANCIAL RESOURCES | 226. | 1691. | 37645. | 41073. | 38933. | 2601. | 0. | 0. | 0. | 0. |
| SHARE CAPITAL | 68. | 507. | 11293. | 12322. | 11354. | 0. | 0. | 0. | 0 | 0. |
| LONG TERM DEBT | 158. | 1184. | 26351. | 28751. | 26494. | 0. | 0. | 0. | 0 | 0. |
| SHORT TERM DEBT | 0. | 0. | 0. | 0. | 1085. | 2601. | 0. | 0. | 0 | 0. |
| USES OF FUNDS | 226. | 1691. | 37645. | 41073. | 37849. | 18855. | 17167. | 13351. | 12623. | 12004 |
| FIXED CAPITAL EXPENDITURE | 226. | 1691. | 37645. | 41073. | 37849. | 0. | 0. | 0. | 0. | 0. |
| NON-DEPRECIABLE ASSETS | 0. | 825. | 700. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| DEPRECIABLE FIXED ASSETS | 220. | 740. | 32359. | 34181. | 29820. | 0. | 0. | 0. | 0. | 0. |
| INTEREST DURING CONSTRUCTION | 6. | 126. | 4586. | 6892. | 8029. | 0. | 0. | 0. | 0. | 0. |
| CHANGE IN WORKING CAPITAL | 0. | 0. | 0. | 0. | 0. | 3330. | 635. | 237. | 130. | 133. |
| DEBT SERVICES | 0. | 0. | 0. | 0. | 0. | 15525. | 16532. | 13115. | 12493. | 11870. |
| REPAYMENT OF LONG TERM DEBT | 0. | 0. | 0. | 0. | 0. | 8294. | 8294. | 8294. | 8294. | 8294. |
| REPAYMENT OF SHORT TERM DEBT | 0. | 0. | 0. | 0. | 0. | 1085. | 2601. | 0. | 0. | 0. |
| INTEREST ON LONG TERM DEBT | 0. | 0. | 0. | 0. | 0. | 6065. | 5443. | 4821. | 4199. | 3577. |
| INTEREST ON SHORT TERM DEBT | 0. | 0. | 0. | 0. | 0. | 81. | 195. | 0. | 0. | 0. |
| DIVIDENDS | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| CASH INCREASE OR (DECREASE) | 0. | -0. | 0. | 0. | 1085. | -1085. | 389. | 6644. | 9498. | 12414. |
| BEGINNING CASH BALANCE | 0. | 0. | -0. | -0. | 0. | 1085. | -0. | 389. | 7033. | 16531. |
| ENDING CASH BALANCE | 0. | -0. | -0. | 0. | 1085. | -0. | 389. | 7033. | 16531. | 28945. |

Table X-11 (2)

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
FUNDS FLOW STATEMENTS



CASE 1-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 21747. | 24102. | 23873. | 23687. | 23500. | 20743. | 21164. | 21164. | 21164. | 21164. |
| CASH GENERATED | 21747. | 24102. | 23873. | 23687. | 23500. | 20743. | 21164. | 21164. | 21164. | 21164. |
| PROFIT AFT. TAX. BFR INT. | 14038. | 16392. | 16164. | 15977. | 15791. | 20353. | 20774. | 20774. | 20774. | 20774. |
| DEPRECIATION AND AMORTIZATION | 7709. | 7709. | 7709. | 7709. | 7709. | 390. | 390. | 390. | 390. | 390. |
| FINANCIAL RESOURCES | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| SHARE CAPITAL | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| LONG TERM DEBT | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| SHORT TERM DEBT | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| USES OF FUNDS | 10951. | 10811. | 10004. | 9382. | 8760. | -602. | 0. | 0. | 0. | 0. |
| FIXED CAPITAL EXPENDITURE | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| NON-DEPRECIABLE ASSETS | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| DEPRECIABLE FIXED ASSETS | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| INTEREST DURING CONSTRUCTION | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| CHANGE IN WORKING CAPITAL | -297. | 184. | 0. | 0. | 0. | -602. | 0. | 0. | 0. | 0. |
| DEBT SERVICES | 11248. | 10626. | 10004. | 9382. | 8760. | 0. | 0. | 0. | 0. | 0. |
| REPAYMENT OF LONG TERM DEBT | 8294. | 8294. | 8294. | 8294. | 8294. | 0. | 0. | 0. | 0. | 0. |
| REPAYMENT OF SHORT TERM DEBT | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| INTEREST ON LONG TERM DEBT | 2955. | 2333. | 1711. | 1089. | 467. | 0. | 0. | 0. | 0. | 0. |
| INTEREST ON SHORT TERM DEBT | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| DIVIDENDS | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| CASH INCREASE OR (DECREASE) | 10796. | 13291. | 13869. | 14304. | 14740. | 21345. | 21164. | 21164. | 21164. | 21164. |
| BEGINNING CASH BALANCE | 28945. | 39740. | 53031. | 66900. | 81205. | 95945. | 117290. | 138454. | 159618. | 180783. |
| ENDING CASH BALANCE | 39740. | 53031. | 66900. | 81205. | 95945. | 117290. | 138454. | 159618. | 180783. | 201947. |

Table X-12 (1)

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

BALANCE SHEET

CASE 1-A — - BASE CASE - — (USD 1000)



| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 226. | 1917. | 39562. | 80635. | 119568. | 110661. | 99086. | 93073. | 89742. | 89345. |
| CURRENT ASSETS | 0. | 0. | 0. | 0. | 0. | 5279. | 6416. | 6860. | 7134. | 7424. |
| OPERATING CASH | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| ACCOUNT RECEIVABLE | 0. | 0. | 0. | 0. | 0. | 2390. | 3148. | 3441. | 3613. | 3791. |
| INVENTORIES | 0. | 0. | 0. | 0. | 0. | 2889. | 3268. | 3419. | 3521. | 3633. |
| ACC. EXCESS CASH | 0. | -0. | -0. | 0. | 1085. | -0. | 389. | 7033. | 16531. | 28945. |
| NET FIXED ASSETS | 226. | 1917. | 39562. | 80634. | 118483. | 105382. | 92280. | 79179 | 66078. | 52977. |
| INVESTMENT | 226. | 1917. | 39562. | 80634. | 118483. | 118483. | 118483. | 118483. | 118483. | 118483. |
| NON-DEPR. ASSETS | 0. | 825. | 1525. | 1525. | 1525. | 1525. | 1525. | 1525. | 1525. | 1525. |
| DEPRECIABLE ASSETS | 220. | 960. | 33319. | 67499. | 97319. | 97319. | 97319. | 97319. | 97319. | 97319. |
| INTEREST DRG CONSTR. | 6. | 132. | 4718. | 11610. | 19639. | 19639. | 19639. | 19639. | 19639. | 19639. |
| LESS: ACC. DEPRECIATION | 0. | 0. | 0. | 0. | 0. | 13101. | 26203. | 39304. | 52405. | 65506. |
| LIABILITIES | 158. | 1342. | 27693. | 56444. | 84023. | 79194. | 68802. | 60715. | 52565. | 44428. |
| CURRENT LIABILITIES | 0. | 0. | 0. | 0. | 9379. | 12844. | 10745. | 10952. | 11096. | 11253. |
| ACCOUNT PAYABLE | 0. | 0. | 0. | 0. | 0. | 1949. | 2451. | 2658. | 2802. | 2959. |
| CURRENT PORTION OF L/T DEBT | 0. | 0. | 0. | 0. | 8294. | 8294. | 8294. | 8294. | 8294. | 8294. |
| SHORT TERM DEBT | 0. | 0. | 0. | 0. | 1085. | 2601. | 0. | 0. | 0. | 0. |
| OTHER LIABILITIES | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| FIXED LIABILITIES | 158. | 1342. | 27693. | 56444. | 74644. | 66350. | 58057. | 49763. | 41469. | 33175. |
| LONG TERM DEBT BALANCE | 158. | 1342. | 27693. | 56444. | 74644. | 66350. | 58057. | 49763. | 41469. | 33175. |
| OTHER FIXED LIABILITIES | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| STOCK HOLDERS EQUITY | 68. | 575. | 11868. | 24190. | 35545. | 31467. | 30284. | 32357. | 37178. | 44917. |
| SHARE CAPITAL | 68. | 575. | 11868. | 24190. | 35545. | 35545. | 35545. | 35545. | 35545. | 35545. |
| ACC. RETAINED EARNINGS | 0. | 0. | -0. | -0. | -0. | -4078. | -5261. | -3187. | 1633. | 9372. |
| LIABILITIES & S/H EQUITY | 226. | 1917. | 39562. | 80635. | 119568. | 110661. | 99086. | 93073. | 89742. | 89345. |

Table X-12 (2)

BALANCE SHEET

CASE 1-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 92307. | 98291. | 104450. | 111045. | 118076. | 138429. | 159203. | 179977. | 200751. | 221525. |
| CURRENT ASSETS | 7300. | 7702. | 7702. | 7702. | 7702. | 7101. | 7101. | 7101. | 7101. | 7101. |
| OPERATING CASH | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| ACCOUNT RECEIVABLE | 3988. | 4235. | 4235. | 4235. | 4235. | 4235. | 4235. | 4235. | 4235. | 4235. |
| INVENTORIES | 3312. | 3467. | 3467. | 3467. | 3467. | 2865. | 2865. | 2865. | 2865. | 2865. |
| ACC. EXCESS CASH | 39740. | 53031. | 66900. | 81205. | 95945. | 117290. | 138454. | 159618. | 180783. | 201947. |
| NET FIXED ASSETS | 45267. | 37558. | 29848. | 22139. | 14429. | 14039. | 13648. | 13258. | 12867. | 12477. |
| INVESTMENT | 118483. | 118483. | 118483. | 118483. | 118483. | 118483. | 118483. | 118483. | 118483. | 118483. |
| NON-DEPR. ASSETS | 1525. | 1525. | 1525. | 1525. | 1525. | 1525. | 1525. | 1525. | 1525. | 1525. |
| DEPRECIABLE ASSETS | 97319. | 97319. | 97319. | 97319. | 97319. | 97319. | 97319. | 97319. | 97319. | 97319. |
| INTEREST DRG CONSTR. | 19639. | 19639. | 19639. | 19639. | 19639. | 19639. | 19639. | 19639. | 19639. | 19639. |
| LESS: ACC. DEPRECIATION | 73216. | 80925. | 88635. | 96344. | 104054. | 104444. | 104835. | 105225. | 105616. | 106006. |
| LIABILITIES | 36307. | 28231. | 19938. | 11644. | 3350. | 3350. | 3350. | 3350. | 3350. | 3350. |
| CURRENT LIABILITIES | 11426. | 11644. | 11644. | 11644. | 3350. | 3350. | 3350. | 3350. | 3350. | 3350. |
| ACCOUNT PAYABLE | 3132. | 3350. | 3350. | 3350. | 3350. | 3350. | 3350. | 3350. | 3350. | 3350. |
| CURRENT PORTION OF L/T DEBT | 8294. | 8294. | 8294. | 8294. | 0. | 0. | 0. | 0. | 0. | 0. |
| SHORT TERM DEBT | 0. | 0. | 0 | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| OTHER LIABILITIES | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| FIXED LIABILITIES | 24881. | 16588. | 8294. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| LONG TERM DEBT BALANCE | 24881. | 16588. | 8294. | 0. | 0. | 0. | 0. | 0. | 0 | 0. |
| OTHER FIXED LIABILITIES | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| STOCK HOLDERS EQUITY | 56000. | 70060. | 84513. | 99402 | 114726. | 135079. | 155853. | 176627. | 197401. | 218175. |
| SHARE CAPITAL | 35545. | 35545. | 35545. | 35545. | 35545. | 35545. | 35545. | 35545. | 35545. | 35545. |
| ACC. RETAINED EARNINGS | 20455. | 34515. | 48968. | 63857. | 79181. | 99534. | 120308. | 141082. | 161856. | 182630. |
| LIABILITIES & S/H EQUITY | 92307. | 98291. | 104450. | 111045. | 118076. | 138429. | 159203. | 179977. | 200751. | 221525. |

Table X-13

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***


LONG TERM DEBT

CASE 1-A - BASE CASE - (USD 1000)

AMOUNT OF DEBT 82938.

INTEREST RATE 7.500 PER CENT/YEAR

REPAYMENT 10 YEAR-EQUAL-INSTALLMENT-REPAYMENT (SEMI ANNUAL)

| YEAR | SER.NO | PRINCIPAL | INTEREST | DEBT SERVICE | BALANCE AFT. PAYMENT |
|---|---|---|---|---|---|
| 1992 | 1 | 0. | 0. | 0. | 79. |
| | 2 | 0. | 0. | 0. | 158. |
| 1993 | 3 | 0. | 0. | 0. | 750. |
| | 4 | 0. | 0. | 0. | 1342. |
| 1994 | 5 | 0. | 0. | 0. | 14517. |
| | 6 | 0. | 0. | 0. | 27693. |
| 1995 | 7 | 0. | 0. | 0. | 42069. |
| | 8 | 0. | 0. | 0. | 56444. |
| 1996 | 9 | 0. | 0. | 0. | 69691. |
| | 10 | 0. | 0. | 0. | 82938. |
| 1997 | 11 | 4147. | 3110. | 7257. | 78791. |
| | 12 | 4147. | 2955. | 7102. | 74644. |
| 1998 | 13 | 4147. | 2799. | 6946. | 70497. |
| | 14 | 4147. | 2644. | 6791. | 66350. |
| 1999 | 15 | 4147. | 2488. | 6635. | 62203. |
| | 16 | 4147. | 2333. | 6480. | 58056. |
| 2000 | 17 | 4147. | 2177. | 6324. | 53909. |
| | 18 | 4147. | 2022. | 6169. | 49763. |
| 2001 | 19 | 4147. | 1866. | 6013. | 45616. |
| | 20 | 4147. | 1711. | 5857. | 41469. |
| 2002 | 21 | 4147. | 1555. | 5702. | 37322. |
| | 22 | 4147. | 1400. | 5546. | 33175. |
| 2003 | 23 | 4147. | 1244. | 5391. | 29028. |
| | 24 | 4147. | 1089. | 5235. | 24881. |
| 2004 | 25 | 4147. | 933. | 5080. | 20734. |
| | 26 | 4147. | 778. | 4924. | 16587. |
| 2005 | 27 | 4147. | 622. | 4769. | 12441. |
| | 28 | 4147. | 467. | 4613. | 8294. |
| 2006 | 29 | 4147. | 311. | 4458. | 4147. |
| | 30 | 4147. | 156. | 4302. | 0. |
| 2007 | 31 | 0. | 0. | 0. | 0. |
| | 32 | 0. | 0. | 0. | 0. |
| 2008 | 33 | 0. | 0. | 0. | 0. |
| | 34 | 0. | 0. | 0. | 0. |
| 2009 | 35 | 0. | 0. | 0. | 0. |
| | 36 | 0. | 0. | 0. | 0. |
| 2010 | 37 | 0. | 0. | 0. | 0. |
| | 38 | 0. | 0. | 0. | 0. |
| 2011 | 39 | 0. | 0. | 0. | 0. |
| | 40 | 0. | 0. | 0. | 0. |
| TOTAL | | 82938. | 32657. | 115594. | 0. |

Table X-14

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PROFITABILITY AND FINANCIAL INDICATORS
CASE 1-A — - BASE CASE - — (USD 1000)

| YEAR | (1) AFT TAX PROFIT -TO- SALES REV (PCT) | (2) AFT TAX PROFIT -TO- S/H EQUITY (PCT) | (3) BFR TAX PROFIT -TO- INVESTMENT (PCT) | (4) AFT TAX PROFIT -TO- S/CAPITAL (PCT) | (5) CURRENT RATIO | (6) QUICK RATIO | (7) DEBT SERVICE RATIO | (8) L/T DEBT -TO- S/H EQUITY | (9)* PROFIT B.E.P. CAPACITY UTILIZE (PCT) | (10)* CASH B.E.P. SALES PRICE (PRICE) | (11)* CASH B.E.P. CAPACITY UTILIZE (PCT) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | -15.1 | -13.0 | -3.4 | -11.5 | 0.41 | 0.19 | 1.05 | 68 / 32 | 90.7 | 187.5 | 74.3 |
| 1998 | -3.6 | -3.9 | -1.0 | -3.3 | 0.60 | 0.29 | 1.26 | 66 / 34 | 100.0 | 174.2 | 81.8 |
| 1999 | 5.6 | 6.4 | 1.7 | 5.8 | 0.63 | 0.31 | 1.52 | 61 / 39 | 92.8 | 155.5 | 75.7 |
| 2000 | 12.1 | 13.0 | 4.1 | 13.6 | 0.64 | 0.33 | 1.77 | 53 / 47 | 84.4 | 139.4 | 68.7 |
| 2001 | 17.9 | 17.2 | 6.5 | 21.8 | 0.66 | 0.34 | 2.06 | 42 / 58 | 77.0 | 125.7 | 62.6 |
| 2002 | 23.6 | 19.8 | 13.4 | 31.2 | 0.64 | 0.35 | 1.93 | 31 / 69 | 55.5 | 114.8 | 57.8 |
| 2003 | 27.3 | 20.1 | 17.0 | 39.6 | 0.66 | 0.36 | 2.27 | 19 / 81 | 50.4 | 103.6 | 52.4 |
| 2004 | 28.1 | 17.1 | 17.4 | 40.7 | 0.66 | 0.36 | 2.39 | 9 / 91 | 48.8 | 101.6 | 50.9 |
| 2005 | 26.9 | 15.0 | 18.0 | 41.9 | 0.66 | 0.36 | 2.52 | 0 / 100 | 47.3 | 99.6 | 49.4 |
| 2006 | 29.7 | 13.4 | 18.5 | 43.1 | 2.30 | 1.26 | 2.68 | 0 / 100 | 45.8 | 97.6 | 47.8 |
| 2007 | 39.5 | 15.1 | 24.5 | 57.3 | 2.12 | 1.26 | ******** | 0 / 100 | 26.5 | 68.8 | 25.5 |
| 2008 | 40.3 | 13.3 | 25.0 | 58.4 | 2.12 | 1.26 | ******** | 0 / 100 | 26.5 | 68.8 | 25.5 |
| 2009 | 40.3 | 11.8 | 25.0 | 58.4 | 2.12 | 1.26 | ******** | 0 / 100 | 26.5 | 68.8 | 25.5 |
| 2010 | 40.3 | 10.5 | 25.0 | 58.4 | 2.12 | 1.26 | ******** | 0 / 100 | 26.5 | 68.8 | 25.5 |
| 2011 | 40.3 | 9.5 | 25.0 | 58.4 | 2.12 | 1.26 | ******** | 0 / 100 | 26.5 | 68.8 | 25.5 |
| AVERAGE1 | 23.7 | 11.0 | 14.5 | 34.3 | 1.23 | 0.70 | ******** | 23 / 77 | 55.0 | 109.6 | 49.9 |
| AVERAGE2 | 26.4 | 11.7 | 12.7 | 30.2 | 0.80 | 0.44 | 2.78 | 23 / 77 | | | |

(AVERAGE1) : SUM OF ANNUAL FIGURES OF PERCENTAGE AND RATIO IS DIVIDED BY NO. OF YEARS(SIMPLE AVERAGE)
(AVERAGE2) : AVERAGE FIGURES ARE CALCULATED BY ACTUAL VALUES ACCUMULATED OVER THE PROJECT LIFE(WEIGHTED AVERAGE)
* NOTE FOR (9)(10)(11)
WHEN THERE ARE TWO OR MORE PRODUCTS, AND DURING THE YEARS WHEN ALL OF PRODUCTS ARE NOT PRODUCED AT THE SAME RATE OF CAPACITY UTILIZATION, ABOVE BREAK-EVEN-POINTS CANNOT GIVE CORRECT FIGURES.

Table X-15

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PROFITABILITY AND FINANCIAL INDICATORS
CASE 1-B — BASE CASE — (USD 1000)

| YEAR | (1) AFT TAX PROFIT -TO- SALES REV (PCT) | (2) AFT TAX PROFIT -TO- S/H EQUITY (PCT) | (3) BFR TAX PROFIT -TO- INVESTMENT (PCT) | (4) AFT TAX PROFIT -TO- S/CAPITAL (PCT) | (5) CURRENT RATIO | (6) QUICK RATIO | (7) DEBT SERVICE RATIO | (8) L/T DEBT -TO- S/H EQUITY | (9)* PROFIT B.E.P. CAPACITY UTILIZE (PCT) | (10)* CASH B.E.P. SALES PRICE (PRICE) | (11)* CASH B.E.P. CAPACITY UTILIZE (PCT) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | -16.9 | -14.5 | -3.8 | -12.6 | 0.41 | 0.19 | 1.02 | 68 / 32 | 93.0 | 210.3 | 75.9 |
| 1998 | -4.0 | -4.5 | -1.1 | -3.8 | 0.61 | 0.30 | 1.25 | 66 / 34 | 100.7 | 198.6 | 82.1 |
| 1999 | 5.0 | 5.8 | 1.5 | 5.2 | 0.65 | 0.33 | 1.51 | 61 / 39 | 93.5 | 175.2 | 75.9 |
| 2000 | 11.1 | 12.2 | 3.7 | 12.3 | 0.67 | 0.34 | 1.74 | 54 / 46 | 85.4 | 156.4 | 69.1 |
| 2001 | 16.6 | 16.4 | 6.0 | 19.9 | 0.68 | 0.35 | 2.00 | 44 / 56 | 78.2 | 140.4 | 63.3 |
| 2002 | 22.7 | 19.5 | 12.5 | 29.2 | 0.66 | 0.36 | 1.88 | 32 / 68 | 66.5 | 127.7 | 58.5 |
| 2003 | 26.0 | 19.4 | 15.5 | 36.2 | 0.68 | 0.38 | 2.16 | 20 / 80 | 51.8 | 115.9 | 53.7 |
| 2004 | 28.5 | 18.7 | 18.3 | 42.8 | 0.70 | 0.39 | 2.47 | 9 / 91 | 47.6 | 105.8 | 49.3 |
| 2005 | 30.8 | 17.9 | 21.4 | 49.9 | 0.72 | 0.40 | 2.83 | 0 / 100 | 43.8 | 97.0 | 45.4 |
| 2006 | 32.5 | 16.7 | 24.0 | 56.1 | 2.26 | 1.27 | 3.22 | 0 / 100 | 40.8 | 90.5 | 42.3 |
| 2007 | 40.8 | 17.4 | 30.2 | 70.4 | 2.10 | 1.27 | ******** | 0 / 100 | 24.4 | 66.3 | 23.7 |
| 2008 | 41.5 | 15.0 | 30.7 | 71.6 | 2.10 | 1.27 | ******** | 0 / 100 | 24.4 | 66.3 | 23.7 |
| 2009 | 41.5 | 13.0 | 30.7 | 71.6 | 2.10 | 1.27 | ******** | 0 / 100 | 24.4 | 66.3 | 23.7 |
| 2010 | 41.5 | 11.5 | 30.7 | 71.6 | 2.10 | 1.27 | ******** | 0 / 100 | 24.4 | 66.3 | 23.7 |
| 2011 | 41.5 | 10.3 | 30.7 | 71.6 | 2.10 | 1.27 | ******** | 0 / 100 | 24.4 | 66.3 | 23.7 |
| AVERAGE1 | 23.9 | 11.7 | 16.7 | 39.4 | 1.24 | 0.71 | ******** | 24 / 76 | 54.2 | 116.5 | 48.9 |
| AVERAGE2 | 27.9 | 12.8 | 14.7 | 34.7 | 0.85 | 0.47 | 3.02 | 22 / 78 | | | |

(AVERAGE1) : SUM OF ANNUAL FIGURES OF PERCENTAGE AND RATIO IS DIVIDED BY NO. OF YEARS(SIMPLE AVERAGE)
(AVERAGE2) : AVERAGE FIGURES ARE CALCULATED BY ACTUAL VALUES ACCUMULATED OVER THE PROJECT LIFE(WEIGHTED AVERAGE)
* NOTE FOR (9)(10)(11)
WHEN THERE ARE TWO OR MORE PRODUCTS, AND DURING THE YEARS WHEN ALL OF PRODUCTS ARE NOT PRODUCED AT THE SAME RATE OF CAPACITY UTILIZATION, ABOVE BREAK-EVEN-POINTS CANNOT GIVE CORRECT FIGURES.

Table X-16

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PROFITABILITY AND FINANCIAL INDICATORS
CASE 2-A - BASE CASE - (USD 1000)

| YEAR | (1) AFT TAX PROFIT -TO- SALES REV (PCT) | (2) AFT TAX PROFIT -TO- S/H EQUITY (PCT) | (3) BFR TAX PROFIT -TO- INVESTMENT (PCT) | (4) AFT TAX PROFIT -TO- S/CAPITAL (PCT) | (5) CURRENT RATIO | (6) QUICK RATIO | (7) DEBT SERVICE RATIO | (8) L/T DEBT -TO- S/H EQUITY | (9)* PROFIT B.E.P. CAPACITY UTILIZE (PCT) | (10)* CASH B.E.P. SALES PRICE (PRICE) | (11)* CASH B.E.P. CAPACITY UTILIZE (PCT) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | -23.1 | -22.2 | -5.4 | -18.1 | 0.38 | 0.16 | 0.89 | 70 / 30 | 101.9 | 213 8 | 84.1 |
| 1998 | -9.0 | -12.9 | -2.8 | -9.4 | 0.49 | 0.23 | 1.11 | 69 / 31 | 109.4 | 211 9 | 90.4 |
| 1999 | -2.1 | -3.3 | -0.7 | -2 3 | 0.66 | 0.31 | 1.30 | 67 / 33 | 103.3 | 190 8 | 85 4 |
| 2000 | 3.4 | 5.4 | 1.2 | 4.0 | 0.70 | 0 33 | 1.50 | 61 / 39 | 95 1 | 167.5 | 78.3 |
| 2001 | 8.0 | 11.9 | 3.0 | 10.0 | 0.70 | 0.33 | 1.70 | 53 / 47 | 88 5 | 148 5 | 72.9 |
| 2002 | 16.0 | 19.9 | 9.0 | 20.9 | 0.66 | 0.33 | 1.82 | 40 / 60 | 66 7 | 133 1 | 68.7 |
| 2003 | 19.5 | 20.4 | 11.6 | 27.0 | 0.65 | 0.33 | 1.86 | 26 / 74 | 62 1 | 117 6 | 63.9 |
| 2004 | 20.4 | 17.6 | 12 1 | 28.2 | 0.63 | 0.33 | 1 96 | 13 / 87 | 60.4 | 115 6 | 62 2 |
| 2005 | 21.3 | 15.5 | 12.6 | 29.5 | 0.65 | 0.33 | 2 07 | 0 / 100 | 58 7 | 113 5 | 60.5 |
| 2006 | 22.2 | 13.9 | 13.2 | 30.7 | 2.04 | 1.04 | 2.19 | 0 / 100 | 57.0 | 111.5 | 58.8 |
| 2007 | 32.5 | 17.0 | 19.3 | 45.1 | 1.89 | 1.04 | ******** | 0 / 100 | 35.1 | 82.4 | 34.0 |
| 2008 | 33.4 | 14.8 | 19.8 | 46.3 | 1.89 | 1.04 | ******** | 0 / 100 | 35.1 | 82.4 | 34.0 |
| 2009 | 33.4 | 12.9 | 19.8 | 46.3 | 1.89 | 1.04 | ******** | 0 / 100 | 35.1 | 82.4 | 34.0 |
| 2010 | 33.4 | 11.4 | 19.8 | 46.3 | 1.89 | 1.04 | ******** | 0 / 100 | 35.1 | 82.4 | 34.0 |
| 2011 | 33.4 | 10.3 | 19.8 | 46.3 | 1.89 | 1.04 | ******** | 0 / 100 | 35.1 | 82.4 | 34.0 |
| AVERAGE1 | 16.2 | 8.8 | 10.2 | 23.4 | 1.14 | 0.59 | ******** | 27 / 73 | 65.2 | 129.0 | 59.7 |
| AVERAGE2 | 18.3 | 11.0 | 8.9 | 20.6 | 0.77 | 0.39 | 2.28 | 29 / 71 | | | |

(AVERAGE1) : SUM OF ANNUAL FIGURES OF PERCENTAGE AND RATIO IS DIVIDED BY NO. OF YEARS(SIMPLE AVERAGE)
(AVERAGE2) : AVERAGE FIGURES ARE CALCULATED BY ACTUAL VALUES ACCUMULATED OVER THE PROJECT LIFE(WEIGHTED AVERAGE)
* NOTE FOR (9)(10)(11)
WHEN THERE ARE TWO OR MORE PRODUCTS, AND DURING THE YEARS WHEN ALL OF PRODUCTS ARE NOT PRODUCED AT THE SAME RATE OF CAPACITY UTILIZATION, ABOVE BREAK-EVEN-POINTS CANNOT GIVE CORRECT FIGURES.

Table X-17

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PROFITABILITY AND FINANCIAL INDICATORS
CASE 2-B - BASE CASE - (USD 1000)

| YEAR | (1) AFT TAX PROFIT -TO- SALES REV (PCT) | (2) AFT TAX PROFIT -TO- S/H EQUITY (PCT) | (3) BFR TAX PROFIT -TO- INVESTMENT (PCT) | (4) AFT TAX PROFIT -TO- S/CAPITAL (PCT) | (5) CURRENT RATIO | (6) QUICK RATIO | (7) DEBT SERVICE RATIO | (8) L/T DEBT -TO- S/H EQUITY | (9)* PROFIT B.E.P. CAPACITY UTILIZE (PCT) | (10)* CASH B.E.P. SALES PRICE (PRICE) | (11)* CASH B.E.P. CAPACITY UTILIZE (PCT) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | -19.7 | -19.8 | -5.0 | -16.8 | 0.43 | 0.19 | 0.93 | 69 / 31 | 100.4 | 251.2 | 82.5 |
| 1998 | -5.7 | -8.3 | -1.9 | -8.4 | 0.59 | 0.28 | 1.19 | 68 / 32 | 105.2 | 252.1 | 86.6 |
| 1999 | 0.6 | 1.0 | 0.2 | 0.8 | 0.77 | 0.37 | 1.39 | 64 / 36 | 99.3 | 227.0 | 81.5 |
| 2000 | 5.2 | 7.8 | 2.0 | 6.6 | 0.77 | 0.37 | 1.58 | 58 / 42 | 91.9 | 199.3 | 75.3 |
| 2001 | 9.1 | 12.5 | 3.6 | 12.0 | 0.78 | 0.37 | 1.77 | 49 / 51 | 86.2 | 178.7 | 70.6 |
| 2002 | 15.9 | 18.5 | 9.4 | 21.9 | 0.73 | 0.37 | 1.66 | 37 / 63 | 65.0 | 157.9 | 66.7 |
| 2003 | 18.8 | 18.6 | 11.6 | 27.1 | 0.73 | 0.37 | 1.87 | 24 / 76 | 61.1 | 141.0 | 62.7 |
| 2004 | 21.0 | 17.9 | 13.6 | 31.7 | 0.72 | 0.37 | 2.09 | 12 / 88 | 57.5 | 126.4 | 59.0 |
| 2005 | 23.2 | 17.2 | 15.7 | 36.7 | 0.72 | 0.37 | 2.35 | 0 / 100 | 54.2 | 113.7 | 55.5 |
| 2006 | 25.0 | 16.1 | 17.6 | 41.1 | 2.00 | 1.04 | 2.62 | 0 / 100 | 51.5 | 104.4 | 52.8 |
| 2007 | 33.9 | 17.9 | 23.3 | 55.7 | 1.87 | 1.04 | ******** | 0 / 100 | 32.8 | 80.0 | 32.0 |
| 2008 | 34.6 | 15.5 | 24.4 | 56.9 | 1.87 | 1.04 | ******** | 0 / 100 | 32.8 | 80.0 | 32.0 |
| 2009 | 34.6 | 13.4 | 24.4 | 56.9 | 1.87 | 1.04 | ******** | 0 / 100 | 32.8 | 80.0 | 32.0 |
| 2010 | 34.6 | 11.8 | 24.4 | 56.9 | 1.87 | 1.04 | ******** | 0 / 100 | 32.8 | 80.0 | 32.0 |
| 2011 | 34.6 | 10.6 | 24.4 | 56.9 | 1.87 | 1.04 | ******** | 0 / 100 | 32.8 | 80.0 | 32.0 |
| AVERAGE1 | 17.7 | 10.0 | 12.6 | 29.2 | 1.17 | 0.62 | ******** | 25 / 75 | 62.4 | 143.3 | 56.9 |
| AVERAGE2 | 20.3 | 12.0 | 11.1 | 25.7 | 0.85 | 0.44 | 2.55 | 26 / 74 | | | |

(AVERAGE1) : SUM OF ANNUAL FIGURES OF PERCENTAGE AND RATIO IS DIVIDED BY NO. OF YEARS(SIMPLE AVERAGE)
(AVERAGE2) : AVERAGE FIGURES ARE CALCULATED BY ACTUAL VALUES ACCUMULATED OVER THE PROJECT LIFE(WEIGHTED AVERAGE)
* NOTE FOR (9)(10)(11)
WHEN THERE ARE TWO OR MORE PRODUCTS, AND DURING THE YEARS WHEN ALL OF PRODUCTS ARE NOT PRODUCED AT THE SAME RATE OF CAPACITY UTILIZATION, ABOVE BREAK-EVEN-POINTS CANNOT GIV. CORRECT FIGURES.

Table X-18

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PROFITABILITY AND FINANCIAL INDICATORS
CASE 3-A - BASE CASE - (USD 1000)

| YEAR | (1) AFT TAX PROFIT -TO- SALES REV (PCT) | (2) AFT TAX PROFIT -TO- S/H EQUITY (PCT) | (3) BFR TAX PROFIT -TO- INVESTMENT (PCT) | (4) AFT TAX PROFIT -TO- S/CAPITAL (PCT) | (5) CURRENT RATIO | (6) QUICK RATIO | (7) DEBT SERVICE RATIO | (8) L/T DEBT -TO- S/H EQUITY | (9)* PROFIT B.E.P. CAPACITY UTILIZE (PCT) | (10)* CASH B.E.P. SALES PRICE (PRICE) | (11)* CASH B.E.P. CAPACITY UTILIZE (PCT) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | -4.1 | -3.1 | -0.9 | -3.0 | 0.51 | 0.23 | 1.26 | 66 / 34 | 79.8 | 174.1 | 63.7 |
| 1998 | 6.5 | 6.0 | 1.9 | 6.2 | 0.59 | 0.29 | 1.51 | 61 / 39 | 87.2 | 159.3 | 69.3 |
| 1999 | 14.9 | 12.6 | 4.5 | 14.9 | 0.62 | 0.32 | 1.77 | 54 / 46 | 81.5 | 143.0 | 64.6 |
| 2000 | 20.8 | 16.1 | 6.8 | 22.6 | 0.64 | 0.33 | 2.03 | 45 / 55 | 74.0 | 128.2 | 58.5 |
| 2001 | 26.2 | 18.0 | 9.3 | 30.9 | 0.65 | 0.34 | 2.33 | 35 / 65 | 67.4 | 115.7 | 53.1 |
| 2002 | 29.2 | 17.9 | 16.0 | 37.4 | 0.63 | 0.35 | 2.14 | 25 / 75 | 46.9 | 105.8 | 48.9 |
| 2003 | 32.5 | 18.0 | 19.6 | 45.8 | 0.65 | 0.37 | 2.48 | 15 / 85 | 42.4 | 95.7 | 44.2 |
| 2004 | 33.3 | 15.5 | 20.1 | 46.9 | 0.65 | 0.37 | 2.61 | 7 / 93 | 40.8 | 93.5 | 42.7 |
| 2005 | 34.2 | 13.8 | 20.6 | 48.1 | 0.65 | 0.37 | 2.77 | 0 / 100 | 39.3 | 91.4 | 41.1 |
| 2006 | 35.0 | 12.4 | 21.1 | 49.3 | 2.49 | 1.40 | 2.94 | 0 / 100 | 37.7 | 89.2 | 39.6 |
| 2007 | 45.2 | 13.8 | 27.3 | 63.7 | 2.29 | 1.40 | ******** | 0 / 100 | 18.2 | 58.1 | 17.3 |
| 2008 | 46.0 | 12.3 | 27.8 | 64.9 | 2.29 | 1.40 | ******** | 0 / 100 | 18.2 | 58.1 | 17.3 |
| 2009 | 46.0 | 10.9 | 27.8 | 64.9 | 2.29 | 1.40 | ******** | 0 / 100 | 18.2 | 58.1 | 17.3 |
| 2010 | 46.0 | 9.9 | 27.8 | 64.9 | 2.29 | 1.40 | ******** | 0 / 100 | 18.2 | 58.1 | 17.3 |
| 2011 | 46.0 | 9.0 | 27.8 | 64.9 | 2.29 | 1.40 | ******** | 0 / 100 | 18.2 | 58.1 | 17.3 |
| AVERAGE1 | 30.5 | 12.2 | 17.2 | 41.5 | 1.30 | 0.76 | ******** | 21 / 79 | 45.9 | 99.1 | 40.8 |
| AVERAGE2 | 33.0 | 11.7 | 15.1 | 36.6 | 0.82 | 0.46 | 3.11 | 19 / 81 | | | |

(AVERAGE1) : SUM OF ANNUAL FIGURES OF PERCENTAGE AND RATIO IS DIVIDED BY NO. OF YEARS(SIMPLE AVERAGE)
(AVERAGE2) : AVERAGE FIGURES ARE CALCULATED BY ACTUAL VALUES ACCUMULATED OVER THE PROJECT LIFE(WEIGHTED AVERAGE)
* NOTE FOR (9)(10)(11)
WHEN THERE ARE TWO OR MORE PRODUCTS, AND DURING THE YEARS WHEN ALL OF PRODUCTS ARE NOT PRODUCED AT THE SAME RATE OF CAPACITY UTILIZATION, ABOVE BREAK-EVEN-POINTS CANNOT GIVE CORRECT FIGURES.

Table X-19

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PROFITABILITY AND FINANCIAL INDICATORS

CASE 3-B — - BASE CASE - — (USD 1000)

| YEAR | (1) AFT TAX PROFIT -TO- SALES REV (PCT) | (2) AFT TAX PROFIT -TO- S/H EQUITY (PCT) | (3) BFR TAX PROFIT -TO- INVESTMENT (PCT) | (4) AFT TAX PROFIT -TO- S/CAPITAL (PCT) | (5) CURRENT RATIO | (6) QUICK RATIO | (7) DEBT SERVICE RATIO | (8) L/T DEBT -TO- S/H EQUITY | (9)* PROFIT B.E.P. CAPACITY UTILIZE (PCT) | (10)* CASH B.E.P. SALES PRICE (PRICE) | (11)* CASH B.E.P. CAPACITY UTILIZE (PCT) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | -18.0 | -15.0 | -3.9 | -13.1 | 0.39 | 0.18 | 1.01 | 68 / 32 | 92.5 | 219.9 | 75.9 |
| 1998 | -4.4 | -4.8 | -1.2 | -4.0 | 0.58 | 0.29 | 1.25 | 66 / 34 | 100.8 | 203.8 | 82.6 |
| 1999 | 5.0 | 5.7 | 1.5 | 5.0 | 0.65 | 0.34 | 1.50 | 61 / 39 | 93.8 | 181.1 | 76.5 |
| 2000 | 11.4 | 12.3 | 3.7 | 12.3 | 0.67 | 0.35 | 1.74 | 54 / 46 | 85.6 | 161.4 | 69.6 |
| 2001 | 17.1 | 16.6 | 6.0 | 19.9 | 0.66 | 0.36 | 2.00 | 44 / 56 | 78.5 | 144.8 | 63.7 |
| 2002 | 23.2 | 19.5 | 12.5 | 29.2 | 0.66 | 0.37 | 1.88 | 32 / 68 | 56.9 | 131.6 | 58.8 |
| 2003 | 26.7 | 19.5 | 15.5 | 36.2 | 0.57 | 0.38 | 2.17 | 20 / 80 | 52.1 | 119.3 | 53.8 |
| 2004 | 29.2 | 18.7 | 18.3 | 42.8 | 0.69 | 0.39 | 2.48 | 9 / 91 | 47.7 | 108.8 | 49.3 |
| 2005 | 31.5 | 18.0 | 21.4 | 50.0 | 0.71 | 0.40 | 2.84 | 0 / 100 | 43.8 | 99.7 | 45.2 |
| 2006 | 33.3 | 16.8 | 24.1 | 56.3 | 2.40 | 1.37 | 3.23 | 0 / 100 | 40.6 | 93.0 | 42.0 |
| 2007 | 41.8 | 17.4 | 30.3 | 70.7 | 2.23 | 1.37 | ******** | 0 / 100 | 24.0 | 67.1 | 23.4 |
| 2008 | 42.5 | 15.1 | 30.8 | 71.9 | 2.23 | 1.37 | ******** | 0 / 100 | 24.0 | 67.1 | 23.4 |
| 2009 | 42.5 | 13.1 | 30.8 | 71.9 | 2.23 | 1.37 | ******** | 0 / 100 | 24.0 | 67.1 | 23.4 |
| 2010 | 42.5 | 11.6 | 30.8 | 71.9 | 2.23 | 1.37 | ******** | 0 / 100 | 24.0 | 67.1 | 23.4 |
| 2011 | 42.5 | 10.4 | 30.8 | 71.9 | 2.23 | 1.37 | ******** | 0 / 100 | 24.0 | 67.1 | 23.4 |
| AVERAGE1 | 24.5 | 11.7 | 16.8 | 39.5 | 1.28 | 0.75 | ******** | 24 / 76 | 54.2 | 119.9 | 48.9 |
| AVERAGE2 | 28.6 | 12.9 | 14.8 | 34.8 | 0.85 | 0.48 | 3.03 | 22 / 78 | | | |

(AVERAGE1) : SUM OF ANNUAL FIGURES OF PERCENTAGE AND RATIO IS DIVIDED BY NO. OF YEARS(SIMPLE AVERAGE)
(AVERAGE2) : AVERAGE FIGURES ARE CALCULATED BY ACTUAL VALUES ACCUMULATED OVER THE PROJECT LIFE(WEIGHTED AVERAGE)
* NOTE FOR (9)(10)(11)
WHEN THERE ARE TWO OR MORE PRODUCTS, AND DURING THE YEARS WHEN ALL OF PRODUCTS ARE NOT PRODUCED AT THE SAME RATE OF CAPACITY UTILIZATION, ABOVE BREAK-EVEN-POINTS CANNOT GIVE CORRECT FIGURES.

Table X-20

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

FIRROI (IN CONSTANT PRICE)

CASE 1-A — - BASE CASE - — (USD 1000)

| YEAR | FIXED CAPITAL EXPEND | CHANGE IN WORKING CAPITAL | (1) GROSS CAPITAL EXPENDTR | OPERATING PROFIT | DEPRECIATN | (2) GROSS CASH IN-FLOW | (3) INCOME TAX | (4) BFR-TAX NET IN-FLOW (2)-(1) | (5) AFT-TAX NET IN-FLOW (4)-(3) |
|---|---|---|---|---|---|---|---|---|---|
| 1992 | 220. | 0 | 220. | 0. | 0 | 0. | 0 | -220 | -220. |
| 1993 | 1565. | 0. | 1565. | 0. | 0 | 0. | 0. | -1565 | -1565. |
| 1994 | 33059. | 0. | 33059. | 0. | 0. | 0. | 0. | -33059. | -33059 |
| 1995 | 34181. | 0. | 34181. | 0. | 0. | 0 | 0. | -34181. | -34181. |
| 1996 | 29820 | 0. | 29820. | 0. | 0. | 0 | 0 | -29820. | -29820 |
| 1997 | 0. | 3330 | 3330. | 2068. | 13101 | 15170 | 0. | 11840. | 11840. |
| 1998 | 0. | 635. | 635. | 4455. | 13101 | 17556. | 0 | 16922 | 16922. |
| 1999 | 0. | 237. | 237. | 6894. | 13101. | 19995. | 0 | 19758. | 19758. |
| 2000 | 0. | 130. | 130. | 9019. | 13101. | 22120 | 0. | 21990. | 21990 |
| 2001 | 0. | 133. | 133. | 11316 | 13101 | 24417. | 0. | 24284 | 24284 |
| 2002 | 0 | -297 | -297. | 18787. | 7709 | 26497. | 4750. | 26794. | 22044 |
| 2003 | 0. | 184. | 184. | 22418 | 7709 | 30127. | 6026. | 29943. | 23917. |
| 2004 | 0. | 0 | 0 | 22358. | 7709. | 30068 | 6194. | 30068 | 23873 |
| 2005 | 0. | 0. | 0. | 22358. | 7709. | 30068. | 6381. | 30068 | 23687. |
| 2006 | 0. | 0. | 0. | 22358 | 7709 | 30068 | 6567 | 30068. | 23500. |
| 2007 | 0. | -602 | -602. | 29076 | 390. | 29466 | 8723. | 30068 | 21345. |
| 2008 | 0. | 0. | 0. | 29677. | 390. | 30068. | 8903. | 30068 | 21154. |
| 2009 | 0. | 0. | 0. | 29677. | 390. | 30068. | 8903 | 30068. | 21164. |
| 2010 | 0. | 0. | 0. | 29677. | 390. | 30068. | 8903. | 30068. | 21164 |
| 2011 | -12477. | -3751. | -16228. | 29677. | 390. | 30068. | 8903. | 46295. | 37392. |
| | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- | -------- |
| | 86367. | -0. | 86367. | 289816. | 106006. | 395822. | 74253. | 309456. | 235202. |

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 17.49 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) 15.47 PER CENT

Table X-21

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
FIRROI (IN CONSTANT PRICE)
CASE 1-B — - BASE CASE - — (USD 1000)

| YEAR | FIXED CAPITAL EXPEND. | CHANGE IN WORKING CAPITAL | (1) GROSS CAPITAL EXPENDTR | OPERATING PROFIT | DEPRECIATN | (2) GROSS CASH IN-FLOW | (3) INCOME TAX | (4) BFR-TAX NET IN-FLOW (2)-(1) | (5) AFT-TAX NET IN-FLOW (4)-(3) |
|---|---|---|---|---|---|---|---|---|---|
| 1992 | 220. | 0. | 220. | 0. | 0. | 0. | 0. | -220 | -220. |
| 1993 | 1565. | 0. | 1565. | 0. | 0. | 0. | 0. | -1565. | -1565. |
| 1994 | 37375. | 0. | 37375. | 0. | 0. | 0. | 0. | -37375. | -37375. |
| 1995 | 38364. | 0. | 38364. | 0. | 0. | 0. | 0. | -38364. | -38364. |
| 1996 | 33228. | 0. | 33228. | 0. | 0. | 0. | 0 | -33228 | -33228. |
| 1997 | 0. | 3889. | 3889. | 1873. | 14713. | 16585. | 0. | 12697 | 12697. |
| 1998 | 0. | 814. | 814. | 4864. | 14713. | 19577. | 0. | 18763 | 18763 |
| 1999 | 0. | 279. | 279. | 7483. | 14713. | 22196 | 0. | 21916. | 21916. |
| 2000 | 0. | 133. | 133. | 9619. | 14713. | 24332. | 0. | 24199. | 24199. |
| 2001 | 0. | 133. | 133. | 11916. | 14713. | 26529. | 0. | 26496 | 25496. |
| 2002 | 0. | -346. | -346. | 19934. | 8726. | 28660. | 4987 | 29006. | 24019 |
| 2003 | 0. | 161. | 161. | 23197. | 8726. | 31923. | 6175. | 31762. | 25587. |
| 2004 | 0. | 176. | 176. | 26241. | 8726. | 34967. | 7297 | 34791 | 27493. |
| 2005 | 0. | 194. | 194. | 29586. | 8726. | 38312. | 8510. | 38118. | 29608 |
| 2006 | 0. | 166. | 166. | 32437. | 8726. | 41163 | 9574. | 40597. | 31422 |
| 2007 | 0. | -685. | -685. | 40033. | 390. | 40424. | 12010. | 41109 | 29099 |
| 2008 | 0. | 0. | 0. | 40718. | 390. | 41109. | 12216. | 41109. | 28893 |
| 2009 | 0. | 0. | 0. | 40718. | 390. | 41109. | 12216. | 41109. | 28893. |
| 2010 | 0. | 0. | 0. | 40718. | 390. | 41109. | 12216. | 41109. | 28893. |
| 2011 | -13606. | -4914. | -18520. | 40718. | 390. | 41109. | 12216. | 59629. | 47413. |
| | 97147. | -0. | 97146. | 370056. | 119145. | 489201. | 97416. | 392055. | 294639. |

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 18.07 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) 15.97 PER CENT

Table X-22

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

FIRROI (IN CONSTANT PRICE)

CASE 2-A — - BASE CASE - — (USD 1000)

| YEAR | FIXED CAPITAL EXPEND. | CHANGE IN WORKING CAPITAL | (1) GROSS CAPITAL EXPENDTR | OPERATING PROFIT | DEPRECIATN | (2) GROSS CASH IN-FLOW | (3) INCOME TAX | (4) BFR-TAX NET IN-FLOW (2)-(1) | (5) AFT-TAX NET IN-FLOW (4)-(3) |
|---|---|---|---|---|---|---|---|---|---|
| 1992 | 220. | 0. | 220. | 0. | 0. | 0. | 0 | -220. | -220. |
| 1993 | 1185. | 0. | 1185. | 0. | 0. | 0. | 0. | -1185. | -1185. |
| 1994 | 33803. | 0. | 33803. | 0. | 0. | 0. | 0. | -33803. | -33803. |
| 1995 | 34762. | 0. | 34762. | 0. | 0. | 0. | 0. | -34762. | -34762. |
| 1996 | 30222. | 0. | 30222. | 0. | 0. | 0. | 0 | -30222. | -30222. |
| 1997 | 0. | 3471. | 3471. | -290. | 13288. | 12998. | 0. | 9526 | 9526 |
| 1998 | 0. | 956. | 956. | 2525. | 13288. | 15813. | C. | 14858. | 14858. |
| 1999 | 0. | 213. | 213. | 4390. | 13288. | 17678 | 0. | 17465. | 17465. |
| 2000 | 0. | -1. | -1. | 5750. | 13288. | 19038. | 0. | 19038. | 19038. |
| 2001 | 0. | -18. | -18. | 7230. | 13288. | 20518. | 0. | 20536. | 20536. |
| 2002 | 0. | -459. | -459. | 13769. | 7939. | 21708. | 3232 | 22167. | 18935. |
| 2003 | 0. | -25. | -25. | 16260. | 7939. | 24199. | 4169 | 24224. | 20056 |
| 2004 | 0. | 0. | 0. | 16274. | 7939. | 24213. | 4362. | 24213. | 19851. |
| 2005 | 0. | 0. | 0. | 16274. | 7939. | 24213. | 4551. | 24213 | 19662 |
| 2006 | 0. | 0. | 0. | 16274. | 7939. | 24213. | 4740. | 24213. | 19473. |
| 2007 | 0. | -621. | -621. | 23207. | 385. | 23592. | 6962. | 24213. | 17251. |
| 2008 | 0. | 0. | 0. | 23828. | 385. | 24213. | 7148. | 24213. | 17065. |
| 2009 | 0. | 0. | 0. | 23828. | 385. | 24213. | 7148. | 24213. | 17065. |
| 2010 | 0. | 0. | 0. | 23828. | 385. | 24213. | 7148. | 24213. | 17065. |
| 2011 | -12065. | -3517. | -15582. | 23828. | 385. | 24213. | 7148. | 39795. | 32647. |
| | 88127. | -0. | 88126. | 216975. | 108062. | 325038. | 56609. | 236911. | 180302. |

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 14.55 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) 12.72 PER CENT

Table X-23

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
FIRROI (IN CONSTANT PRICE)
CASE 2-B - BASE CASE - (USD 1000)

| YEAR | FIXED CAPITAL EXPEND. | CHANGE IN WORKING CAPITAL | (1) GROSS CAPITAL EXPENDTR | OPERATING PROFIT | DEPRECIATN | (2) GROSS CASH IN-FLOW | (3) INCOME TAX | (4) BFR-TAX NET IN-FLOW (2)-(1) | (5) AFT-TAX NET IN-FLOW (4)-(3) |
|---|---|---|---|---|---|---|---|---|---|
| 1992 | 220. | 0. | 220. | 0. | 0. | 0. | 0 | -220. | -220. |
| 1993 | 1185. | 0. | 1185. | 0. | 0. | 0. | 0. | -1185. | -1185. |
| 1994 | 38267. | 0. | 38267. | 0. | 0. | 0. | 0. | -38267. | -38267. |
| 1995 | 39077. | 0. | 39077. | 0. | 0. | 0. | 0. | -39077. | -39077. |
| 1996 | 33724. | 0. | 33724. | 0. | 0. | 0. | 0. | -33724. | -33724. |
| 1997 | 0. | 4351. | 4351. | 336. | 14947. | 15283. | 0. | 10932. | 10932. |
| 1998 | 0. | 1279. | 1279. | 4011. | 14947. | 18957. | 0. | 17679. | 17679. |
| 1999 | 0. | 289. | 289. | 6086. | 14947. | 21033. | 0 | 20744 | 20744. |
| 2000 | 0. | 4. | 4. | 7449. | 14947. | 22396. | 0. | 22391. | 22391 |
| 2001 | 0. | -18. | -18. | 8929. | 14947. | 23876. | 0. | 23893. | 23893 |
| 2002 | 0. | -509. | -509. | 16025. | 8990. | 25015. | 3799. | 25524. | 21726 |
| 2003 | 0. | -21. | -21. | 18304. | 8990. | 27294. | 4695. | 27316. | 22521 |
| 2004 | 0. | -24. | -24. | 20270. | 8990 | 29260. | 5497. | 2,284. | 23787. |
| 2005 | 0. | -26. | -26. | 22430. | 8990. | 31420. | 6357. | 31446. | 25089. |
| 2006 | 0. | -22. | -22. | 24283. | 8990. | 33273. | 7126. | 33295. | 26169. |
| 2007 | 0. | -707. | -707. | 32193. | 385. | 32578. | 9658. | 33285. | 23627. |
| 2008 | 0. | 0. | 0. | 32900. | 385. | 33285. | 9870. | 33285. | 23415. |
| 2009 | 0. | 0. | 0. | 32900. | 385. | 33285. | 9870. | 33285. | 23415. |
| 2010 | 0. | 0. | 0. | 32900. | 385. | 33285. | 9870. | 33285. | 23415. |
| 2011 | -13233. | -4596. | -17829. | 32900. | 385. | 33285. | 9870. | 51114. | 41244. |
| | 99240. | -0. | 99240. | 291915. | 121610. | 413525. | 76611. | 314285. | 237674. |

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 15.81 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) 13.89 PER CENT

Table X-24

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
FIRROI (IN CONSTANT PRICE)
- BASE CASE -
CASE 3-A (USD 1000)

| YEAR | FIXED CAPITAL EXPEND. | CHANGE IN WORKING CAPITAL | (1) GROSS CAPITAL EXPENDTR | OPERATING PROFIT | DEPRECIATN | (2) GROSS CASH IN-FLOW | (3) INCOME TAX | (4) BFR-TAX NET IN-FLOW (2)-(1) | (5) AFT-TAX NET IN-FLOW (4)-(3) |
|---|---|---|---|---|---|---|---|---|---|
| 1992 | 220. | 0. | 220. | 0. | 0. | 0. | 0. | -220. | -220. |
| 1993 | 1635. | 0. | 1635. | 0. | 0. | 0. | 0. | -1635. | -1635. |
| 1994 | 33850. | 0. | 33850. | 0. | 0. | 0. | 0. | -33850. | -33850. |
| 1995 | 37977. | 0. | 37977. | 0. | 0. | 0. | 0. | -37977. | -37977. |
| 1996 | 32972. | 0. | 32972. | 0. | 0. | 0. | 0. | -32972. | -32972. |
| 1997 | 0. | 3726. | 3726. | 5495. | 14145. | 19641. | 0. | 15915. | 15915. |
| 1998 | 0. | 688. | 688. | 8278. | 14145. | 22424. | 0. | 21736. | 21736. |
| 1999 | 0. | 244. | 244. | 10929. | 14145. | 25075. | 0. | 24831. | 24831. |
| 2000 | 0. | 127. | 127. | 13230. | 14145. | 27376. | 0. | 27249. | 27249. |
| 2001 | 0. | 130. | 130. | 15717. | 14145. | 29863. | 0. | 29733. | 29733. |
| 2002 | 0. | -330. | -330. | 23725. | 8396. | 32121. | 6160. | 32451. | 26292. |
| 2003 | 0. | 179. | 179. | 27649. | 8396. | 36045. | 7539. | 35866. | 28327. |
| 2004 | 0. | 0. | 0. | 27578. | 8396. | 35975. | 7719. | 35975. | 28256. |
| 2005 | 0. | 0. | 0. | 27578. | 8396. | 35975. | 7921. | 35975. | 28054. |
| 2006 | 0. | 0. | 0. | 27578. | 8396. | 35975. | 8122. | 35975. | 27852. |
| 2007 | 0. | -658. | -658. | 34926. | 390. | 35316. | 10478. | 35975. | 25497. |
| 2008 | 0. | 0. | 0. | 35584. | 390. | 35975. | 10675. | 35975. | 25299. |
| 2009 | 0. | 0. | 0. | 35584. | 390. | 35975. | 10675. | 35975. | 25299. |
| 2010 | 0. | 0. | 0. | 35584. | 390. | 35975. | 10675. | 35975. | 25299. |
| 2011 | -13360. | -4105. | -17465. | 35584. | 390. | 35975. | 10675. | 53440. | 42764. |
| | 93293. | -0. | 93293. | 365020. | 114661. | 479681. | 90639. | 386389. | 295750. |

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 19.71 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) 17.68 PER CENT

Table X-25

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

FIRROI (IN CONSTANT PRICE)

CASE 3-B — - BASE CASE - — (USD 1000)

| YEAR | FIXED CAPITAL EXPEND. | CHANGE IN WORKING CAPITAL | (1) GROSS CAPITAL EXPENDTR | OPERATING PROFIT | DEPRECIATN | (2) GROSS CASH IN-FLOW | (3) INCOME TAX | (4) BFR-TAX NET IN-FLOW (2)-(1) | (5) AFT-TAX NET IN-FLOW (4)-(3) |
|---|---|---|---|---|---|---|---|---|---|
| 1992 | 220. | 0. | 220. | 0. | 0. | 0. | 0. | -220. | -220. |
| 1993 | 1635. | 0. | 1635. | 0. | 0. | 0. | 0. | -1635. | -1635. |
| 1994 | 38166. | 0. | 38166. | 0. | 0. | 0. | 0. | -38166 | -38166. |
| 1995 | 42160. | 0. | 42160. | 0. | 0. | 0. | 0. | -42160. | -42160. |
| 1996 | 36386. | 0. | 36386. | 0. | 0. | 0. | 0. | -36386. | -36386. |
| 1997 | 0. | 4328. | 4328. | 1825. | 15758. | 17583. | 0. | 13255. | 13255. |
| 1998 | 0. | 882. | 882. | 5145. | 15758 | 20903. | 0. | 20020. | 20020. |
| 1999 | 0. | 289. | 289. | 7991. | 15758. | 23748. | 0. | 23459. | 23459. |
| 2000 | 0. | 130. | 130. | 10304. | 15758. | 26062. | 0. | 25932. | 25932. |
| 2001 | 0. | 130. | 130. | 12791. | 15758. | 28549. | 0. | 28419. | 28419. |
| 2002 | 0. | -379. | -379. | 21345. | 9413. | 30758. | 5339. | 31137. | 25798. |
| 2003 | 0. | 155. | 156. | 24867. | 9413. | 34280. | 6620. | 34123. | 27504. |
| 2004 | 0. | 172. | 172. | 28163. | 9413. | 37576. | 7833. | 37404. | 29571. |
| 2005 | 0. | 189. | 189. | 31785. | 9413. | 41197. | 9143. | 41008. | 31865. |
| 2006 | 0. | 162. | 162. | 34869. | 9413. | 44282. | 10293. | 44120. | 33827. |
| 2007 | 0. | -742. | -742. | 43086. | 390. | 43476. | 12928. | 44218. | 31292. |
| 2008 | 0. | 0. | 0. | 43828. | 390. | 44218. | 13148. | 44218. | 31070. |
| 2009 | 0. | 0. | 0. | 43828. | 390. | 44218. | 13148. | 44218. | 31070. |
| 2010 | 0. | 0. | 0. | 43828. | 390. | 44218. | 13148. | 44218. | 31070. |
| 2011 | -14489. | -5316. | -19806. | 43828. | 390. | 44218. | 13148. | 64024. | 50876. |
| | 104078. | -0. | 104077. | 397480. | 127804. | 525285. | 104746. | 421207. | 316461. |

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 18.13 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) 16.02 PER CENT

Table X-26 PRODUCTION COST ANALYSIS (300,000 MT CASE)

| | CASE-1A 300000 MT/Y | | | CASE-2A 300000 MT/Y | | | CASE-3A 300000 MT/Y | | | CASE-1A-ALT 300000 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1000 US$) | (US$/T-CLK) | (%) | (1000 US$) | (US$/T-CLK) | (%) | (1000 US$) | (US$/T-CLK) | (%) | (1000 US$) | (US$/T-CLK) | (%) |
| VARIABLE COST | | | | | | | | | | | | |
| Pyrite Cinder | 144 | 0.48 | 0.5% | 434 | 1.45 | 1.2% | 144 | 0.48 | 0.5% | 144 | 0.48 | 0.4% |
| Gypsum | 432 | 1.44 | 1.4% | 1170 | 3.90 | 0.4% | 927 | 3.09 | 3.1% | 432 | 1.44 | 1.3% |
| Fuel(Coal) | 3123 | 10.41 | 9.8% | 3990 | 13.30 | 1.3% | 3123 | 10.41 | 10.5% | 3123 | 10.41 | 9.3% |
| Diesel Oil (CLK) | 274 | 0.91 | 0.9% | 0 | 0.00 | 0.0% | 638 | 2.13 | 2.2% | 0 | 0.00 | 0.0% |
| Diesel Oil (CMT) | 2831 | 9.44 | 8.8% | 3605 | 12.02 | 1.2% | 1028 | 3.43 | 3.5% | 3606 | 12.02 | 10.7% |
| Fire Brick | 67 | 0.22 | 0.2% | 67 | 0.22 | 0.0% | 67 | 0.22 | 0.2% | 67 | 0.22 | 0.2% |
| Steel Ball | 29 | 0.10 | 0.1% | 37 | 0.12 | 0.0% | 29 | 0.10 | 0.1% | 37 | 0.12 | 0.1% |
| Lube Oil | 30 | 0.10 | 0.1% | 38 | 0.13 | 0.0% | 30 | 0.10 | 0.1% | 38 | 0.13 | 0.1% |
| Explosives | 66 | 0.22 | 0.2% | 66 | 0.22 | 0.0% | 66 | 0.22 | 0.2% | 66 | 0.22 | 0.2% |
| Electric Power | | | | | | | 307 | 1.02 | 1.0% | 0 | 0.00 | 0.0% |
| KP Paper Sack (3P) | 1336 | 4.45 | 4.2% | 733 | 2.44 | 0.2% | 2069 | 6.90 | 7.0% | 1336 | 4.45 | 4.0% |
| KP Paper Sack (4P) | 1533 | 5.11 | 4.8% | 2252 | 7.51 | 0.8% | 657 | 2.19 | 2.2% | 1533 | 5.11 | 4.6% |
| PP Paper Sack (2P) | 0 | 0.00 | 0.0% | 1119 | 3.73 | 0.4% | 0 | 0.00 | 0.0% | 1119 | 3.73 | 3.3% |
| (Sub-total) | 9865 | 32.88 | 30.8% | 13511 | 45.04 | 4.5% | 9085 | 30.28 | 30.7% | 11501 | 38.34 | 34.2% |
| FIXED COST | | | | | 0.00 | 0.0% | | 0.00 | 0.0% | | 0.00 | 0.0% |
| Direct Labor Cost | 214 | 0.71 | 0.7% | 230 | 0.77 | 0.1% | 234 | 0.78 | 0.8% | 214 | 0.71 | 0.6% |
| General Overhead | 128 | 0.43 | 0.4% | 138 | 0.46 | 0.0% | 140 | 0.47 | 0.5% | 128 | 0.43 | 0.4% |
| Maintenance | 2918 | 9.73 | 9.1% | 2977 | 9.92 | 1.0% | 3149 | 10.50 | 10.6% | 2918 | 9.73 | 8.7% |
| Tax & Insurance | 1184 | 3.95 | 3.7% | 1200 | 4.00 | 0.4% | 1279 | 4.26 | 4.3% | 1184 | 3.95 | 3.5% |
| Depreciation | 8422 | 28.07 | 26.3% | 8541 | 28.47 | 2.8% | 9109 | 30.36 | 30.7% | 8422 | 28.07 | 25.0% |
| Amortization | 4664 | 15.55 | 14.6% | 4730 | 15.77 | 1.6% | 5022 | 16.74 | 16.9% | 4664 | 15.55 | 13.9% |
| (Sub-total) | 17530 | 58.43 | 54.8% | 17817 | 59.39 | 5.9% | 18933 | 63.11 | 63.9% | 17530 | 58.43 | 52.1% |
| OTHER COST | | | | | 0.00 | 0.0% | | 0.00 | 0.0% | | 0.00 | 0.0% |
| Sales Expenses | 216 | 0.72 | 0.7% | 224 | 0.75 | 0.1% | 227 | 0.76 | 0.8% | 229 | 0.76 | 0.7% |
| Transportat'n cost | 4384 | 14.61 | 13.7% | 6045 | 20.15 | 2.0% | 1391 | 4.64 | 4.7% | 4384 | 14.61 | 13.0% |
| (Sub-total) | 4600 | 15.33 | 14.4% | 6269 | 20.90 | 2.1% | 1618 | 5.39 | 5.5% | 4613 | 15.38 | 13.7% |
| GRAND TOTAL | 31995 | 106.65 | 100.0% | 37597 | 125.32 | 12.5% | 29636 | 98.79 | 100.0% | 33644 | 112.15 | 100.0% |

Table X-27 PRODUCTION COST ANALYSIS (400,000 MT CASE)

| | CASE-1B 400000 MT/Y | | | CASE-2B 400000 MT/Y | | | CASE-3B 400000 MT/Y | | | CASE-1B-ALT 400000 MT/Y | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1000 US$) | (US$/T-CLK) | (%) | (1000 US$) | (US$/T-CLK) | (%) | (1000 US$) | (US$/T-CLK) | (%) | (1000 US$) | (US$/T-CLK) | (%) |
| VARIABLE COST | | | | | | | | | | | | |
| Pyrite Cinder | 192 | 0.48 | 0.5% | 578 | 1.45 | 1.3% | 192 | 0.48 | 1.6% | 192 | 0.48 | 0.5% |
| Gypsum | 540 | 1.35 | 1.5% | 1561 | 3.90 | 3.5% | 1235 | 3.09 | 4.2% | 540 | 1.35 | 1.3% |
| Fuel(Coal) | 4164 | 10.41 | 11.6% | 5320 | 13.30 | 11.9% | 4164 | 10.41 | 14.4% | 4164 | 10.41 | 10.4% |
| Diesel Oil (CLK) | 700 | 1.75 | 2.0% | 0 | 0.00 | 0.0% | 638 | 1.60 | 0.0% | 0 | 0.00 | 0.0% |
| Diesel Oil (CMT) | 2831 | 7.08 | 7.9% | 4808 | 12.02 | 10.8% | 1028 | 2.57 | 13.0% | 4808 | 12.02 | 12.0% |
| Fire Brick | 89 | 0.22 | 0.2% | 89 | 0.22 | 0.2% | 89 | 0.22 | 0.2% | 89 | 0.22 | 0.2% |
| Steel Ball | 29 | 0.07 | 0.1% | 49 | 0.12 | 0.1% | 29 | 0.07 | 0.1% | 49 | 0.12 | 0.1% |
| Lube Oil | 30 | 0.08 | 0.1% | 51 | 0.13 | 0.1% | 30 | 0.08 | 0.1% | 51 | 0.13 | 0.1% |
| Explosives | 88 | 0.22 | 0.2% | 88 | 0.22 | 0.2% | 88 | 0.22 | 0.2% | 88 | 0.22 | 0.2% |
| Electric Power | 0 | 0.00 | 0.0% | 0 | 0.00 | 0.0% | 307 | 0.77 | 0.0% | 0 | 0.00 | 0.0% |
| KP Paper Sack (3P) | 1336 | 3.34 | 3.7% | 733 | 1.83 | 1.6% | 2069 | 5.17 | 2.0% | 1336 | 3.34 | 3.3% |
| KP Paper Sack (4P) | 1533 | 3.83 | 4.3% | 2252 | 5.63 | 5.0% | 657 | 1.64 | 6.1% | 1533 | 3.83 | 3.8% |
| PP Paper Sack (2P) | 0 | 0.00 | 0.0% | 2854 | 7.14 | 6.4% | 0 | 0.00 | 7.7% | 2854 | 7.14 | 7.1% |
| (Sub-total) | 11532 | 28.83 | 32.2% | 18383 | 45.96 | 41.1% | 10526 | 26.32 | 49.7% | 15704 | 39.26 | 39.2% |
| FIXED COST | | 0.00 | | | 0.00 | 0.0% | | 0.00 | 0.0% | | 0.00 | 0.0% |
| Direct Labor Cost | 214 | 0.54 | 0.6% | 230 | 0.58 | 0.5% | 234 | 0.58 | 0.6% | 214 | 0.54 | 0.5% |
| General Overhead | 128 | 0.32 | 0.4% | 138 | 0.35 | 0.3% | 140 | 0.35 | 0.4% | 128 | 0.32 | 0.3% |
| Maintenance | 3277 | 8.19 | 9.1% | 3345 | 8.36 | 7.5% | 3508 | 8.77 | 9.0% | 3277 | 8.19 | 8.2% |
| Tax & Insurance | 1328 | 3.32 | 3.7% | 1347 | 3.37 | 3.0% | 1423 | 3.56 | 3.6% | 1328 | 3.32 | 3.3% |
| Depreciation | 9558 | 23.90 | 26.7% | 9711 | 24.28 | 21.7% | 10246 | 25.62 | 26.3% | 9558 | 23.90 | 23.9% |
| Amortization | 5155 | 12.89 | 14.4% | 5216 | 13.04 | 11.7% | 5512 | 13.78 | 14.1% | 5155 | 12.89 | 12.9% |
| (Sub-total) | 19660 | 49.15 | 54.9% | 19988 | 49.97 | 44.7% | 21063 | 52.66 | 54.1% | 19660 | 49.15 | 49.1% |
| OTHER COST | | 0.00 | | | 0.00 | 0.0% | | 0.00 | 0.0% | | 0.00 | 0.0% |
| Sales Expenses | 238 | 0.60 | 0.7% | 268 | 0.67 | 0.6% | 249 | 0.62 | 0.7% | 271 | 0.68 | 0.7% |
| Transportat'n cost | 4384 | 10.96 | 12.2% | 6045 | 15.11 | 13.5% | 5141 | 12.85 | 16.3% | 4384 | 10.96 | 11.0% |
| (Sub-total) | 4622 | 11.56 | 12.9% | 6313 | 15.78 | 14.1% | 5390 | 13.48 | 17.1% | 4655 | 11.64 | 11.6% |
| GRAND TOTAL | 35814 | 89.54 | 100.0% | 44684 | 111.71 | 100.0% | 36979 | 92.45 | 120.8% | 40019 | 100.05 | 100.0% |

Table X - 28 SENSITIVITY ANALYSIS

| CASE 1A | | +20% | +10% | BASE | -10% | -20% |
|---|---|---|---|---|---|---|
| SALES PRICE | BT | 22.56% | 20.13% | 17.49% | 14.58% | 11.31% |
| | AT | 20.45% | 18.05% | 15.47% | 12.67% | 9.60% |
| COAL | BT | 17.09% | 17.29% | 17.49% | 17.68% | 17.88% |
| | AT | 15.08% | 15.28% | 15.47% | 15.67% | 15.86% |
| PAPER SACK | BT | 17.11% | 17.30% | 17.49% | 17.67% | 17.85% |
| | AT | 15.12% | 15.30% | 15.47% | 15.65% | 15.83% |
| TRANSPORTATION | BT | 16.91% | 17.20% | 17.49% | 17.77% | 18.05% |
| | AT | 14.92% | 15.20% | 15.47% | 15.75% | 16.02% |
| INVESTMENT | BT | 14.26% | 15.78% | 17.49% | 19.45% | 21.73% |
| | AT | 12.37% | 13.82% | 15.47% | 17.38% | 19.62% |

| CASE 1B | | | | | | |
|---|---|---|---|---|---|---|
| SALES PRICE | BT | 23.02% | 20.64% | 18.07% | 15.24% | 12.06% |
| | AT | 20.83% | 18.48% | 15.97% | 13.23% | 10.23% |
| COAL | BT | 17.62% | 17.85% | 18.07% | 18.29% | 18.51% |
| | AT | 15.53% | 15.75% | 15.97% | 16.19% | 16.41% |
| PAPER SACK | BT | 17.73% | 17.90% | 18.07% | 18.24% | 18.40% |
| | AT | 15.64% | 15.81% | 15.97% | 16.13% | 16.29% |
| TRANSPORTATION | BT | 17.54% | 17.81% | 18.07% | 18.33% | 18.59% |
| | AT | 15.46% | 15.72% | 15.97% | 16.22% | 16.47% |
| INVESTMENT | BT | 14.94% | 16.41% | 18.07% | 19.97% | 22.19% |
| | AT | 12.95% | 14.36% | 15.97% | 17.83% | 20.01% |

## Table X - 29 FOREIGN EXCHANGE FLOW BALANCE (CASE:A-1)

(1000 US$)

| | FOREIGN EXCHANGE OUT-FLOW | | | | | FOREIGN EXCHANGE IN-FLOW | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| | INVESTMENT COST | F.LOAN REPAYMENT | IMPORTED GOODS | MAINT'CE PARTS | TOTAL OUT-FLOW | FOREIGN LOAN | IMPORT SUBSTIT'N | EXPORT EARNING | TOTAL INFLOW | F.EXCHANGE BALANCE |
| 1992 | 140 | | | | 140 | 158 | | | 158 | 18 |
| 1993 | 732 | | | | 732 | 592 | | | 592 | -140 |
| 1994 | 34090 | | | | 34090 | 26351 | | | 26351 | -7739 |
| 1995 | 36852 | | | | 36852 | 14375 | | | 14375 | -22477 |
| 1996 | 34093 | | 1085 | | 35178 | 13220 | | | 13220 | -21958 |
| 1997 | | 14354 | 4179 | 2334 | 20867 | | 17007 | 4940 | 21947 | 1080 |
| 1998 | | 13737 | 5273 | 2334 | 21344 | | 19314 | 9127 | 28441 | 7096 |
| 1999 | | 13115 | 5711 | 2334 | 21160 | | 21846 | 9348 | 31194 | 10034 |
| 2000 | | 12493 | 6005 | 2334 | 20832 | | 24626 | 8380 | 33006 | 12173 |
| 2001 | | 11870 | 6327 | 2334 | 20531 | | 27678 | 7237 | 34915 | 14384 |
| 2002 | | 11248 | 6682 | 2334 | 20264 | | 31030 | 5982 | 37012 | 16748 |
| 2003 | | 10626 | 7129 | 2334 | 20089 | | 34712 | 4604 | 39316 | 19227 |
| 2004 | | 10004 | 7129 | 2334 | 19467 | | 38758 | 3089 | 41847 | 22379 |
| 2005 | | 9382 | 7129 | 2334 | 18845 | | 43202 | 1425 | 44627 | 25782 |
| 2006 | | 8760 | 7129 | 2334 | 18223 | | 47008 | 0 | 47008 | 28785 |
| 2007 | | | 7129 | 2334 | 9463 | | 47008 | 0 | 47008 | 37545 |
| 2008 | | | 7129 | 2334 | 9463 | | 47008 | 0 | 47008 | 37545 |
| 2009 | | | 7129 | 2334 | 9463 | | 47008 | 0 | 47008 | 37545 |
| 2010 | | | 7129 | 2334 | 9463 | | 47008 | 0 | 47008 | 37545 |
| 2011 | | | 7129 | 2334 | 9463 | | 47008 | 0 | 47008 | 37545 |
| TOTAL | | 115589 | 99423 | 35016 | 355935 | 54696 | 540221 | 54132 | 649049 | 293114 |

Table X - 30 FOREIGN EXCHANGE FLOW BALANCE (CASE:B-1)

(1000 US$)

| | FOREIGN EXCHANGE OUT-FLOW | | | | | FOREIGN EXCHANGE IN-FLOW | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| | INVESTMENT COST | F.LOAN REPAYMENT | IMPORTED GOODS | MAINT'CE PARTS | TOTAL OUT-FLOW | FOREIGN LOAN | IMPORT SUBSTIT'N | EXPORT EARNING | TOTAL INFLOW | F.EXCHANGE BALANCE |
| 1992 | 140 | | | | 140 | 158 | | | 158 | 18 |
| 1993 | 732 | | | | 732 | 1184 | | | 1184 | 452 |
| 1994 | 38835 | | | | 38835 | 29792 | | | 29792 | -9043 |
| 1995 | 41653 | | | | 41653 | 32270 | | | 32270 | -9383 |
| 1996 | 38240 | | 1444 | | 39684 | 29522 | | | 29522 | -10162 |
| 1997 | | 17890 | 4972 | 2622 | 25484 | | 17007 | 4940 | 21947 | -3537 |
| 1998 | | 15391 | 6348 | 2622 | 24361 | | 19314 | 9127 | 28441 | 4080 |
| 1999 | | 14694 | 6844 | 2622 | 24160 | | 21846 | 9348 | 31194 | 7034 |
| 2000 | | 13997 | 7138 | 2622 | 23757 | | 24626 | 8380 | 33006 | 9249 |
| 2001 | | 13300 | 7460 | 2622 | 23382 | | 27678 | 7237 | 34915 | 11534 |
| 2002 | | 12603 | 7815 | 2622 | 23040 | | 31030 | 5982 | 37012 | 13973 |
| 2003 | | 11906 | 8204 | 2622 | 22732 | | 34712 | 4604 | 39316 | 16585 |
| 2004 | | 11209 | 8632 | 2622 | 22463 | | 38758 | 3089 | 41847 | 19384 |
| 2005 | | 10512 | 9102 | 2622 | 22236 | | 43202 | 1425 | 44627 | 22392 |
| 2006 | | 9816 | 9505 | 2622 | 21943 | | 47008 | 0 | 47008 | 25065 |
| 2007 | | | 9505 | 2622 | 12127 | | 47008 | 0 | 47008 | 34881 |
| 2008 | | | 9505 | 2622 | 12127 | | 47008 | 0 | 47008 | 34881 |
| 2009 | | | 9505 | 2622 | 12127 | | 47008 | 0 | 47008 | 34881 |
| 2010 | | | 9505 | 2622 | 12127 | | 47008 | 0 | 47008 | 34881 |
| 2011 | | | 9505 | 2622 | 12127 | | 47008 | 0 | 47008 | 34881 |
| TOTAL | 119600 | 131318 | 124989 | 39324 | 415231 | 92926 | 540221 | 54132 | 687279 | 272048 |

## Table X - 31 EIRR CALCULATION SHEET

(ECONOMIC) * FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *
EIRROI (IN CONSTANT PRICE)
CASE 1-A - BASE CASE - (USD 1000)

| YEAR | FIXED CAPITAL EXPEND. | CHANGE IN WORKING CAPITAL | (1) GROSS CAPITAL EXPENDTR | OPERATING PROFIT | DEPRECIATN | (2) GROSS CASH IN-FLOW | (3) INCOME TAX | (4) BFR-TAX NET IN-FLOW (2)-(1) | (5) AFT-TAX NET IN-FLOW (4)-(3) |
|---|---|---|---|---|---|---|---|---|---|
| 1992 | 185. | 0. | 185. | 0. | 0. | 0. | 0. | -185. | -185. |
| 1993 | 1170. | 0. | 1170. | 0. | 0. | 0. | 0. | -1170. | -1170. |
| 1994 | 31796. | 0. | 31796. | 0. | 0. | 0. | 0. | -31796. | -31796. |
| 1995 | 32442. | 0. | 32442. | 0. | 0. | 0. | 0. | -32442. | -32442. |
| 1996 | 28164. | 0. | 28164. | 0. | 0. | 0. | 0. | -28164. | -28164. |
| 1997 | 0. | 2813. | 2813. | 6145. | 8757. | 14903. | 0. | 12090. | 12090. |
| 1998 | 0. | 617. | 617. | 8845. | 8757. | 17603. | 0. | 16985. | 16985. |
| 1999 | 0. | 223. | 223. | 11208. | 8757. | 19965. | 0. | 19743. | 19743. |
| 2000 | 0. | 116. | 116. | 13257. | 8757. | 22014. | 0. | 21898. | 21898. |
| 2001 | 0. | 117. | 117. | 15472. | 8757. | 24229. | 0. | 24112. | 24112. |
| 2002 | 0. | 17. | 17. | 19148. | 7401. | 26549. | 0. | 26531. | 26531. |
| 2003 | 0. | 162. | 162. | 22332. | 7401. | 29733. | 0. | 29571. | 29571. |
| 2004 | 0. | 0. | 0. | 22272. | 7401. | 29672. | 0. | 29672. | 29672. |
| 2005 | 0. | 0. | 0. | 22272. | 7401. | 29672. | 0. | 29672. | 29672. |
| 2006 | 0. | 0. | 0. | 22272. | 7401. | 29672. | 0. | 29672. | 29672. |
| 2007 | 0. | -580. | -580. | 28746. | 346. | 29093. | 0. | 29672. | 29672. |
| 2008 | 0. | 0. | 0. | 29326. | 346. | 29672. | 0. | 29672. | 29672. |
| 2009 | 0. | 0. | 0. | 29326. | 346. | 29672. | 0. | 29672. | 29672. |
| 2010 | 0. | 0. | 0. | 29326. | 346. | 29672. | 0. | 29672. | 29672. |
| 2011 | -11236. | -3485. | -14721. | 29326. | 346. | 29672. | 0. | 44394. | 44394. |
| | 82521. | -0. | 82521. | 309273. | 82521. | 391794. | 0. | 309273. | 309273. |

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 18.23 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) 18.23 PER CENT

**Figure I-1 SENSITIVITY CURVE**
**CASE 1-A FIRR AFTER TAX**

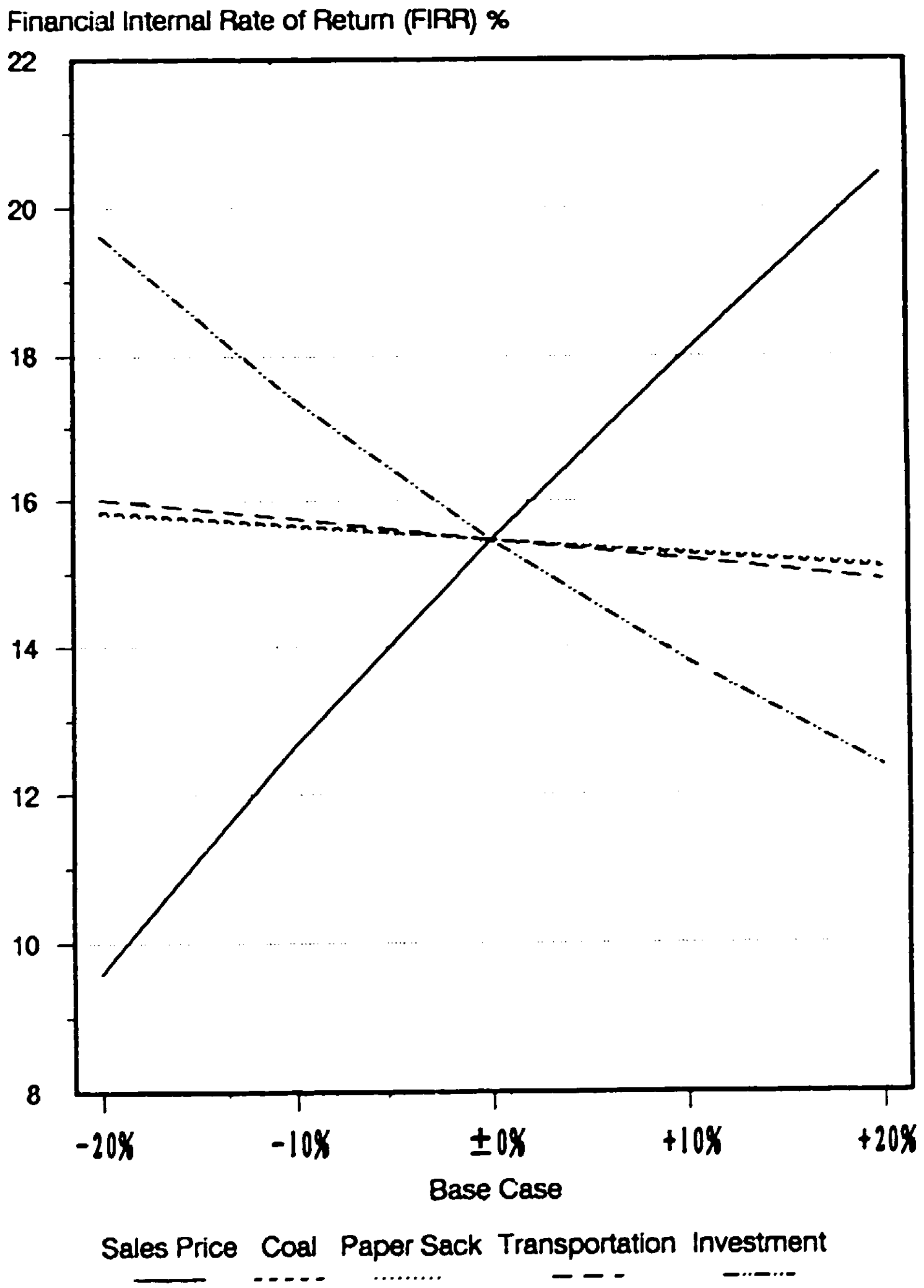
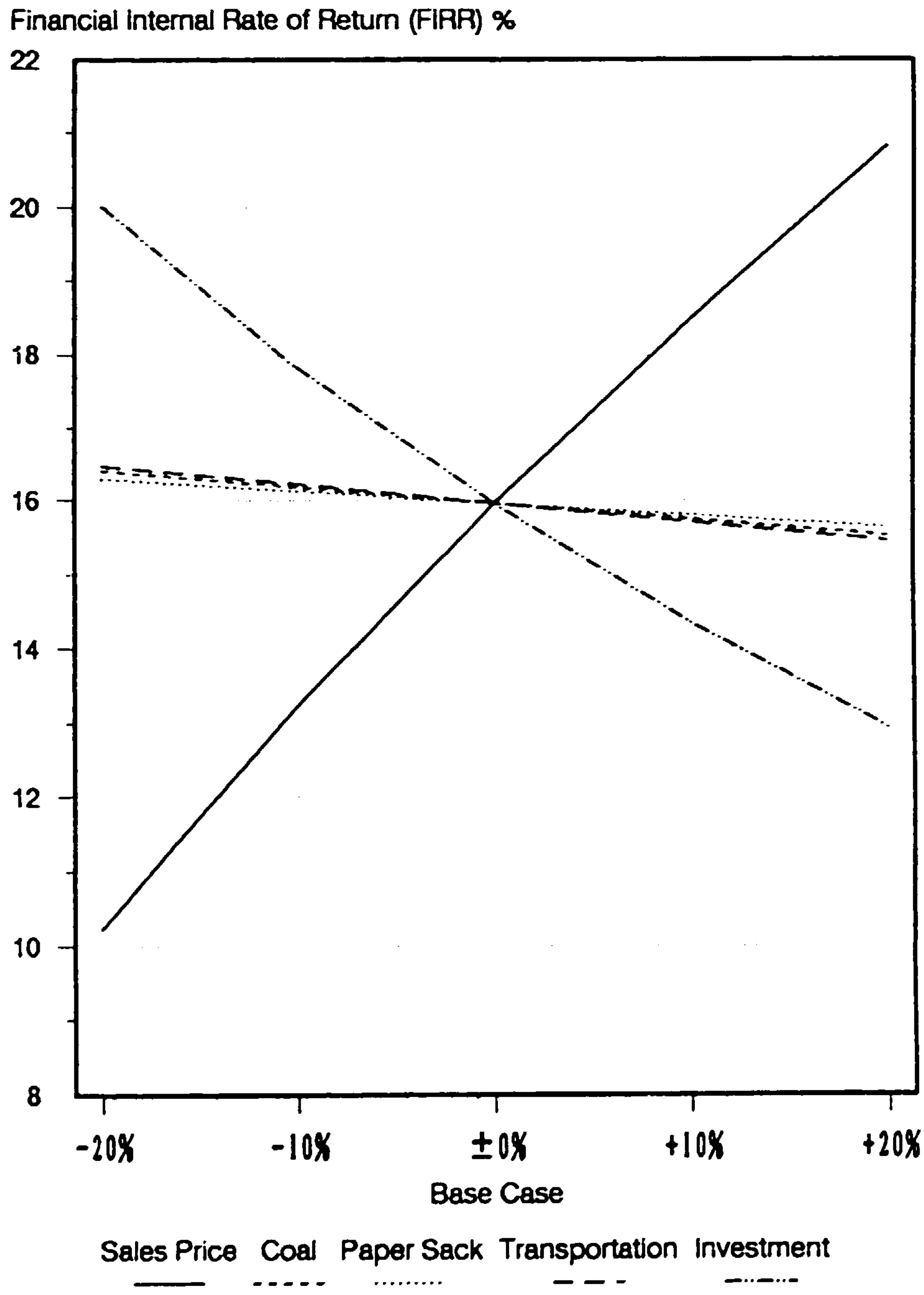


**Figure I-2 SENSITIVITY CURVE**
**CASE 1-B FIRR AFTER TAX**



# APPENDIX

APPENDIX III-I

Study Data on Production Scale Study

PRODUCTION AND SALES SCHEDULE A-(1)

CASE : MEDIUM CASE

LOCAL SUPPLY : 30,000 MT/Y

PRODUCTION CAPACITY: 200,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 30,000 | 190,504 | 140,000 | -50,504 | 0 | 0.00% |
| 2. | 1998 | 240,919 | 30,000 | 210,919 | 190,000 | -20,919 | 0 | 0.00% |
| 3. | 1999 | 263,327 | 30,000 | 233,327 | 200,000 | -33,327 | 0 | 0.00% |
| 4. | 2000 | 287,927 | 30,000 | 257,927 | 200,000 | -57,927 | 0 | 0.00% |
| 5. | 2001 | 314,939 | 30,000 | 284,939 | 200,000 | -84,939 | 0 | 0.00% |
| 6. | 2002 | 344,604 | 30,000 | 314,604 | 200,000 | -114,604 | 0 | 0.00% |
| 7. | 2003 | 377,189 | 30,000 | 347,189 | 200,000 | -147,189 | 0 | 0.00% |
| 8. | 2004 | 412,988 | 30,000 | 382,988 | 200,000 | -182,988 | 0 | 0.00% |
| 9. | 2005 | 452,322 | 30,000 | 422,322 | 200,000 | -222,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 30,000 | 465,548 | 200,000 | -265,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 30,000 | 513,058 | 200,000 | -313,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 30,000 | 565,282 | 200,000 | -365,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 30,000 | 622,697 | 200,000 | -422,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 30,000 | 685,826 | 200,000 | -485,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 30,000 | 755,245 | 200,000 | -555,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 450000 | 6252375 | 2930000 | -3322375 | 0 | 0.00% |

PRODUCTION AND SALES SCHEDULE A(2)

CASE : MEDIUM CASE

LOCAL SUPPLY : 30,000 MT/Y

PRODUCTION CAPACITY: 300,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 30,000 | 190,504 | 210,000 | 19,496 | 19,496 | 9.28% |
| 2. | 1998 | 240,919 | 30,000 | 210,919 | 285,000 | 74,081 | 74,081 | 25.99% |
| 3. | 1999 | 263,327 | 30,000 | 233,327 | 300,000 | 66,673 | 66,673 | 22.22% |
| 4. | 2000 | 287,927 | 30,000 | 257,927 | 300,000 | 42,073 | 42,073 | 14.02% |
| 5. | 2001 | 314,939 | 30,000 | 284,939 | 300,000 | 15,061 | 15,061 | 5.02% |
| 6. | 2002 | 344,604 | 30,000 | 314,604 | 300,000 | -14,604 | 0 | 0.00% |
| 7. | 2003 | 377,189 | 30,000 | 347,189 | 300,000 | -47,189 | 0 | 0.00% |
| 8. | 2004 | 412,988 | 30,000 | 382,988 | 300,000 | -82,988 | 0 | 0.00% |
| 9. | 2005 | 452,322 | 30,000 | 422,322 | 300,000 | -122,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 30,000 | 465,548 | 300,000 | -165,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 30,000 | 513,[illegible] | 300,000 | -213,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 30,000 | 565,282 | 300,000 | -265,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 30,000 | 622,697 | 300,000 | -322,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 30,000 | 685,826 | 300,000 | -385,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 30,000 | 755,245 | 300,000 | -455,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 450000 | 6252375 | 4395000 | -1857375 | 217384 | 4.95% |

PRODUCTION AND SALES SCHEDULE A-(3)

CASE : MEDIUM CASE

LOCAL SUPPLY : 30,000 MT/Y

PRODUCTION CAPACITY: 400,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 30,000 | 190,504 | 280,000 | 89,496 | 89,496 | 31.96% |
| 2. | 1998 | 240,919 | 30,000 | 210,919 | 380,000 | 169,081 | 169,081 | 44.50% |
| 3. | 1999 | 263,327 | 30,000 | 233,327 | 400,000 | 166,673 | 166,673 | 41.67% |
| 4. | 2000 | 287,927 | 30,000 | 257,927 | 400,000 | 142,073 | 142,073 | 35.52% |
| 5. | 2001 | 314,939 | 30,000 | 284,939 | 400,000 | 115,061 | 115,061 | 28.77% |
| 6. | 2002 | 344,604 | 30,000 | 314,604 | 400,000 | 85,396 | 85,396 | 21.35% |
| 7. | 2003 | 377,189 | 30,000 | 347,189 | 400,000 | 52,811 | 52,811 | 13.20% |
| 8. | 2004 | 412,988 | 30,000 | 382,988 | 400,000 | 17,012 | 17,012 | 4.25% |
| 9. | 2005 | 452,322 | 30,000 | 422,322 | 400,000 | -22,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 30,000 | 465,548 | 400,000 | -65,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 30,000 | 513,058 | 400,000 | -113,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 30,000 | 565,282 | 400,000 | -165,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 30,000 | 622,697 | 400,000 | -222,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 30,000 | 685,826 | 400,000 | -285,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 30,000 | 755,245 | 400,000 | -355,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 450000 | 6252375 | 5860000 | -392375 | 837603 | 14.29% |

PRODUCTION AND SALES SCHEDULE A-(4)

CASE : MEDIUM CASE

LOCAL SUPPLY : 30,000 MT/Y

PRODUCTION CAPACITY: 500,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 30,000 | 190,504 | 350,000 | 159,496 | 159,496 | 45.57% |
| 2. | 1998 | 240,919 | 30,000 | 210,919 | 475,000 | 264,081 | 264,081 | 55.60% |
| 3. | 1999 | 263,327 | 30,000 | 233,327 | 500,000 | 266,673 | 266,673 | 53.33% |
| 4. | 2000 | 287,927 | 30,000 | 257,927 | 500,000 | 242,073 | 242,073 | 48.41% |
| 5. | 2001 | 314,939 | 30,000 | 284,939 | 500,000 | 215,061 | 215,061 | 43.01% |
| 6. | 2002 | 344,604 | 30,000 | 314,604 | 500,000 | 185,396 | 185,396 | 37.08% |
| 7. | 2003 | 377,189 | 30,000 | 347,189 | 500,000 | 152,811 | 152,811 | 30.56% |
| 8. | 2004 | 412,988 | 30,000 | 382,988 | 500,000 | 117,012 | 117,012 | 23.40% |
| 9. | 2005 | 452,322 | 30,000 | 422,322 | 500,000 | 77,678 | 77,678 | 15.54% |
| 10. | 2006 | 495,548 | 30,000 | 465,548 | 500,000 | 34,452 | 34,452 | 6.89% |
| 11. | 2007 | 543,058 | 30,000 | 513,058 | 500,000 | -13,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 30,000 | 565,282 | 500,000 | -65,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 30,000 | 622,697 | 500,000 | -122,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 30,000 | 685,826 | 500,000 | -185,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 30,000 | 755,245 | 500,000 | -255,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 450000 | 6252375 | 7325000 | 1072625 | 1714733 | 23.41% |

PRODUCTION AND SALES SCHEDULE A-(5)

CASE : MEDIUM CASE

LOCAL SUPPLY : 30,000 MT/Y

PRODUCTION CAPACITY: 600,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 30,000 | 190,504 | 420,000 | 229,496 | 229,496 | 54.64% |
| 2. | 1998 | 240,919 | 30,000 | 210,919 | 570,000 | 359,081 | 359,081 | 63.00% |
| 3. | 1999 | 263,327 | 30,000 | 233,327 | 600,000 | 366,673 | 366,673 | 61.11% |
| 4. | 2000 | 287,927 | 30,000 | 257,927 | 600,000 | 342,073 | 342,073 | 57.01% |
| 5. | 2001 | 314,939 | 30,000 | 284,939 | 600,000 | 315,061 | 315,061 | 52.51% |
| 6. | 2002 | 344,604 | 30,000 | 314,604 | 600,000 | 285,396 | 285,396 | 47.57% |
| 7. | 2003 | 377,189 | 30,000 | 347,189 | 600,000 | 252,811 | 252,811 | 42.14% |
| 8. | 2004 | 412,988 | 30,000 | 382,988 | 600,000 | 217,012 | 217,012 | 36.17% |
| 9. | 2005 | 452,322 | 30,000 | 422,322 | 600,000 | 177,678 | 177,678 | 29.61% |
| 10. | 2006 | 495,548 | 30,000 | 465,548 | 600,000 | 134,452 | 134,452 | 22.41% |
| 11. | 2007 | 543,058 | 30,000 | 513,058 | 600,000 | 86,942 | 86,942 | 14.49% |
| 12. | 2008 | 595,282 | 30,000 | 565,282 | 600,000 | 34,718 | 34,718 | 5.79% |
| 13. | 2009 | 652,697 | 30,000 | 622,697 | 600,000 | -22,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 30,000 | 685,826 | 600,000 | -85,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 30,000 | 755,245 | 600,000 | -155,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 450000 | 6252375 | 8790000 | 2537625 | 2801393 | 31.87% |

PRODUCTION AND SALES SCHEDULE B-(1)

CASE : MEDIUM CASE

LOCAL SUPPLY : 50,000 MT/Y

PRODUCTION CAPACITY: 200,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 50,000 | 170,504 | 140,000 | -30,504 | 0 | 0.00% |
| 2. | 1998 | 240,919 | 50,000 | 190,919 | 190,000 | -919 | 0 | 0.00% |
| 3. | 1999 | 263,327 | 50,000 | 213,327 | 200,000 | -13,327 | 0 | 0.00% |
| 4. | 2000 | 287,927 | 50,000 | 237,927 | 200,000 | -37,927 | 0 | 0.00% |
| 5. | 2001 | 314,939 | 50,000 | 264,939 | 200,000 | -64,939 | 0 | 0.00% |
| 6. | 2002 | 344,604 | 50,000 | 294,604 | 200,000 | -94,604 | 0 | 0.00% |
| 7. | 2003 | 377,189 | 50,000 | 327,189 | 200,000 | -127,189 | 0 | 0.00% |
| 8. | 2004 | 412,988 | 50,000 | 362,988 | 200,000 | -162,988 | 0 | 0.00% |
| 9. | 2005 | 452,322 | 50,000 | 402,322 | 200,000 | -202,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 50,000 | 445,548 | 200,000 | -245,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 50,000 | 493,058 | 200,000 | -293,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 50,000 | 545,282 | 200,000 | -345,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 50,000 | 602,697 | 200,000 | -402,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 50,000 | 665,826 | 200,000 | -465,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 50,000 | 735,245 | 200,000 | -535,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 750000 | 5952375 | 2930000 | -3022375 | 0 | 0.00% |

PRODUCTION AND SALES SCHEDULE E-(2)

CASE : MEDIUM CASE

LOCAL SUPPLY : 50,000 MT/Y

PRODUCTION CAPACITY: 300,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 50,000 | 170,504 | 210,000 | 39,496 | 39,496 | 18.81% |
| 2. | 1998 | 240,919 | 50,000 | 190,919 | 285,000 | 94,081 | 94,081 | 33.01% |
| 3. | 1999 | 263,327 | 50,000 | 213,327 | 300,000 | 86,673 | 86,673 | 28.89% |
| 4. | 2000 | 287,927 | 50,000 | 237,927 | 300,000 | 62,073 | 62,073 | 20.69% |
| 5. | 2001 | 314,939 | 50,000 | 264,939 | 300,000 | 35,061 | 35,061 | 11.69% |
| 6. | 2002 | 344,604 | 50,000 | 294,604 | 300,000 | 5,396 | 5,396 | 1.80% |
| 7. | 2003 | 377,189 | 50,000 | 327,189 | 300,000 | -27,189 | 0 | 0.00% |
| 8. | 2004 | 412,988 | 50,000 | 362,988 | 300,000 | -62,988 | 0 | 0.00% |
| 9. | 2005 | 452,322 | 50,000 | 402,322 | 300,000 | -102,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 50,000 | 445,548 | 300,000 | -145,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 50,000 | 493,058 | 300,000 | -193,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 50,000 | 545,282 | 300,000 | -245,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 50,000 | 602,697 | 300,000 | -302,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 50,000 | 665,826 | 300,000 | -365,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 50,000 | 735,245 | 300,000 | -435,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 750000 | 5952375 | 4395000 | -1557375 | 322780 | 7.34% |

PRODUCTION AND SALES SCHEDULE B-(3)

CASE : MEDIUM CASE

LOCAL SUPPLY : 50,000 MT/Y

PRODUCTION CAPACITY: 400,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 50,000 | 170,504 | 280,000 | 109,496 | 109,496 | 39.11% |
| 2. | 1998 | 240,919 | 50,000 | 190,919 | 380,000 | 189,081 | 189,081 | 49.76% |
| 3. | 1999 | 263,327 | 50,000 | 213,327 | 400,000 | 186,673 | 186,673 | 46.67% |
| 4. | 2000 | 287,927 | 50,000 | 237,927 | 400,000 | 162,073 | 162,073 | 40.52% |
| 5. | 2001 | 314,939 | 50,000 | 264,939 | 400,000 | 135,061 | 135,061 | 33.77% |
| 6. | 2002 | 344,604 | 50,000 | 294,604 | 400,000 | 105,396 | 105,396 | 26.35% |
| 7. | 2003 | 377,189 | 50,000 | 327,189 | 400,000 | 72,811 | 72,811 | 18.20% |
| 8. | 2004 | 412,988 | 50,000 | 362,988 | 400,000 | 37,012 | 37,012 | 9.25% |
| 9. | 2005 | 452,322 | 50,000 | 402,322 | 400,000 | -2,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 50,000 | 445,548 | 400,000 | -45,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 50,000 | 493,058 | 400,000 | -93,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 50,000 | 545,282 | 400,000 | -145,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 50,000 | 602,697 | 400,000 | -202,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 50,000 | 665,826 | 400,000 | -265,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 50,000 | 735,245 | 400,000 | -335,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 750000 | 5952375 | 5860000 | -92375 | 997603 | 17.02% |

PRODUCTION AND SALES SCHEDULE B-(4)

CASE : MEDIUM CASE

LOCAL SUPPLY : 50,000 MT/Y

PRODUCTION CAPACITY: 500,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 50,000 | 170,504 | 350,000 | 179,496 | 179,496 | 51.28% |
| 2. | 1998 | 240,919 | 50,000 | 190,919 | 475,000 | 284,081 | 284,081 | 59.81% |
| 3. | 1999 | 263,327 | 50,000 | 213,327 | 500,000 | 286,673 | 286,673 | 57.33% |
| 4. | 2000 | 287,927 | 50,000 | 237,927 | 500,000 | 262,073 | 262,073 | 52.41% |
| 5. | 2001 | 314,939 | 50,000 | 264,939 | 500,000 | 235,061 | 235,061 | 47.01% |
| 6. | 2002 | 344,604 | 50,000 | 294,604 | 500,000 | 205,396 | 205,396 | 41.08% |
| 7. | 2003 | 377,189 | 50,000 | 327,189 | 500,000 | 172,811 | 172,811 | 34.56% |
| 8. | 2004 | 412,988 | 50,000 | 362,988 | 500,000 | 137,012 | 137,012 | 27.40% |
| 9. | 2005 | 452,322 | 50,000 | 402,322 | 500,000 | 97,678 | 97,678 | 19.54% |
| 10. | 2006 | 495,548 | 50,000 | 445,548 | 500,000 | 54,452 | 54,452 | 10.89% |
| 11. | 2007 | 543,058 | 50,000 | 493,058 | 500,000 | 6,942 | 6,942 | 1.39% |
| 12. | 2008 | 595,282 | 50,000 | 545,282 | 500,000 | -45,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 50,000 | 602,697 | 500,000 | -102,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 50,000 | 665,826 | 500,000 | -165,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 50,000 | 735,245 | 500,000 | -235,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 750000 | 5952375 | 7325000 | 1372625 | 1921675 | 26.23% |

PRODUCTION AND SALES SCHEDULE B-(5)

CASE : MEDIUM CASE

LOCAL SUPPLY : 50,000 MT/Y

PRODUCTION CAPACITY: 600,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 50,000 | 170,504 | 420,000 | 249,496 | 249,496 | 59.40% |
| 2. | 1998 | 240,919 | 50,000 | 190,919 | 570,000 | 379,081 | 379,081 | 66.51% |
| 3. | 1999 | 263,327 | 50,000 | 213,327 | 600,000 | 386,673 | 386,673 | 64.45% |
| 4. | 2000 | 287,927 | 50,000 | 237,927 | 600,000 | 362,073 | 362,073 | 60.35% |
| 5. | 2001 | 314,939 | 50,000 | 264,939 | 600,000 | 335,061 | 335,061 | 55.84% |
| 6. | 2002 | 344,604 | 50,000 | 294,604 | 600,000 | 305,396 | 305,396 | 50.90% |
| 7. | 2003 | 377,189 | 50,000 | 327,189 | 600,000 | 272,811 | 272,811 | 45.47% |
| 8. | 2004 | 412,988 | 50,000 | 362,988 | 600,000 | 237,012 | 237,012 | 39.50% |
| 9. | 2005 | 452,322 | 50,000 | 402,322 | 600,000 | 197,678 | 197,678 | 32.95% |
| 10. | 2006 | 495,548 | 50,000 | 445,548 | 600,000 | 154,452 | 154,452 | 25.74% |
| 11. | 2007 | 543,058 | 50,000 | 493,058 | 600,000 | 106,942 | 106,942 | 17.82% |
| 12. | 2008 | 595,282 | 50,000 | 545,282 | 600,000 | 54,718 | 54,718 | 9.12% |
| 13. | 2009 | 652,697 | 50,000 | 602,697 | 600,000 | -2,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 50,000 | 665,826 | 600,000 | -65,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 50,000 | 735,245 | 600,000 | -135,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 750000 | 5952375 | 8790000 | 2837625 | 3041393 | 34.60% |

PRODUCTION AND SALES SCHEDULE C-(1)

CASE : MEDIUM CASE

LOCAL SUPPLY : 70,000 MT/Y

PRODUCTION CAPACITY: 200,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 70,000 | 150,504 | 140,000 | -10,504 | 0 | 0.00% |
| 2. | 1998 | 240,919 | 70,000 | 170,919 | 190,000 | 19,081 | 19,081 | 10.04% |
| 3. | 1999 | 263,327 | 70,000 | 193,327 | 200,000 | 6,673 | 6,673 | 3.34% |
| 4. | 2000 | 287,927 | 70,000 | 217,927 | 200,000 | -17,927 | 0 | 0.00% |
| 5. | 2001 | 314,939 | 70,000 | 244,939 | 200,000 | -44,939 | 0 | 0.00% |
| 6. | 2002 | 344,604 | 70,000 | 274,604 | 200,000 | -74,604 | 0 | 0.00% |
| 7. | 2003 | 377,189 | 70,000 | 307,189 | 200,000 | -107,189 | 0 | 0.00% |
| 8. | 2004 | 412,988 | 70,000 | 342,988 | 200,000 | -142,988 | 0 | 0.00% |
| 9. | 2005 | 452,322 | 70,000 | 382,322 | 200,000 | -182,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 70,000 | 425,548 | 200,000 | -225,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 70,000 | 473,058 | 200,000 | -273,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 70,000 | 525,282 | 200,000 | -325,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 70,000 | 582,697 | 200,000 | -382,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 70,000 | 645,826 | 200,000 | -445,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 70,000 | 715,245 | 200,000 | -515,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1050000 | 5652375 | 2930000 | -2722375 | 25754 | 0.88% |

PRODUCTION AND SALES SCHEDULE C-(2)

CASE : MEDIUM CASE

LOCAL SUPPLY : 70,000 MT/Y

PRODUCTION CAPACITY: 300,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 70,000 | 150,504 | 210,000 | 59,496 | 59,496 | 28.33% |
| 2. | 1998 | 240,919 | 70,000 | 170,919 | 285,000 | 114,081 | 114,081 | 40.03% |
| 3. | 1999 | 263,327 | 70,000 | 193,327 | 300,000 | 106,673 | 106,673 | 35.56% |
| 4. | 2000 | 287,927 | 70,000 | 217,927 | 300,000 | 82,073 | 82,073 | 27.36% |
| 5. | 2001 | 314,939 | 70,000 | 244,939 | 300,000 | 55,061 | 55,061 | 18.35% |
| 6. | 2002 | 344,604 | 70,000 | 274,604 | 300,000 | 25,396 | 25,396 | 8.47% |
| 7. | 2003 | 377,189 | 70,000 | 307,189 | 300,000 | -7,189 | 0 | 0.00% |
| 8. | 2004 | 412,988 | 70,000 | 342,988 | 300,000 | -42,988 | 0 | 0.00% |
| 9. | 2005 | 452,322 | 70,000 | 382,322 | 300,000 | -82,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 70,000 | 425,548 | 300,000 | -125,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 70,000 | 473,058 | 300,000 | -173,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 70,000 | 525,282 | 300,000 | -225,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 70,000 | 582,697 | 300,000 | -282,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 70,000 | 645,826 | 300,000 | -345,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 70,000 | 715,245 | 300,000 | -415,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1050000 | 5652375 | 4395000 | -1257375 | 442780 | 10.07% |

PRODUCTION AND SALES SCHEDULE C-(3)

CASE : MEDIUM CASE

LOCAL SUPPLY : 70,000 MT/Y

PRODUCTION CAPACITY: 400,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 70,000 | 150,504 | 280,000 | 129,496 | 129,496 | 46.25% |
| 2. | 1998 | 240,919 | 70,000 | 170,919 | 380,000 | 209,081 | 209,081 | 55.02% |
| 3. | 1999 | 263,327 | 70,000 | 193,327 | 400,000 | 206,673 | 206,673 | 51.67% |
| 4. | 2000 | 287,927 | 70,000 | 217,927 | 400,000 | 182,073 | 182,073 | 45.52% |
| 5. | 2001 | 314,939 | 70,000 | 244,939 | 400,000 | 155,061 | 155,061 | 38.77% |
| 6. | 2002 | 344,604 | 70,000 | 274,604 | 400,000 | 125,396 | 125,396 | 31.35% |
| 7. | 2003 | 377,189 | 70,000 | 307,189 | 400,000 | 92,811 | 92,811 | 23.20% |
| 8. | 2004 | 412,988 | 70,000 | 342,988 | 400,000 | 57,012 | 57,012 | 14.25% |
| 9. | 2005 | 452,322 | 70,000 | 382,322 | 400,000 | 17,678 | 17,678 | 4.42% |
| 10. | 2006 | 495,548 | 70,000 | 425,548 | 400,000 | -25,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 70,000 | 473,058 | 400,000 | -73,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 70,000 | 525,282 | 400,000 | -125,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 70,000 | 582,697 | 400,000 | -182,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 70,000 | 645,826 | 400,000 | -245,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 70,000 | 715,245 | 400,000 | -315,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1050000 | 5652375 | 5860000 | 207625 | 1175281 | 20.06% |

PRODUCTION AND SALES SCHEDULE C-(4)

CASE : MEDIUM CASE

LOCAL SUPPLY : 70,000 MT/Y

PRODUCTION CAPACITY: 500,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 70,000 | 150,504 | 350,000 | 199,496 | 199,496 | 57.00% |
| 2. | 1998 | 240,919 | 70,000 | 170,919 | 475,000 | 304,081 | 304,081 | 64.02% |
| 3. | 1999 | 263,327 | 70,000 | 193,327 | 500,000 | 306,673 | 306,673 | 61.33% |
| 4. | 2000 | 287,927 | 70,000 | 217,927 | 500,000 | 282,073 | 282,073 | 56.41% |
| 5. | 2001 | 314,939 | 70,000 | 244,939 | 500,000 | 255,061 | 255,061 | 51.01% |
| 6. | 2002 | 344,604 | 70,000 | 274,604 | 500,000 | 225,396 | 225,396 | 45.08% |
| 7. | 2003 | 377,189 | 70,000 | 307,189 | 500,000 | 192,811 | 192,811 | 38.56% |
| 8. | 2004 | 412,988 | 70,000 | 342,988 | 500,000 | 157,012 | 157,012 | 31.40% |
| 9. | 2005 | 452,322 | 70,000 | 382,322 | 500,000 | 117,678 | 117,678 | 23.54% |
| 10. | 2006 | 495,548 | 70,000 | 425,548 | 500,000 | 74,452 | 74,452 | 14.89% |
| 11. | 2007 | 543,058 | 70,000 | 473,058 | 500,000 | 26,942 | 26,942 | 5.39% |
| 12. | 2008 | 595,282 | 70,000 | 525,282 | 500,000 | -25,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 70,000 | 582,697 | 500,000 | -82,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 70,000 | 645,826 | 500,000 | -145,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 70,000 | 715,245 | 500,000 | -215,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1050000 | 5652375 | 7325000 | 1672625 | 2141675 | 29.24% |

PRODUCTION AND SALES SCHEDULE C-(5)

CASE : MEDIUM CASE

LOCAL SUPPLY : 70,000 MT/Y

PRODUCTION CAPACITY: 600,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 70,000 | 150,504 | 420,000 | 269,496 | 269,496 | 64.17% |
| 2. | 1998 | 240,919 | 70,000 | 170,919 | 570,000 | 399,081 | 399,081 | 70.01% |
| 3. | 1999 | 263,327 | 70,000 | 193,327 | 600,000 | 406,673 | 406,673 | 67.78% |
| 4. | 2000 | 287,927 | 70,000 | 217,927 | 600,000 | 382,073 | 382,073 | 63.68% |
| 5. | 2001 | 314,939 | 70,000 | 244,939 | 600,000 | 355,061 | 355,061 | 59.18% |
| 6. | 2002 | 344,604 | 70,000 | 274,604 | 600,000 | 325,396 | 325,396 | 54.23% |
| 7. | 2003 | 377,189 | 70,000 | 307,189 | 600,000 | 292,811 | 292,811 | 48.80% |
| 8. | 2004 | 412,988 | 70,000 | 342,988 | 600,000 | 257,012 | 257,012 | 42.84% |
| 9. | 2005 | 452,322 | 70,000 | 382,322 | 600,000 | 217,678 | 217,678 | 36.28% |
| 10. | 2006 | 495,548 | 70,000 | 425,548 | 600,000 | 174,452 | 174,452 | 29.08% |
| 11. | 2007 | 543,058 | 70,000 | 473,058 | 600,000 | 126,942 | 126,942 | 21.16% |
| 12. | 2008 | 595,282 | 70,000 | 525,282 | 600,000 | 74,718 | 74,718 | 12.45% |
| 13. | 2009 | 652,697 | 70,000 | 582,697 | 600,000 | 17,303 | 17,303 | 2.88% |
| 14. | 2010 | 715,826 | 70,000 | 645,826 | 600,000 | -45,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 70,000 | 715,245 | 600,000 | -115,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1050000 | 5652375 | 8790000 | 3137625 | 3298696 | 37.53% |

PRODUCTION AND SALES SCHEDULE D-(1)

CASE : MEDIUM CASE

LOCAL SUPPLY : 100,000 MT/Y

PRODUCTION CAPACITY: 200,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 77,176 | 143,328 | 140,000 | -3,328 | 0 | 0.00% |
| 2. | 1998 | 240,919 | 84,322 | 156,597 | 190,000 | 33,403 | 33,403 | 17.58% |
| 3. | 1999 | 263,327 | 92,164 | 171,163 | 200,000 | 28,837 | 28,837 | 14.42% |
| 4. | 2000 | 287,927 | 100,000 | 187,927 | 200,000 | 12,073 | 12,073 | 6.04% |
| 5. | 2001 | 314,939 | 100,000 | 214,939 | 200,000 | -14,939 | 0 | 0.00% |
| 6. | 2002 | 344,604 | 100,000 | 244,604 | 200,000 | -44,604 | 0 | 0.00% |
| 7. | 2003 | 377,189 | 100,000 | 277,189 | 200,000 | -77,189 | 0 | 0.00% |
| 8. | 2004 | 412,988 | 100,000 | 312,988 | 200,000 | -112,988 | 0 | 0.00% |
| 9. | 2005 | 452,322 | 100,000 | 352,322 | 200,000 | -152,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 100,000 | 395,548 | 200,000 | -195,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 100,000 | 443,058 | 200,000 | -243,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 100,000 | 495,282 | 200,000 | -295,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 100,000 | 552,697 | 200,000 | -352,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 100,000 | 615,826 | 200,000 | -415,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 100,000 | 685,245 | 200,000 | -485,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1453663 | 5248713 | 2930000 | -2318713 | 74313 | 2.54% |

PRODUCTION AND SALES SCHEDULE D-(2)

CASE : MEDIUM CASE

LOCAL SUPPLY : 100,000 MT/Y

PRODUCTION CAPACITY: 300,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 77,176 | 143,328 | 210,000 | 66,672 | 66,672 | 31.75% |
| 2. | 1998 | 240,919 | 84,322 | 156,597 | 285,000 | 128,403 | 128,403 | 45.05% |
| 3. | 1999 | 263,327 | 92,164 | 171,163 | 300,000 | 128,837 | 128,837 | 42.95% |
| 4. | 2000 | 287,927 | 100,000 | 187,927 | 300,000 | 112,073 | 112,073 | 37.36% |
| 5. | 2001 | 314,939 | 100,000 | 214,939 | 300,000 | 85,061 | 85,061 | 28.35% |
| 6. | 2002 | 344,604 | 100,000 | 244,604 | 300,000 | 55,396 | 55,396 | 18.47% |
| 7. | 2003 | 377,189 | 100,000 | 277,189 | 300,000 | 22,811 | 22,811 | 7.60% |
| 8. | 2004 | 412,988 | 100,000 | 312,988 | 300,000 | -12,988 | 0 | 0.00% |
| 9. | 2005 | 452,322 | 100,000 | 352,322 | 300,000 | -52,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 100,000 | 395,548 | 300,000 | -95,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 100,000 | 443,058 | 300,000 | -143,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 100,000 | 495,282 | 300,000 | -195,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 100,000 | 552,697 | 300,000 | -252,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 100,000 | 615,826 | 300,000 | -315,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 100,000 | 685,245 | 300,000 | -385,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1453663 | 5248713 | 4395000 | -853713 | 599254 | 13.63% |

PRODUCTION AND SALES SCHEDULE D-(3)

CASE : MEDIUM CASE

LOCAL SUPPLY : 100,000 MT/Y

PRODUCTION CAPACITY: 400,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 77,176 | 143,328 | 280,000 | 136,672 | 136,672 | 48.81% |
| 2. | 1998 | 240,919 | 84,322 | 156,597 | 380,000 | 223,403 | 223,403 | 58.79% |
| 3. | 1999 | 263,327 | 92,164 | 171,163 | 400,000 | 228,837 | 228,837 | 57.21% |
| 4. | 2000 | 287,927 | 100,000 | 187,927 | 400,000 | 212,073 | 212,073 | 53.02% |
| 5. | 2001 | 314,939 | 100,000 | 214,939 | 400,000 | 185,061 | 185,061 | 46.27% |
| 6. | 2002 | 344,604 | 100,000 | 244,604 | 400,000 | 155,396 | 155,396 | 38.85% |
| 7. | 2003 | 377,189 | 100,000 | 277,189 | 400,000 | 122,811 | 122,811 | 30.70% |
| 8. | 2004 | 412,988 | 100,000 | 312,988 | 400,000 | 87,012 | 87,012 | 21.75% |
| 9. | 2005 | 452,322 | 100,000 | 352,322 | 400,000 | 47,678 | 47,678 | 11.92% |
| 10. | 2006 | 495,548 | 100,000 | 395,548 | 400,000 | 4,452 | 4,452 | 1.11% |
| 11. | 2007 | 543,058 | 100,000 | 443,058 | 400,000 | -43,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 100,000 | 495,282 | 400,000 | -95,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 100,000 | 552,697 | 400,000 | -152,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 100,000 | 615,826 | 400,000 | -215,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 100,000 | 685,245 | 400,000 | -285,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1453663 | 5248713 | 5860000 | 611288 | 1403396 | 23.95% |

PRODUCTION AND SALES SCHEDULE D-(4)

CASE : MEDIUM CASE

LOCAL SUPPLY : 100,000 MT/Y

PRODUCTION CAPACITY: 500,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 77,176 | 143,328 | 350,000 | 206,672 | 206,672 | 59.05% |
| 2. | 1998 | 240,919 | 84,322 | 156,597 | 475,000 | 318,403 | 318,403 | 67.03% |
| 3. | 1999 | 263,327 | 92,164 | 171,163 | 500,000 | 328,837 | 328,837 | 65.77% |
| 4. | 2000 | 287,927 | 100,000 | 187,927 | 500,000 | 312,073 | 312,073 | 62.41% |
| 5. | 2001 | 314,939 | 100,000 | 214,939 | 500,000 | 285,061 | 285,061 | 57.01% |
| 6. | 2002 | 344,604 | 100,000 | 244,604 | 500,000 | 255,396 | 255,396 | 51.08% |
| 7. | 2003 | 377,189 | 100,000 | 277,189 | 500,000 | 222,811 | 222,811 | 44.56% |
| 8. | 2004 | 412,988 | 100,000 | 312,988 | 500,000 | 187,012 | 187,012 | 37.40% |
| 9. | 2005 | 452,322 | 100,000 | 352,322 | 500,000 | 147,678 | 147,678 | 29.54% |
| 10. | 2006 | 495,548 | 100,000 | 395,548 | 500,000 | 104,452 | 104,452 | 20.89% |
| 11. | 2007 | 543,058 | 100,000 | 443,058 | 500,000 | 56,942 | 56,942 | 11.39% |
| 12. | 2008 | 595,282 | 100,000 | 495,282 | 500,000 | 4,718 | 4,718 | 0.94% |
| 13. | 2009 | 652,697 | 100,000 | 552,697 | 500,000 | -52,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 100,000 | 615,826 | 500,000 | -115,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 100,000 | 685,245 | 500,000 | -185,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1453663 | 5248713 | 7325000 | 2076288 | 2430056 | 33.17% |

PRODUCTION AND SALES SCHEDULE D-(5)

CASE : MEDIUM CASE

LOCAL SUPPLY : 100,000 MT/Y

PRODUCTION CAPACITY: 600,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 77,176 | 143,328 | 420,000 | 276,672 | 276,672 | 65.87% |
| 2. | 1998 | 240,919 | 84,322 | 156,597 | 570,000 | 413,403 | 413,403 | 72.53% |
| 3. | 1999 | 263,327 | 92,164 | 171,163 | 600,000 | 428,837 | 428,837 | 71.47% |
| 4. | 2000 | 287,927 | 100,000 | 187,927 | 600,000 | 412,073 | 412,073 | 68.68% |
| 5. | 2001 | 314,939 | 100,000 | 214,939 | 600,000 | 385,061 | 385,061 | 64.18% |
| 6. | 2002 | 344,604 | 100,000 | 244,604 | 600,000 | 355,396 | 355,396 | 59.23% |
| 7. | 2003 | 377,189 | 100,000 | 277,189 | 600,000 | 322,811 | 322,811 | 53.80% |
| 8. | 2004 | 412,988 | 100,000 | 312,988 | 600,000 | 287,012 | 287,012 | 47.84% |
| 9. | 2005 | 452,322 | 100,000 | 352,322 | 600,000 | 247,678 | 247,678 | 41.28% |
| 10. | 2006 | 495,548 | 100,000 | 395,548 | 600,000 | 204,452 | 204,452 | 34.08% |
| 11. | 2007 | 543,058 | 100,000 | 443,058 | 600,000 | 156,942 | 156,942 | 26.16% |
| 12. | 2008 | 595,282 | 100,000 | 495,282 | 600,000 | 104,718 | 104,718 | 17.45% |
| 13. | 2009 | 652.697 | 100,000 | 552,697 | 600,000 | 47,303 | 47,303 | 7.88% |
| 14. | 2010 | 715,826 | 100,000 | 615,826 | 600,000 | -15,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 100,000 | 685,245 | 600,000 | -85,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1453663 | 5248713 | 8790000 | 3541288 | 3642359 | 41.44% |

PRODUCTION AND SALES SCHEDULE E-(1)

CASE : MEDIUM CASE

LOCAL SUPPLY : 140,000 MT/Y

PRODUCTION CAPACITY: 200,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 77,176 | 143,328 | 140,000 | -3,328 | 0 | 0.00% |
| 2. | 1998 | 240,919 | 84,322 | 156,597 | 190,000 | 33,403 | 33,403 | 17.58% |
| 3. | 1999 | 263,327 | 92,164 | 171,163 | 200,000 | 28,837 | 28,837 | 14.42% |
| 4. | 2000 | 287,927 | 100,774 | 187,153 | 200,000 | 12,847 | 12,847 | 6.42% |
| 5. | 2001 | 314,939 | 110,229 | 204,710 | 200,000 | -4,710 | 0 | 0.00% |
| 6. | 2002 | 344,604 | 120,611 | 223,993 | 200,000 | -23,993 | 0 | 0.00% |
| 7. | 2003 | 377,189 | 132,016 | 245,173 | 200,000 | -45,173 | 0 | 0.00% |
| 8. | 2004 | 412,988 | 140,000 | 272,988 | 200,000 | -72,988 | 0 | 0.00% |
| 9. | 2005 | 452,322 | 140,000 | 312,322 | 200,000 | -112,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 140,000 | 355,548 | 200,000 | -155,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 140,000 | 403,058 | 200,000 | -203,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 140,000 | 455,282 | 200,000 | -255,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 140,000 | 512,697 | 200,000 | -312,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 140,000 | 575,826 | 200,000 | -375,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 140,000 | 645,245 | 200,000 | -445,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1837293 | 4865082 | 2930000 | -1935082 | 75088 | 2.56% |

PRODUCTION AND SALES SCHEDULE E-(2)

CASE : MEDIUM CASE

LOCAL SUPPLY : 140.000 MT/Y

PRODUCTION CAPACITY: 300.000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 77,176 | 143,328 | 210,000 | 66,672 | 66,672 | 31.75% |
| 2. | 1998 | 240,919 | 84,322 | 156,597 | 285,000 | 128,403 | 128,403 | 45.05% |
| 3. | 1999 | 263,327 | 92,164 | 171,163 | 300,000 | 128,837 | 128,837 | 42.95% |
| 4. | 2000 | 287,927 | 100,774 | 187,153 | 300,000 | 112,847 | 112,847 | 37.62% |
| 5. | 2001 | 314,939 | 110,229 | 204,710 | 300,000 | 95,290 | 95,290 | 31.76% |
| 6. | 2002 | 344,604 | 120,611 | 223,993 | 300,000 | 76,007 | 76,007 | 25.34% |
| 7. | 2003 | 377,189 | 132,016 | 245,173 | 300,000 | 54,827 | 54,827 | 18.28% |
| 8. | 2004 | 412,988 | 140,000 | 272,988 | 300,000 | 27,012 | 27,012 | 9.00% |
| 9. | 2005 | 452,322 | 140,000 | 312,322 | 300,000 | -12,322 | 0 | 0.00% |
| 10. | 2006 | 495,548 | 140,000 | 355,548 | 300,000 | -55,548 | 0 | 0.00% |
| 11. | 2007 | 543,058 | 140,000 | 403,058 | 300,000 | -103,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 140,000 | 455,282 | 300,000 | -155,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 140,000 | 512,697 | 300,000 | -212,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 140,000 | 575,826 | 300,000 | -275,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 140,000 | 645,245 | 300,000 | -345,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1837293 | 4865082 | 4395000 | -470082 | 689896 | 15.70% |

PRODUCTION AND SALES SCHEDULE E-(3)

CASE : MEDIUM CASE

LOCAL SUPPLY : 140,000 MT/Y

PRODUCTION CAPACITY: 400,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 77,176 | 143,328 | 280,000 | 136,672 | 136,672 | 48.81% |
| 2. | 1998 | 240,919 | 84,322 | 156,597 | 380,000 | 223,403 | 223,403 | 58.79% |
| 3. | 1999 | 263,327 | 92,164 | 171,163 | 400,000 | 228,837 | 228,837 | 57.21% |
| 4. | 2000 | 287,927 | 100,774 | 187,153 | 400,000 | 212,847 | 212,847 | 53.21% |
| 5. | 2001 | 314,939 | 110,229 | 204,710 | 400,000 | 195,290 | 195,290 | 48.82% |
| 6. | 2002 | 344,604 | 120,611 | 223,993 | 400,000 | 176,007 | 176,007 | 44.00% |
| 7. | 2003 | 377,189 | 132,016 | 245,173 | 400,000 | 154,827 | 154,827 | 38.71% |
| 8. | 2004 | 412,988 | 140,000 | 272,988 | 400,000 | 127,012 | 127,012 | 31.75% |
| 9. | 2005 | 452,322 | 140,000 | 312,322 | 400,000 | 87,678 | 87,678 | 21.92% |
| 10. | 2006 | 495,548 | 140,000 | 355,548 | 400,000 | 44,452 | 44,452 | 11.11% |
| 11. | 2007 | 543,058 | 140,000 | 403,058 | 400,000 | -3,058 | 0 | 0.00% |
| 12. | 2008 | 595,282 | 140,000 | 455,282 | 400,000 | -55,282 | 0 | 0.00% |
| 13. | 2009 | 652,697 | 140,000 | 512,697 | 400,000 | -112,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 140,000 | 575,826 | 400,000 | -175,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 140,000 | 645,245 | 400,000 | -245,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1837293 | 4865082 | 5860000 | 994918 | 1587026 | 27.08% |

PRODUCTION AND SALES SCHEDULE E-(4)

CASE : MEDIUM CASE

LOCAL SUPPLY : 140,000 MT/Y

PRODUCTION CAPACITY: 500,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 77,176 | 143,328 | 350,000 | 206,672 | 206,672 | 59.05% |
| 2. | 1998 | 240,919 | 84,322 | 156,597 | 475,000 | 318,403 | 318,403 | 67.03% |
| 3. | 1999 | 263,327 | 92,164 | 171,163 | 500,000 | 328,837 | 328,837 | 65.77% |
| 4. | 2000 | 287,927 | 100,774 | 187,153 | 500,000 | 312,847 | 312,847 | 62.57% |
| 5. | 2001 | 314,939 | 110,229 | 204,710 | 500,000 | 295,290 | 295,290 | 59.06% |
| 6. | 2002 | 344,604 | 120,611 | 223,993 | 500,000 | 276,007 | 276,007 | 55.20% |
| 7. | 2003 | 377,189 | 132,016 | 245,173 | 500,000 | 254,827 | 254,827 | 50.97% |
| 8. | 2004 | 412,988 | 140,000 | 272,988 | 500,000 | 227,012 | 227,012 | 45.40% |
| 9. | 2005 | 452,322 | 140,000 | 312,322 | 500,000 | 187,678 | 187,678 | 37.54% |
| 10. | 2006 | 495,548 | 140,000 | 355,548 | 500,000 | 144,452 | 144,452 | 28.89% |
| 11. | 2007 | 543,058 | 140,000 | 403,058 | 500,000 | 96,942 | 96,942 | 19.39% |
| 12. | 2008 | 595,282 | 140,000 | 455,282 | 500,000 | 44,718 | 44,718 | 8.94% |
| 13. | 2009 | 652,697 | 140,000 | 512,697 | 500,000 | -12,697 | 0 | 0.00% |
| 14. | 2010 | 715,826 | 140,000 | 575,826 | 500,000 | -75,826 | 0 | 0.00% |
| 15. | 2011 | 785,245 | 140,000 | 645,245 | 500,000 | -145,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1837293 | 4865082 | 7325000 | 2459918 | 2693686 | 36.77% |

PRODUCTION AND SALES SCHEDULE E-(5)

CASE : MEDIUM CASE

LOCAL SUPPLY : 140,000 MT/Y

PRODUCTION CAPACITY: 600,000 MT/Y

| | | LOCAL DEMAND | LOCAL SUPPLY | EFFECTIVE DEMAND | NEW LOCAL PRODUCTION | SURPLUS OR SHORT | REQUIRED EXPORT | RATIO OF EXPORT |
|---|---|---|---|---|---|---|---|---|
| 1. | 1997 | 220,504 | 77,176 | 143,328 | 420,000 | 276,672 | 276,672 | 65.87% |
| 2. | 1998 | 240,919 | 84,322 | 156,597 | 570,000 | 413,403 | 413,403 | 72.53% |
| 3. | 1999 | 263,327 | 92,164 | 171,163 | 600,000 | 428,837 | 428,837 | 71.47% |
| 4. | 2000 | 287,927 | 100,774 | 187,153 | 600,000 | 412,847 | 412,847 | 68.81% |
| 5. | 2001 | 314,939 | 110,229 | 204,710 | 600,000 | 395,290 | 395,290 | 65.88% |
| 6. | 2002 | 344,504 | 120,611 | 223,993 | 600,000 | 376,007 | 376,007 | 62.67% |
| 7. | 2003 | 377,189 | 132,016 | 245,173 | 600,000 | 354,827 | 354,827 | 59.14% |
| 8. | 2004 | 412,988 | 140,000 | 272,988 | 600,000 | 327,012 | 327,012 | 54.50% |
| 9. | 2005 | 452,322 | 140,000 | 312,322 | 600,000 | 287,678 | 287,678 | 47.95% |
| 10. | 2006 | 495,548 | 140,000 | 355,548 | 600,000 | 244,452 | 244,452 | 40.74% |
| 11. | 2007 | 543,058 | 140,000 | 403,058 | 600,000 | 196,942 | 196,942 | 32.82% |
| 12. | 2008 | 595,282 | 140,000 | 455,282 | 600,000 | 144,718 | 144,718 | 24.12% |
| 13. | 2009 | 652,697 | 140,000 | 512,697 | 600,000 | 87,303 | 87,303 | 14.55% |
| 14. | 2010 | 715,826 | 140,000 | 575,826 | 600,000 | 24,174 | 24,174 | 4.03% |
| 15. | 2011 | 785,245 | 140,000 | 645,245 | 600,000 | -45,245 | 0 | 0.00% |
| TOTAL | | 6702375 | 1837293 | 4865082 | 8790000 | 3924918 | 3970163 | 45.17% |

# APPENDIX III-2

## Cement Standard Specifications in U.S.A., U.K. and France

# UNITED STATES

## 1. STANDARD CEMENTS. - PORTLAND CEMENTS -

| TYPE | DENOMINATION | SYMBOL | STRENGTH CLASS | STANDARD | Year |
|---|---|---|---|---|---|
| P | Portland | I | | ASTM C-150 | 1978 |
| P | Air-entraining Portland | I A | | | |
| P | Portland with high early strength | III | | | |
| P | Air-entraining Portland with high early strength | III A | | | |
| SR-P | Portland with moderate sulfate resistance | II | | | |
| SR-P | Air-entraining Portland with moderate sulfate resistance | II A | | | |
| SR-P | Portland with high sulfate resistance | V | | | |
| LH-P | Portland with moderate heat of hydration | II | | | |
| LH-P | Air-entraining Portland with moderate heat of hydration | II A | | | |
| LH-P | Portland with low heat of hydration | IV | | | |

## 2. COMPOSITION.

| SYMBOL | COMPONENTS (%) | | | | |
|---|---|---|---|---|---|
| | Clinker | Slag | Pozzolana | Fly Ash | |
| I | 100 | | | | |
| I A | 100 | | | | |
| II | 100 | | | | |
| II A | 100 | | | | |
| III | 100 | | | | |
| III A | 100 | | | | |
| IV | 100 | | | | |
| V | 100 | | | | |

## 3. MECHANICAL REQUIREMENTS.

| CLASS | TEST METHOD: ASTM C-109 | | | | | | | N/mm2 |
|---|---|---|---|---|---|---|---|---|
| | Compression (days) | | | | Flexure (days) | | | |
| | 1 | 3 | 7 | 28 | | | | |
| I | | 12.4 | 19.3 | 27.6 [a] | | | | |
| I A | | 10.0 | 15.5 | 22.1 [a] | | | | |
| II | | 10.3<br>( 6.9) | 17.2<br>(11.7) | 27.6 [a]<br>(22.1) [a] | | | | |
| II A | | 8.3<br>( 5.5) | 13.8<br>( 9.3) | 21.1 [a]<br>(17.7) [a] | | | | |
| III | 12.4 | 24.1 | | | | | | |
| III A | 10.0 | 19.3 | | | | | | |
| IV | | | 6.9 | 17.2 | | | | |
| V | | 8.3 | 15.2 | 20.7 | | | | |

[a] when specially requested

[a] figures in brackets: when the optional heat of hydration or the chemical limit on $C_3S + C_3A$ is specified

# UNITED STATES

## 4. CHEMICAL REQUIREMENTS.

| SYMBOL | LOSS ON IGNITION max % | INSOLUBLE RESIDUE max % | MgO max % | $SO_3$ max % | | $C_3A$ max % | Others % |
|---|---|---|---|---|---|---|---|
| | | | | $C_3A \leq 8$ | $C_3A > 8$ | | |
| I<br>I A | 3.0 | 0.75 | 6.0 | 3.0 | 3.5 | - | |
| II [a]<br>II A [a] | 3.0 | 0.75 | 6.0 | 3.0 | - | 8.0 | $Al_2O_3 \leq 6.0$<br>$SiO_2 \leq 21.0$<br>$Fe_2O_3 \leq 6.0$ |
| III [b]<br>III A [b] | 3.0 | 0.75 | 6.0 | 3.5 | 4.5 | 15.0 | |
| IV | 2.5 | 0.75 | 6.0 | 2.3 | - | 7.0 | $C_3S \leq 35.0$<br>$Fe_2O_3 \leq 6.5$<br>$C_2S \geq 40.0$ |
| V | 3.0 | 0.75 | 6.0 | 2.3 | - | 5.0 | $C_4AF + 2\,C_3A$ or $C_4AF + C_2F$ $\leq 20.0$ |

[a] $C_3S + C_3A \leq 58$ % for moderate heat of hydration

[b] $C_3A$ for moderate SR $\leq 8$ %, for high SR $\leq 5$ %

[*] for all types $(Na_2O + 0.658\,K_2O) \leq 0.60$ % if low alkali cement is required

## 5. PHYSICAL REQUIREMENTS.

| TEST METHOD | FINENESS | | SETTING TIME | | | | SOUNDNESS | | HEAT of HYDRATION | | Air entrainment % | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WAGNER min | BLAINE min | Gillmore I | Gillmore F | Vicat I | Vicat F | Le Chatelier | Autoclave | SOLUTION | | | |
| SYMBOL | m2/kg | m2/kg | min in ' | max in h | min in ' | max in h | mm (max) | % (max) | 7 days (max) | 28 days (max) | min | max |
| I | 160 | 280 | 60 | 10 | 45 | 8 | | 0.80 | | | - | 12 |
| I A | 160 | 280 | 60 | 10 | 45 | 8 | | 0.80 | | | 16 | 22 |
| II | 160 | 280 | 60 | 10 | 45 | 8 | | 0.80 | 290 | | - | 12 |
| II A | 160 | 280 | 60 | 10 | 45 | 8 | | 0.80 | 290 | | 16 | 22 |
| III | - | - | 60 | 10 | 45 | 8 | | 0.80 | | | - | 12 |
| III A | - | - | 60 | 10 | 45 | 8 | | 0.80 | | | 16 | 22 |
| IV | 160 | 280 | 60 | 10 | 45 | 8 | | 0.80 | 250 | 290 | - | 12 |
| V | 160 | 280 | 60 | 10 | 45 | 8 | | 0.80 | | | - | 12 |

# UNITED STATES

## 1. STANDARD CEMENTS. - BLENDED HYDRAULIC CEMENTS -

| TYPE | DENOMINATION | SYMBOL | STANDARD | Year |
|---|---|---|---|---|
| P. Pc. | Pozzolan-modified Portland | I(PM) | ASTM<br>C 595 | 1979 |
| P. Po. | Air-entraining pozzolan-modified Portland | I(PM)-A | | |
| P. Pc. | Portland-pozzolan | IP or P | | |
| P. Po. | Air-entraining pozzolan | IP-A or P-A | | |
| BLF | Portland blast-furnace slag | IS | | |
| BLF | Air-entraining Portland blast-furnace slag | IS-A | | |
| SR | For the following 8 types of cement: moderate sulfate resistance may be specified by adding the suffixes (MS) | I(PM)(MS)<br>I(PM)-A(MS)<br>IP-A(MS)<br>IS(MS)<br>IP(MS)<br>P(MS)<br>P-A(MS)<br>IS-A(MS) | | |
| LH | For the following 8 types of cement: moderate heat of hydration may be specified by adding the suffixes (MH) | I(PM)(MH)<br>I(PM)-A(MH)<br>IP-A(MH)<br>IS(MH)<br>IP(MH)<br>P(MH)<br>P-A(MH)<br>IS-A(MH) | | |
| Sl. Li. | Slag | S | | |
| Sl. Li. | Air-entraining slag | S-A | | |

## 2. COMPOSITION.

| SYMBOL | COMPONENTS (%) | | | | |
|---|---|---|---|---|---|
| | Clinker | Slag | Pozzolana | Fly Ash | Hydrated Lime |
| I(PM)<br>I(PM)-A | ≥ 85[a] | | ≤ 15 | | |
| IP or P<br>IP-A or P-A | 85-60[a] | | 15-40 | | |
| IS<br>IS-A | 75-35[b] | 25-65 | | | |
| S<br>S-A | | ≥ 60 | | | ≤ 40 |

## 3. MECHANICAL REQUIREMENTS.

| CLASS | TEST METHOD: ASTM C-109 N/mm2 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Compression (days) | | | | Flexure (days) | | | |
| | | 3 | 7 | 28 | | | | |
| I(PM)<br>IP<br>IS<br>IS(MS) | | 12.4 | 19.3 | 24.1 | | | | |
| I(PM)-A<br>IP-A<br>IS-A | | 9.9 | 15.5 | 19.3 | | | | |
| P | | | 10.3 | 20.7 | | | | |
| P-A | | | 8.6 | 17.2 | | | | |
| IS-A(MS) | | 5.2 | 9.7 | 19.3 | | | | |
| S | | | 4.1 | 10.3 | | | | |
| S-A | | | 3.4 | 8.6 | | | | |

[a] the clinker may be replaced by Portland cement or by Portland blast-furnace cement

[b] the clinker may be replaced by Portland cement

# UNITED STATES

## 4. CHEMICAL REQUIREMENTS.

| SYMBOL | LOSS ON IGNITION max % | INSOLUBLE RESIDUE max % | MgO max % | $SO_3$ max % | S max % | Water Soluble Alkali max % | |
|---|---|---|---|---|---|---|---|
| I(PM)<br>I(PM)-A | 5.0 | | 5.0 | 4.0 | | | |
| IP<br>IP-A<br>P<br>P-A | 5.0 | | 5.0 | 4.0 | | | |
| IS<br>IS-A | 3.0 | 1.0 | | 3.0 | 2.0 | | |
| S<br>S-A | 4.0 | 1.0 | | 4.0 | 2.0 | 0.03[a] | |

[a] applicable only when the cement is specified to be non-staining to limestone

## 5. PHYSICAL REQUIREMENTS.

| TEST METHOD | FINENESS | | SETTING TIME | | SOUNDNESS | | HEAT of HYDRATION | | Air entrainment |
|---|---|---|---|---|---|---|---|---|---|
| | SIEVE max % | BLAINE min. | VICAT | | Le Chatelier | Autoclave | SOLUTION kJ/kg | | |
| SYMBOL | < 45 µm | $cm^2/g$ | Initial min. in ' | Final max. in h. | m m (max) | % (max) | 7 days (max) | 28 days (max) | max % |
| I(PM)<br>IP | a | a | 45 | 7 | | 0.50 | 293 | 335 | 12 |
| P [b] | | | 45 | 7 | | 0.50 | 251 | 293 | 12 |
| I(PM)-A<br>IP-A | | | 45 | 7 | | 0.50 | 293 | 335 | 19 ± 3 |
| P-A [b] | | | 45 | 7 | | 0.50 | 251 | 293 | 19 ± 3 |
| IS<br>IS(MS) | | | 45 | 7 | | 0.20 | 293 | 335 | 12 |
| IS-A<br>IS-A(MS) | | | 45 | 7 | | 0.20 | 293 | 335 | 19 ± 3 |
| S | | | 45 | 7 | | 0.50 | | | 12 |
| S-A | | | 45 | 7 | | 0.50 | | | 19 ± 3 |

[a] for all types, fineness will be reported when requested by the purchaser

[b] for types P and P-A

| | P | P-A |
|---|---|---|
| . water requirements, max weight % of cement: | 64 | 56 |
| . drying shrinkage, max % : | 0.15 | 0.15 |

| mortar expansion | P | P-A |
|---|---|---|
| . at 14 days, max %: | 0.020 | 0.020 |
| . at 8 weeks, max %: | 0.060 | 0.060 |

# UNITED STATES

## 1. STANDARD CEMENTS. - EXPANSIVE HYDRAULIC AND MASONRY CEMENTS -

| TYPE | DENOMINATION | SYMBOL | STRENGTH CLASS | STANDARD | Year |
|---|---|---|---|---|---|
| E | Expansive | K<br>M<br>S | | ASTM C-845 | 1976 |
| M | Masonry | | | ASTM C-91 | 1978 |

## 2. COMPOSITION.

| SYMBOL | COMPONENTS (%) |
|---|---|
| E | Hydraulic calcium silicates such as those characteristic of Portland cement containing:<br>- K: (4 CaO . 3 $Al_2O_3$ . $SO_3$) + $SO_4Ca$ + CaO<br>- M: calcium aluminate cement + $SO_4Ca$<br>- S: $C_3A$ + $SO_4Ca$ |
| M | One or more of the following materials<br>Portland cement,<br>Portland blast-furnace slag cement<br>Portland-pozzolan cement<br>Natural cement<br>Slag cement<br>or hydraulic lime |

## 3. MECHANICAL REQUIREMENTS.

| CLASS | TEST METHOD: ASTM C-109 N/mm2 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Compression (days) | | | | Flexure (days) | | | |
| | | | 7 | 28 | | | | |
| E | | | 14.7 | 24.5 | | | | |
| M[a] | | | 3.45 | 6.21 | | | | |

[a] composition of mortar cubes:

- 1 part cement
- 3 parts blended sand

# UNITED STATES

## 4. CHEMICAL REQUIREMENTS.

| SYMBOL | LOSS ON IGNITION max % | INSOLUBLE RESIDUE max % | MgO max % | $SO_3$ max % | |
|---|---|---|---|---|---|
| K<br>M<br>S | 4.0 | 1.0 | 5.0 | | |

## 5. PHYSICAL REQUIREMENTS.

| TEST METHOD | FINENESS | | SETTING TIME | | SOUNDNESS | | RESTRAINED EXPANSION | | | Air entrainment % | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SIEVE max % | BLAINE min. | VICAT | | Le Chatelier | Autoclave | | | | | |
| SYMBOL | < 45 µm | $cm^2/g$ | Initial min. in ' | Final max. in h. | mm (max) | % (max) | 7 days min | 7 days max | 28 days (max) | min | max |
| K<br>M<br>S | | | 90 | - | | | 0.04 | 0.10 | 115 % of 7 days | | 12 |
| M[b] | 24 | | 120[a] | 24[a] | | 1 | | | | 12 | 22 |

[a] Gillmore method

[b] for Masonry cement, water retention min %: 70

# UNITED KINGDOM TABLE-2

## 1. STANDARD CEMENTS.

| TYPE | DENOMINATION | SYMBOL | STRENGTH CLASS | STANDARD | Year |
|---|---|---|---|---|---|
| P | Ordinary Portland | OP | | BS 12 | 1978 |
| P | Rapid-hardening Portland | RHP | | | |
| BLF | Portland Blastfurnace | PBLF | | BS 146 | 1973 |
| SR-P | Sulphate-resisting Portland | SRP | | BS 4027 | 1972 |
| LH-P | Low heat Portland | LHP | | BS 1370 | 1979 |
| LH-P | Low heat Portland Blastfurnace | LHPBLF | | BS 4246 | 1974 |
| SS | Supersulphated | SS | | BS 4248 | 1974 |
| AL | High Alumina | HA | | BS 915 | 1972 |
| M | Masonry | M | | BS 5224 | 1976 |

## 2. COMPOSITION.

| SYMBOL | COMPONENTS (%) | | | | |
|---|---|---|---|---|---|
| | Clinker | Slag | Pozzo-lans | Fly Ash | |
| OP | 100 | | | | |
| RHP | 100 | | | | |
| PBLF | ≥ 35 | ≤ 65 | | | |
| SRP | 100 | | | | |
| LHP | 100 | | | | |
| LHPBLF | 50-10 | 50-90 | | | |
| SS | a | ≥ 75 | | | |
| HA | b | | | | |
| | Portland cement | Air en-training | Plasticizing | | |
| M | x | x | ≤ 25 if inert<br>≤ 35 if hydraulic properties | | |

## 3. MECHANICAL REQUIREMENTS.

| CLASS | TEST METHOD: [c d] BS 4550 N/mm2 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | [c] Compression (days) | | | | [d] Compression (days) | | | |
| | | 3 | 7[e] | 28[e] | 1 | 3 | 7[e] | 28[e] |
| OP | | 13 | | 29 | | 23 | | 41 |
| RHP | | 18 | | 33 | | 29 | | 46 |
| PBLF | | 8 | 14 | 22 | | 15 | 23 | 34 |
| SRP | | 8 | 14 | | | 15 | 23 | |
| LHP | | 5 | | 19 | | 10 | | 28 |
| LHPBLF | | 3 | 7 | 14 | | 8 | 14 | 28 |
| SS | | 7 | 17 | 26 | | 14 | 23 | 34 |
| HA | | | | | 42 | 49 | | |
| M | | | | | | | 4[f] | 6[f] |

[a] can consist of Portland cement, Portland cement clinker or other source of lime
[b] aluminous clinker
[c] concrete cubes: W/C ratio is 0.60 except for SS (0.55)
[d] mortar cubes
[e] strength at this age should be higher than that obtained at previous testing age
[f] method as specified in BS 5224 Appendix F

# UNITED KINGDOM

## 4. CHEMICAL REQUIREMENTS.

| SYMBOL | LOSS ON IGNITION max % | INSOLUBLE RESIDUE max % | MgO max % | $SO_3$ max % | | $C_3A$ max % | LSF | $\frac{Al_2O_3}{CaO}$ |
|---|---|---|---|---|---|---|---|---|
| | | | | $C_3A \le 5$ | $C_3A > 5$ | | | |
| OP | 3.0[a] | 1.5 | 4.0 | 2.5 | 3.0 | | 0.66-1.02 | |
| RHP | 3.0[a] | 1.5 | 4.0 | 3.0 | 3.5 | | 0.66-1.02 | |
| PBLF | 3.0[a] | 1.5 | 7.0 | 3.0[b] | | | | |
| SRP | 3.0[a] | 1.5 | 4.0 | 2.5 | | 3.5 | 0.66-1.02 | |
| LHP | 3.0[a] | 1.5 | 4.0 | 2.5 | 3.0 | | 0.66-0.88 | |
| LHPBLF | | 1.5 | 9.0 | 3.0[c] | | | | |
| SS | | 3.0 | 9.0 | 4.5[b] | | | | |
| HA | | | | | | | | 0.85-1.3 |
| M | | | | 3.0 | | | | |

[a] in tropical climate, max % 4.0

[b] the weight of sulphur other than present as $SO_3$ shall not exceed 1.5 %

[c] the weight of sulphur other than present as $SO_3$ shall not exceed 2.0 %

## 5. PHYSICAL REQUIREMENTS.

| TEST METHOD | FINENESS | | SETTING TIME | | SOUNDNESS | | HEAT of HYDRATION | | Air entrainment |
|---|---|---|---|---|---|---|---|---|---|
| | SIEVE max % | BLAINE min. | VICAT | | Le Chatelier | Autoclave | SOLUTION kJ/kg | | |
| SYMBOL | < 90 µm | $cm^2/g$ | Initial min. in | Final max. in h. | mm (max) | % (max) | 7 days (max) | 28 days (max) | % |
| OP | | 2 250 | 45 | 10 | 10[c] | | | | |
| RHP | | 3 250 | 45 | 10 | 10[c] | | | | |
| PBLF | | 2 250 | 45 | 10 | 10[c] | | | | |
| SRP | | 2 500 | 45 | 10 | 10[c] | | | | |
| LHP | | 2 750 | 60 | 10 | 10[c] | | 250 | 290 | |
| LHPBLF | | 2 750 | 60 | 15 | 10[c] | | 250 | 290 | |
| SS | | 4 000 | 45 | 10 | 5[d] | | 250 | 290 | |
| HA | 8 | 2 250 | 120-360 | b | 1 | | | | |
| M[a] | | | 45 | 10 | 10 | | | | 10-25 |

[a] water retentivity %: 70-95

[b] 2 hours after the initial set

[c] in case of failure, 5 mm after 7 days at 50-80 % humidity

[d] cold water method

# FRANCE TABLE-3

## 1. STANDARD CEMENTS.

| TYPE | DENOMINATION | SYMBOL | STRENGTH CLASS | STANDARD | Year |
|---|---|---|---|---|---|
| P | Portland artificiel | CPA | 35 [b] | NF P-15 301 | 1978 |
| P. Co. | Portland composé | CPJ | 45 - 45 R | | |
| BLF | De haut fourneau | CHF | 55 - 55 R | | |
| BLF | Laitier au clinker | CLK | HP - HPR | | |
| Sl. Li. | Laitier à la chaux [a] | CLX | 100 - 160 | NF P-15 306 | 1964 |
| SS | Sursulfaté [a] | CSS | 325 - 400 | NF P-15 313 | 1964 |
| M | À maçonner | CM | 160 - 250 | NF P-15 307 | 1965 |
| N | Naturel [a] | CN | 160 | NF P-15 308 | 1964 |

[a] no longer produced

[b] R = Rapid HP = High Performance

## 2. COMPOSITION.

| SYMBOL | COMPONENTS (%) | | | | |
|---|---|---|---|---|---|
| | Clinker | Slag | Pozzolana | Fly Ash | Filler |
| CPA | $\geqslant 97$ | | | | $\leqslant 3$ |
| CPJ | $\geqslant 65$ | $\leqslant 35$ | | | |
| CHF | 22-40 [d] | 75-60 [d] | | | $\leqslant 3$ |
| CLK | $\leqslant 20$ | $\geqslant 80$ | | | $\leqslant 3$ |
| | Clinker | Slag | Lime | | |
| CLX | | $\geqslant 70$ | $\leqslant 30$ | | |
| CSS | | a | | | |
| CM | b | | | | |
| CN | c | | | | |

## 3. MECHANICAL REQUIREMENTS.

| CLASS | TEST METHOD: ISO/CEN N/mm2 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Compression (days) | | | | | Flexure (days) | | |
| | 2 | | 7 | 28 inf. | 28 sup. | | | |
| guarantee level | 100 | 90 | 100 | 100 | 90 | | | |
| 35 | | | 10 | 25 | 45 | | | |
| 45 | | | 17.5 | 35 | 55 | | | |
| 45 R | 10 | 15 | | 35 | 55 | | | |
| 55 | 10 | - | | 45 | 65 | | | |
| 55 R | 15 | 22.5 | | 45 | 65 | | | |
| HP | 15 | - | | 55 | - | | | |
| HPR | 20 | 27 | | 55 | - | | | |
| 100 | | | 5 | 10 | | | | |
| 160 | | | 10 | 16 | | | | |
| 250 | | | 16 | 25 | | 4 | 5.5 | |
| 325 | | | 21 | 32.5 | | | | |
| 400 | | | 31.5 | 40 | | 5.5 | 6.5 | |

[a] supersulphated cement containing granulated slag, gypsum and a small quantity of lime, or Portland clinker

[b] masonry cement comprising Portland cement and/or other hydraulic binders and up to 50 of inert materials

[c] natural cement resulting from the grinding of natural clinkerized rocks similar in composition to the materials in artificial Portland clinker

[d] in the near future, clinker will increase from 22-40 to 22-60 and slag will decrease from 75-60 to 75-40

## 4. CHEMICAL REQUIREMENTS.

| SYMBOL | LOSS ON IGNITION max % | INSOLUBLE RESIDUE max % | MgO max % | $SO_3$ max % | Cl max % | CaO max % | Inert max % |
|---|---|---|---|---|---|---|---|
| CPA | | | 5.0 | 4.0 | 0.05 | | |
| CPJ | | | - | 4.0 | - | | |
| CHF | | | - | 4.0 | - | | |
| CLK | | | - | 5.0 | - | | |
| CLX | | 3.0 | | 5.0 | | 50.0 | |
| CSS | | 3.0 | | (5.0 min) | | | |
| CM | | | | 3.5[a] | | | 50.0 |
| CN | 6.0 | 4.0 | | 5.0 | | | |

[a] referred to the mass of active constituents

## 5. PHYSICAL REQUIREMENTS.

| TEST METHOD | FINENESS | | SETTING TIME | | SOUNDNESS | | HEAT of HYDRATION | | Shrinkage length variation µm/m |
|---|---|---|---|---|---|---|---|---|---|
| | SIEVE max % | BLAINE min. | VICAT | | Le Chatelier | Autoclave | SOLUTION | | |
| Strength Class | < µm | cm²/g | Initial min. in ' | Final max. in h. | mm (max) | % (max) | 7 days (max) | 28 days (max) | at 28 days (max) |
| 35<br>45 | | | 90 | | 10 | | | | 800 |
| 55<br>HP | | | 60 | | 10 | | | | 1 000 |
| CLK | | | 30 | | 3 | | | | |
| CSS | | | 30 | | 3 | | | | |
| CM | | | 30 | | 3 | | | | |
| CN | | | 30 | | 3 | | | | |

# APPENDIX IV-1

## Results of Analytical Test of Local Raw Materials

# 試験成績表

RESULT OF LABORATORY TEST ON
RAW MATERIALS

平成 3年 1月

MARCH, 1991

麻生セメント株式会社

ASO CEMENT CO., LTD.

# 石灰石試験成績表

RESULT OF ANALYTICAL TEST
OF LIMESTONE

国連工業開発機構御中
FOR MESSRS. UNIDO

平成3年1月16日
JANUARY 16, 1991

福岡県田川市大字弓削田2877番地
3877, YUGETA,TAGAWA-SI, FUKUOKA PREF.
麻生セメント株式会社 田川工場
TAGAWA MILL, ASO CEMENT CO., LTD.
生産課
PRODUCTION DEPT.

品名 石灰石(1)
COMMODITY : LIMESTONE (1)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPONENTS | 強熱減量 IGNITION LOSS | Ig loss | 37.8 (%) |
| | 酸化けい素 SILICEOUS MATERIAL | SiO2 | 14.7 (%) |
| | 酸化アルミニウム ALUMINA | Al2O3 | 1.7 (%) |
| | 酸化第二鉄 FERRIC OXIDE | Fe2O3 | 1.4 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 40.0 (%) |
| | 酸化マグネシウム MAGNESIUM OXIDE | MgO | 0.6 (%) |
| | 酸化ナトリウム SODIUM OXIDE | Na2O | |
| | 酸化カリウム PTASSIUM OXIDE | K2O | 0.8 (%) |
| | 合計 TOTAL | Total | 97.2 (%) |

# 石灰石試験成績表

RESULT OF ANALYTICAL TEST
OF LIMESTONE

国連工業開発機構御中　　　　平成3年1月16日

FOR MESSRS. UNIDO

福岡県田川市大字弓削田2877番地
2887, YUGETA, TAGAWA-SHI, FUKUOKA PREF.
麻生セメント株式会社　田川工場
TAGAWA MILL, ASO CEMENT CO.,LTD.
生産課
PRODUCTION DEPT.

品名　石灰石(2)
COMMODITY : LIMESTONE (2)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPONENTS | 強熱減量 IGNITION LOSS | Ig loss | 42.4 (%) |
| | 酸化けい素 SILICEOUS MATERIAL | $SiO_2$ | 3.2 (%) |
| | 酸化アルミニウム ALUMINA | $Al_2O_3$ | 0.1 (%) |
| | 酸化第二鉄 FERRIC OXIDE | $Fe_2O_3$ | 0.1 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 52.7 (%) |
| | 酸化マグネシウム MAGNESIUM OXIDE | MgO | 0.2 (%) |
| | 酸化ナトリウム SODIUM OXIDE | $Na_2O$ | |
| | 酸化カリウム PTASSIUM OXIDE | $K_2O$ | |
| | 合計 TOTAL | Total | 98.9 (%) |

# 石灰石試験成績表

RESULT OF ANALYTICAL TEST
OF LIMESTONE

国連工業開発機構御中
FOR MESSRS. UNIDO

平成3年1月16日
JANUARY 16, 1991

福岡県田川市大字弓削田2877番地
2887, YUGETA, TAGAWA-SI, FUKUOKA PREF.
麻生セメント株式会社 田川工場
TAGAWA MILL, ASO CEMENT CO., LTD.
生産課
PRODUCTION DEPT.

品名 石灰石（3）
COMMODITY : LIMESTONE (3)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPONENTS | 強熱減量 IGNITION LOSS | Ig loss | 41.7 (%) |
| | 酸化けい素 SILICEOUS MATERIAL | SiO2 | 1.9 (%) |
| | 酸化アルミニウム ALUMINA | Al2O3 | 0.2 (%) |
| | 酸化第二鉄 FERRIC OXIDE | Fe2O3 | 1.0 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 53.1 (%) |
| | 酸化マグネシウム MAGNESIUM OXIDE | MgO | 0.2 (%) |
| | 酸化ナトリウム SODIUM OXIDE | Na2O | |
| | 酸化カリウム PTASSIUM OXIDE | K2O | |
| | 合計 TOTAL | Total | 98.3 (%) |

# 石灰石試験成績表
RESULT OF ANALYTICAL TEST
OF LIMESTONE

国連工業開発機構御中　　　　　平成3年1月16日
FOR MESSRS. UNIDO　　　　　JANUARY 16, 1991

福岡県田川市大字弓削田2877番地
2887, YUGETA, FUKUOKA PREF.
麻生セメント株式会社　田川工場
TAGAWA MILL, ASO CEMENT CO.,LTD.
生産課
PRODUCTION DEPT.

品名　石灰石(4)

COMMODITY: LIMESTONE (4)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPONENTS | 強熱減量 IGNITION LOSS | Ig loss | 41.6 (%) |
| | 酸化けい素 SILICEOUS MATERIAL | SiO2 | 3.4 (%) |
| | 酸化アルミニウム ALUMINA | Al2O3 | 0.3 (%) |
| | 酸化第二鉄 FERRIC OXIDE | Fe2O3 | 0.3 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 51.7 (%) |
| | 酸化マグネシウム MAGNESIUM OXIDE | MgO | 0.3 (%) |
| | 酸化ナトリウム SODIUM OXIDE | Na2O | |
| | 酸化カリウム PTASSIUM OXIDE | K2O | |
| | 合計 TOTAL | Total | 97.8 (%) |

# 石灰石試験成績表

RESULT OF ANALYTICAL TEST
OF LIMESTONE

国連工業開発機構御中
FOR MESSRS. UNIDO

平成3年1月16日
JANUARY 16, 1991

福岡県田川市大字弓削田2877番地
2877, YUGETA, FUKUOKA PREF.
麻生セメント株式会社 田川工場
TAGAWA MILL, ASO CEMENT CO., LTD.
生 産 課
PRODUCTION DEPT.

品 名 石灰石(5)
COMMODITY: LIMESTONE (5)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPONENTS | 強熱減量 IGNITION LOSS | Ig loss | 42.5 (%) |
| | 酸化けい素 SILICEOUS MATERIAL | SiO2 | 2.6 (%) |
| | 酸化アルミニウム ALUMINA | Al203 | 0.2 (%) |
| | 酸化第二鉄 FERRIC OXIDE | Fe203 | 0.7 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 52.5 (%) |
| | 酸化マグネシウム MAGNESIUM OXIDE | MgO | 0.2 (%) |
| | 酸化ナトリウム SODIUM OXIDE | Na20 | |
| | 酸化カリウム PTASSIUM OXIDE | K20 | |
| | 合計 TOTAL | Total | 98.9 (%) |

# 石灰石試験成績表
# RESULT OF ANALYTICAL TEST OF LIMESTONE

国連工業開発機構御中
FOR MESSRS. UNIDO

平成3年1月16日
JANUARY 16, 1991

福岡県田川市大字弓削田2877番地
2877, YUGETA, FUKUOKA PREF.
麻生セメント株式会社 田川工場
TAGAWA MILL, ASO CEMENT CO., LTD.
生 産 課
PRODUCTION DEPT.

品 名 石灰石（6）
COMMODITY: LIMESTONE (6)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPONENTS | 強 熱 減 量 IGNITION LOSS | Ig loss | 41.8 (%) |
| | 酸 化 け い 素 SILICEOUS MATERIAL | $SiO_2$ | 3.4 (%) |
| | 酸化アルミニウム ALUMINA | $Al_2O_3$ | 0.5 (%) |
| | 酸 化 第 二 鉄 FERRIC OXIDE | $Fe_2O_3$ | 0.5 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 51.0 (%) |
| | 酸化マグネシウム MAGNESIUM OXIDE | MgO | 0.4 (%) |
| | 酸化ナトリウム SODIUM OXIDE | $Na_2O$ | |
| | 酸化カリウム PTASSIUM OXIDE | $K_2O$ | 0.1 (%) |
| | 合 計 TOTAL | Total | 97.9 (%) |

# 石炭試験成績表

RESULT OF ANALYTICAL TEST
OF COAL

平成3年1月16日
JANUARY 16, 1991

国連工業開発機構御中
FOR MESSRS. UNIDO

福岡県田川市大字弓削田2877番地
2877, YUGETA, FUKUOKA PREF.
麻生セメント株式会社　田川工場
TAGAWA MILL, ASO CEMENT CO., LTD.
生 産 課
PRODUCTION DEPT.

品 名　石炭(マダガスカル 炭)
COMMODITY: COAL (FROM MADAGASCAR)

| 銘柄 SAMPLE | 湿分 (%) | 工業分析 ANALYTICAL TEST | | | | 発熱量 CALORIFIC VALUE (cal/g) | 硫黄S分 (%) |
|---|---|---|---|---|---|---|---|
| | | 水分 MOIST (%) | 灰分 ASH (%) | 揮発分 VOLATILE (%) | 固定炭素 CARBON (%) | | |
| 石炭 1 SAMPLE-1 | | 2.5 | 13.1 | 25.4 | 59.0 | 6,510 | 0.7 |
| 石炭 2 SAMPLE-2 | | 2.0 | 20.8 | 33.5 | 43.7 | 5,390 | 0.7 |

# 粘土試験成績表
RESULT OF ANALYTICAL TEST
OF CLAY

国連工業開発機構御中
FOR MESSRS. UNIDO

平成3年1月16日
JANUARY 16, 1991

福岡県田川市大字弓削田2877番地
2887, YUGETA, FUKUOKA PREF.
麻生セメント株式会社 田川工場
TAGAWA MILL, ASO CEMENT CO., LTD.
生産課
PRODUCTION DEPT.

品名 粘土(1)
COMMODITY: CLAY (1)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPONENTS | 強熱減量 IGNITION LOSS | Ig loss | 8.9 (%) |
| | 酸化けい素 SILICEOUS MATERIAL | $SiO_2$ | 61.2 (%) |
| | 酸化アルミニウム ALUMINA | $Al_2O_3$ | 13.1 (%) |
| | 酸化第二鉄 FERRIC OXIDE | $Fe_2O_3$ | 7.4 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 1.6 (%) |
| | 酸化マグネシウム MAGNESIUM OXIDE | MgO | 1.9 (%) |
| | 酸化ナトリウム SODIUM OXIDE | $Na_2O$ | 0.6 (%) |
| | 酸化カリウム PTASSIUM OXIDE | $K_2O$ | 3.9 (%) |
| | 合計 TOTAL | Total | 99.0 (%) |

# 粘土試験成績表

RESULT OF ANALYTICAL TEST
OF CLAY

国連工業開発機構御中
FOR MESSRS. UNIDO

平成3年1月16日
JANUARY 16, 1991

福岡県田川市大字弓削田2877番地
2877, YUGETA, FUKUOKA PREF.
麻生セメント株式会社 田川工場
TAGAWA MILL, ASO CEMENT CO., LTD.
生 産 課
PRODUCTION DEPT.

品 名 粘土(2)
COMMODITY: CLAY (2)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPONENTS | 強熱減量 IGNITION LOSS | Ig loss | 26.5 (%) |
| | 酸化けい素 SILICEOUS MATERIAL | $SiO_2$ | 42.1 (%) |
| | 酸化アルミニウム ALUMINA | $Al_2O_3$ | 15.8 (%) |
| | 酸化第二鉄 FERRIC OXIDE | $Fe_2O_3$ | 5.7 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 2.7 (%) |
| | 酸化マグネシウム MAGNESIUM OXIDE | MgO | 2.3 (%) |
| | 酸化ナトリウム SODIUM OXIDE | $Na_2O$ | 0.1 (%) |
| | 酸化カリウム PTASSIUM OXIDE | $K_2O$ | 2.2 (%) |
| | 合計 TOTAL | Total | 97.9 (%) |

# 粘土試験成績表
RESULT OF ANALYTICAL TEST
OF CLAY

国連工業開発機構御中
FOR MESSRS. UNIDO

平成3年1月16日
JANUARY 16, 1991

福岡県田川市大字弓削田2877番地
2877, YUGETA, FUKUOKA PREF.
麻生セメント株式会社　田川工場
TAGAWA MILL, ASO CEMENT CO., LTD.
生 産 課
PRODUCTION DEPT.

品 名　粘土(3)
COMMODITY: CLAY (3)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPONENTS | 強熱減量 IGNITION LOSS | Ig loss | 19.8 (%) |
| | 酸化けい素 SILICEOUS MATERIAL | SiO2 | 49.6 (%) |
| | 酸化アルミニウム ALUMINA | Al2O3 | 16.2 (%) |
| | 酸化第二鉄 FERRIC OXIDE | Fe2O3 | 6.4 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 2.9 (%) |
| | 酸化マグネシウム MAGNESIUM OXIDE | MgO | 1.7 (%) |
| | 酸化ナトリウム SODIUM OXIDE | Na2O | 0.1 (%) |
| | 酸化カリウム PTASSIUM OXIDE | K2O | 1.9 (%) |
| | 合計 TOTAL | Total | 98.9 (%) |

## 石膏試験成績表

RESULT OF ANALYTICAL TEST OF GYPSUM

平成3年1月16日
JANUARY 16, 1991

国連工業開発機構御中
FOR MESSRS. UNIDO

福岡県田川市大字弓削田2877番地
2877, YUGETA-SI, FUKUOKA PREF.
麻生セメント株式会社 田川工場
TAGAWA MILL, ASO CEMENT CO., LTD.
生産課
PRODUCTION DEPT.

品名 石膏(1)
COMMODITY: GYPSUM (1)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPOSIT'N | 結合水 COMBINED MOISTURE | H2O | 20.5 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 31.5 (%) |
| | 三酸化硫黄 SULFUR TRIOXIDE | SO3 | 46.2 (%) |
| | 合計 TOTAL | Total | 98.2 (%) |
| 備考 NOTE | | | |

## 石膏試験成績表

RESULT OF ANALYTICAL TEST
OF GYPSUM

平成3年1月16日
JANUARY 16, 1991

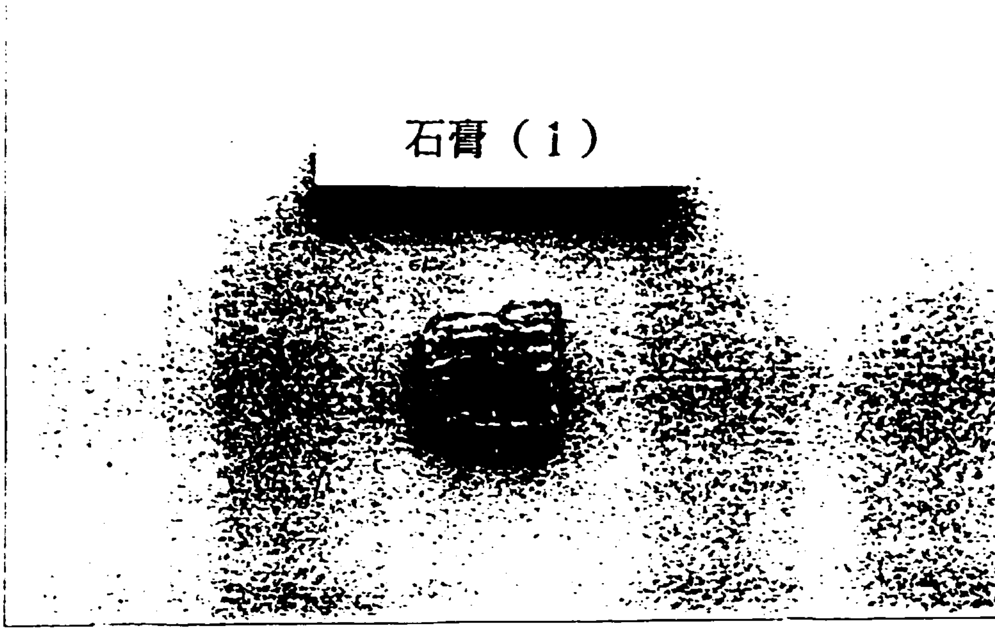
国連工業開発機構御中
FOR MESSRS. UNIDO

福岡県田川市大字弓削田2877番地
2877, YUGETA, FUKUOKA PREF.
麻生セメント株式会社 田川工場
TAGAWA MILL, ASO CEMENT CO., LTD.
生産課
PRODUCTION DEPT.

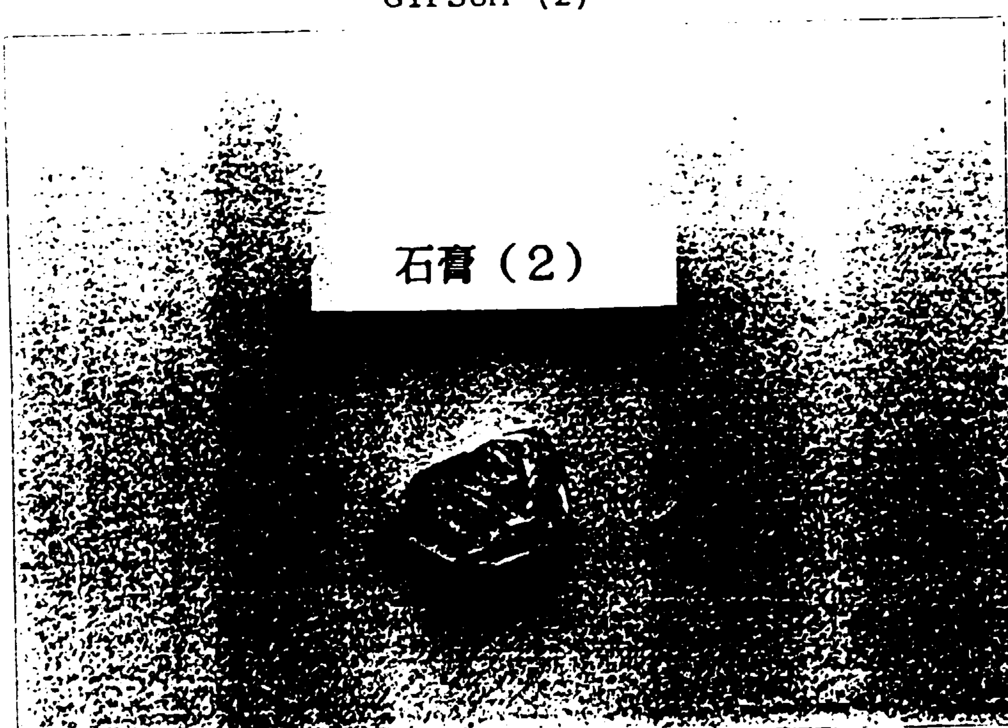
品名 石膏（2）
COMMODITY: GYPSUM (2)

| | | | |
|---|---|---|---|
| 化学成分 CHEMICAL COMPOSIT'N | 結合水 COMBINED MOISTURE | H20 | 0.5 (%) |
| | 酸化カルシウム CALCIUM OXIDE | CaO | 54.8 (%) |
| | 三酸化硫黄 SULFUR TRIOXIDE | SO3 | 0.5 (%) |
| | 合計 TOTAL | Total | 55.8 (%) |
| 備考 NOTE | | | |

GYPSUM (1)




GYPSUM (2)



CLAY (3)

粘土（3）

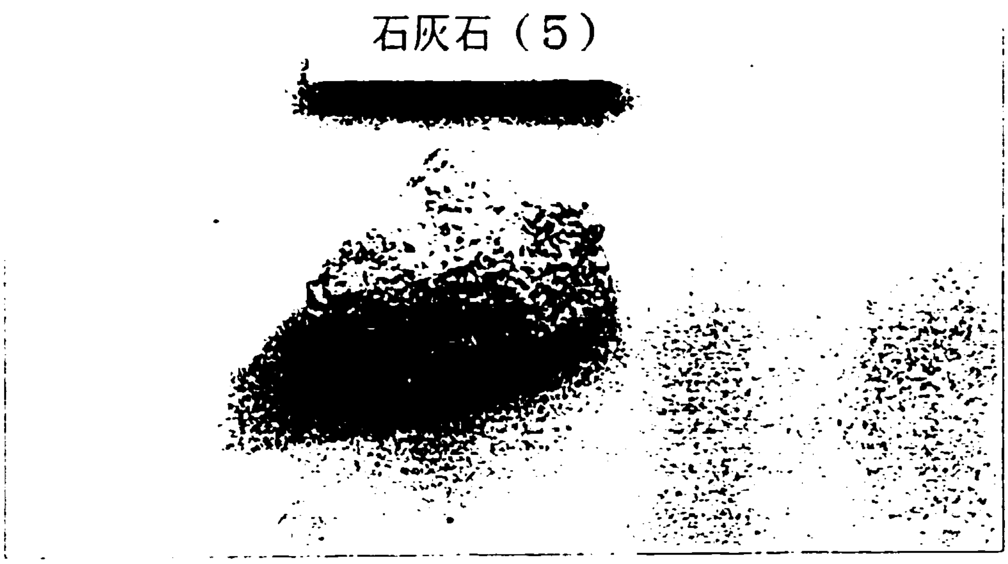
CLAY (1)

粘土（1）

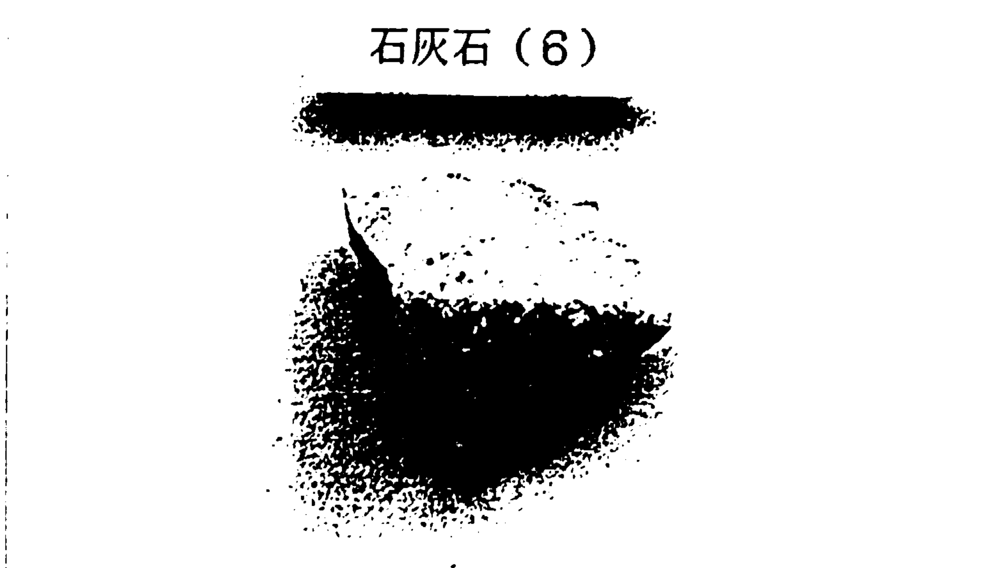
CLAY (2)

粘土（2）

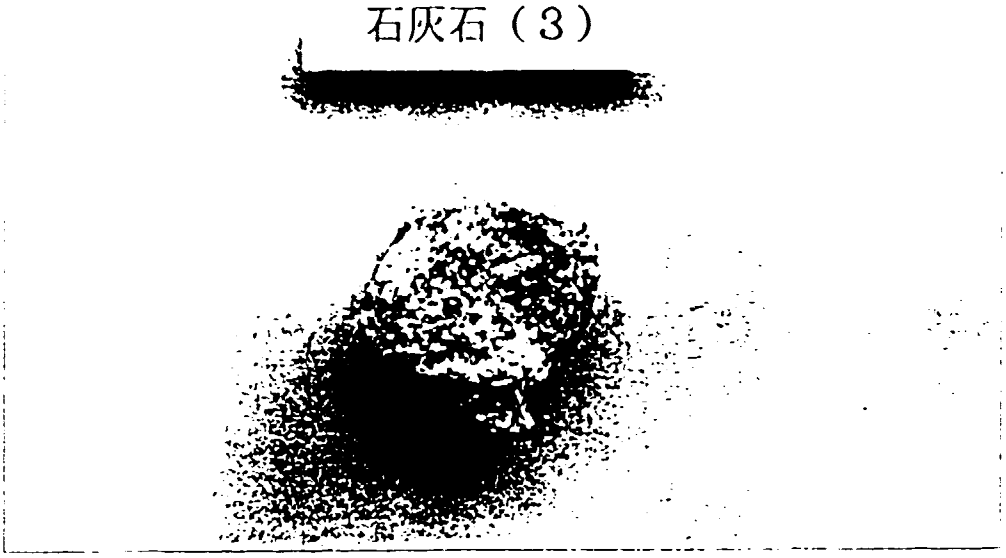
LIMESTONE (5)



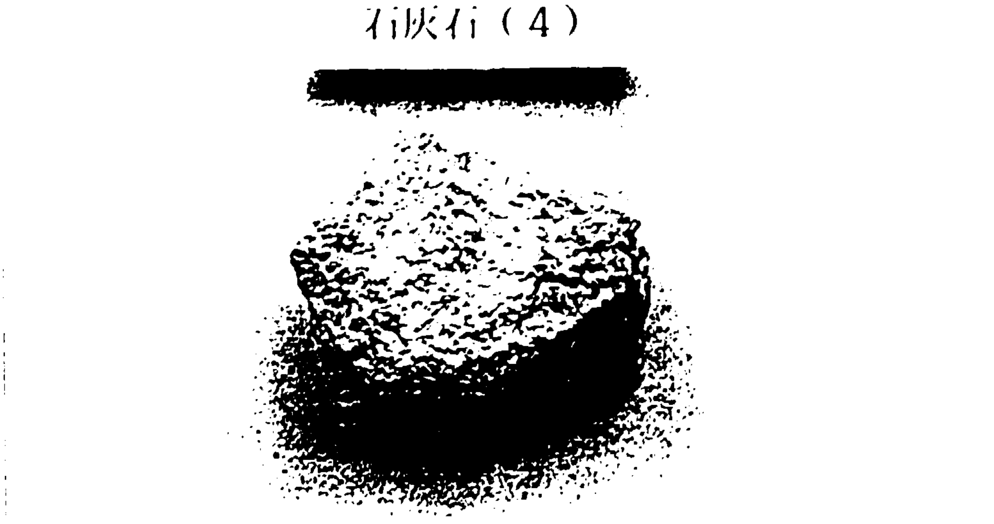

LIMESTONE (6)



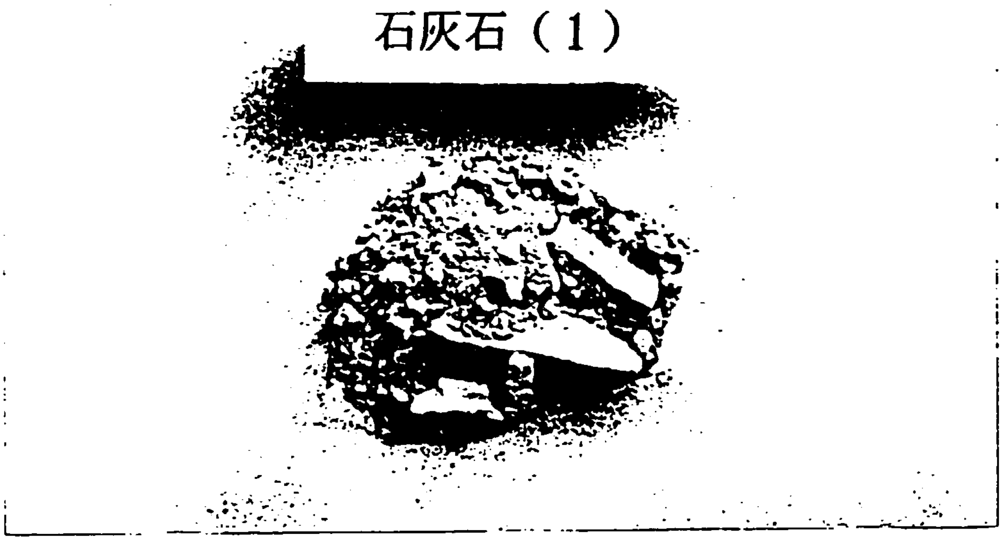
LIMESTONE (3)



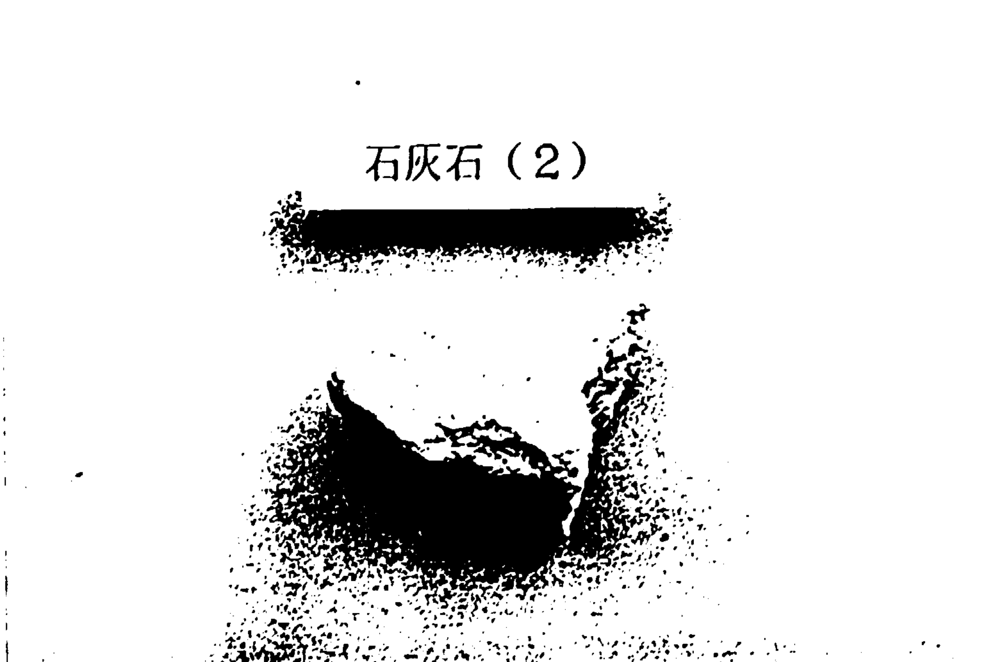
LIMESTONE (4)



LIMESTONE (1)




LIMESTONE (2)



APPENDIX X-1

Financial Projections
Case 1B, 2A, 2B, 3A, 3B

FINANCIAL PROJECTIONS

CASE 1B

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



PRODUCTION AND SALES PLAN

CASE 1-8 - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 0. | 0. | 0. | 0. | 0. | 400000. | 400000. | 400000. | 400000. | 400000. |
| CAPACITY UTILIZATION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.700 | 0.950 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 0 | 0 | 0 | 0 | 0 | 280000. | 380000 | 400000 | 400000 | 400000 |
| INCREASE IN INVENTORY | 0 | 0 | 0 | 0 | 0 | 23016 | 8220 | 1644 | 0 | 0 |
| SALES VOLUME (DOMESTIC CEMENT) | 0 | 0 | 0 | 0 | 0 | 150504 | 170919 | 193327 | 217927 | 244939 |
| UNIT SALES PRICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 |
| SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 24854 | 28226 | 31926 | 35988 | 40449 |
| SALES VOLUME (EXPORT CLINKER) | 0 | 0 | 0 | 0 | 0 | 112269 | 207435 | 212465 | 190455 | 164482 |
| UNIT SALES PRICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 |
| SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 4940 | 9127 | 9348 | 8380 | 7237 |
| TOTAL SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 29794 | 37353 | 41274 | 44368 | 47686 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

PRODUCTION AND SALES PLAN

CASE 1-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| CAPACITY UTILIZATION | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| INCREASE IN INVENTORY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES VOLUME (DOMESTIC CEMENT) | 274604 | 307189 | 342985 | 382322 | 416000 | 416000 | 416000 | 416000 | 416000 | 416000 |
| UNIT SALES PRICE | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 | 0.1651 |
| SALES REVENUE | 45348 | 50729 | 56641 | 63137 | 68698 | 68698 | 68698 | 68698 | 68698 | 68698 |
| SALES VOLUME (EXPORT CLINKER) | 135958 | 104626 | 70204 | 32383 | -0 | -0 | -0 | -0 | -0 | -0 |
| UNIT SALES PRICE | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 |
| SALES REVENUE | 5982 | 4604 | 3089 | 1425 | -0 | -0 | -0 | -0 | -0 | -0 |
| TOTAL SALES REVENUE | 51330 | 55333 | 59730 | 64561 | 68698 | 68698 | 68698 | 68698 | 68698 | 68698 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

PRODUCTION COST STATEMENTS

CASE 1-B — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 0 | 0 | 0 | 0 | 0 | 280000 | 380000 | 400000 | 400000 | 400000 |
| RAW MATERIALS | 0 | 0 | 0 | 0 | 0 | 512 | 695 | 732 | 732 | 732 |
| PYRITE CINDER | 0 | 0 | 0 | 0 | 0 | 134 | 182 | 192 | 192 | 192 |
| GYPSUM | 0 | 0 | 0 | 0 | 0 | 378 | 513 | 5[illegible] | 540 | 540 |
| UTILITIES | 0 | 0 | 0 | 0 | 0 | 5230 | 6848 | 7309 | 7493 | 7694 |
| FUEL (COAL) | 0 | 0 | 0 | 0 | 0 | 2915 | 3955 | 4164 | 4164 | 4164 |
| DIESEL OIL (CLINKER) | 0 | 0 | 0 | 0 | 0 | 575 | 917 | 911 | 810 | 700 |
| DIESEL OIL (CEMENT) | 0 | 0 | 0 | 0 | 0 | 1740 | 1976 | 2235 | 2519 | 2831 |
| CONSUMBLES | 0 | 0 | 0 | 0 | 0 | 160 | 209 | 223 | 229 | 236 |
| FIRE BRICKS | 0 | 0 | 0 | 0 | 0 | 63 | 85 | 89 | 89 | 89 |
| STEEL BALL | 0 | 0 | 0 | 0 | 0 | 18 | 20 | 23 | 26 | 29 |
| LUBE OIL | 0 | 0 | 0 | 0 | 0 | 18 | 21 | 24 | 27 | 30 |
| EXPLOSIVES | 0 | 0 | 0 | 0 | 0 | 61 | 83 | 88 | 88 | 88 |
| KRAFT PAPER SACK | 0 | 0 | 0 | 0 | 0 | 1763 | 2002 | 2264 | 2552 | 2868 |
| KRAFT PAPER SACK (TRUCK) | 0 | 0 | 0 | 0 | 0 | 821 | 932 | 1054 | 1188 | 1336 |
| KRAFT PAPER SACK (BOAT) | 0 | 0 | 0 | 0 | 0 | 942 | 1070 | 1210 | 1364 | 1533 |
| VARIABLE COST | 0 | 0 | 0 | 0 | 0 | 7664 | 9754 | 10528 | 11006 | 11530 |
| EMPLOYMENT COST | 0 | 0 | 0 | 0 | 0 | 343 | 343 | 343 | 343 | 343 |
| MAINTENANCE COST | 0 | 0 | 0 | 0 | 0 | 3277 | 3277 | 3277 | 3277 | 3277 |
| INSURANCE | 0 | 0 | 0 | 0 | 0 | 1328 | 1328 | 1328 | 1328 | 1328 |
| DIRECT FIXED COST | 0 | 0 | 0 | 0 | 0 | 4947 | 4947 | 4947 | 4947 | 4947 |
| CASH FACTORY COST | 0 | 0 | 0 | 0 | 0 | 12612 | 14702 | 15475 | 15953 | 16478 |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 7289 | 7289 | 7289 | 7289 | 7289 |
| QUARRY DEVELOPEMENT | 0 | 0 | 0 | 0 | 0 | 832 | 832 | 832 | 832 | 832 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 1046 | 1046 | 1046 | 1046 | 1046 |
| OFFSITE FACILITIES | 0 | 0 | 0 | 0 | 0 | 390 | 390 | 390 | 390 | 390 |
| FINISHING MILL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXPEXSES | 0 | 0 | 0 | 0 | 0 | 755 | 755 | 755 | 755 | 755 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 4400 | 4400 | 4400 | 4400 | 4400 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 14713 | 14713 | 14713 | 14713 | 14713 |
| TOTAL FACTORY COST | 0 | 0 | 0 | 0 | 0 | 27325 | 29415 | 30188 | 30666 | 31191 |
| UNIT FACTORY COST | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 0976 | 0 0774 | 0 0755 | 0 0767 | 0 0780 |
| SALES EXPENSES | 0 | 0 | 0 | 0 | 0 | 149 | 187 | 206 | 222 | 238 |
| TRANSPORTATION COST | 0 | 0 | 0 | 0 | 0 | 2694 | 3059 | 3461 | 3901 | 4384 |
| SALES EXPENSES/ADMINISTRATION | 0 | 0 | 0 | 0 | 0 | 2843 | 3246 | 3667 | 4123 | 4623 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6795 | 6098 | 5401 | 4704 | 4007 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 108 | 262 | 29 | 0 | 0 |
| TOTAL PRODUCTION COST | 0 | 0 | 0 | 0 | 0 | 37071 | 39021 | 39286 | 39493 | 39821 |
| UNIT PRODUCTION COST | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 1324 | 0 1027 | 0 0982 | 0 0987 | 0 0996 |

### *** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



### PRODUCTION COST STATEMENTS

CASE 1-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| RAW MATERIALS | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 | 732 |
| PYRITE CINDER | 192 | 192 | 192 | 192 | 192 | 192 | 192 | 192 | 192 | 192 |
| GYPSUM | 540 | 540 | 540 | 540 | 540 | 540 | 540 | 540 | 540 | 540 |
| UTILITIES | 7916 | 8159 | 8427 | 8720 | 8972 | 8972 | 8972 | 8972 | 8972 | 8972 |
| FUEL (COAL) | 4164 | 4164 | 4164 | 4164 | 4164 | 4164 | 4164 | 4164 | 4164 | 4164 |
| DIESEL OIL (CLINKER) | 578 | 445 | 299 | 138 | -0 | -0 | -0 | -0 | -0 | -0 |
| DIESEL OIL (CEMENT) | 3174 | 3551 | 3964 | 4419 | 4808 | 4808 | 4808 | 4808 | 4808 | 4808 |
| CONSUMBLES | 243 | 251 | 259 | 269 | 277 | 277 | 277 | 277 | 277 | 277 |
| FIRE BRICKS | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |
| STEEL BALL | 32 | 36 | 40 | 45 | 49 | 49 | 49 | 49 | 49 | 49 |
| LUBE OIL | 34 | 38 | 42 | 47 | 51 | 51 | 51 | 51 | 51 | 51 |
| EXPLOSIVES | 88 | 88 | 85 | 88 | 88 | 88 | 88 | 88 | 88 | 88 |
| KRAFT PAPER SACK | 3216 | 3597 | 4017 | 4477 | 4872 | 4872 | 4872 | 4872 | 4872 | 4872 |
| KRAFT PAPER SACK (TRUCK) | 1497 | 1675 | 1870 | 2085 | 2268 | 2268 | 2268 | 2268 | 2268 | 2268 |
| KRAFT PAPER SACK (BOAT) | 1719 | 1922 | 2147 | 2393 | 2603 | 2603 | 2603 | 2603 | 2603 | 2603 |
| VARIABLE COST | 12106 | 12739 | 13434 | 14198 | 14852 | 14852 | 14852 | 14852 | 14852 | 14852 |
| EMPLOYMENT COST | 343 | 343 | 343 | 343 | 343 | 343 | 343 | [illegible] | 343 | 343 |
| MAINTENANCE COST | 3277 | 3277 | 3277 | 3277 | 3277 | 3277 | 3277 | [illegible] | 3277 | 3277 |
| INSURANCE | 1328 | 1328 | 1328 | 1328 | 1328 | 1328 | 1328 | 1328 | 1328 | 1328 |
| DIRECT FIXED COST | 4947 | 4947 | 4947 | 4947 | 4947 | 4947 | 4947 | 4947 | 4947 | 4947 |
| CASH FACTORY COST | 17054 | 17687 | 18382 | 19146 | 19800 | 19800 | 19800 | 19800 | 19800 | 19800 |
| PLANT CONSTRUCTION | 7289 | 7289 | 7289 | 7289 | 7289 | 0 | 0 | 0 | 0 | 0 |
| QUARRY DEVELOPEMENT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UTILITY FACILITIES | 1046 | 1046 | 1046 | 1046 | 1046 | 0 | 0 | 0 | 0 | 0 |
| OFFSITE FACILITIES | 390 | 390 | 390 | 390 | 390 | 390 | 390 | 390 | 390 | 390 |
| FINISHING MILL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXPEXSES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIATION AND AMORTIZATION | 8726 | 8726 | 8726 | 8726 | 8726 | 390 | 390 | 390 | 390 | 390 |
| TOTAL FACTORY COST | 25780 | 26412 | 27108 | 27871 | 28525 | 20190 | 20190 | 20190 | 20190 | 20190 |
| UNIT FACTORY COST | 0 0644 | 0 0660 | 0 0678 | 0 0697 | 0 0713 | 0 0505 | 0 0505 | 0 0505 | 0 0505 | 0 0505 |
| SALES EXPENSES | 257 | 277 | 299 | 323 | 343 | 343 | 343 | 343 | 343 | 343 |
| TRANSPORTATION COST | 4915 | 5499 | 6139 | 6844 | 7446 | 7446 | 7446 | 7446 | 7446 | 7446 |
| SALES EXPENSES/ADMINISTRATION | 5172 | 5775 | 6438 | 7166 | 7790 | 7790 | 7790 | 7790 | 7790 | 7790 |
| INTEREST ON LONG TERM DEBT | 3310 | 2614 | 1917 | 1220 | 523 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL PRODUCTION COST | 34262 | 34801 | 35462 | 36257 | 36838 | 27980 | 27980 | 27980 | 27980 | 27980 |
| UNIT PRODUCTION COST | 0 0857 | 0 0870 | 0 0887 | 0 0906 | 0 0921 | 0 0699 | 0 0699 | 0 0699 | 0 0699 | 0 0699 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

WORKING CAPITAL STATEMENTS

CASE 1-B — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 0 | 0 | 0 | 0 | 0 | 6188 | 7629 | 8140 | 8417 | 8707 |
| ACCOUNT RECEIVABLE | 0 | 0 | 0 | 0 | 0 | 2855 | 3821 | 4161 | 4336 | 4515 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 0 | 0 | 0 | 0 | 0 | 2043 | 2320 | 2624 | 2958 | 3325 |
| ACCOUNT RECEIVABLE (EXPORT) | 0 | 0 | 0 | 0 | 0 | 812 | 1501 | 1537 | 1378 | 1190 |
| INVENTORIES | 0 | 0 | 0 | 0 | 0 | 3333 | 3808 | 3979 | 4081 | 4192 |
| PRODUCT INVENTORY | 0 | 0 | 0 | 0 | 0 | 2246 | 2418 | 2481 | 2521 | 2564 |
| MATERIAL INV (PAPER SACK) | 0 | 0 | 0 | 0 | 0 | 353 | 400 | 453 | 510 | 574 |
| MATERIAL INV (PYRITE.COAL) | 0 | 0 | 0 | 0 | 0 | 610 | 828 | 871 | 871 | 871 |
| MATERIAL INV (GYPSUM) | 0 | 0 | 0 | 0 | 0 | 35 | 51 | 54 | 54 | 54 |
| MATERIAL INV (DIESEL) | 0 | 0 | 0 | 0 | 0 | 39 | 48 | 53 | 56 | 59 |
| MATERIAL INV (CONSUMABLES) | 0 | 0 | 0 | 0 | 0 | 48 | 63 | 67 | 69 | 71 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CURRENT LIABILITIES W/O DEBT | 0 | 0 | 0 | 0 | 0 | 2299 | 2926 | 3158 | 3302 | 3459 |
| ACCOUNT PAYABLE | 0 | 0 | 0 | 0 | 0 | 2299 | 2926 | 3158 | 3302 | 3459 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERMANENT WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 3889 | 4702 | 4982 | 5115 | 5248 |
| CHANGE IN WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 3889 | 814 | 279 | 133 | 133 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
WORKING CAPITAL STATEMENTS

CASE 1-B — - BASE CASE - — (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 8534 | 8884 | 9269 | 9692 | 10054 | 9369 | 9369 | 9369 | 9369 | 9369 |
| ACCOUNT RECEIVABLE | 4711 | 4927 | 5164 | 5424 | 5647 | 5647 | 5647 | 5647 | 5647 | 5647 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 3728 | 4170 | 4656 | 5190 | 5647 | 5647 | 5647 | 5647 | 5647 | 5647 |
| ACCOUNT RECEIVABLE (EXPORT) | 983 | 757 | 508 | 234 | -0 | -0 | -0 | -0 | -0 | -0 |
| INVENTORIES | 3823 | 39[illegible]8 | 4106 | 4268 | 4407 | 3722 | 3722 | 3722 | 3722 | 3722 |
| PRODUCT INVENTORY | 2119 | 2171 | 2228 | 2291 | 2345 | 1660 | 1660 | 1660 | 1660 | 1660 |
| MATERIAL INV (PAPER SACK) | 643 | 719 | 803 | 895 | 974 | 974 | 974 | 974 | 974 | 974 |
| MATERIAL INV (PYRITE.COAL) | 871 | 871 | 871 | 871 | 871 | 871 | 871 | 871 | 871 | 871 |
| MATERIAL INV (GYPSUM) | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 |
| MATERIAL INV (DIESEL) | 63 | 67 | 71 | 76 | 80 | 80 | 80 | 80 | 80 | 80 |
| MATERIAL INV (CONSUMABLES) | 73 | 75 | 78 | 81 | 83 | 83 | 83 | 83 | 83 | 83 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CURRENT LIABILITIES W/O DEBT | 3632 | 3822 | 4030 | 4259 | 4456 | 4456 | 4456 | 4456 | 4456 | 4456 |
| ACCOUNT PAYABLE | 3632 | 3822 | 4030 | 4259 | 4456 | 4456 | 4456 | 4456 | 4456 | 4456 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERMANENT WORKING CAPITAL | 4902 | 5063 | 5239 | 5433 | 5599 | 4914 | 4914 | 4914 | 4914 | 4914 |
| CHANGE IN WORKING CAPITAL | -346 | 161 | 176 | 194 | 166 | -685 | 0 | 0 | 0 | 0 |

### *** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

INCOME STATEMENTS

CASE 1-B — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 0 | 0 | 0 | 0 | 0 | 29794 | 37353 | 41274 | 44368 | 47686 |
| TOTAL SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 29794 | 37353 | 41274 | 44368 | 47686 |
| COST OF SALES | 0 | 0 | 0 | 0 | 0 | 25079 | 29243 | 30125 | 30627 | 31147 |
| VARIABLE COST | 0 | 0 | 0 | 0 | 0 | 7564 | 9754 | 10528 | 11006 | 11530 |
| DIRECT FIXED COST | 0 | 0 | 0 | 0 | 0 | 4947 | 4947 | 4947 | 4947 | 4947 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 14713 | 14713 | 14713 | 14713 | 14713 |
| INC IN PRODUCT INVENTORY | 0 | 0 | 0 | 0 | 0 | 2246 | [illegible] | 64 | 39 | 43 |
| GROSS PROFIT ON SALES | 0 | 0 | 0 | 0 | 0 | 4716 | 8110 | 11150 | 13742 | 16539 |
| SALES EXPENSES/ADMINISTRATION | 0 | 0 | 0 | 0 | 0 | 2843 | 3246 | 3667 | 4123 | 4623 |
| OPERATING PROFIT | 0 | 0 | 0 | 0 | 0 | 1873 | 4864 | 7453 | 9619 | 11916 |
| NON-OPERATING EXPENSES | 0 | 0 | 0 | 0 | 0 | 6904 | 6361 | 5431 | 4704 | 4007 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6795 | 6098 | 5401 | 4704 | 4007 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 108 | 262 | 29 | 0 | 0 |
| NET PROFIT OR (LOSS) BEFORE TAX | 0 | -0 | -0 | 0 | 0 | -5031 | -1497 | 2052 | 4915 | 7909 |
| INCOME TAX | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) AFTER TAX | 0 | -0 | -0 | 0 | 0 | -5031 | -1497 | 2052 | 4915 | 7909 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RETAINED EARNINGS | 0 | -0 | -0 | 0 | 0 | -5031 | -1497 | 2052 | 4915 | 7909 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

INCOME STATEMENTS

CASE 1-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 51330 | 55333 | 59730 | 64561 | 68698 | 68698 | 68698 | 68698 | 68698 | 68698 |
| TOTAL SALES REVENUE | 51330 | 55333 | 59730 | 64561 | 68698 | 68698 | 68698 | 68698 | 68698 | 68698 |
| COST OF SALES | 26224 | 26360 | 27050 | 27809 | 28472 | 20875 | 20190 | 20190 | 20190 | 20190 |
| VARIABLE COST | 12106 | 12739 | 13434 | 14198 | 14852 | 14852 | 14852 | 14852 | 14852 | 14852 |
| DIRECT FIXED COST | 4947 | 4947 | 4947 | 4947 | 4947 | 4947 | 4947 | 4947 | 4947 | 4947 |
| DEPRECIATION AND AMORTIZATION | 8726 | 8726 | 8726 | 8726 | 8726 | 390 | 390 | 390 | 390 | 390 |
| INC IN PRODUCT INVENTORY | 445 | 52 | 57 | 63 | 64 | 686 | 0 | 0 | 0 | 0 |
| GROSS PROFIT ON SALES | 25106 | 28972 | 32680 | 36753 | 40227 | 47823 | 48508 | 48508 | 48508 | 48508 |
| SALES EXPENSES/ADMINISTRATION | 5172 | 5775 | 6438 | 7166 | 7790 | 7790 | 7790 | 7790 | 7790 | 7790 |
| OPERATING PROFIT | 19934 | 23197 | 26241 | 29586 | 32437 | 40033 | 40718 | 40718 | 40718 | 40718 |
| NON-OPERATING EXPENSES | 3310 | 2614 | 1917 | 1220 | 523 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 3310 | 2614 | 1917 | 1220 | 523 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) BEFORE TAX | 16623 | 20583 | 24325 | 28367 | 31914 | 40033 | 40718 | 40718 | 40718 | 40718 |
| INCOME TAX | 4987 | 6175 | 7297 | 8510 | 9574 | 12010 | 12216 | 12216 | 12216 | 12216 |
| NET PROFIT OR (LOSS) AFTER TAX | 11636 | 14408 | 17027 | 19857 | 22340 | 28023 | 28503 | 28503 | 28503 | 28503 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RETAINED EARNINGS | 11636 | 14408 | 17027 | 19857 | 22340 | 28023 | 28503 | 28503 | 28503 | 28503 |

### *** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



FUNDS FLOW STATEMENTS

CASE 1-B — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 226 | 1691 | 42560 | 46099 | 43619 | 20085 | 19967 | 22196 | 24332 | 26629 |
| CASH GENERATED | 0 | 0 | 0 | 0 | 0 | 16585 | 19577 | 22196 | 24332 | 26629 |
| PROFIT AFT. TAX. BFR INT | 0 | 0 | 0 | 0 | 0 | 1873 | 4864 | 7483 | 9619 | 11916 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 14713 | 14713 | 14713 | 14713 | 14713 |
| FINANCIAL RESOURCES | 226 | 1691 | 42560 | 46099 | 43619 | 3499 | 390 | 0 | 0 | 0 |
| SHARE CAPITAL | 68 | 507 | 12768 | 13830 | 12653 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT | 158 | 1184 | 29792 | 32270 | 29523 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 1444 | 3499 | 390 | 0 | 0 | 0 |
| USES OF FUNDS | 226 | 1691 | 42560 | 46099 | 42175 | 21529 | 19967 | 15392 | 14130 | 13433 |
| FIXED CAPITAL EXPENDITURE | 226 | 1691 | 42560 | 46099 | 42175 | 0 | 0 | 0 | 0 | 0 |
| NON-DEPRECIABLE ASSETS | 0 | 825 | 700 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIABLE FIXED ASSETS | 220 | 740 | 36675 | 38364 | 33228 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 6 | 126 | 5185 | 7735 | 8947 | 0 | 0 | 0 | 0 | 0 |
| CHANGE IN WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 3889 | 814 | 279 | 133 | 133 |
| DEBT SERVICES | 0 | 0 | 0 | 0 | 0 | 17640 | 19153 | 15113 | 13997 | 13300 |
| REPAYMENT OF LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 9293 | 9293 | 9293 | 9293 | 9293 |
| REPAYMENT OF SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 1444 | 3499 | 390 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6795 | 6098 | 5401 | 4704 | 4007 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 108 | 262 | 29 | 0 | 0 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CASH INCREASE OR (DECREASE) | 0 | 0 | 0 | -0 | 1444 | -1444 | 0 | 6803 | 10202 | 13196 |
| BEGINNING CASH BALANCE | 0 | 0 | 0 | 0 | 0 | 1444 | 0 | 0 | 6803 | 17005 |
| ENDING CASH BALANCE | 0 | 0 | 0 | 0 | 1444 | 0 | 0 | 6803 | 17005 | 30201 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

FUNDS FLOW STATEMENTS

CASE 1-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 23673 | 25748 | 27670 | 29802 | 31588 | 28414 | 28893 | 28893 | 28893 | 28893 |
| CASH GENERATED | 23673 | 25748 | 27670 | 29802 | 31588 | 28414 | 28893 | 28893 | 28893 | 28893 |
| PROFIT AFT. TAX. BFR INT | 14947 | 17022 | 18944 | 21076 | 22862 | 28023 | 28503 | 28503 | 28503 | 28503 |
| DEPRECIATION AND AMORTIZATION | 8726 | 8726 | 8726 | 8726 | 8726 | 390 | 390 | 390 | 390 | 390 |
| FINANCIAL RESOURCES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHARE CAPITAL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| USES OF FUNDS | 12257 | 12067 | 11386 | 10706 | 9981 | -685 | 0 | 0 | 0 | 0 |
| FIXED CAPITAL EXPENDITURE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NON-DEPRECIABLE ASSETS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIABLE FIXED ASSETS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CHANGE IN WORKING CAPITAL | -346 | 161 | 176 | 194 | 166 | -685 | 0 | 0 | 0 | 0 |
| DEBT SERVICES | 12603 | 11906 | 11209 | 10512 | 9815 | 0 | 0 | 0 | 0 | 0 |
| REPAYMENT OF LONG TERM DEBT | 9293 | 9293 | 9293 | 9293 | 9293 | 0 | 0 | 0 | 0 | 0 |
| REPAYMENT OF SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 3310 | 2614 | 1917 | 1220 | 523 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CASH INCREASE OR (DECREASE) | 11415 | 13681 | 16284 | 19096 | 21607 | 29099 | 28893 | 28893 | 28893 | 28893 |
| BEGINNING CASH BALANCE | 30201 | 41616 | 55297 | 71581 | 90677 | 112284 | 141383 | 170276 | 199170 | 228063 |
| ENDING CASH BALANCE | 41616 | 55297 | 71581 | 90677 | 112284 | 141383 | 170276 | 199170 | 228063 | 256956 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

BALANCE SHEET

CASE 1-B — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 226 | 1917 | 44477 | 90577 | 134196 | 124227 | 110955 | 103557 | 99322 | 98095 |
| CURRENT ASSETS | 0 | 0 | 0 | 0 | 0 | 6188 | 7629 | 8140 | 8417 | 8707 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ACCOUNT RECEIVABLE | 0 | 0 | 0 | 0 | 0 | 2855 | 3821 | 4161 | 4336 | 4515 |
| INVENTORIES | 0 | 0 | 0 | 0 | 0 | 3333 | 3808 | 3979 | 4081 | 4192 |
| ACC EXCESS CASH | 0 | 0 | 0 | 0 | 1444 | 0 | 0 | 6803 | 17005 | 30201 |
| NET FIXED ASSETS | 226 | 1917 | 44477 | 90577 | 132752 | 118039 | 103326 | 88613 | 73901 | 59188 |
| INVESTMENT | 226 | 1917 | 44477 | 90577 | 132752 | 132752 | 132752 | 132752 | 132752 | 132752 |
| NON-DEPR ASSETS | 0 | 825 | 1525 | 1525 | 1525 | 1525 | 1525 | 1525 | 1525 | 1525 |
| DEPRECIABLE ASSETS | 220 | 960 | 37635 | 76000 | 109228 | 109228 | 109228 | 109228 | 109228 | 109228 |
| INTEREST DRG CONSTR | 6 | 132 | 5317 | 13052 | 21999 | 21999 | 21999 | 21999 | 21999 | 21999 |
| LESS ACC DEPRECIATION | 0 | 0 | 0 | 0 | 0 | 14713 | 29426 | 44139 | 58851 | 73564 |
| LIABILITIES | 158 | 1342 | 31134 | 63404 | 94370 | 89432 | 77657 | 68207 | 59058 | 49922 |
| CURRENT LIABILITIES | 0 | 0 | 0 | 0 | 10737 | 15091 | 12609 | 12451 | 12594 | 12752 |
| ACCOUNT PAYABLE | 0 | 0 | 0 | 0 | 0 | 2299 | 2926 | 3158 | 3302 | 3459 |
| CURRENT PORTION OF L/T DEBT | 0 | 0 | 0 | 0 | 9293 | 9293 | 9293 | 9293 | 9293 | 9293 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 1444 | 3499 | 390 | 0 | 0 | 0 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FIXED LIABILITIES | 158 | 1342 | 31134 | 63404 | 83634 | 74341 | 65048 | 55756 | 46463 | 37171 |
| LONG TERM DEBT BALANCE | 158 | 1342 | 31134 | 63404 | 83634 | 74341 | 65048 | 55756 | 46463 | 37171 |
| OTHER FIXED LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STOCK HOLDERS EQUITY | 68 | 575 | 13343 | 27173 | 39826 | 34795 | 33298 | 35350 | 40264 | 48173 |
| SHARE CAPITAL | 68 | 575 | 13343 | 27173 | 39826 | 39826 | 39826 | 39826 | 39826 | 39826 |
| ACC RETAINED EARNINGS | 0 | -0 | -0 | -0 | -0 | -5031 | -6528 | -4476 | 439 | 8347 |
| LIABILITIES & S/H EQUITY | 226 | 1917 | 44477 | 90577 | 134196 | 124227 | 110955 | 103557 | 99322 | 98095 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



BALANCE SHEET

CASE 1-B — - BASE CASE - — (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 100612 | 105917 | 113861 | 124654 | 137897 | 165921 | 194423 | 222926 | 251429 | 279932 |
| CURRENT ASSETS | 8534 | 8884 | 9269 | 9692 | 10054 | 9369 | 9369 | 9369 | 9369 | 9369 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ACCOUNT RECEIVABLE | 4711 | 4927 | 5164 | 5424 | 5647 | 5647 | 5647 | 5647 | 5647 | 5647 |
| INVENTORIES | 3823 | 3958 | 4105 | 4268 | 4407 | 3722 | 3722 | 3722 | 3722 | 3722 |
| ACC. EXCESS CASH | 41616 | 55297 | 71581 | 90677 | 112284 | 141383 | 170276 | 199170 | 228063 | 256956 |
| NET FIXED ASSETS | 50462 | 41736 | 33010 | 24284 | 15558 | 15168 | 14778 | 14387 | 13997 | 13606 |
| INVESTMENT | 132752 | 132752 | 132752 | 132752 | 132752 | 132752 | 132752 | 132752 | 132752 | 132752 |
| NON-DEPR. ASSETS | 1525 | 1525 | 1525 | 1525 | 1525 | 1525 | 1525 | 1525 | 1525 | 1525 |
| DEPRECIABLE ASSETS | 109228 | 109228 | 109228 | 109228 | 109228 | 109228 | 109228 | 109228 | 109228 | 109228 |
| INTEREST DRG CONSTR | 21999 | 21999 | 21999 | 21999 | 21999 | 21999 | 21999 | 21999 | 21999 | 21999 |
| LESS: ACC. DEPRECIATION | 82290 | 91016 | 99742 | 108468 | 117194 | 117584 | 117974 | 118365 | 118755 | 119146 |
| LIABILITIES | 40803 | 31700 | 22616 | 13552 | 4456 | 4456 | 4456 | 4456 | 4456 | 4456 |
| CURRENT LIABILITIES | 12925 | 13114 | 13323 | 13552 | 4456 | 4456 | 4456 | 4456 | 4456 | 4456 |
| ACCOUNT PAYABLE | 3632 | 3822 | 4030 | 4259 | 4456 | 4456 | 4456 | 4456 | 4456 | 4456 |
| CURRENT PORTION OF L/T DEBT | 9293 | 9293 | 9293 | 9293 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FIXED LIABILITIES | 27878 | 18585 | 9293 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT BALANCE | 27878 | 18585 | 9293 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHER FIXED LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STOCK HOLDERS EQUITY | 59809 | 74218 | 91245 | 111102 | 133442 | 161465 | 189968 | 218470 | 246973 | 275476 |
| SHARE CAPITAL | 39826 | 39826 | 39826 | 39826 | 39826 | 39826 | 39826 | 39826 | 39826 | 39826 |
| ACC. RETAINED EARNINGS | 19984 | 34392 | 51419 | 71276 | 93616 | 121639 | 150142 | 178645 | 207148 | 235651 |
| LIABILITIES & S/H EQUITY | 100612 | 105917 | 113861 | 124654 | 137897 | 165921 | 194423 | 222926 | 251429 | 279932 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
LONG TERM DEBT
CASE 1-B - BASE CASE - (USD 1000)

AMOUNT OF DEBT 92926.

INTEREST RATE 7.500 PER CENT/YEAR

REPAYMENT 10 YEAR-EQUAL-INSTALLMENT-REPAYMENT (SEMI ANNUAL)

| YEAR | SER NO | PRINCIPAL | INTEREST | DEBT SERVICE | BALANCE AFT PAYMENT |
|---|---|---|---|---|---|
| 1992 | 1 | 0 | 0 | 0 | 79 |
| | 2 | 0 | 0 | 0 | 158 |
| 1993 | 3 | 0 | 0 | 0 | 750 |
| | 4 | 0 | 0 | 0 | 1342 |
| 1994 | 5 | 0 | 0 | 0 | 16238 |
| | 6 | 0 | 0 | 0 | 31134 |
| 1995 | 7 | 0 | 0 | 0 | 47269 |
| | 8 | 0 | 0 | 0 | 63404 |
| 1996 | 9 | 0 | 0 | 0 | 78165 |
| | 10 | 0 | 0 | 0 | 92926 |
| 1997 | 11 | 4646 | 3485 | 8131 | 88280 |
| | 12 | 4646 | 3310 | 7957 | 83634 |
| 1998 | 13 | 4646 | 3136 | 7783 | 78987 |
| | 14 | 4646 | 2962 | 7608 | 74341 |
| 1999 | 15 | 4646 | 2788 | 7434 | 69695 |
| | 16 | 4646 | 2614 | 7260 | 65048 |
| 2000 | 17 | 4646 | 2439 | 7086 | 60402 |
| | 18 | 4646 | 2265 | 6911 | 55756 |
| 2001 | 19 | 4646 | 2091 | 6737 | 51109 |
| | 20 | 4646 | 1917 | 6563 | 46463 |
| 2002 | 21 | 4646 | 1742 | 6389 | 41817 |
| | 22 | 4646 | 1568 | 6214 | 37171 |
| 2003 | 23 | 4646 | 1394 | 6040 | 32524 |
| | 24 | 4646 | 1220 | 5866 | 27878 |
| 2004 | 25 | 4646 | 1045 | 5692 | 23232 |
| | 26 | 4646 | 871 | 5517 | 18585 |
| 2005 | 27 | 4646 | 697 | 5343 | 13939 |
| | 28 | 4646 | 523 | 5169 | 9293 |
| 2006 | 29 | 4646 | 348 | 4995 | 4646 |
| | 30 | 4646 | 174 | 4821 | 0 |
| 2007 | 31 | 0 | 0 | 0 | 0 |
| | 32 | 0 | 0 | 0 | 0 |
| 2008 | 33 | 0 | 0 | 0 | 0 |
| | 34 | 0 | 0 | 0 | 0 |
| 2009 | 35 | 0 | 0 | 0 | 0 |
| | 36 | 0 | 0 | 0 | 0 |
| 2010 | 37 | 0 | 0 | 0 | 0 |
| | 38 | 0 | 0 | 0 | 0 |
| 2011 | 39 | 0 | 0 | 0 | 0 |
| | 40 | 0 | 0 | 0 | 0 |
| TOTAL | | 92926 | 36590 | 129516 | 0 |

FINANCIAL PROJECTIONS

CASE 2A

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

PRODUCTION AND SALES PLAN

CASE 2-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 0. | 0. | 0. | 0. | 0 | 300000. | 300000. | 300000 | 300000. | 300000 |
| CAPACITY UTILIZATION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.700 | 0.950 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 0. | 0. | 0. | 0. | 0 | 210000. | 285000. | 300000. | 300000 | 300000 |
| INCREASE IN INVENTORY | 0. | 0 | 0. | 0. | 0. | 17262 | 8165 | 1233 | 0 | 0 |
| SALES VOLUME (DOMESTIC CEMENT) | 0 | 0 | 0 | 0 | 0 | 150504 | 170919 | 193327 | 217927 | 244939 |
| UNIT SALES PRICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 |
| SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 24082 | 27349 | 30934 | 34870 | 39193 |
| SALES VOLUME (EXPORT CEMENT) | 0 | 0 | 0 | 0 | 0 | 49944 | 119069 | 117391 | 94073 | 67061 |
| UNIT SALES PRICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 |
| SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 4220 | 10061 | 9920 | 7949 | 5667 |
| TOTAL SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 28302 | 37410 | 40854 | 42820 | 44859 |

PRODUCTION AND SALES PLAN

CASE 2-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| CAPACITY UTILIZATION | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| INCREASE IN INVENTORY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES VOLUME (DOMESTIC CEMENT) | 274604 | 312000 | 312000 | 312000 | 312000 | 312000 | 312000 | 312000 | 312000 | 312000 |
| UNIT SALES PRICE | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 |
| SALES REVENUE | 43939 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 |
| SALES VOLUME (EXPORT CEMENT) | 37396 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 |
| UNIT SALES PRICE | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 |
| SALES REVENUE | 3160 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 |
| TOTAL SALES REVENUE | 47099 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** PAGE 1

PRODUCTION COST STATEMENTS

CASE 2-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 0 | 0 | 0 | 0 | 0 | 210000 | 285000 | 300000 | 300000 | 300000 |
| RAW MATERIALS | 0 | 0 | 0 | 0 | 0 | 1123 | 1524 | 1604 | 1604 | 1604 |
| PYRITE CINDER | 0 | 0 | 0 | 0 | 0 | 304 | 412 | 434 | 434 | 434 |
| GYPSUM | 0 | 0 | 0 | 0 | 0 | 819 | 1112 | 1170 | 1170 | 1170 |
| UTILITIES | 0 | 0 | 0 | 0 | 0 | 5183 | 7169 | 7587 | 7596 | 7596 |
| FUEL (COAL) | 0 | 0 | 0 | 0 | 0 | 2793 | 3790 | 3990 | 3990 | 3990 |
| DIESEL OIL (CLINKER) | 0 | 0 | 0 | 0 | 0 | 73 | 26 | 5 | 0 | 0 |
| DIESEL OIL (CEMENT) | 0 | 0 | 0 | 0 | 0 | 2317 | 3352 | 3591 | 3606 | 3606 |
| CONSUMBLES | 0 | 0 | 0 | 0 | 0 | 141 | 196 | 207 | 207 | 207 |
| FIRE BRICKS | 0 | 0 | 0 | 0 | 0 | 47 | 64 | 67 | 67 | 67 |
| STEEL BALL | 0 | 0 | 0 | 0 | 0 | 24 | 34 | 36 | 37 | 37 |
| LUBE OIL | 0 | 0 | 0 | 0 | 0 | 25 | 36 | 38 | 38 | 38 |
| EXPLOSIVES | 0 | 0 | 0 | 0 | 0 | 46 | 62 | 66 | 66 | 66 |
| KRAFT PAPER SACK | 0 | 0 | 0 | 0 | 0 | 2669 | 4070 | 4315 | 4226 | 4105 |
| KRAFT PAPER SACK (TRUCK) | 0 | 0 | 0 | 0 | 0 | 451 | 512 | 579 | 652 | 733 |
| KRAFT PAPER SACK (BOAT) | 0 | 0 | 0 | 0 | 0 | 1384 | 1572 | 1778 | 2004 | 2252 |
| KRAFT PAPER SACK (EXPORT) | 0 | 0 | 0 | 0 | 0 | 833 | 1987 | 1959 | 1570 | 1119 |
| VARIABLE COST | 0 | 0 | 0 | 0 | 0 | 9115 | 12958 | 13713 | 13634 | 13512 |
| EMPLOYMENT COST | 0 | 0 | 0 | 0 | 0 | 369 | 369 | 369 | 369 | 369 |
| MAINTENANCE COST | 0 | 0 | 0 | 0 | 0 | 2979 | 2979 | 2979 | 2979 | 2979 |
| INSURANCE | 0 | 0 | 0 | 0 | 0 | 1201 | 1201 | 1201 | 1201 | 1201 |
| DIRECT FIXED COST | 0 | 0 | 0 | 0 | 0 | 4549 | 4549 | 4549 | 4549 | 4549 |
| CASH FACTORY COST | 0 | 0 | 0 | 0 | 0 | 13664 | 17507 | 18262 | 18183 | 18062 |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 6655 | 6655 | 6655 | 6655 | 6655 |
| QUARRY DEVELOPEMENT | 0 | 0 | 0 | 0 | 0 | 602 | 602 | 602 | 602 | 602 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 899 | 899 | 899 | 899 | 899 |
| OFFSITE FACILITIES | 0 | 0 | 0 | 0 | 0 | 385 | 385 | 385 | 385 | 385 |
| FINISHING MILL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXPEXSES | 0 | 0 | 0 | 0 | 0 | 760 | 760 | 760 | 760 | 760 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 3987 | 3987 | 3987 | 3987 | 3987 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 13288 | 13288 | 13288 | 13288 | 13288 |
| TOTAL FACTORY COST | 0 | 0 | 0 | 0 | 0 | 26952 | 30795 | 31550 | 31471 | 31349 |
| UNIT FACTORY COST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1283 | 0.1081 | 0.1052 | 0.1049 | 0.1045 |
| SALES EXPENSES | 0 | 0 | 0 | 0 | 0 | 142 | 187 | 204 | 214 | 224 |
| TRANSPORTATION COST | 0 | 0 | 0 | 0 | 0 | 3714 | 4219 | 4771 | 5378 | 6045 |
| SALES EXPENSES/ADMINISTRATION | 0 | 0 | 0 | 0 | 0 | 3856 | 4405 | 4976 | 5593 | 6269 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6149 | 5518 | 4888 | 4257 | 3626 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 99 | 385 | 341 | 57 | 0 |
| TOTAL PRODUCTION COST | 0 | 0 | 0 | 0 | 0 | 37056 | 41104 | 41757 | 41378 | 41245 |
| UNIT PRODUCTION COST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1765 | 0.1442 | 0.1392 | 0.1379 | 0.1375 |

PRODUCTION COST STATEMENTS

CASE 2-A    - BASE CASE -    (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 300000 | 300000 | 300000 | 300000. | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| RAW MATERIALS | 1604 | 1604 | 1604 | 1604 | 1604 | 1604 | 1604 | 1604 | 1604 | 1604 |
| PYRITE CINDER | 434 | 434 | 434 | 434 | 434 | 434 | 434 | 434 | 434 | 434 |
| GYPSUM | 1170 | 1170 | 1170 | 1170 | 1170 | 1170 | 1170 | 1170 | 1170 | 1170 |
| UTILITIES | 7596 | 7596 | 7596 | 7596 | 7596 | 7596 | 7596 | 7596 | 7596 | 7596 |
| FUEL (COAL) | 3990 | 3990 | 3990 | 3990 | 3990 | 3990 | 3990 | 3990 | 3990 | 3990 |
| DIESEL OIL (CLINKER) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DIESEL OIL (CEMENT) | 3606 | 3606 | 3606 | 3606 | 3606 | 3606 | 3606 | 3606 | 3606 | 3606 |
| CONSUMBLES | 207 | 207 | 207 | 207 | 207 | 207 | 207 | 207 | 207 | 207 |
| FIRE BRICKS | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 |
| STEEL BALL | 37 | 37 | 37 | 37 | 37 | 37 | 37 | 37 | 37 | 37 |
| LUBE OIL | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 |
| EXPLOSIVES | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 |
| KRAFT PAPER SACK | 3971 | 3803 | 3803 | 3803 | 3803 | 3803 | 3803 | 3803 | 3803 | 3803 |
| KRAFT PAPER SACK (TRUCK) | 822 | 934 | 934 | 934 | 934 | 934 | 934 | 934 | 934 | 934 |
| KRAFT PAPER SACK (BOAT) | 2525 | 2869 | 2869 | 2869 | 2869 | 2869 | 2869 | 2869 | 2869 | 2869 |
| KRAFT PAPER SACK (EXPORT) | 624 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 |
| VARIABLE COST | 13379 | 13211 | 13211 | 13211 | 13211 | 13211 | 13211 | 13211 | 13211 | 13211 |
| EMPLOYMENT COST | 369 | 369 | 369 | 369 | 369 | 369 | 369 | 369 | 369 | 369 |
| MAINTENANCE COST | 2979 | 2979 | 2979 | 2979 | 2979 | 2979 | 2979 | 2979 | 2979 | 2979 |
| INSURANCE | 1201 | 1201 | 1201 | 1201 | 1201 | 1201 | 1201 | 1201 | 1201 | 1201 |
| DIRECT FIXED COST | 4549 | 4549 | 4549 | 4549 | 4549 | 4549 | 4549 | 4549 | 4549 | 4549 |
| CASH FACTORY COST | 17928 | 17760 | 17760 | 17760. | 17760 | 17760 | 17760 | 17760 | 17760 | 17760 |
| PLANT CONSTRUCTION | 6655 | 6655 | 6655 | 6655 | 6655 | 0 | 0 | 0 | 0 | 0 |
| QUARRY DEVELOPEMENT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UTILITY FACILITIES | 899 | 899 | 899 | 899 | 899 | 0 | 0 | 0 | 0 | 0 |
| OFFSITE FACILITIES | 385 | 385 | 385 | 385 | 385 | 385 | 385 | 385 | 385 | 385 |
| FINISHING MILL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXPEXSES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIATION AND AMORTIZATION | 7939 | 7939 | 7939 | 7939 | 7939 | 385 | 385 | 385 | 385 | 385 |
| TOTAL FACTORY COST | 25867 | 25699 | 25699 | 25699 | 25699 | 18145 | 18145 | 18145 | 18145 | 18145 |
| UNIT FACTORY COST | 0 0862 | 0 0857 | 0 0857 | 0 0857 | 0 0857 | 0 0605 | 0 0605 | 0 0605 | 0 0605 | 0 0605 |
| SALES EXPENSES | 235 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| TRANSPORTATION COST | 6777 | 7700 | 7700 | 7700 | 7700 | 7700 | 7700 | 7700 | 7700 | 7700 |
| SALES EXPENSES/ADMINISTRATION | 7013 | 7950 | 7950 | 7950 | 7950 | 7950 | 7950 | 7950 | 7950 | 7950 |
| INTEREST ON LONG TERM DEBT | 2996 | 2365 | 1734 | 1104 | 473 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL PRODUCTION COST | 35876 | 36014 | 35383 | 34753 | 34122 | 26095 | 26095 | 26095 | 26095 | 26095 |
| UNIT PRODUCTION COST | 0 1196 | 0 1200 | 0 1179 | 0 1158 | 0 1137 | 0 0870 | 0 0870 | 0 0870 | 0 0870 | 0 0870 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

WORKING CAPITAL STATEMENTS

CASE 2-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 0 | 0 | 0 | 0 | 0 | 6206 | 8314 | 8754 | 8730 | 8675 |
| ACCOUNT RECEIVABLE | 0 | 0 | 0 | 0 | 0 | 2673 | 3902 | 4174 | 4173 | 4153 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 0 | 0 | 0 | 0 | 0 | 1980 | 2248 | 2543 | 2866 | 3222 |
| ACCOUNT RECEIVABLE (EXPORT) | 0 | 0 | 0 | 0 | 0 | 694 | 1654 | 1631 | 1307 | 932 |
| INVENTORIES | 0 | 0 | 0 | 0 | 0 | 3532 | 4412 | 4580 | 4556 | 4522 |
| PRODUCT INVENTORY | 0 | 0 | 0 | 0 | 0 | 2215 | 2531 | 2593 | 2587 | 2577 |
| MATERIAL INV (PAPER SACK) | 0 | 0 | 0 | 0 | 0 | 534 | 814 | 863 | 845 | 821 |
| MATERIAL INV (PYRITE.COAL) | 0 | 0 | 0 | 0 | 0 | 619 | 840 | 885 | 885 | 885 |
| MATERIAL INV (GYPSUM) | 0 | 0 | 0 | 0 | 0 | 82 | 111 | 117 | 117 | 117 |
| MATERIAL INV (DIESEL) | 0 | 0 | 0 | 0 | 0 | 40 | 56 | 60 | 60 | 60 |
| MATERIAL INV (CONSUMABLES) | 0 | 0 | 0 | 0 | 0 | 42 | 59 | 62 | 62 | 62 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CURRENT LIABILITIES W/O DEBT | 0 | 0 | 0 | 0 | 0 | 2735 | 3887 | 4114 | 4090 | 4054 |
| ACCOUNT PAYABLE | 0 | 0 | 0 | 0 | 0 | 2735 | 3887 | 4114 | 4090 | 4054 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERMANENT WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 3471 | 4427 | 4640 | 4639 | 4622 |
| CHANGE IN WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 3471 | 956 | 213 | -1 | -18 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

WORKING CAPITAL STATEMENTS

CASE 2-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 8176 | 8101 | 8101 | 8101 | 8101 | 7480 | 7480 | 7480 | 7480 | 7480 |
| ACCOUNT RECEIVABLE | 4131 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 3612 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 |
| ACCOUNT RECEIVABLE (EXPORT) | 519 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 |
| INVENTORIES | 4045 | 3997 | 3997 | 3997 | 3997 | 3376 | 3376 | 3376 | 3376 | 3376 |
| PRODUCT INVENTORY | 2126 | 2112 | 2112 | 2112 | 2112 | 1492 | 1492 | 1492 | 1492 | 1492 |
| MATERIAL INV (PAPER SACK) | 794 | 761 | 761 | 761 | 761 | 761 | 761 | 761 | 761 | 761 |
| MATERIAL INV (PYRITE.COAL) | 885 | 885 | 885 | 885 | 885 | 885 | 885 | 885 | 885 | 885 |
| MATERIAL INV (GYPSUM) | 117 | 117 | 117 | 117 | 117 | 117 | 117 | 117 | 117 | 117 |
| MATERIAL INV (DIESEL) | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| MATERIAL INV (CONSUMABLES) | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CURRENT LIABILITIES W/O DEBT | 4014 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 |
| ACCOUNT PAYABLE | 4014 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERMANENT WORKING CAPITAL | 4162 | 4138 | 4138 | 4138 | 4138 | 3517 | 3517 | 3517 | 3517 | 3517 |
| CHANGE IN WORKING CAPITAL | -459 | -25 | 0 | 0 | 0 | -621 | 0 | 0 | 0 | 0 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

INCOME STATEMENTS

CASE 2-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 0 | 0 | 0 | 0 | 0 | 28302 | 37410 | 40854 | 42820 | 44859 |
| TOTAL SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 28302 | 37410 | 40854 | 42820 | 44859 |
| COST OF SALES | 0 | 0 | 0 | 0 | 0 | 24737 | 30479 | 31488 | 31477 | 31359 |
| VARIABLE COST | 0 | 0 | 0 | 0 | 0 | 9115 | 12958 | 13713 | 13634 | 13512 |
| DIRECT FIXED COST | 0 | 0 | 0 | 0 | 0 | 4549 | 4549 | 4549 | 4549 | 4549 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 13288 | 13288 | 13288 | 13288 | 13288 |
| INC IN PRODUCT INVENTORY | 0 | 0 | 0 | 0 | 0 | 2215 | 316 | 62 | 7 | -10 |
| GROSS PROFIT ON SALES | 0 | 0 | 0 | 0 | 0 | 3566 | 6931 | 9366 | 11342 | 13500 |
| SALES EXPENSES/ADMINISTRATION | 0 | 0 | 0 | 0 | 0 | 3856 | 4405 | 4976 | 5593 | 6269 |
| OPERATING PROFIT | 0 | 0 | 0 | 0 | 0 | -290 | 2525 | 4390 | 5750 | 7230 |
| NON-OPERATING EXPENSES | 0 | 0 | 0 | 0 | 0 | 6248 | 5903 | 5232 | 4314 | 3626 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6149 | 5518 | 4888 | 4257 | 3626 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 99 | 385 | 344 | 57 | 0 |
| NET PROFIT OR (LOSS) BEFORE TAX | 0 | -0 | 0 | -0 | -0 | -6538 | -3378 | -842 | 1436 | 3604 |
| INCOME TAX | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) AFTER TAX | 0 | -0 | 0 | -0 | -0 | -6538 | -3378 | -842 | 1436 | 3604 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RETAINED EARNINGS | 0 | -0 | 0 | -0 | -0 | -6538 | -3378 | -842 | 1436 | 3604 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

INCOME STATEMENTS

CASE 2-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 47099 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 |
| TOTAL SALES REVENUE | 47099 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 | 49923 |
| COST OF SALES | 26318 | 25713 | 25699 | 25699 | 25699 | 18766 | 18145 | 18145 | 18145 | 18145 |
| VARIABLE COST | 13379 | 13211 | 13211 | 13211 | 13211 | 13211 | 13211 | 13211 | 13211 | 13211 |
| DIRECT FIXED COST | 4549 | 4549 | 4549 | 4549 | 4549 | 4549 | 4549 | 4549 | 4549 | 4549 |
| DEPRECIATION AND AMORTIZATION | 7939 | 7939 | 7939 | 7939 | 7939 | 385 | 385 | 385 | 385 | 385 |
| INC IN PRODUCT INVENTORY | -451 | -14 | 0 | 0 | 0 | -621 | 0 | 0 | 0 | [illegible] |
| GROSS PROFIT ON SALES | 20781 | 24210 | 24224 | 24224 | 24224 | 31157 | 31778 | 31778 | 31778 | 31778 |
| SALES EXPENSES/ADMINISTRATION | 7013 | 7950 | 7950 | 7950 | 7950 | 7950 | 7950 | 7950 | 7950 | 7950 |
| OPERATING PROFIT | 13769 | 16260 | 16274 | 16274 | 16274 | 23207 | 23828 | 23828 | 23828 | 23828 |
| NON-OPERATING EXPENSES | 2996 | 2365 | 1734 | 1104 | 473 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 2996 | 2365 | 1734 | 1104 | 473 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) BEFORE TAX | 10773 | 13895 | 14540 | 15170 | 15801 | 23207 | 23828 | 23828 | 23828 | 23828 |
| INCOME TAX | 3232 | 4169 | 4362 | 4551 | 4740 | 6962 | 7148 | 7148 | 7148 | 7148 |
| NET PROFIT OR (LOSS) AFTER TAX | 7541 | 9727 | 10178 | 10619 | 11061 | 16245 | 16680 | 16680 | 16680 | 16680 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RETAINED EARNINGS | 7541 | 9727 | 10178 | 10619 | 11061 | 16245 | 16680 | 16680 | 16680 | 16680 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

FUNDS FLOW STATEMENTS

CASE 2-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 226 | 1281 | 38492 | 41772 | 39678 | 18128 | 20398 | 18439 | 19038 | 20518 |
| CASH GENERATED | 0 | 0 | 0 | 0 | 0 | 12998 | 15813 | 17678 | 19038 | 20518 |
| PROFIT AFT TAX. BFR INT | 0 | 0 | 0 | 0 | 0 | -290 | 2525 | 4390 | 5750 | 7230 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 13288 | 13288 | 13288 | 13288 | 13288 |
| FINANCIAL RESOURCES | 226 | 1281 | 38492 | 41772 | 39678 | 5131 | 4585 | 761 | 0 | 0 |
| SHARE CAPITAL | 68 | 384 | 11547 | 12531 | 11508 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT | 158 | 896 | 26944 | 29240 | 26851 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 1 | 1 | 1319 | 5131 | 4585 | 761 | 0 | 0 |
| USES OF FUNDS | 226 | 1280 | 38492 | 41772 | 38359 | 19447 | 20398 | 18439 | 13483 | 12018 |
| FIXED CAPITAL EXPENDITURE | 226 | 1280 | 38492 | 41771 | 38358 | 0 | 0 | 0 | 0 | 0 |
| NON-DEPRECIABLE ASSETS | 0 | 445 | 444 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIABLE FIXED ASSETS | 220 | 740 | 33359 | 34762 | 30222 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 6 | 95 | 4689 | 7009 | 8137 | 0 | 0 | 0 | 0 | 0 |
| CHANGE IN WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 3471 | 956 | 213 | -1 | -18 |
| DEBT SERVICES | 0 | 0 | 0 | 1 | 1 | 15976 | 19443 | 18225 | 13484 | 12035 |
| REPAYMENT OF LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 8409 | 8409 | 8409 | 8409 | 8409 |
| REPAYMENT OF SHORT TERM DEBT | 0 | 0 | 0 | 1 | 1 | 1319 | 5131 | 4585 | 761 | 0 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6149 | 5518 | 4888 | 4257 | 3626 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 99 | 385 | 344 | 57 | 0 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CASH INCREASE OR (DECREASE) | 0 | 0 | -0 | 0 | 1319 | -1319 | 0 | 0 | 5555 | 8501 |
| BEGINNING CASH BALANCE | 0 | 0 | 0 | -0 | -0 | 119 | -0 | -0 | -0 | 5555 |
| ENDING CASH BALANCE | 0 | 0 | -0 | -0 | 1319 | -0 | -0 | -0 | 5555 | 14055 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

FUNDS FLOW STATEMENTS

CASE 2-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 18476 | 20031 | 19851 | 19662 | 19473 | 16630 | 17065 | 17065 | 17065 | 17065 |
|   CASH GENERATED | 18476 | 20031 | 19851 | 19662 | 19473 | 16630 | 17065 | 17065 | 17065 | 17065 |
|     PROFIT AFT. TAX. BFR INT | 10537 | 12092 | 11912 | 11723 | 11534 | 16245 | 16680 | 16680 | 16680 | 16680 |
|     DEPRECIATION AND AMORTIZATION | 7939 | 7939 | 7939 | 7939 | 7939 | 385 | 385 | 385 | 385 | 385 |
|   FINANCIAL RESOURCES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|     SHARE CAPITAL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|     LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|     SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| USES OF FUNDS | 10945 | 10749 | 10143 | 9513 | 8882 | -621 | 0 | 0 | 0 | 0 |
|   FIXED CAPITAL EXPENDITURE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|     NON-DEPRECIABLE ASSETS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|     DEPRECIABLE FIXED ASSETS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|     INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|   CHANGE IN WORKING CAPITAL | -459 | -25 | 0 | 0 | 0 | -621 | 0 | 0 | 0 | 0 |
|   DEBT SERVICES | 11405 | 10774 | 10143 | 9513 | 8882 | 0 | 0 | 0 | 0 | 0 |
|     REPAYMENT OF LONG TERM DEBT | 8409 | 8409 | 8409 | 8409 | 8409 | 0 | 0 | 0 | 0 | 0 |
|     REPAYMENT OF SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|     INTEREST ON LONG TERM DEBT | 2996 | 2365 | 1734 | 1104 | 473 | 0 | 0 | 0 | 0 | 0 |
|     INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|   DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CASH INCREASE OR (DECREASE) | 7531 | 9282 | 9708 | 10150 | 10591 | 17251 | 17065 | 17065 | 17065 | 17065 |
|     BEGINNING CASH BALANCE | 14055 | 21586 | 30868 | 40576 | 50725 | 61316 | 78568 | 95632 | 112697 | 129762 |
|     ENDING CASH BALANCE | 21586 | 30868 | 40576 | 50725 | 61316 | 78568 | 95632 | 112697 | 129762 | 146827 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



BALANCE SHEET

CASE 2-A — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 226 | 1506 | 39998 | 81770 | 121447 | 113046 | 101867 | 89018 | 81261 | 76419 |
| CURRENT ASSETS | 0 | 0 | 0 | 0 | 0 | 6206 | 8314 | 8754 | 8730 | 8675 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ACCOUNT RECEIVABLE | 0 | 0 | 0 | 0 | 0 | 2673 | 3902 | 4174 | 4173 | 4153 |
| INVENTORIES | 0 | 0 | 0 | C | 0 | 3532 | 4412 | 4580 | 4556 | 4522 |
| ACC EXCESS CASH | 0 | 0 | -0 | -0 | 1319 | -0 | -0 | -0 | 5555 | 14055 |
| NET FIXED ASSETS | 226 | 1506 | 39998 | 81770 | 120128 | 106840 | 93552 | 80264 | 66976 | 53688 |
| INVESTMENT | 226 | 1506 | 39998 | 81770 | 120128 | 120128 | 120128 | 120128 | 120128 | 120128 |
| NON-DEPR ASSETS | 0 | 445 | 889 | 889 | 889 | 889 | 889 | 889 | 889 | 889 |
| DEPRECIABLE ASSETS | 220 | 960 | 34319 | 69081 | 99303 | 99303 | 99303 | 99303 | 99303 | 99303 |
| INTEREST DRG CONSTR | 6 | 101 | 4790 | 11799 | 19936 | 19936 | 19936 | 19936 | 19936 | 19936 |
| LESS ACC DEPRECIATION | 0 | 0 | 0 | 0 | 0 | 13288 | 26576 | 39864 | 53152 | 66440 |
| LIABILITIES | 158 | 1054 | 27999 | 57239 | 85409 | 83546 | 75744 | 63737 | 54544 | 46099 |
| CURRENT LIABILITIES | 0 | 0 | 1 | 1 | 9728 | 16274 | 16881 | 13284 | 12499 | 12463 |
| ACCOUNT PAYABLE | 0 | 0 | 0 | 0 | 0 | 2735 | 3887 | 4114 | 4090 | 4054 |
| CURRENT PORTION OF L/T DEBT | 0 | 0 | 0 | 0 | 8409 | 8409 | 8409 | 8409 | 8409 | 8409 |
| SHORT TERM DEBT | 0 | 0 | 1 | 1 | 1319 | 5131 | 4585 | 761 | 0 | 0 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FIXED LIABILITIES | 158 | 1054 | 27998 | 57238 | 75681 | 67272 | 58863 | 50454 | 42045 | 33636 |
| LONG TERM DEBT BALANCE | 158 | 1054 | 27998 | 57238 | 75681 | 67272 | 58863 | 50454 | 42045 | 33636 |
| OTHER FIXED LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STOCK HOLDERS EQUITY | 68 | 452 | 11999 | 24531 | 36038 | 29500 | 26123 | 25281 | 26717 | 30321 |
| SHARE CAPITAL | 68 | 452 | 11999 | 24531 | 36038 | 36038 | 36038 | 36038 | 36038 | 36038 |
| ACC RETAINED EARNINGS | 0 | -0 | -0 | -0 | -0 | -6538 | -9916 | -10757 | -9322 | -5718 |
| LIABILITIES & S/H EQUITY | 226 | 1506 | 39998 | 81770 | 121447 | 113046 | 101867 | 89018 | 81261 | 76419 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

BALANCE SHEET

CASE 2-A — - BASE CASE - — (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 75511 | 76778 | 78547 | 80758 | 83409 | 99654 | 116334 | 133013 | 149693 | 166373 |
| CURRENT ASSETS | 8176 | 8101 | 8101 | 8101 | 8101 | 7480 | 7480 | 7480 | 7480 | 7480 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ACCOUNT RECEIVABLE | 4131 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 | 4104 |
| INVENTORIES | 4045 | 3997 | 3997 | 3997 | 3997 | 3376 | 3376 | 3376 | 3376 | 3376 |
| ACC EXCESS CASH | 21586 | 30868 | 40576 | 50725 | 61316 | 78568 | 95632 | 112697 | 129762 | 146827 |
| NET FIXED ASSETS | 45749 | 37810 | 29871 | 21931 | 13992 | 13607 | 13221 | 12836 | 12451 | 12065 |
| INVESTMENT | 120128 | 120128 | 120128 | 120128 | 120128 | 120128 | 120128 | 120128 | 120128 | 120128 |
| NON-DEPR ASSETS | 889 | 889 | 889 | 889 | 889 | 889 | 889 | 889 | 889 | 889 |
| DEPRECIABLE ASSETS | 99303 | 99303 | 99303 | 99303 | 99303 | 99303 | 99303 | 99303 | 99303 | 99303 |
| INTEREST DRG CONSTR | 19936 | 19936 | 19936 | 19936 | 19936 | 19936 | 19936 | 19936 | 19936 | 19936 |
| LESS: ACC. DEPRECIATION | 74379 | 82318 | 90257 | 98197 | 106136 | 106521 | 106907 | 107292 | 107677 | 108063 |
| LIABILITIES | 37650 | 29190 | 20781 | 12372 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 |
| CURRENT LIABILITIES | 12423 | 12372 | 12372 | 12372 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 |
| ACCOUNT PAYABLE | 4014 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 | 3963 |
| CURRENT PORTION OF L/T DEBT | 8409 | 8409 | 8409 | 8409 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FIXED LIABILITIES | 25227 | 16818 | 8409 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT BALANCE | 25227 | 16818 | 8409 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHER FIXED LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STOCK HOLDERS EQUITY | 37862 | 47588 | 57766 | 68385 | 79446 | 95691 | 112371 | 129050 | 145730 | 162409 |
| SHARE CAPITAL | 36038 | 36038 | 36038 | 36038 | 36038 | 36038 | 36038 | 36038 | 36038 | 36038 |
| ACC RETAINED EARNINGS | 1823 | 11550 | 21728 | 32347 | 43408 | 59653 | 76332 | 93012 | 109691 | 126371 |
| LIABILITIES & S/H EQUITY | 75511 | 76778 | 78547 | 80758 | 83409 | 99654 | 116334 | 133013 | 149693 | 166373 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



LONG TERM DEBT

CASE 2-A — - BASE CASE - — (USD 1000)

AMOUNT OF DEBT 84090.

INTEREST RATE 7.500 PER CENT/YEAR

REPAYMENT 10 YEAR-EQUAL-INSTALLMENT-REPAYMENT (SEMI ANNUAL)

| YEAR | SER NO | PRINCIPAL | INTEREST | DEBT SERVICE | BALANCE AFT PAYMENT |
|---|---|---|---|---|---|
| 1992 | 1 | 0 | 0 | 0 | 79 |
| | 2 | 0 | 0 | 0 | 158 |
| 1993 | 3 | 0 | 0 | 0 | 606 |
| | 4 | 0 | 0 | 0 | 1054 |
| 1994 | 5 | 0 | 0 | 0 | 14526 |
| | 6 | 0 | 0 | 0 | 27998 |
| 1995 | 7 | 0 | 0 | 0 | 42618 |
| | 8 | 0 | 0 | 0 | 57238 |
| 1996 | 9 | 0 | 0 | 0 | 70664 |
| | 10 | 0 | 0 | 0 | 84090 |
| 1997 | 11 | 4204. | 3153 | 7358. | 79885 |
| | 12 | 4204 | 2996 | 7200 | 75681 |
| 1998 | 13 | 4204 | 2838 | 7042 | 71476 |
| | 14 | 4204. | 2680 | 6885 | 67272 |
| 1999 | 15 | 4204. | 2523 | 6727 | 63067 |
| | 16 | 4204. | 2365. | 6569. | 58863. |
| 2000 | 17 | 4204. | 2207. | 6412. | 54658. |
| | 18 | 4204. | 2050. | 6254. | 50454. |
| 2001 | 19 | 4204. | 1892. | 6096. | 46249. |
| | 20 | 4204. | 1734. | 5939. | 42045. |
| 2002 | 21 | 4204. | 1577. | 5781. | 37840. |
| | 22 | 4204. | 1419 | 5623. | 33636 |
| 2003 | 23 | 4204 | 1261 | 5466. | 29431. |
| | 24 | 4204. | 1104. | 5308 | 25227. |
| 2004 | 25 | 4204. | 946. | 5150. | 21022 |
| | 26 | 4204. | 788 | 4993 | 16818 |
| 2005 | 27 | 4204. | 631 | 4835. | 12613 |
| | 28 | 4204 | 473 | 4677 | 8409 |
| 2006 | 29 | 4204. | 315 | 4520 | 4204 |
| | 30 | 4204. | 158 | 4362 | 0 |
| 2007 | 31 | 0 | 0 | 0 | 0 |
| | 32 | 0 | 0 | 0 | 0 |
| 2008 | 33 | 0. | 0 | 0 | 0 |
| | 34 | 0 | 0 | 0 | 0 |
| 2009 | 35 | 0. | 0 | 0 | 0 |
| | 36 | 0 | 0 | 0 | 0 |
| 2010 | 37 | 0. | 0 | 0 | 0 |
| | 38 | 0. | 0 | 0 | 0 |
| 2011 | 39 | 0. | 0 | 0 | 0 |
| | 40 | 0 | 0 | 0 | 0 |
| TOTAL | | 84089 | 33110 | 117199 | 0 |

FINANCIAL PROJECTIONS

CASE 2B

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

PRODUCTION AND SALES PLAN

CASE 2-B - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 0 | 0 | 0 | 0 | 0 | 400000 | 400000 | 400000 | 400000 | 400000 |
| CAPACITY UTILIZATION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.700 | 0.950 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 0 | 0 | 0 | 0 | 0 | 280000 | 380000 | 400000 | 400000 | 400000 |
| INCREASE IN INVENTORY | 0 | 0 | 0 | 0 | 0 | 23016 | 8220 | 1644 | 0 | 0 |
| SALES VOLUME (DOMESTIC CEMENT) | 0 | 0 | 0 | 0 | 0 | 150504 | 170919 | 193327 | 217927 | 244939 |
| UNIT SALES PRICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 |
| SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 24082 | 27349 | 30934 | 34870 | 39193 |
| SALES VOLUME (EXPORT CEMENT) | 0 | 0 | 0 | 0 | 0 | 116759 | 215732 | 220963 | 198073 | 171061 |
| UNIT SALES PRICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 |
| SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 9866 | 18229 | 18671 | 16737 | 14455 |
| TOTAL SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 33948 | 45578 | 49606 | 51608 | 53647 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PRODUCTION AND SALES PLAN

CASE 2-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| CAPACITY UTILIZATION | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| INCREASE IN INVENTORY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES VOLUME (DOMESTIC CEMENT) | 274604 | 307189 | 342988 | 382322 | 416000 | 416000 | 416000 | 416000 | 416000 | 416000 |
| UNIT SALES PRICE | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 | 0.1600 |
| SALES REVENUE | 43939 | 49153 | 54882 | 61175 | 66564 | 66564 | 66564 | 66564 | 66564 | 66564 |
| SALES VOLUME (EXPORT CEMENT) | 141396 | 108811 | 73012 | 33678 | -0 | -0 | -0 | -0 | -0 | -0 |
| UNIT SALES PRICE | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 | 0.0845 |
| SALES REVENUE | 11948 | 9195 | 6170 | 2846 | -0 | -0 | -0 | -0 | -0 | -0 |
| TOTAL SALES REVENUE | 55887 | 58348 | 61051 | 64021 | 66564 | 66564 | 66564 | 66564 | 66564 | 564 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

PRODUCTION COST STATEMENTS

CASE 2-B - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 0 | 0 | 0 | 0 | 0 | 280000 | 380000 | 400000 | 400000 | 400000 |
| RAW MATERIALS | 0 | 0 | 0 | 0 | 0 | 1497 | 2032 | 2139 | 2139 | 2139 |
| PYRITE CINDER | 0 | 0 | 0 | 0 | 0 | 405 | 549 | 578 | 578 | 578 |
| GYPSUM | 0 | 0 | 0 | 0 | 0 | 1092 | 1483 | 1561 | 1561 | 1561 |
| UTILITIES | 0 | 0 | 0 | 0 | 0 | 6911 | 9558 | 10116 | 10128 | 10128 |
| FUEL (COAL) | 0 | 0 | 0 | 0 | 0 | 3724 | 5054 | 5320 | 5320 | 5320 |
| DIESEL OIL (CLINKER) | 0 | 0 | 0 | 0 | 0 | 98 | 35 | 7 | 0 | 0 |
| DIESEL OIL (CEMENT) | 0 | 0 | 0 | 0 | 0 | 3089 | 4469 | 4789 | 4808 | 4808 |
| CONSUMBLES | 0 | 0 | 0 | 0 | 0 | 188 | 261 | 276 | 277 | 277 |
| FIRE BRICKS | 0 | 0 | 0 | 0 | 0 | 63 | 85 | 89 | 89 | 89 |
| STEEL BALL | 0 | 0 | 0 | 0 | 0 | 31 | 45 | 49 | 49 | 49 |
| LUBE OIL | 0 | 0 | 0 | 0 | 0 | 33 | 47 | 51 | 51 | 51 |
| EXPLOSIVES | 0 | 0 | 0 | 0 | 0 | 61 | 83 | 88 | 88 | 88 |
| KRAFT PAPER SACK | 0 | 0 | 0 | 0 | 0 | 3783 | 5683 | 6044 | 5961 | 5840 |
| KRAFT PAPER SACK (TRUCK) | 0 | 0 | 0 | 0 | 0 | 451 | 517 | 579 | 652 | 733 |
| KRAFT PAPER SACK (BOAT) | 0 | 0 | 0 | 0 | 0 | 1384 | 1572 | 1778 | 2004 | 2252 |
| KRAFT PAPER SACK (EXPORT) | 0 | 0 | 0 | 0 | 0 | 1948 | 3600 | 4687 | 3305 | 2854 |
| VARIABLE COST | 0 | 0 | 0 | 0 | 0 | 12379 | 17534 | 18574 | 18505 | 18384 |
| EMPLOYMENT COST | 0 | 0 | 0 | 0 | 0 | 369 | 369 | 369 | 369 | 369 |
| MAINTENANCE COST | 0 | 0 | 0 | 0 | 0 | 3348 | 3348 | 3348 | 3348 | 3348 |
| INSURANCE | 0 | 0 | 0 | 0 | 0 | 1348 | 1348 | 1348 | 1348 | 1348 |
| DIRECT FIXED COST | 0 | 0 | 0 | 0 | 0 | 5065 | 5065 | 5065 | 5065 | 5065 |
| CASH FACTORY COST | 0 | 0 | 0 | 0 | 0 | 17444 | 22598 | 23639 | 23570 | 23448 |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 7556 | 7556 | 7556 | 7556 | 7556 |
| QUARRY DEVELOPEMENT | 0 | 0 | 0 | 0 | 0 | 721 | 721 | 721 | 721 | 721 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 1048 | 1048 | 1048 | 1048 | 1048 |
| OFFSITE FACILITIES | 0 | 0 | 0 | 0 | 0 | 385 | 385 | 385 | 385 | 385 |
| FINISHING MILL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXPEXSES | 0 | 0 | 0 | 0 | 0 | 762 | 762 | 762 | 762 | 762 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 4474 | 4474 | 4474 | 4474 | 4474 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 14947 | 14947 | 14947 | 14947 | 14947 |
| TOTAL FACTORY COST | 0 | 0 | 0 | 0 | 0 | 32390 | 37545 | 38585 | 38517 | 38395 |
| UNIT FACTORY COST | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 1157 | 0 0988 | 0 0965 | 0 0963 | 0 0960 |
| SALES EXPENSES | 0 | 0 | 0 | 0 | 0 | 170 | 228 | 248 | 258 | 268 |
| TRANSPORTATION COST | 0 | 0 | 0 | 0 | 0 | 3714 | 4218 | 4771 | 5378 | 6045 |
| SALES EXPENSES/ADMINISTRATION | 0 | 0 | 0 | 0 | 0 | 3884 | 4446 | 5019 | 5636 | 6313 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6902 | 6194 | 5486 | 4778 | 4071 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 132 | 416 | 293 | 0 | 0 |
| TOTAL PRODUCTION COST | 0 | 0 | 0 | 0 | 0 | 43309 | 48601 | 49385 | 48332 | 48779 |
| UNIT PRODUCTION COST | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 1547 | 0 1279 | 0 1235 | 0 1223 | 0 1219 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

PRODUCTION COST STATEMENTS

CASE 2-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| RAW MATERIALS | 2139 | 2139 | 2139 | 2139 | 2139 | 2139 | 2139 | 2139 | 2139 | 2139 |
| PYRITE CINDER | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 | 578 |
| GYPSUM | 1561 | 1561 | 1561 | 1561 | 1561 | 1561 | 1561 | 1561 | 1561 | 1561 |
| UTILITIES | 10128 | 10128 | 10128 | 10128 | 10128 | 10128 | 10128 | 10128 | 10128 | 10128 |
| FUEL (COAL) | 5320 | 5320 | 5320 | 5320 | 5320 | 5320 | 5320 | 5320 | 5320 | 5320 |
| DIESEL OIL (CLINKER) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DIESEL OIL (CEMENT) | 4808 | 4808 | 4808 | 4808 | 4808 | 4808 | 4808 | 4808 | 4808 | 4808 |
| CONSUMBLES | 277 | 277 | 277 | 277 | 277 | 277 | 277 | 277 | 277 | 277 |
| FIRE BRICKS | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |
| STEEL BALL | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 |
| LUBE OIL | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 |
| EXPLOSIVES | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 |
| KRAFT PAPER SACK | 5707 | 5560 | 5399 | 5223 | 5071 | 5071 | 5071 | 5071 | 5071 | 5071 |
| KRAFT PAPER SACK (TRUCK) | 822 | 920 | 1027 | 1145 | 1245 | 1245 | 1245 | 1245 | 1245 | 1245 |
| KRAFT PAPER SACK (BOAT) | 2525 | 2825 | 3154 | 3516 | 3825 | 3825 | 3825 | 3825 | 3825 | 3825 |
| KRAFT PAPER SACK (EXPORT) | 2359 | 1816 | 1218 | 562 | -0 | -0 | -0 | -0 | -0 | -0 |
| VARIABLE COST | 18250 | 18104 | 17943 | 17766 | 17615 | 17615 | 17615 | 17615 | 17615 | 17615 |
| EMPLOYMENT COST | 369 | 369 | 369 | 369 | 369 | 369 | 369 | 369 | 369 | 369 |
| MAINTENANCE COST | 3348 | 3348 | 3348 | 3348 | 3348 | 3348 | 3348 | 3348 | 3348 | 3348 |
| INSURANCE | 1348 | 1348 | 1348 | 1348 | 1348 | 1348 | 1348 | 1348 | 1348 | 1348 |
| DIRECT FIXED COST | 5065 | 5065 | 5065 | 5065 | 5065 | 5065 | 5065 | 5065 | 5065 | 5065 |
| CASH FACTORY COST | 23315 | 23169 | 23008 | 22831 | 22679 | 22679 | 22679 | 22679 | 22679 | 22679 |
| PLANT CONSTRUCTION | 7556 | 7556 | 7556 | 7556 | 7556 | 0 | 0 | 0 | 0 | 0 |
| QUARRY DEVELOPEMENT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UTILITY FACILITIES | 1048 | 1048 | 1048 | 1048 | 1048 | 0 | 0 | 0 | 0 | 0 |
| OFFSITE FACILITIES | 385 | 385 | 385 | 385 | 385 | 385 | 385 | 385 | 385 | 385 |
| FINISHING MILL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXPEXSES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIATION AND AMORTIZATION | 8990 | 8990 | 8990 | 8990 | 8990 | 385 | 385 | 385 | 385 | 385 |
| TOTAL FACTORY COST | 32305 | 32159 | 31998 | 31821 | 31669 | 23065 | 23065 | 23065 | 23065 | 23065 |
| UNIT FACTORY COST | 0.0808 | 0.0804 | 0.0800 | 0.0796 | 0.0792 | 0.0577 | 0.0577 | 0.0577 | 0.0577 | 0.0577 |
| SALES EXPENSES | 279 | 292 | 305 | 320 | 333 | 333 | 333 | 333 | 333 | 333 |
| TRANSPORTATION COST | 6777 | 7581 | 8465 | 9436 | 10267 | 10267 | 10267 | 10267 | 10267 | 10267 |
| SALES EXPENSES/ADMINISTRATION | 7057 | 7873 | 8770 | 9756 | 10600 | 10600 | 10600 | 10600 | 10600 | 10600 |
| INTEREST ON LONG TERM DEBT | 3363 | 2655 | 1947 | 1239 | 531 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL PRODUCTION COST | 42724 | 42686 | 42715 | 42815 | 42800 | 33664 | 33664 | 33664 | 33664 | 33664 |
| UNIT PRODUCTION COST | 0.1068 | 0.1067 | 0.1068 | 0.1070 | 0.1070 | 0.0842 | 0.0842 | 0.0842 | 0.0842 | 0.0842 |

### *** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

### WORKING CAPITAL STATEMENTS

CASE 2-8 — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 0 | 0 | 0 | 0 | 0 | 8066 | 10890 | 11491 | 11475 | 11421 |
| ACCOUNT RECEIVABLE | 0 | 0 | 0 | 0 | 0 | 3602 | 5245 | 5612 | 5618 | 5598 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 0 | 0 | 0 | 0 | 0 | 1980 | 2248 | 2543 | 2866 | 3222 |
| ACCOUNT RECEIVABLE (EXPORT) | 0 | 0 | 0 | 0 | 0 | 1622 | 2997 | 3070 | 2752 | 2376 |
| INVENTORIES | 0 | 0 | 0 | 0 | 0 | 4464 | 5645 | 5879 | 5857 | 5823 |
| PRODUCT INVENTORY | 0 | 0 | 0 | 0 | 0 | 2662 | 3086 | 3172 | 3166 | 3156 |
| MATERIAL INV (PAPER SACK) | 0 | 0 | 0 | 0 | 0 | 757 | 1137 | 1209 | 1192 | 1168 |
| MATERIAL INV (PYRITE,COAL) | 0 | 0 | 0 | 0 | 0 | 826 | 1121 | 1180 | 1180 | 1180 |
| MATERIAL INV (GYPSUM) | 0 | 0 | 0 | 0 | 0 | 109 | 145 | 156 | 156 | 156 |
| MATERIAL INV (DIESEL) | 0 | 0 | 0 | 0 | 0 | 53 | 75 | 80 | 80 | 80 |
| MATERIAL INV (CONSUMABLES) | 0 | 0 | 0 | 0 | 0 | 56 | 78 | 83 | 83 | 83 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CURRENT LIABILITIES W/O DEBT | 0 | 0 | 0 | 0 | 0 | 3714 | 5260 | 5572 | 5552 | 5515 |
| ACCOUNT PAYABLE | 0 | 0 | 0 | 0 | 0 | 3714 | 5260 | 5572 | 5552 | 5515 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERMANENT WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 4351 | 5630 | 5919 | 5924 | 5906 |
| CHANGE IN WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 4351 | 1279 | 289 | 4 | -18 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

WORKING CAPITAL STATEMENTS

CASE 2-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 10872 | 10806 | 10735 | 10656 | 10588 | 9881 | 9881 | 9881 | 9881 | 9881 |
| ACCOUNT RECEIVABLE | 5576 | 5552 | 5526 | 5496 | 5472 | 5472 | 5472 | 5472 | 5472 | 5472 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 3612 | 4040 | 4511 | 5029 | 5472 | 5472 | 5472 | 5472 | 5472 | 5472 |
| ACCOUNT RECEIVABLE (EXPORT) | 1964 | 1512 | 1014 | 468 | -0 | -0 | -0 | -0 | -0 | -0 |
| INVENTORIES | 5296 | 5254 | 5209 | 5159 | 5116 | 4409 | 4409 | 4409 | 4409 | 4409 |
| PRODUCT INVENTORY | 2655 | 2643 | 2630 | 2616 | 2603 | 1896 | 1896 | 1896 | 1896 | 1896 |
| MATERIAL INV (PAPER SACK) | 1141 | 1112 | 1080 | 1044 | 1014 | 1014 | 1014 | 1014 | 1014 | 1014 |
| MATERIAL INV (PYRITE,COAL) | 1180 | 1180 | 1180 | 1180 | 1180 | 1180 | 1180 | 1180 | 1180 | 1180 |
| MATERIAL INV (GYPSUM) | 156 | 156 | 156 | 156 | 156 | 156 | 156 | 156 | 156 | 156 |
| MATERIAL INV (DIESEL) | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| MATERIAL INV (CONSUMABLES) | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CURRENT LIABILITIES W/O DEBT | 5475 | 5431 | 5383 | 5330 | 5284 | 5284 | 5284 | 5284 | 5284 | 5284 |
| ACCOUNT PAYABLE | 5475 | 5431 | 5383 | 5330 | 5284 | 5284 | 5284 | 5284 | 5284 | 5284 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERMANENT WORKING CAPITAL | 5397 | 5375 | 5352 | 5326 | 5304 | 4596 | 4596 | 4596 | 4596 | 4596 |
| CHANGE IN WORKING CAPITAL | -509 | -21 | -24 | -26 | -22 | -707 | 0 | 0 | 0 | 0 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



INCOME STATEMENTS

CASE 2-B — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 0 | 0 | 0 | 0 | 0 | 33948 | 45578 | 49606 | 51608 | 53647 |
| TOTAL SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 33948 | 45578 | 49606 | 51608 | 53647 |
| COST OF SALES | 0 | 0 | 0 | 0 | 0 | 29728 | 37121 | 38500 | 38522 | 38405 |
| VARIABLE COST | 0 | 0 | 0 | 0 | 0 | 12379 | 17534 | 18574 | 18505 | 18384 |
| DIRECT FIXED COST | 0 | 0 | 0 | 0 | 0 | 5065 | 5065 | 5065 | 5065 | 5065 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 14947 | 14947 | 14947 | 14947 | 14947 |
| INC IN PRODUCT INVENTORY | 0 | 0 | 0 | 0 | 0 | 2662 | 474 | 86 | -6 | -10 |
| GROSS PROFIT ON SALES | 0 | 0 | 0 | 0 | 0 | 4221 | 8457 | 11106 | 13085 | 15242 |
| SALES EXPENSES/ADMINISTRATION | 0 | 0 | 0 | 0 | 0 | 3884 | 4446 | 5019 | 5636 | 6313 |
| OPERATING PROFIT | 0 | 0 | 0 | 0 | 0 | 336 | 4011 | 6086 | 7449 | 8929 |
| NON-OPERATING EXPENSES | 0 | 0 | 0 | 0 | 0 | 7034 | 6610 | 5780 | 4778 | 4071 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6902 | 6194 | 5486 | 4778 | 4071 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 132 | 416 | 293 | 0 | 0 |
| NET PROFIT OR (LOSS) BEFORE TAX | 0 | 0 | 0 | -0 | -0 | -6698 | -2599 | 307 | 2670 | 4858 |
| INCOME TAX | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) AFTER TAX | 0 | 0 | 0 | -0 | -0 | -6698 | -2599 | 307 | 2670 | 4858 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RETAINED EARNINGS | 0 | 0 | 0 | -0 | -0 | -6698 | -2599 | 307 | 2670 | 4858 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

INCOME STATEMENTS

CASE 2-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 55887 | 58348 | 61051 | 64021 | 66564 | 66564 | 66564 | 66564 | 66564 | 66564 |
| TOTAL SALES REVENUE | 55887 | 58348 | 61051 | 64021 | 66564 | 66564 | 66564 | 66564 | 66564 | 66564 |
| COST OF SALES | 32806 | 32171 | 32011 | 31835 | 31682 | 23772 | 23065 | 23065 | 23065 | 23065 |
| VARIABLE COST | 18250 | 18104 | 17943 | 17766 | 17515 | 17615 | 17615 | 17615 | 17615 | 17615 |
| DIRECT FIXED COST | 5065 | 5065 | 5065 | 5065 | 5065 | 5065 | 5065 | 5065 | 5065 | 5065 |
| DEPRECIATION AND AMORTIZATION | 8990 | 8990 | 8990 | 8990 | 8990 | 385 | 385 | 385 | 385 | 385 |
| INC. IN PRODUCT INVENTORY | -501 | -12 | -13 | -15 | -12 | -707 | 0 | 0 | 0 | 0 |
| GROSS PROFIT ON SALES | 23082 | 26177 | 29040 | 32186 | 34882 | 42791 | 43500 | 43500 | 43500 | 43500 |
| SALES EXPENSES/ADMINISTRATION | 7057 | 7873 | 8770 | 9756 | 10600 | 10600 | 10600 | 10600 | 10600 | 10600 |
| OPERATING PROFIT | 16025 | 18304 | 20270 | 22430 | 24283 | 32193 | 32900 | 32900 | 32900 | 32900 |
| NON-OPERATING EXPENSES | 3363 | 2655 | 1947 | 1239 | 531 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 3363 | 2655 | 1947 | 1239 | 531 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) BEFORE TAX | 12662 | 15649 | 18323 | 21191 | 23752 | 32193 | 32900 | 32900 | 32900 | 32900 |
| INCOME TAX | 3799 | 4695 | 5497 | 6357 | 7126 | 9658 | 9870 | 9870 | 9870 | 9870 |
| NET PROFIT OR (LOSS) AFTER TAX | 8864 | 10955 | 12826 | 14834 | 16626 | 22535 | 23030 | 23030 | 23030 | 23030 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RETAINED EARNINGS | 8864 | 10955 | 12826 | 14834 | 16626 | 22535 | 23030 | 23030 | 23030 | 23030 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

FUNDS FLOW STATEMENTS

CASE 2-B - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 227 | 1280 | 43576 | 46956 | 44564 | 20825 | 22869 | 21033 | 22396 | 23876 |
| CASH GENERATED | 0 | 0 | 0 | 0 | 0 | 15283 | 18957 | 21033 | 22396 | 23876 |
| PROFIT AFT TAX. BFR INT | 0 | 0 | 0 | 0 | 0 | 336 | 4011 | 6086 | 7449 | 8929 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 14947 | 14947 | 14947 | 14947 | 14947 |
| FINANCIAL RESOURCES | 227 | 1280 | 43576 | 46956 | 44564 | 5542 | 3912 | 0 | 0 | 0 |
| SHARE CAPITAL | 68 | 384 | 13073 | 14087 | 12841 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT | 159 | 896 | 30503 | 32869 | 29963 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 1759 | 5542 | 3912 | 0 | 0 | 0 |
| USES OF FUNDS | 226 | 1280 | 43576 | 46956 | 42805 | 22584 | 22869 | 19420 | 14222 | 13492 |
| FIXED CAPITAL EXPENDITURE | 226 | 1280 | 43576 | 46956 | 42805 | 0 | 0 | 0 | 0 | 0 |
| NON-DEPRECIABLE ASSETS | 0 | 445 | 444 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIABLE FIXED ASSETS | 220 | 740 | 37823 | 39077 | 33724 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 6 | 95 | 5309 | 7879 | 9081 | 0 | 0 | 0 | 0 | 0 |
| CHANGE IN WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 4351 | 1279 | 289 | 4 | -18 |
| DEBT SERVICES | 0 | 0 | 0 | 0 | 0 | 18232 | 21591 | 19131 | 14217 | 13510 |
| REPAYMENT OF LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 9439 | 9439 | 9439 | 9439 | 9439 |
| REPAYMENT OF SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 1759 | 5542 | 3912 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6902 | 6194 | 5486 | 4778 | 4071 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 132 | 416 | 293 | 0 | 0 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CASH INCREASE OR (DECREASE) | 0 | -0 | -0 | 0 | 1759 | -1759 | 0 | 1613 | 8174 | 10384 |
| BEGINNING CASH BALANCE | 0 | 0 | 0 | -0 | -0 | 1759 | -0 | -0 | 1613 | 9787 |
| ENDING CASH BALANCE | 0 | 0 | -0 | -0 | 1759 | -0 | -0 | 1613 | 9787 | 20170 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

FUNDS FLOW STATEMENTS

CASE 2-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 21216 | 22599 | 23763 | 25063 | 26147 | 22920 | 23415 | 23415 | 23415 | 23415 |
| CASH GENERATED | 21216 | 22599 | 23763 | 25063 | 26147 | 22920 | 23415 | 23415 | 23415 | 23415 |
| PROFIT AFT. TAX. BFR INT | 12226 | 13609 | 14773 | 16073 | 17157 | 22535 | 23030 | 23030 | 23030 | 23030 |
| DEPRECIATION AND AMORTIZATION | 8990 | 8990 | 8990 | 8990 | 8990 | 385 | 385 | 385 | 385 | 385 |
| FINANCIAL RESOURCES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHARE CAPITAL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| USES OF FUNDS | 12292 | 12072 | 11362 | 10652 | 9948 | -707 | 0 | 0 | 0 | 0 |
| FIXED CAPITAL EXPENDITURE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NON-DEPRECIABLE ASSETS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIABLE FIXED ASSETS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CHANGE IN WORKING CAPITAL | -509 | -21 | -24 | -26 | -22 | -707 | 0 | 0 | 0 | 0 |
| DEBT SERVICES | 12802 | 12094 | 11386 | 10678 | 9970 | 0 | 0 | 0 | 0 | 0 |
| REPAYMENT OF LONG TERM DEBT | 9439 | 9439 | 9439 | 9439 | 9439 | 0 | 0 | 0 | 0 | 0 |
| REPAYMENT OF SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 3363 | 2655 | 1947 | 1239 | 531 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CASH INCREASE OR (DECREASE) | 8924 | 10527 | 12401 | 14411 | 16199 | 23627 | 23415 | 23415 | 23415 | 23415 |
| BEGINNING CASH BALANCE | 20170 | 29094 | 39621 | 52022 | 66433 | 82632 | 106260 | 129675 | 153090 | 176506 |
| ENDING CASH BALANCE | 29094 | 39621 | 52022 | 66433 | 82632 | 106260 | 129675 | 153090 | 176506 | 199921 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

BALANCE SHEET

CASE 2-B — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 221 | 1506 | 45082 | 92038 | 136602 | 127962 | 115840 | 103107 | 96318 | 91701 |
| CURRENT ASSETS | 0 | 0 | 0 | 0 | 0 | 8065 | 10890 | 11491 | 11475 | 11421 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ACCOUNT RECEIVABLE | 0 | 0 | 0 | 0 | 0 | 3602 | 5245 | 5612 | 5618 | 5598 |
| INVENTORIES | 0 | 0 | 0 | 0 | 0 | 4464 | 5645 | 5879 | 5857 | 5823 |
| ACC EXCESS CASH | 0 | 0 | -0 | -0 | 1759 | -0 | -0 | 1613 | 9787 | 20172 |
| NET FIXED ASSETS | 226 | 1506 | 45082 | 92038 | 134843 | 119896 | 104950 | 90003 | 75056 | 60110 |
| INVESTMENT | 226 | 1506 | 45082 | 92038 | 134843 | 134843 | 134843 | 134843 | 134843 | 134843 |
| NON-DEPR ASSETS | 0 | 445 | 889 | 889 | 889 | 889 | 889 | 889 | 889 | 889 |
| DEPRECIABLE ASSETS | 220 | 960 | 38783 | 77860 | 111584 | 111584 | 111584 | 111584 | 111584 | 111584 |
| INTEREST DRG CONSTR | 6 | 101 | 5410 | 13289 | 22370 | 22370 | 22370 | 22370 | 22370 | 22370 |
| LESS ACC DEPRECIATION | 0 | 0 | 0 | 0 | 0 | 14947 | 29893 | 44840 | 59787 | 74733 |
| LIABILITIES | 159 | 1054 | 31558 | 64427 | 96149 | 94206 | 84684 | 71645 | 62186 | 52710 |
| CURRENT LIABILITIES | 0 | 0 | 0 | 0 | 11198 | 18694 | 18611 | 15011 | 14991 | 14954 |
| ACCOUNT PAYABLE | 0 | 0 | 0 | 0 | 0 | 3714 | 5260 | 5572 | 5552 | 5515 |
| CURRENT PORTION OF L/T DEBT | 0 | 0 | 0 | 0 | 9439 | 9439 | 9439 | 9439 | 9439 | 9439 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 1759 | 5542 | 3912 | 0 | 0 | 0 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FIXED LIABILITIES | 159 | 1054 | 31557 | 64427 | 84951 | 75512 | 66073 | 56634 | 47195 | 37756 |
| LONG TERM DEBT BALANCE | 159 | 1054 | 31557 | 64427 | 84951 | 75512 | 66073 | 56634 | 47195 | 37156 |
| OTHER FIXED LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STOCK HOLDERS EQUITY | 68 | 452 | 13525 | 27612 | 40453 | 33755 | 31156 | 31462 | 34133 | 38991 |
| SHARE CAPITAL | 68 | 452 | 13525 | 27612 | 40453 | 40453 | 40453 | 40453 | 40453 | 40453 |
| ACC RETAINED EARNINGS | 0 | 0 | 0 | -0 | -0 | -6698 | -9297 | -8991 | -6320 | -1462 |
| LIABILITIES & S/H EQUITY | 227 | 1506 | 45082 | 92038 | 136602 | 127962 | 115840 | 103107 | 96318 | 91701 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

BALANCE SHEET

CASE 2-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 91086 | 92557 | 95896 | 101238 | 108380 | 130915 | 153945 | 176974 | 200004 | 223034 |
| CURRENT ASSETS | 10872 | 10806 | 10735 | 10656 | 10588 | 9881 | 9881 | 9881 | 9881 | 9881 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ACCOUNT RECEIVABLE | 5576 | 5552 | 5525 | 5496 | 5472 | 5472 | 5472 | 5472 | 5472 | 5472 |
| INVENTORIES | 5296 | 5254 | 5209 | 5159 | 5116 | 4409 | 4409 | 4409 | 4409 | 4409 |
| ACC EXCESS CASH | 29094 | 39621 | 52022 | 66433 | 82632 | 106260 | 129675 | 153090 | 176506 | 199920 |
| NET FIXED ASSETS | 51120 | 42130 | 33140 | 24150 | 15159 | 14774 | 14389 | 14003 | 13618 | 13233 |
| INVESTMENT | 134843 | 134843 | 134843 | 134843 | 134843 | 134843 | 134843 | 134843 | 134843 | 134843 |
| NON-DEPR ASSETS | 889 | 889 | 889 | 889 | 889 | 889 | 889 | 889 | 889 | 889 |
| DEPRECIABLE ASSETS | 111584 | 111584 | 111584 | 111584 | 111584 | 111584 | 111584 | 111584 | 111584 | 111584 |
| INTEREST DRG CONSTR | 22370 | 22370 | 22370 | 22370 | 22370 | 22370 | 22370 | 22370 | 22370 | 22370 |
| LESS ACC DEPRECIATION | 83723 | 92713 | 101703 | 110693 | 119684 | 120069 | 120454 | 120840 | 121225 | 121610 |
| LIABILITIES | 43231 | 33748 | 24261 | 14769 | 5284 | 5284 | 5284 | 5284 | 5284 | 5284 |
| CURRENT LIABILITIES | 14914 | 14870 | 14822 | 14769 | 5284 | 5284 | 5284 | 5284 | 5284 | 5284 |
| ACCOUNT PAYABLE | 5475 | 5431 | 5383 | 5330 | 5284 | 5284 | 5284 | 5284 | 5284 | 5284 |
| CURRENT PORTION OF L/T DEBT | 9439 | 9439 | 9439 | 9439 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FIXED LIABILITIES | 28317 | 18878 | 9439 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT BALANCE | 28317 | 18878 | 9439 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHER FIXED LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STOCK HOLDERS EQUITY | 47855 | 58809 | 71635 | 86469 | 103095 | 125630 | 148660 | 171690 | 194720 | 217750 |
| SHARE CAPITAL | 40453 | 40453 | 40453 | 40453 | 40453 | 40453 | 40453 | 40453 | 40453 | 40453 |
| ACC RETAINED EARNINGS | 7402 | 18356 | 31182 | 46016 | 62642 | 85177 | 108207 | 131237 | 154267 | 177297 |
| LIABILITIES & S/H EQUITY | 91086 | 92557 | 95896 | 101238 | 108380 | 130915 | 153945 | 176974 | 200004 | 223034 |

***** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *****



LONG TERM DEBT

CASE 2-B — - BASE CASE - — (USD 1000)

AMOUNT OF DEBT 94390

INTEREST RATE 7.500 PER CENT/YEAR

REPAYMENT 10 YEAR-EQUAL-INSTALLMENT-REPAYMENT (SEMI ANNUAL)

| YEAR | SER NO | PRINCIPAL | INTEREST | DEBT SERVICE | BALANCE AFT PAYMENT |
|---|---|---|---|---|---|
| 1992 | 1 | 0 | 0 | 0 | 79 |
| | 2 | 0 | 0 | 0 | 159 |
| 1993 | 3 | 0 | 0 | 0 | 606 |
| | 4 | 0 | 0 | 0 | 1054 |
| 1994 | 5 | 0 | 0 | 0 | 16306 |
| | 6 | 0 | 0 | 0 | 31557 |
| 1995 | 7 | 0 | 0 | 0 | 47992 |
| | 8 | 0 | 0 | 0 | 64427 |
| 1996 | 9 | 0 | 0 | 0 | 7940[illegible] |
| | 10 | 0 | 0 | 0 | 94390 |
| 1997 | 11 | 4720 | 3540 | 8259 | 89671 |
| | 12 | 4720 | 3363 | 8082 | 84951 |
| 1998 | 13 | 4720 | 3186 | 7905 | 80232 |
| | 14 | 4720 | 3009 | 7728 | 75512 |
| 1999 | 15 | 4720 | 2832 | 7551 | 70793 |
| | 16 | 4720 | 2655 | 7374 | 66073 |
| 2000 | 17 | 4720 | 2478 | 7197 | 61354 |
| | 18 | 4720 | 2301 | 7020 | 56634 |
| 2001 | 19 | 4720 | 2124 | 6843 | 51915 |
| | 20 | 4720 | 1947 | 6666 | 47195 |
| 2002 | 21 | 4720 | 1770 | 6489 | 42476 |
| | 22 | 4720 | 1593 | 6312 | 37756 |
| 2003 | 23 | 4720 | 1416 | 6135 | 33037 |
| | 24 | 4720 | 1239 | 5958 | 28317 |
| 2004 | 25 | 4720 | 1062 | 5781 | 23598 |
| | 26 | 4720 | 885 | 5604 | 18878 |
| 2005 | 27 | 4720 | 708 | 5427 | 14159 |
| | 28 | 4720 | 531 | 5250 | 9439 |
| 2006 | 29 | 4720 | 354 | 5073 | 4720 |
| | 30 | 4720 | 177 | 4896 | 0 |
| 2007 | 31 | 0 | 0 | 0 | 0 |
| | 32 | 0 | 0 | 0 | 0 |
| 2008 | 33 | 0 | 0 | 0 | 0 |
| | 34 | 0 | 0 | 0 | 0 |
| 2009 | 35 | 0 | 0 | 0 | 0 |
| | 36 | 0 | 0 | 0 | 0 |
| 2010 | 37 | 0 | 0 | 0 | 0 |
| | 38 | 0 | 0 | 0 | 0 |
| 2011 | 39 | 0 | 0 | 0 | 0 |
| | 40 | 0 | 0 | 0 | 0 |
| TOTAL | | 94390 | 37166 | 131556 | 0 |

FINANCIAL PROJECTIONS

CASE 3A

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

PRODUCTION AND SALES PLAN

CASE 3-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 0. | 0. | 0. | 0. | 0. | 300000. | 300000. | 300000 | 300000 | 300000. |
| CAPACITY UTILIZATION | 0 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.700 | 0.950 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 0. | 0 | 0. | 0. | 0. | 210000. | 285000. | 300000 | 300000 | 300000 |
| INCREASE IN INVENTORY | 0. | 0 | 0. | 0 | 0. | 17262 | 6165 | 1233. | 0 | 0 |
| SALES VOLUME (DOMESTIC CEMENT) | 0. | 0 | 0 | 0. | 0 | 150504 | 170919 | 193327 | 217927 | 244939 |
| UNIT SALES PRICE | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 1734 | 0 1734 | 0 1734 | 0 1734 | 0 1734 |
| SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 26102 | 29642 | 33529 | 37795 | 42480 |
| SALES VOLUME (EXPORT CLINKER) | 0 | 0 | 0 | 0 | 0 | 48023 | 114490 | 112876 | 90455 | 64482 |
| UNIT SALES PRICE | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 0440 | 0 0440 | 0 0440 | 0 0440 | 0 0440 |
| SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 2113 | 5038 | 4967 | 3980 | 2837 |
| TOTAL SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 28215 | 34680 | 38495 | 41775 | 45317 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

PRODUCTION AND SALES PLAN

CASE 3-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| CAPACITY UTILIZATION | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| INCREASE IN INVENTORY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES VOLUME (DOMESTIC CEMENT) | 274604 | 312000 | 312000 | 312000 | 312000 | 312000 | 312000 | 312000 | 312000 | 312000 |
| UNIT SALES PRICE | 0.1734 | 0.1734 | 0.1734 | 0.1734 | 0.1734 | 0.1734 | 0.1734 | 0.1734 | 0.1734 | 0.1734 |
| SALES REVENUE | 47625 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 |
| SALES VOLUME (EXPORT CLINKER) | 35958 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 |
| UNIT SALES PRICE | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 | 0.0440 |
| SALES REVENUE | 1582 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | 0 |
| TOTAL SALES REVENUE | 49207 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

PRODUCTION COST STATEMENTS

CASE 3-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 0 | 0 | 0 | 0 | 0 | 210000 | 285000 | 300000 | 300000 | 300000 |
| RAW MATERIALS | 0 | 0 | 0 | 0 | 0 | 749 | 1017 | 1070 | 1070 | 1070 |
| PYRITE CINDER | 0 | 0 | 0 | 0 | 0 | 101 | 137 | 144 | 144 | 144 |
| GYPSUM | 0 | 0 | 0 | 0 | 0 | 649 | 880 | 927 | 927 | 927 |
| UTILITIES | 0 | 0 | 0 | 0 | 0 | 3098 | 4084 | 4499 | 4784 | 5096 |
| FUEL (COAL) | 0 | 0 | 0 | 0 | 0 | 2186 | 2967 | 3123 | 3123 | 3123 |
| DIESEL OIL (CLINKER) | 0 | 0 | 0 | 0 | 0 | 616 | 638 | 638 | 638 | 638 |
| DIESEL OIL (CEMENT) | 0 | 0 | 0 | 0 | 0 | 0 | 172 | 431 | 716 | 1028 |
| ELECTRIC POWER | 0 | 0 | 0 | 0 | 0 | 296 | 307 | 307 | 307 | 307 |
| CONSUMBLES | 0 | 0 | 0 | 0 | 0 | 129 | 167 | 179 | 185 | 191 |
| FIRE BRICKS | 0 | 0 | 0 | 0 | 0 | 47 | 64 | 67 | 67 | 67 |
| STEEL BALL | 0 | 0 | 0 | 0 | 0 | 18 | 20 | 23 | 26 | 29 |
| LUBE OIL | 0 | 0 | 0 | 0 | 0 | 18 | 21 | 24 | 27 | 30 |
| EXPLOSIVES | 0 | 0 | 0 | 0 | 0 | 46 | 62 | 66 | 66 | 66 |
| KRAFT PAPER SACK | 0 | 0 | 0 | 0 | 0 | 1675 | 1902 | 2151 | 2425 | 2726 |
| KRAFT PAPER SACK (TRUCK) | 0 | 0 | 0 | 0 | 0 | 1271 | 1444 | 1633 | 1841 | 2069 |
| KRAFT PAPER SACK (BOAT) | 0 | 0 | 0 | 0 | 0 | 404 | 458 | 519 | 585 | 657 |
| VARIABLE COST | 0 | 0 | 0 | 0 | 0 | 5651 | 7170 | 7900 | 8464 | 9083 |
| EMPLOYMENT COST | 0 | 0 | 0 | 0 | 0 | 374 | 374 | 374 | 374 | 374 |
| MAINTENANCE COST | 0 | 0 | 0 | 0 | 0 | 3150 | 3150 | 3150 | 3150 | 3150 |
| INSURANCE | 0 | 0 | 0 | 0 | 0 | 1280 | 1280 | 1280 | 1280 | 1280 |
| DIRECT FIXED COST | 0 | 0 | 0 | 0 | 0 | 4804 | 4804 | 4804 | 4804 | 4804 |
| CASH FACTORY COST | 0 | 0 | 0 | 0 | 0 | 10455 | 11974 | 12704 | 13268 | 13888 |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 6423 | 6423 | 6423 | 6423 | 6423 |
| QUARRY DEVELOPEMENT | 0 | 0 | 0 | 0 | 0 | 713 | 713 | 713 | 713 | 713 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 896 | 896 | 896 | 896 | 896 |
| OFFSITE FACILITIES | 0 | 0 | 0 | 0 | 0 | 390 | 390 | 390 | 390 | 390 |
| FINISHING MILL | 0 | 0 | 0 | 0 | 0 | 687 | 687 | 687 | 687 | 687 |
| PREOPERATIONAL EXPEXSES | 0 | 0 | 0 | 0 | 0 | 762 | 762 | 762 | 762 | 762 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 4274 | 4274 | 4274 | 4274 | 4274 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 14145 | 14145 | 14145 | 14145 | 14145 |
| TOTAL FACTORY COST | 0 | 0 | 0 | 0 | 0 | 24601 | 26120 | 26850 | 27414 | 28033 |
| UNIT FACTORY COST | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 1171 | 0 0916 | 0 0895 | 0 0914 | 0 0934 |
| SALES EXPENSES | 0 | 0 | 0 | 0 | 0 | 141 | 173 | 192 | 209 | 227 |
| TRANSPORTATION COST | 0 | 0 | 0 | 0 | 0 | 0 | 233 | 584 | 969 | 1391 |
| SALES EXPENSES/ADMINISTRATION | 0 | 0 | 0 | 0 | 0 | 141 | 407 | 776 | 1177 | 1618 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6553 | 5881 | 5209 | 4537 | 3865 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 |
| TOTAL PRODUCTION COST | 0 | 0 | 0 | 0 | 0 | 31380 | 32408 | 32835 | 33128 | 33515 |
| UNIT PRODUCTION COST | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 1494 | 0 1137 | 0 1095 | 0 1104 | 0 1117 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PRODUCTION COST STATEMENTS

CASE 3-A - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| RAW MATERIALS | 1070 | 1070 | 1070 | 1070 | 1070 | 1070 | 1070 | 1070 | 1070 | 1070 |
| PYRITE CINDER | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 |
| GYPSUM | 927 | 927 | 927 | 927 | 927 | 927 | 927 | 927 | 927 | 927 |
| UTILITIES | 5439 | 5871 | 5871 | 5871 | 5871 | 5871 | 5871 | 5871 | 5871 | 5871 |
| FUEL (COAL) | 3123 | 3123 | 3123 | 3123 | 3123 | 3123 | 3123 | 3123 | 3123 | 3123 |
| DIESEL OIL (CLINKER) | 638 | 638 | 638 | 638 | 638 | 638 | 638 | 638 | 638 | 638 |
| DIESEL OIL (CEMENT) | 1371 | 1803 | 1803 | 1803 | 1803 | 1803 | 1803 | 1803 | 1803 | 1803 |
| ELECTRIC POWER | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 |
| CONSUMBLES | 199 | 207 | 207 | 207 | 207 | 207 | 207 | 207 | 207 | 207 |
| FIRE BRICKS | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 |
| STEEL BALL | 32 | 37 | 37 | 37 | 37 | 37 | 37 | 37 | 37 | 37 |
| LUBE OIL | 34 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 |
| EXPLOSIVES | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 |
| KRAFT PAPER SACK | 3056 | 3472 | 3472 | 3472 | 3472 | 3472 | 3472 | 3472 | 3472 | 3472 |
| KRAFT PAPER SACK (TRUCK) | 2319 | 2635 | 2635 | 2635 | 2635 | 2635 | 2635 | 2635 | 2635 | 2635 |
| KRAFT PAPER SACK (BOAT) | 737 | 837 | 837 | 837 | 837 | 837 | 837 | 837 | 837 | 837 |
| VARIABLE COST | 9763 | 10621 | 10621 | 10621 | 10621 | 10621 | 10621 | 10621 | 10621 | 10621 |
| EMPLOYMENT COST | 374 | 374 | 374 | 374 | 374 | 374 | 374 | 374 | 374 | 374 |
| MAINTENANCE COST | 3150 | 3150 | 3150 | 3150 | 3150 | 3150 | 3150 | 3150 | 3150 | 3150 |
| INSURANCE | 1280 | 1280 | 1280 | 1280 | 1280 | 1280 | 1280 | 1280 | 1280 | 1280 |
| DIRECT FIXED COST | 4804 | 4804 | 4804 | 4804 | 4804 | 4804 | 4804 | 4804 | 4804 | 4804 |
| CASH FACTORY COST | 14568 | 15425 | 15425 | 15425 | 15425 | 15425 | 15425 | 15425 | 15425 | 15425 |
| PLANT CONSTRUCTION | 6423 | 6423 | 6423 | 6423 | 6423 | 0 | 0 | 0 | 0 | 0 |
| QUARRY DEVELOPEMENT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UTILITY FACILITIES | 896 | 896 | 896 | 896 | 896 | 0 | 0 | 0 | 0 | 0 |
| OFFSITE FACILITIES | 390 | 390 | 390 | 390 | 390 | 390 | 390 | 390 | 390 | 390 |
| FINISHING MILL | 687 | 687 | 687 | 687 | 687 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXPEXSES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIATION AND AMORTIZATION | 8396 | 8396 | 8396 | 8396 | 8396 | 390 | 390 | 390 | 390 | 390 |
| TOTAL FACTORY COST | 22964 | 23822 | 23822 | 23822 | 23822 | 15816 | 15816 | 15816 | 15816 | 15816 |
| UNIT FACTORY COST | 0.0765 | 0.0794 | 0.0794 | 0.0794 | 0.0794 | 0.0527 | 0.0527 | 0.0527 | 0.0527 | 0.0527 |
| SALES EXPENSES | 246 | 271 | 271 | 271 | 271 | 271 | 271 | 271 | 271 | 271 |
| TRANSPORTATION COST | 1855 | 2440 | 2440 | 2440 | 2440 | 2440 | 2440 | 2440 | 2440 | 2440 |
| SALES EXPENSES/ADMINISTRATION | 2101 | 2710 | 2710 | 2710 | 2710 | 2710 | 2710 | 2710 | 2710 | 2710 |
| INTEREST ON LONG TERM DEBT | 3193 | 2520 | 1848 | 1176 | 504 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL PRODUCTION COST | 28258 | 29052 | 28380 | 27708 | 27036 | 18526 | 18526 | 18526 | 18526 | 18526 |
| UNIT PRODUCTION COST | 0.0942 | 0.0968 | 0.0946 | 0.0924 | 0.0901 | 0.0618 | 0.0618 | 0.0618 | 0.0618 | 0.0618 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

WORKING CAPITAL STATEMENTS

CASE 3-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 0 | 0 | 0 | 0 | 0 | 5421 | 6565 | 7027 | 7324 | 7639 |
| ACCOUNT RECEIVABLE | 0 | 0 | 0 | 0 | 0 | 2493 | 3265 | 3573 | 3761 | 3958 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 0 | 0 | 0 | 0 | 0 | 2146 | 2437 | 2756 | 3107 | 3492 |
| ACCOUNT RECEIVABLE (EXPORT) | 0 | 0 | 0 | 0 | 0 | 347 | 828 | 816 | 654 | 466 |
| INVENTORIES | 0 | 0 | 0 | 0 | 0 | 2928 | 3300 | 3455 | 3562 | 3681 |
| PRODUCT INVENTORY | 0 | 0 | 0 | 0 | 0 | 2022 | 2147 | 2207 | 2253 | 2304 |
| MATERIAL INV (PAPER SACK) | 0 | 0 | 0 | 0 | 0 | 335 | 380 | 430 | 485 | 545 |
| MATERIAL INV (PYRITE.COAL) | 0 | 0 | 0 | 0 | 0 | 457 | 621 | 653 | 653 | 653 |
| MATERIAL INV (GYPSUM) | 0 | 0 | 0 | 0 | 0 | 65 | 88 | 93 | 93 | 93 |
| MATERIAL INV (DIESEL) | 0 | 0 | 0 | 0 | 0 | 10 | 14 | 18 | 23 | 28 |
| MATERIAL INV (CONSUMABLES) | 0 | 0 | 0 | 0 | 0 | 39 | 50 | 54 | 55 | 57 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CURRENT LIABILITIES W/O DEBT | 0 | 0 | 0 | 0 | 0 | 1695 | 2151 | 2370 | 2539 | 2725 |
| ACCOUNT PAYABLE | 0 | 0 | 0 | 0 | 0 | 1695 | 2151 | 2370 | 2539 | 2725 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERMANENT WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 3726 | 4414 | 4657 | 4784 | 4914 |
| CHANGE IN WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 3726 | 688 | 244 | 127 | 130 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
WORKING CAPITAL STATEMENTS

CASE 3-A — BASE CASE — (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 7513 | 7949 | 7949 | 7949 | 7949 | 7291 | 7291 | 7291 | 7291 | 7291 |
| ACCOUNT RECEIVABLE | 4175 | 4448 | 4448 | 4448 | 4448 | 4448 | 4448 | 4448 | 4448 | 4448 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 3915 | 4448 | 4448 | 4448 | 44.8 | 4448 | 4448 | 4448 | 4448 | 4448 |
| ACCOUNT RECEIVABLE (EXPORT) | 260 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 | -0 |
| INVENTORIES | 3338 | 3502 | 3502 | 3502 | 3502 | 2843 | 2843 | 2843 | 2843 | 2843 |
| PRODUCT INVENTORY | 1888 | 1958 | 1958 | 1958 | 1958 | 1300 | 1300 | 1300 | 1300 | 1300 |
| MATERIAL INV (PAPER SACK) | 611 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 | 694 |
| MATERIAL INV (PYRITE.COAL) | 653 | 653 | 653 | 653 | 653 | 653 | 653 | 653 | 653 | 653 |
| MATERIAL INV (GYPSUM) | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| MATERIAL INV (DIESEL) | 34 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 |
| MATERIAL INV (CONSUMABLES) | 60 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CURRENT LIABILITIES W/O DEBT | 2929 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 |
| ACCOUNT PAYABLE | 2929 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERMANENT WORKING CAPITAL | 4584 | 4763 | 4763 | 4763 | 4763 | 4105 | 4105 | 4105 | 4105 | 4105 |
| CHANGE IN WORKING CAPITAL | -330 | 179 | 0 | 0 | 0 | -658 | 0 | 0 | 0 | 0 |

### *** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

INCOME STATEMENTS

CASE 3-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 0 | 0 | 0 | 0 | 0 | 28215 | 34680 | 38495 | 41775 | 45317 |
| TOTAL SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 28215 | 34680 | 38495 | 41775 | 45317 |
| COST OF SALES | 0 | 0 | 0 | 0 | 0 | 22578 | 25995 | 26790 | 27368 | 27982 |
| VARIABLE COST | 0 | 0 | 0 | 0 | 0 | 5651 | 7170 | 7900 | 8464 | 9083 |
| DIRECT FIXED COST | 0 | 0 | 0 | 0 | 0 | 4804 | 4804 | 4804 | 4804 | 4804 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 14145 | 14145 | 14145 | 14145 | 14145 |
| INC IN PRODUCT INVENTORY | 0 | 0 | 0 | 0 | 0 | 2022 | 125 | 60 | 46 | 51 |
| GROSS PROFIT ON SALES | 0 | 0 | 0 | 0 | 0 | 5636 | 8685 | 11705 | 14405 | 17335 |
| SALES EXPENSES/ADMINISTRATION | 0 | 0 | 0 | 0 | 0 | 141 | 407 | 776 | 1177 | 1618 |
| OPERATING PROFIT | 0 | 0 | 0 | 0 | 0 | 5495 | 8278 | 10929 | 13230 | 15717 |
| NON-OPERATING EXPENSES | 0 | 0 | 0 | 0 | 0 | 6639 | 5881 | 5209 | 4537 | 3865 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 6553 | 5881 | 5209 | 4537 | 3865 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) BEFORE TAX | 0 | 0 | 0 | 0 | 0 | -1143 | 2397 | 5720 | 8693 | 11852 |
| INCOME TAX | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) AFTER TAX | 0 | 0 | 0 | 0 | 0 | -1143 | 2397 | 5720 | 8693 | 11852 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RETAINED EARNINGS | 0 | 0 | 0 | 0 | 0 | -1143 | 2397 | 5720 | 8693 | 11852 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

INCOME STATEMENTS

CASE 3-A — - BASE CASE - — (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 49207 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 |
| TOTAL SALES REVENUE | 49207 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 | 54110 |
| COST OF SALES | 23381 | 23751 | 23822 | 23822 | 23822 | 16474 | 15816 | 15816 | 15816 | 15816 |
| VARIABLE COST | 9763 | 10621 | 10621 | 10621 | 10621 | 10621 | 10621 | 10621 | 10621 | 10621 |
| DIRECT FIXED COST | 4804 | 4804 | 4804 | 4804 | 4804 | 4804 | 4804 | 4804 | 4804 | 4804 |
| DEPRECIATION AND AMORTIZATION | 8396 | 8396 | 8396 | 8396 | 8396 | 390 | 390 | 390 | 390 | 390 |
| INC IN PRODUCT INVENTORY | -417 | 70 | 0 | 0 | 0 | -658 | 0 | 0 | 0 | 0 |
| GROSS PROFIT ON SALES | 25826 | 30359 | 30289 | 30289 | 30289 | 37636 | 38295 | 38295 | 38295 | 38295 |
| SALES EXPENSES/ADMINISTRATION | 2101 | 2710 | 2710 | 2710 | 2710 | 2710 | 2710 | 2710 | 2710 | 2710 |
| OPERATING PROFIT | 23725 | 27649 | 27578 | 27578 | 27578 | 34926 | 35584 | 35584 | 35584 | 35584 |
| NON-OPERATING EXPENSES | 3193 | 2520 | 1848 | 1176 | 504 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 3193 | 2520 | 1848 | 1176 | 504 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) BEFORE TAX | 20532 | 25128 | 25730 | 26402 | 27074 | 34926 | 35584 | 35584 | 35584 | 35584 |
| INCOME TAX | 6160 | 7539 | 7719 | 7921 | 8122 | 10478 | 10675 | 10675 | 10675 | 10675 |
| NET PROFIT OR (LOSS) AFTER TAX | 14373 | 17590 | 18011 | 18481 | 18952 | 24448 | 24909 | 24909 | 24909 | 24909 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RETAINED EARNINGS | 14373 | 17590 | 18011 | 18481 | 18952 | 24448 | 24909 | 24909 | 24909 | 24909 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

FUNDS FLOW STATEMENTS

CASE 3-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 227 | 1765 | 38546 | 45634 | 42991 | 19641 | 22424 | 25075 | 27376 | 29863 |
| CASH GENERATED | 0 | 0 | 0 | 0 | 0 | 19641 | 22424 | 25075 | 27376 | 29863 |
| PROFIT AFT TAX. BFR INT | 0 | 0 | 0 | 0 | 0 | 5495 | 8278 | 10929 | 13230 | 15717 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 14145 | 14145 | 14145 | 14145 | 14145 |
| FINANCIAL RESOURCES | 227 | 1765 | 38546 | 45634 | 42991 | 0 | 0 | 0 | 0 | 0 |
| SHARE CAPITAL | 68 | 530 | 11564 | 13690 | 12555 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT | 159 | 1236 | 26982 | 31944 | 29294 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 1142 | 0 | 0 | 0 | 0 | 0 |
| USES OF FUNDS | 226 | 1766 | 38546 | 45634 | 41850 | 20468 | 15530 | 14414 | 13625 | 12956 |
| FIXED CAPITAL EXPENDITURE | 226. | 1766. | 38546. | 45634 | 41850 | 0 | 0 | 0. | 0 | 0 |
| NON-DEPRECIABLE ASSETS | 0. | 895. | 750. | 0. | 0. | 0. | 0. | 0. | 0 | 0 |
| DEPRECIABLE FIXED ASSETS | 220. | 740. | 33100. | 37977. | 32972. | 0 | 0. | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 6. | 131 | 4696. | 7657. | 8878. | 0. | 0. | 0. | 0 | 0 |
| CHANGE IN WORKING CAPITAL | 0 | 0. | 0 | 0. | 0. | 3726. | 688 | 244. | 127 | 130 |
| DEBT SERVICES | 0. | 0. | 0. | 0. | 0 | 16742. | 14842. | 14170 | 13498 | 12826 |
| REPAYMENT OF LONG TERM DEBT | 0. | 0 | 0. | 0. | 0 | 8961. | 8961 | 8961 | 8961 | 8961 |
| REPAYMENT OF SHORT TERM DEBT | 0 | 0 | 0. | 0. | 0 | 1142 | 0 | 0 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | C | 0. | 0 | 0. | 0 | 6553 | 5881 | 5209 | 4537 | 3865 |
| INTEREST ON SHORT TERM DEBT | 0. | 0. | 0. | 0 | 0 | 86 | 0 | 0 | 0 | 0 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CASH INCREASE OR (DECREASE) | 1 | -1 | 0 | 1 | 1141 | -827 | 6894 | 10660 | 13750 | 16907 |
| BEGINNING CASH BALANCE | 0 | 1 | 0. | 0. | 1 | 1142 | 315 | 7208 | 17869 | 31619 |
| ENDING CASH BALANCE | 1. | 0. | 0 | 1. | 1142 | 315. | 7208 | 17869 | 31619 | 48526 |

# *** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

## FUNDS FLOW STATEMENTS

CASE 3-A — - BASE CASE - — (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 25961 | 28507 | 28256 | 28054 | 27852 | 24839 | 25299 | 25299 | 25299 | 25299 |
| CASH GENERATED | 25961 | 28507 | 28256 | 28054 | 27852 | 24839 | 25299 | 25299 | 25299 | 25299 |
| PROFIT AFT TAX. BFR INT | 17565 | 20110 | 19859 | 19658 | 19456 | 24448 | 24909 | 24909 | 24909 | 24909 |
| DEPRECIATION AND AMORTIZATION | 8396 | 8396 | 8396 | 8396 | 8396 | 390 | 390 | 390 | 390 | 390 |
| FINANCIAL RESOURCES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHARE CAPITAL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| USES OF FUNDS | 11824 | 11661 | 10810 | 10138 | 9466 | -658 | 0 | 0 | 0 | 0 |
| FIXED CAPITAL EXPENDITURE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NON-DEPRECIABLE ASSETS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIABLE FIXED ASSETS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CHANGE IN WORKING CAPITAL | -330 | 179 | 0 | 0 | 0 | -658 | 0 | 0 | 0 | 0 |
| DEBT SERVICES | 12154 | 11482 | 10810 | 10138 | 9466 | 0 | 0 | 0 | 0 | 0 |
| REPAYMENT OF LONG TERM DEBT | 8961 | 8961 | 8961 | 8961 | 8961 | 0 | 0 | 0 | 0 | 0 |
| REPAYMENT OF SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 3193 | 2520 | 1848 | 1176 | 504 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CASH INCREASE OR (DECREASE) | 14138 | 16845 | 17446 | 17916 | 18387 | 25497 | 25299 | 25299 | 25299 | 25299 |
| BEGINNING CASH BALANCE | 48526 | 62664 | 79509 | 96955 | 114871 | 133258 | 158755 | 184054 | 209353 | 234653 |
| ENDING CASH BALANCE | 62664 | 79509 | 96955 | 114871 | 133258 | 158755 | 184054 | 209353 | 234653 | 259952 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

BALANCE SHEET

CASE 3-A - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 227 | 1992 | 40538 | 86172 | 129163 | 119611 | 113503 | 110481 | 110382 | 113459 |
| CURRENT ASSETS | 0 | 0 | 0 | 0 | 0 | 5421 | 6565 | 7027 | 7324 | 7639 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ACCOUNT RECEIVABLE | 0 | 0 | 0 | 0 | 0 | 2493 | 3265 | 3573 | 3761 | 3958 |
| INVENTORIES | 0 | 0 | 0 | 0 | 0 | 2928 | 3300 | 3455 | 3562 | 3681 |
| ACC EXCESS CASH | 1 | 0 | 0 | 1 | 1142 | 315 | 7208 | 17869 | 31619 | 48526 |
| NET FIXED ASSETS | 226 | 1992 | 40538 | 86171 | 128021 | 113876 | 99730 | 85585 | 71439 | 57294 |
| INVESTMENT | 226 | 1992 | 40538 | 86171 | 128021 | 128021 | 128021 | 128021 | 128021 | 128021 |
| NON-DEPR ASSETS | 0 | 895 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 |
| DEPRECIABLE ASSETS | 220 | 960 | 34060 | 72036 | 105008 | 105008 | 105008 | 105008 | 105008 | 105008 |
| INTEREST DRG CONSTR | 6 | 137 | 4833 | 12490 | 21368 | 21368 | 21368 | 21368 | 21368 | 21368 |
| LESS: ACC DEPRECIATION | 0 | 0 | 0 | 0 | 0 | 14145 | 28291 | 42436 | 56582 | 70727 |
| LIABILITIES | 159 | 1394 | 28376 | 60321 | 90757 | 82348 | 73843 | 65100 | 56308 | 47532 |
| CURRENT LIABILITIES | 0 | 0 | 0 | 0 | 10103 | 10657 | 11112 | 11331 | 11501 | 11686 |
| ACCOUNT PAYABLE | 0 | 0 | 0 | 0 | 0 | 1695 | 2151 | 2370 | 2539 | 2725 |
| CURRENT PORTION OF L/T DEBT | 0 | 0 | 0 | 0 | 8961 | 8961 | 8961 | 8961 | 8961 | 8961 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 1142 | 0 | 0 | 0 | 0 | 0 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FIXED LIABILITIES | 159 | 1394 | 28376 | 60321 | 80653 | 71692 | 62730 | 53769 | 44807 | 35846 |
| LONG TERM DEBT BALANCE | 159 | 1394 | 28376 | 60321 | 80653 | 71692 | 62730 | 53769 | 44807 | 35846 |
| OTHER FIXED LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STOCK HOLDERS EQUITY | 68 | 598 | 12161 | 25852 | 38406 | 37263 | 39660 | 45380 | 54074 | 65926 |
| SHARE CAPITAL | 68 | 598 | 12161 | 25852 | 38406 | 38406 | 38406 | 38406 | 38406 | 38406 |
| ACC. RETAINED EARNINGS | 0 | 0 | 0 | 0 | 0 | -1143 | 1254 | 6974 | 15668 | 27520 |
| LIABILITIES & S/H EQUITY | 227 | 1992 | 40538 | 86172 | 129163 | 119611 | 113503 | 110481 | 110382 | 113459 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

BALANCE SHEET

CASE 3-A — - BASE CASE - — (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 119074 | 127960 | 137009 | 146529 | 156520 | 180968 | 205877 | 230786 | 255694 | 280603 |
| CURRENT ASSETS | 7513 | 7949 | 7949 | 7949 | 7949 | 7291 | 7291 | 7291 | 7291 | 7291 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ACCOUNT RECEIVABLE | 4175 | 4448 | 4448 | 4448 | 4448 | 4448 | 4448 | 4448 | 4448 | 4448 |
| INVENTORIES | 3338 | 3502 | 3502 | 3502 | 3502 | 2843 | 2843 | 2843 | 2843 | 2843 |
| ACC. EXCESS CASH | 62664 | 79509 | 96955 | 114871 | 133258 | 158755 | 184054 | 209353 | 234653 | 259952 |
| NET FIXED ASSETS | 48897 | 40501 | 32105 | 23708 | 15312 | 14922 | 14531 | 14141 | 13751 | 13360 |
| INVESTMENT | 128021 | 128021 | 128021 | 128021 | 128021 | 128021 | 128021 | 128021 | 128021 | 128021 |
| NON-DEPR. ASSETS | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 |
| DEPRECIABLE ASSETS | 105008 | 105008 | 105008 | 105008 | 105008 | 105008 | 105008 | 105008 | 105008 | 105008 |
| INTEREST DRG CONSTR. | 21368 | 21368 | 21368 | 21368 | 21368 | 21368 | 21368 | 21368 | 21368 | 21368 |
| LESS: ACC. DEPRECIATION | 79124 | 87520 | 95916 | 104313 | 112709 | 113099 | 113490 | 113880 | 114270 | 114661 |
| LIABILITIES | 38775 | 30071 | 21109 | 12148 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 |
| CURRENT LIABILITIES | 11891 | 12148 | 12148 | 12148 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 |
| ACCOUNT PAYABLE | 2929 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 | 3186 |
| CURRENT PORTION OF L/T DEBT | 8961 | 8961 | 8961 | 8961 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FIXED LIABILITIES | 26884 | 17923 | 8962 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT BALANCE | 26884 | 17923 | 8962 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHER FIXED LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STOCK HOLDERS EQUITY | 80299 | 97889 | 115900 | 134381 | 153333 | 177781 | 202690 | 227599 | 252508 | 277417 |
| SHARE CAPITAL | 38406 | 38406 | 38406 | 38406 | 38406 | 38406 | 38406 | 38406 | 38406 | 38406 |
| ACC. RETAINED EARNINGS | 41893 | 59483 | 77494 | 95975 | 114927 | 139375 | 164284 | 189193 | 214102 | 239011 |
| LIABILITIES & S/H EQUITY | 119074 | 127960 | 137009 | 146529 | 156520 | 180968 | 205877 | 230786 | 255694 | 280603 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
LONG TERM DEBT

CASE 3-A - BASE CASE - (USD 1000)

AMOUNT OF DEBT 89615.

INTEREST RATE 7 500 PER CENT/YEAR

REPAYMENT 10 YEAR-EQUAL-INSTALLMENT-REPAYMENT (SEMI ANNUAL)

| YEAR | SER NO | PRINCIPAL | INTEREST | DEBT SERVICE | BALANCE AFT. PAYMENT |
|---|---|---|---|---|---|
| 1992 | 1 | 0 | 0 | 0 | 79 |
| | 2 | 0 | 0 | 0 | 159 |
| 1993 | 3 | 0 | 0 | 0 | 777 |
| | 4 | 0 | 0 | 0 | 1394 |
| 1994 | 5 | 0 | 0 | 0 | 14885 |
| | 6 | 0 | 0 | 0 | 28376 |
| 1995 | 7 | 0 | 0 | 0 | 44348 |
| | 8 | 0 | 0 | 0 | 60321 |
| 1996 | 9 | 0 | 0 | 0 | 74968 |
| | 10 | 0 | 0 | 0 | 89615 |
| 1997 | 11 | 4481 | 3361 | 7841 | 85134 |
| | 12 | 4481 | 3193 | 7673 | 80653 |
| 1998 | 13 | 4481 | 3024 | 7505 | 76172 |
| | 14 | 4481 | 2856 | 7337 | 71692 |
| 1999 | 15 | 4481 | 2688 | 7169 | 67211 |
| | 16 | 4481 | 2520 | 7001 | 62730 |
| 2000 | 17 | 4481 | 2352 | 6833 | 58249 |
| | 18 | 4481 | 2184 | 6665 | 53769 |
| 2001 | 19 | 4481 | 2016 | 6497 | 49288 |
| | 20 | 4481 | 1848 | 6329 | 44807 |
| 2002 | 21 | 4481 | 1680 | 6161 | 40326 |
| | 22 | 4481 | 1512 | 5993 | 35846 |
| 2003 | 23 | 4481 | 1344 | 5825 | 31365 |
| | 24 | 4481 | 1176 | 5657 | 26884 |
| 2004 | 25 | 4481 | 1008 | 5489 | 22404 |
| | 26 | 4481 | 840 | 5321 | 17923 |
| 2005 | 27 | 4481 | 672 | 5153 | 13442 |
| | 28 | 4481 | 504 | 4985 | 8961 |
| 2006 | 29 | 4481 | 336 | 4817 | 4481 |
| | 30 | 4481 | 168 | 4649 | 0 |
| 2007 | 31 | 0 | 0 | 0 | 0 |
| | 32 | 0 | 0 | 0 | 0 |
| 2008 | 33 | 0 | 0 | 0 | 0 |
| | 34 | 0 | 0 | 0 | 0 |
| 2009 | 35 | 0 | 0 | 0 | 0 |
| | 36 | 0 | 0 | 0 | 0 |
| 2010 | 37 | 0 | 0 | 0 | 0 |
| | 38 | 0 | 0 | 0 | 0 |
| 2011 | 39 | 0 | 0 | 0 | 0 |
| | 40 | 0 | 0 | 0 | 0 |
| TOTAL | | 89614 | 35286 | 124900 | 0 |

FINANCIAL PROJECTIONS

CASE 3B

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PRODUCTION AND SALES PLAN

CASE 3-B - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 0. | 0. | 0. | 0. | 0. | 400000. | 400000. | 400000. | 400000. | 400000. |
| CAPACITY UTILIZATION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.700 | 0.950 | 1.000 | 1.000 | 1.000 |
| PRODUCTION (VOLUME) | 0. | 0. | 0. | 0. | 0. | 280000. | 380000. | 400000. | 400000. | 400000 |
| INCREASE IN INVENTORY | 0 | 0 | 0 | 0 | 0 | 23016. | 8220 | 1644 | 0 | 0 |
| SALES VOLUME (DOMESTIC CEMENT) | 0 | 0 | 0 | 0 | 0 | 150504 | 170919 | 193327 | 217927 | 244939 |
| UNIT SALES PRICE | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 1734 | 0 1734 | 0.1734 | 0 1734 | 0 1734 |
| SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 26102 | 29642 | 33529 | 37795 | 42480 |
| SALES VOLUME (EXPORT CLINKER) | 0 | 0 | 0 | 0 | 0 | 112269 | 207435 | 212465 | 190455 | 164482 |
| UNIT SALES PRICE | 0 0 | 0 0 | 0 0 | 0 0 | 0 0 | 0 0440 | 0 0440 | 0 0440 | 0 0440 | 0 0440 |
| SALES REVENUE | 0 | 0 | 0 | 0 | 0. | 4940 | 9127 | 9348 | 8380 | 7237 |
| TOTAL SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 31042 | 38770 | 42877 | 46175 | 49717 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

PRODUCTION AND SALES PLAN

CASE 3-B — BASE CASE — (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| RATED CAPACITY (CLINKER) | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| CAPACITY UTILIZATION | 1 000 | 1.000 | 1 000 | 1.000 | 1 000 | 1 000 | 1 000 | 1 000 | 1 000 | 1 000 |
| PRODUCTION (VOLUME) | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| INCREASE IN INVENTORY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SALES VOLUME (DOMESTIC CEMENT) | 274604 | 307189 | 342988 | 382322 | 416000 | 416000 | 416000 | 416000 | 416000 | 416000 |
| UNIT SALES PRICE | 0 1734 | 0 1734 | 0 1734 | 0 1734 | 0 1734 | 0 1734 | 0 1734 | 0 1734 | 0 1734 | 0 1734 |
| SALES REVENUE | 47625 | 53276 | 59484 | 66306 | 72147 | 72147 | 72147 | 72147 | 72147 | 72147 |
| SALES VOLUME (EXPORT CLINKER) | 135958 | 104626 | 70204 | 32383 | -0 | -0 | -0 | -0 | -0 | -0 |
| UNIT SALES PRICE | 0 0440 | 0 0440 | 0 0440 | 0 0440 | 0 0440 | 0 0440 | 0 0440 | 0 0440 | 0 0440 | 0 0440 |
| SALES REVENUE | 5982 | 4604 | 3089 | 1425 | -0 | -0 | -0 | -0 | -0 | -0 |
| TOTAL SALES REVENUE | 53607 | 57879 | 62573 | 67731 | 72147 | 72147 | 72147 | 72147 | 72147 | 72147 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
PRODUCTION COST STATEMENTS

CASE 3-B - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOL E) | 0 | 0 | 0 | 0 | 0 | 280000 | 380000 | 400000 | 400000 | 400000 |
| RAW MATERIALS | 0 | 0 | 0 | 0 | 0 | 999 | 1356 | 1427 | 1427 | 1427 |
| PYRITE CINDER | 0 | 0 | 0 | 0 | 0 | 134 | 182 | 192 | 192 | 192 |
| GYPSUM | 0 | 0 | 0 | 0 | 0 | 865 | 1174 | 1235 | 1235 | 1235 |
| UTILITIES | 0 | 0 | 0 | 0 | 0 | 3826 | 5073 | 5540 | 5825 | 6137 |
| FUEL (COAL) | 0 | 0 | 0 | 0 | 0 | 2915 | 3955 | 4164 | 4164 | 4164 |
| DIESEL OIL (CLINKER) | 0 | 0 | 0 | 0 | 0 | 616 | 638 | 638 | 638 | 638 |
| DIESEL OIL (CEMENT) | 0 | 0 | 0 | 0 | 0 | 0 | 172 | 431 | 716 | 1028 |
| ELECTRIC POWER | 0 | 0 | 0 | 0 | 0 | 296 | 307 | 307 | 307 | 307 |
| CONSUMBLES | 0 | 0 | 0 | 0 | 0 | 160 | 209 | 223 | 229 | 236 |
| FIRE BRICKS | 0 | 0 | 0 | 0 | 0 | 63 | 85 | 89 | 89 | [illegible] |
| STEEL BALL | 0 | 0 | 0 | 0 | 0 | 18 | 20 | 23 | 26 | 29 |
| LUBE OIL | 0 | 0 | 0 | 0 | 0 | 18 | 21 | 24 | 27 | 30 |
| EXPLOSIVES | 0 | 0 | 0 | 0 | 0 | 61 | 83 | 88 | 88 | 86 |
| KRAFT PAPER SACK | 0 | 0 | 0 | 0 | 0 | 1675 | 1902 | 2151 | 2425 | 2726 |
| KRAFT PAPER SACK (TRUCK) | 0 | 0 | 0 | 0 | 0 | 1271 | 1444 | 1633 | 1841 | 2069 |
| KRAFT PAPER SACK (BOAT) | 0 | 0 | 0 | 0 | 0 | 404 | 458 | 519 | 585 | 657 |
| VARIABLE COST | 0 | 0 | 0 | 0 | 0 | 6660 | 8540 | 9342 | 9906 | 10529 |
| EMPLOYMENT COST | 0 | 0 | 0 | 0 | 0 | 374 | 374 | 374 | 374 | 374 |
| MAINTENANCE COST | 0 | 0 | 0 | 0 | 0 | 3508 | 3508 | 3508 | 3508 | 3508 |
| INSURANCE | 0 | 0 | 0 | 0 | 0 | 1423 | 1423 | 1423 | 1423 | 1423 |
| DIRECT FIXED COST | 0 | 0 | 0 | 0 | 0 | 5305 | 5305 | 5305 | 5305 | 5305 |
| CASH FACTORY COST | 0 | 0 | 0 | 0 | 0 | 11965 | 13844 | 14646 | 15210 | 15830 |
| PLANT CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 7289 | 7289 | 7289 | 7289 | 7289 |
| QUARRY DEVELOPEMENT | 0 | 0 | 0 | 0 | 0 | 833 | 833 | 833 | 833 | 833 |
| UTILITY FACILITIES | 0 | 0 | 0 | 0 | 0 | 1046 | 1046 | 1046 | 1046 | 1046 |
| OFFSITE FACILITIES | 0 | 0 | 0 | 0 | 0 | 390 | 390 | 390 | 390 | 390 |
| FINISHING MILL | 0 | 0 | 0 | 0 | 0 | 687 | 687 | 687 | 687 | 687 |
| PREOPERATIONAL EXPEXSES | 0 | 0 | 0 | 0 | 0 | 767 | 767 | 767 | 767 | 767 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 4745 | 4745 | 4745 | 4745 | 4745 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 15758 | 15758 | 15758 | 15758 | 15758 |
| TOTAL FACTORY COST | 0 | 0 | 0 | 0 | 0 | 27723 | 29602 | 30404 | 30968 | 31588 |
| UNIT FACTORY COST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0990 | 0.0779 | 0.0760 | 0.0774 | 0.0790 |
| SALES EXPENSES | 0 | 0 | 0 | 0 | 0 | 155 | 194 | 214 | 231 | 249 |
| TRANSPORTATION COST | 0 | 0 | 0 | 0 | 0 | 3618 | 3983 | 4334 | 4719 | 5141 |
| SALES EXPENSES/ADMINISTRATION | 0 | 0 | 0 | 0 | 0 | 3773 | 4177 | 4548 | 4949 | 5390 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 7284 | 6537 | 5790 | 5043 | 4295 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 113 | 308 | 67 | 0 | 0 |
| TOTAL PRODUCTION COST | 0 | 0 | 0 | 0 | 0 | 38893 | 40624 | 40809 | 40960 | 41273 |
| UNIT PRODUCTION COST | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1389 | 0.1069 | 0.1020 | 0.1024 | 0.1032 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

PRODUCTION COST STATEMENTS

CASE 3-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION (VOLUME) | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 | 400000 |
| RAW MATERIALS | 1427 | 1427 | 1427 | 1427 | 1427 | 1427 | 1427 | 1427 | 1427 | 1427 |
| PYRITE CINDER | 192 | 192 | 192 | 192 | 192 | 192 | 192 | 192 | 192 | 192 |
| GYPSUM | 1235 | 1235 | 1235 | 1235 | 1235 | 1235 | 1235 | 1235 | 1235 | 1235 |
| UTILITIES | 6480 | 6856 | 7270 | 7725 | 8114 | 8114 | 8114 | 8114 | 8114 | 8114 |
| FUEL (COAL) | 4164 | 4164 | 4164 | 4164 | 4164 | 4164 | 4164 | 4164 | 4164 | 4164 |
| DIESEL OIL (CLINKER) | 638 | 638 | 638 | 638 | 638 | 638 | 638 | 638 | 638 | 638 |
| DIESEL OIL (CEMENT) | 1371 | 1748 | 2161 | 2616 | 3005 | 3005 | 3005 | 3005 | 3005 | 3005 |
| ELECTRIC POWER | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 |
| CONSUMBLES | 243 | 251 | 259 | 269 | 277 | 277 | 277 | 277 | 277 | 277 |
| FIRE BRICKS | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |
| STEEL BALL | 32 | 36 | 40 | 45 | 49 | 49 | 49 | 49 | 49 | 49 |
| LUBE OIL | 34 | 38 | 42 | 47 | 51 | 51 | 51 | 51 | 51 | 51 |
| EXPLOSIVES | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 |
| KRAFT PAPER SACK | 3056 | 3418 | 3817 | 4255 | 4629 | 4629 | 4629 | 4629 | 4629 | 4629 |
| KRAFT PAPER SACK (TRUCK) | 2319 | 2595 | 2897 | 3229 | 3514 | 3514 | 3514 | 3514 | 3514 | 3514 |
| KRAFT PAPER SACK (BOAT) | 737 | 824 | 920 | 1025 | 1116 | 1116 | 1116 | 1116 | 1116 | 1116 |
| VARIABLE COST | 11205 | 11952 | 12773 | 13675 | 14447 | 14447 | 14447 | 14447 | 14447 | 14447 |
| EMPLOYMENT COST | 374 | 374 | 374 | 374 | 374 | 374 | 374 | 374 | 374 | 374 |
| MAINTENANCE COST | 3508 | 3508 | 3508 | 3508 | 3508 | 3508 | 3508 | 3508 | 3508 | 3508 |
| INSURANCE | 1423 | 1423 | 1423 | 1423 | 1423 | 1423 | 1423 | 1423 | 1423 | 1423 |
| DIRECT FIXED COST | 5305 | 5305 | 5305 | 5305 | 5305 | 5305 | 5305 | 5305 | 5305 | 5305 |
| CASH FACTORY COST | 16510 | 17257 | 18078 | 18980 | 19752 | 19752 | 19752 | 19752 | 19752 | 19752 |
| PLANT CONSTRUCTION | 7289 | 7289 | 7289 | 7289 | 7289 | 0 | 0 | 0 | 0 | 0 |
| QUARRY DEVELOPEMENT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| UTILITY FACILITIES | 1046 | 1046 | 1046 | 1046 | 1046 | 0 | 0 | 0 | 0 | 0 |
| OFFSITE FACILITIES | 390 | 390 | 390 | 390 | 390 | 390 | 390 | 390 | 390 | 390 |
| FINISHING MILL | 687 | 687 | 687 | 687 | 687 | 0 | 0 | 0 | 0 | 0 |
| PREOPERATIONAL EXPEXSES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIATION AND AMORTIZATION | 9413 | 9413 | 9413 | 9413 | 9413 | 390 | 390 | 390 | 390 | 390 |
| TOTAL FACTORY COST | 25923 | 26670 | 27490 | 28392 | 29164 | 20142 | 20142 | 20142 | 20142 | 20142 |
| UNIT FACTORY COST | 0.0648 | 0.0667 | 0.0687 | 0.0710 | 0.0729 | 0.0504 | 0.0504 | 0.0504 | 0.0504 | 0.0504 |
| SALES EXPENSES | 268 | 289 | 313 | 339 | 361 | 361 | 361 | 361 | 361 | 361 |
| TRANSPORTATION COST | 5605 | 6115 | 6674 | 7290 | 7816 | 7816 | 7816 | 7816 | 7816 | 7816 |
| SALES EXPENSES/ADMINISTRATION | 5873 | 6404 | 6987 | 7628 | 8177 | 8177 | 8177 | 8177 | 8177 | 8177 |
| INTEREST ON LONG TERM DEBT | 3548 | 2801 | 2054 | 1307 | 560 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL PRODUCTION COST | 35344 | 35875 | 36532 | 37328 | 37902 | 28319 | 28319 | 28319 | 28319 | 28319 |
| UNIT PRODUCTION COST | 0.0884 | 0.0897 | 0.0913 | 0.0933 | 0.0948 | 0.0708 | 0.0708 | 0.0708 | 0.0708 | 0.0708 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
WORKING CAPITAL STATEMENTS

CASE 3-B — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 0 | 0 | 0 | 0 | 0 | 6326 | 7772 | 8302 | 8601 | 8916 |
| ACCOUNT RECEIVABLE | 0 | 0 | 0 | 0 | 0 | 2958 | 3937 | 4293 | 4484 | 4682 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 0 | 0 | 0 | 0 | 0 | 2146 | 2437 | 2756 | 3107 | 3492 |
| ACCOUNT RECEIVABLE (EXPORT) | 0 | 0 | 0 | 0 | 0 | 812 | 1501 | 1537 | 1378 | 1190 |
| INVENTORIES | 0 | 0 | 0 | 0 | 0 | 3368 | 3835 | 4009 | 4117 | 4235 |
| PRODUCT INVENTORY | 0 | 0 | 0 | 0 | 0 | 2279 | 2433 | 2499 | 2546 | 2597 |
| MATERIAL INV (PAPER SACK) | 0 | 0 | 0 | 0 | 0 | 335 | 380 | 430 | 485 | 545 |
| MATERIAL INV (PYRITE.COAL) | 0 | 0 | 0 | 0 | 0 | 610 | 828 | 871 | 871 | 871 |
| MATERIAL INV (GYPSUM) | 0 | 0 | 0 | 0 | 0 | 86 | 117 | 124 | 124 | 124 |
| MATERIAL INV (DIESEL) | 0 | 0 | 0 | 0 | 0 | 10 | 14 | 18 | 23 | 28 |
| MATERIAL INV (CONSUMABLES) | 0 | 0 | 0 | 0 | 0 | 48 | 63 | 67 | 69 | 71 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CURRENT LIABILITIES W/O DEBT | 0 | 0 | 0 | 0 | 0 | 1998 | 2562 | 2803 | 2972 | 3158 |
| ACCOUNT PAYABLE | 0 | 0 | 0 | 0 | 0 | 1998 | 2562 | 2803 | 2972 | 3158 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERMANENT WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 4328 | 5210 | 5499 | 5629 | 5759 |
| CHANGE IN WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 4328 | 882 | 289 | 130 | 130 |

***** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *****

**WORKING CAPITAL STATEMENTS**

CASE 3-B — - BASE CASE - — (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| CURRENT ASSETS | 8741 | 9122 | 9540 | 9999 | 10392 | 9650 | 9650 | 9650 | 9650 | 9650 |
| ACCOUNT RECEIVABLE | 4898 | 5136 | 5397 | 5685 | 5930 | 5930 | 5930 | 5930 | 5930 | 5930 |
| ACCOUNT RECEIVABLE (DOMESTIC) | 3915 | 4379 | 4890 | 5450 | 5930 | 5930 | 5930 | 5930 | 5930 | 5930 |
| ACCOUNT RECEIVABLE (EXPORT) | 983 | 757 | 508 | 234 | -0 | -0 | -0 | -0 | -0 | -0 |
| INVENTORIES | 3843 | 3986 | 4142 | 4314 | 4462 | 3720 | 3720 | 3720 | 3720 | 3720 |
| PRODUCT INVENTORY | 2131 | 2192 | 2260 | 2334 | 2397 | 1656 | 1656 | 1656 | 1656 | 1656 |
| MATERIAL INV (PAPER SACK) | 611 | 684 | 763 | 851 | 926 | 926 | 926 | 926 | 926 | 926 |
| MATERIAL INV (PYRITE.COAL) | 871 | 871 | 871 | 871 | 871 | 871 | 871 | 871 | 871 | 871 |
| MATERIAL INV (GYPSUM) | 124 | 124 | 124 | 124 | 124 | 124 | 124 | 124 | 124 | 124 |
| MATERIAL INV (DIESEL) | 34 | 40 | 47 | 54 | 61 | 61 | 61 | 61 | 61 | 61 |
| MATERIAL INV (CONSUMABLES) | 73 | 75 | 78 | 81 | 83 | 83 | 83 | 83 | 83 | 83 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CURRENT LIABILITIES W/O DEBT | 3362 | 3586 | 3832 | 4103 | 4334 | 4334 | 4334 | 4334 | 4334 | 4334 |
| ACCOUNT PAYABLE | 3362 | 3586 | 3832 | 4103 | 4334 | 4334 | 4334 | 4334 | 4334 | 4334 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERMANENT WORKING CAPITAL | 5380 | 5536 | 5708 | 5896 | 6058 | 5316 | 5316 | 5316 | 5316 | 5316 |
| CHANGE IN WORKING CAPITAL | -379 | 156 | 172 | 189 | 162 | -742 | 0 | 0 | 0 | 0 |

### *** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

### INCOME STATEMENTS

CASE 3-B — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 0 | 0 | 0 | 0 | 0 | 31042 | 38770 | 42877 | 46175 | 49717 |
| TOTAL SALES REVENUE | 0 | 0 | 0 | 0 | 0 | 31042 | 38770 | 42877 | 46175 | 49717 |
| COST OF SALES | 0 | 0 | 0 | 0 | 0 | 25444 | 29448 | 30338 | 30922 | 31537 |
| VARIABLE COST | 0 | 0 | 0 | 0 | 0 | 6660 | 8540 | 9342 | 9906 | 10525 |
| DIRECT FIXED COST | 0 | 0 | 0 | 0 | 0 | 5305 | 5305 | 5305 | 5305 | 5305 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 15758 | 15758 | 15758 | 15758 | 15758 |
| INC IN PRODUCT INVENTORY | 0 | 0 | 0 | 0 | 0 | 2279 | 155 | 66 | 46 | 51 |
| GROSS PROFIT ON SALES | 0 | 0 | 0 | 0 | 0 | 5598 | 9322 | 12539 | 15253 | 18180 |
| SALES EXPENSES/ADMINISTRATION | 0 | 0 | 0 | 0 | 0 | 3773 | 4177 | 4548 | 4349 | 5390 |
| OPERATING PROFIT | 0 | 0 | 0 | 0 | 0 | 1825 | 5145 | 7991 | 10304 | 12791 |
| NON-OPERATING EXPENSES | 0 | 0 | 0 | 0 | 0 | 7397 | 6844 | 5856 | 5043 | 4295 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 7284 | 6537 | 5790 | 5043 | 4295 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 113 | 308 | 67 | 0 | 0 |
| NET PROFIT OR (LOSS) BEFORE TAX | 0 | 0 | 0 | 0 | 0 | -5572 | -1700 | 2134 | 5261 | 8495 |
| INCOME TAX | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) AFTER TAX | 0 | 0 | 0 | 0 | 0 | -5572 | -1700 | 2134 | 5261 | 8495 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RETAINED EARNINGS | 0 | 0 | 0 | 0 | 0 | -5572 | -1700 | 2134 | 5261 | 8495 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

INCOME STATEMENTS

CASE 3-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| OPERATING INCOME | 53607 | 57879 | 62573 | 67731 | 72147 | 72147 | 72147 | 72147 | 72147 | 72147 |
| TOTAL SALES REVENUE | 53607 | 57879 | 62573 | 67731 | 72147 | 72147 | 72147 | 72147 | 72147 | 72147 |
| COST OF SALES | 26388 | 26608 | 27423 | 28318 | 29101 | 20884 | 20142 | 20142 | 20142 | 20142 |
| VARIABLE COST | 11205 | 11952 | 12773 | 13675 | 14447 | 14447 | 14447 | 14447 | 14447 | 14447 |
| DIRECT FIXED COST | 5305 | 5305 | 5305 | 5305 | 5305 | 5305 | 5305 | 5305 | 5305 | 5305 |
| DEPRECIATION AND AMORTIZATION | 9413 | 9413 | 9413 | 9413 | 9413 | 390 | 390 | 390 | 390 | 390 |
| INC IN PRODUCT INVENTORY | -466 | 61 | 67 | 74 | 63 | -742 | 0 | 0 | 0 | 0 |
| GROSS PROFIT ON SALES | 27218 | 31271 | 35150 | 39413 | 43046 | 51263 | 52005 | 52005 | 52005 | 52005 |
| SALES EXPENSES/ADMINISTRATION | 5873 | 6404 | 6987 | 7628 | 8177 | 8177 | 8177 | 8177 | 8177 | 8177 |
| OPERATING PROFIT | 21345 | 24867 | 28163 | 31785 | 34869 | 43086 | 43828 | 43828 | 43828 | 43828 |
| NON-OPERATING EXPENSES | 3548 | 2801 | 2054 | 1307 | 560 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 3548 | 2801 | 2054 | 1307 | 560 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NET PROFIT OR (LOSS) BEFORE TAX | 17797 | 22066 | 26109 | 30477 | 34309 | 43086 | 43828 | 43828 | 43828 | 43828 |
| INCOME TAX | 5339 | 6620 | 7833 | 9143 | 10293 | 12926 | 13148 | 13148 | 13148 | 13148 |
| NET PROFIT OR (LOSS) AFTER TAX | 12458 | 15446 | 18276 | 21334 | 24016 | 30160 | 30679 | 30679 | 30679 | 30679 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RETAINED EARNINGS | 12458 | 15446 | 18276 | 21334 | 24016 | 30160 | 30679 | 30679 | 30679 | 30679 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

FUNDS FLOW STATEMENTS

CASE 3-B - BASE CASE - (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 228 | 1766 | 43461 | 50661 | 47692 | 21686 | 21790 | 23748 | 26062 | 28549 |
| CASH GENERATED | 0 | 0 | 0 | 0 | 0 | 17583 | 20903 | 23748 | 26062 | 28549 |
| PROFIT AFT. TAX. BFR INT | 0 | 0 | 0 | 0 | 0 | 1825 | 5145 | 7991 | 10304 | 12791 |
| DEPRECIATION AND AMORTIZATION | 0 | 0 | 0 | 0 | 0 | 15758 | 15758 | 15758 | 15758 | 15758 |
| FINANCIAL RESOURCES | 228 | 1766 | 43461 | 50661 | 47692 | 4103 | 887 | 0 | 0 | 0 |
| SHARE CAPITAL | 68 | 530 | 13038 | 15198 | 13854 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT | 159 | 1236 | 30423 | 35463 | 32325 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 1513 | 4103 | 887 | 0 | 0 | 0 |
| USES OF FUNDS | 226 | 1766 | 43460 | 50660 | 46182 | 23199 | 21790 | 16993 | 15133 | 14386 |
| FIXED CAPITAL EXPENDITURE | 226 | 1766 | 43460 | 50660 | 46182 | 0 | 0 | 0 | 0 | 0 |
| NON-DEPRECIABLE ASSETS | 0 | 895 | 750 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIABLE FIXED ASSETS | 220 | 740 | 37416 | 42160 | 36386 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 6 | 131 | 5294 | 8500 | 9796 | 0 | 0 | 0 | 0 | 0 |
| CHANGE IN WORKING CAPITAL | 0 | 0 | 0 | 0 | 0 | 4328 | 882 | 289 | 130 | 130 |
| DEBT SERVICES | 0 | 0 | 0 | 0 | 0 | 18871 | 20908 | 16704 | 15003 | 14256 |
| REPAYMENT OF LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 9961 | 9961 | 9961 | 9961 | 9961 |
| REPAYMENT OF SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 1513 | 4103 | 887 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 7284 | 6537 | 5790 | 5043 | 4295 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 113 | 308 | 67 | 0 | 0 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CASH INCREASE OR (DECREASE) | 2 | -0 | 1 | 1 | 1510 | -1513 | 0 | 6755 | 10929 | 14163 |
| BEGINNING CASH BALANCE | 0 | 2 | 2 | 2 | 3 | 1513 | -0 | -0 | 6755 | 17684 |
| ENDING CASH BALANCE | 2 | 2 | 2 | 3 | 1513 | -0 | -0 | 6755 | 17684 | 31846 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***

FUNDS FLOW STATEMENTS

CASE 3-B - BASE CASE - (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCE OF FUNDS | 25419 | 27660 | 29743 | 32054 | 33989 | 30551 | 31070 | 31070 | 31070 | 31070 |
| CASH GENERATED | 25419 | 27660 | 29743 | 32054 | 33989 | 30551 | 31070 | 31070 | 31070 | 31070 |
| PROFIT AFT. TAX. BFR INT | 16006 | 18247 | 20330 | 22641 | 24576 | 30160 | 30679 | 30679 | 30679 | 30679 |
| DEPRECIATION AND AMORTIZATION | 9413 | 9413 | 9413 | 9413 | 9413 | 390 | 390 | 390 | 390 | 390 |
| FINANCIAL RESOURCES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHARE CAPITAL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LONG TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| USES OF FUNDS | 13130 | 12918 | 12187 | 11457 | 10682 | -742 | 0 | 0 | 0 | 0 |
| FIXED CAPITAL EXPENDITURE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NON-DEPRECIABLE ASSETS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DEPRECIABLE FIXED ASSETS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST DURING CONSTRUCTION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CHANGE IN WORKING CAPITAL | -379 | 156 | 172 | 189 | 162 | -742 | 0 | 0 | 0 | 0 |
| DEBT SERVICES | 13509 | 12762 | 12015 | 11268 | 10521 | 0 | 0 | 0 | 0 | 0 |
| REPAYMENT OF LONG TERM DEBT | 9961 | 9961 | 9961 | 9961 | 9961 | 0 | 0 | 0 | 0 | 0 |
| REPAYMENT OF SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON LONG TERM DEBT | 3548 | 2801 | 2054 | 1307 | 560 | 0 | 0 | 0 | 0 | 0 |
| INTEREST ON SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DIVIDENDS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CASH INCREASE OR (DECREASE) | 12289 | 14742 | 17556 | 20597 | 23307 | 31292 | 31070 | 31070 | 31070 | 31070 |
| BEGINNING CASH BALANCE | 31846 | 44136 | 58877 | 76434 | 97031 | 120338 | 151630 | 182700 | 213770 | 244840 |
| ENDING CASH BALANCE | 44136 | 58877 | 76434 | 97031 | 120338 | 151630 | 182700 | 213770 | 244840 | 275909 |

## *** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***



### BALANCE SHEET

CASE 3-B — - BASE CASE - — (USD 1000)

| YEAR | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 228 | 1994 | 45454 | 96115 | 143807 | 132862 | 118550 | 110078 | 105547 | 104268 |
| CURRENT ASSETS | 0 | 0 | 0 | 0 | 0 | 6326 | 7772 | 8302 | 8601 | 8916 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ACCOUNT RECEIVABLE | 0 | 0 | 0 | 0 | 0 | 2958 | 3937 | 4293 | 4484 | 4682 |
| INVENTORIES | 0 | 0 | 0 | 0 | 0 | 3368 | 3835 | 4009 | 4117 | 4235 |
| ACC EXCESS CASH | 2 | 2 | 2 | 3 | 1513 | -0 | -0 | 6755 | 17684 | 31846 |
| NET FIXED ASSETS | 226 | 1992 | 45452 | 96112 | 142294 | 126536 | 110778 | 95021 | 79263 | 63505 |
| INVESTMENT | 226 | 1992 | 45452 | 96112 | 142294 | 142294 | 142294 | 142294 | 142294 | 142294 |
| NON-DEPR ASSETS | 0 | 895 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 |
| DEPRECIABLE ASSETS | 220 | 960 | 38376 | 80537 | 116922 | 116922 | 116922 | 116922 | 116922 | 116922 |
| INTEREST DRG CONSTR | 6 | 137 | 5431 | 13931 | 23727 | 23727 | 23727 | 23727 | 23727 | 23727 |
| LESS ACC DEPRECIATION | 0 | 0 | 0 | 0 | 0 | 15758 | 31516 | 47274 | 63032 | 78789 |
| LIABILITIES | 159 | 1395 | 31818 | 67281 | 101119 | 95746 | 83134 | 72527 | 62735 | 52961 |
| CURRENT LIABILITIES | 0 | 0 | 0 | 0 | 11474 | 16061 | 13410 | 12763 | 12932 | 13118 |
| ACCOUNT PAYABLE | 0 | 0 | 0 | 0 | 0 | 1998 | 2562 | 2803 | 2972 | 3158 |
| CURRENT PORTION OF L/T DEBT | 0 | 0 | 0 | 0 | 9961 | 9961 | 9961 | 9961 | 9961 | 9961 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 1513 | 4103 | 887 | 0 | 0 | 0 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FIXED LIABILITIES | 159 | 1395 | 31818 | 67281 | 89645 | 79685 | 69724 | 59764 | 49803 | 39842 |
| LONG TERM DEBT BALANCE | 159 | 1395 | 31818 | 67281 | 89645 | 79685 | 69724 | 59764 | 49803 | 39842 |
| OTHER FIXED LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STOCK HOLDERS EQUITY | 68 | 598 | 13636 | 28835 | 42688 | 37116 | 35416 | 37551 | 42812 | 51307 |
| SHARE CAPITAL | 68 | 598 | 13636 | 28835 | 42688 | 42688 | 42688 | 42688 | 42688 | 42688 |
| ACC RETAINED EARNINGS | 0 | 0 | 0 | 0 | 0 | -5572 | -7272 | -5137 | 124 | 8619 |
| LIABILITIES & S/H EQUITY | 228 | 1994 | 45454 | 96115 | 143807 | 132862 | 118550 | 110078 | 105547 | 104268 |

### *** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR ***
### BALANCE SHEET
CASE 3-B — - BASE CASE - — (USD 1000)

| YEAR | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| ASSETS | 106969 | 112679 | 121240 | 132884 | 147172 | 177332 | 208011 | 238690 | 269370 | 300049 |
| CURRENT ASSETS | 8741 | 9122 | 9540 | 9993 | 10392 | 9650 | 9650 | 9650 | 9650 | 9650 |
| OPERATING CASH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ACCOUNT RECEIVABLE | 4898 | 5136 | 5397 | 5685 | 5930 | 5930 | 5930 | 5930 | 5930 | 5930 |
| INVENTORIES | 3843 | 3986 | 4142 | 4314 | 4462 | 3720 | 3720 | 3720 | 3720 | 3720 |
| ACC EXCESS CASH | 44136 | 58877 | 75434 | 97031 | 120338 | 151630 | 182700 | 213770 | 244340 | 275909 |
| NET FIXED ASSETS | 54092 | 44679 | 35267 | 25854 | 16442 | 16051 | 15661 | 15270 | 14880 | 14484 |
| INVESTMENT | 142294 | 142294 | 142294 | 142294 | 142294 | 142294 | 142294 | 142294 | 142294 | 142294 |
| NON-DEPR ASSETS | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 | 1645 |
| DEPRECIABLE ASSETS | 116922 | 116922 | 116922 | 116922 | 116922 | 116922 | 116922 | 116922 | 116922 | 116922 |
| INTEREST DRG CONSTR | 23727 | 23727 | 23727 | 23727 | 23727 | 23727 | 23727 | 23727 | 23727 | 23727 |
| LESS ACC DEPRECIATION | 88202 | 97615 | 107027 | 116440 | 125853 | 126243 | 126633 | 127024 | 127414 | 127805 |
| LIABILITIES | 43204 | 33468 | 23753 | 14063 | 4334 | 4334 | 4334 | 4334 | 4334 | 4334 |
| CURRENT LIABILITIES | 13322 | 13546 | 13793 | 14063 | 4334 | 4334 | 4334 | 4334 | 4334 | 4334 |
| ACCOUNT PAYABLE | 3362 | 3586 | 3832 | 4103 | 4334 | 4334 | 4334 | 4334 | 4334 | 4334 |
| CURRENT PORTION OF L/T DEBT | 9961 | 9961 | 9961 | 9961 | 0 | 0 | 0 | 0 | 0 | 0 |
| SHORT TERM DEBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OTHER LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FIXED LIABILITIES | 29882 | 19921 | 9961 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ...M DEBT BALANCE | 29882 | 19921 | 9961 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ...KED LIABILITIES | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| STOCK ... EQUITY | 63765 | 79211 | 97487 | 118821 | 142837 | 172998 | 203677 | 234356 | 265036 | 295715 |
| SH... ...PITAL | 42688 | 42688 | 42688 | 42688 | 42688 | 42688 | 42688 | 42688 | 42688 | 42688 |
| ACC ...TAINED EARNINGS | 21077 | 36523 | 54799 | 76133 | 100149 | 130309 | 160989 | 191668 | 222347 | 253027 |
| LIABILITIES & S/H EQUITY | 106969 | 112679 | 121240 | 132884 | 147172 | 177332 | 208011 | 238690 | 269370 | 300049 |

*** FEASIBILITY STUDY ON CEMENT PROJECT IN MADAGASCAR *** 

LONG TERM DEBT

CASE 3-B - BASE CASE - (USD 1000)

AMOUNT OF DEBT 99606.

INTEREST RATE 7.500 PER CENT/YEAR

REPAYMENT 10 YEAR-EQUAL-INSTALLMENT-REPAYMENT (SEMI ANNUAL)

| YEAR | SER NO | PRINCIPAL | INTEREST | DEBT SERVICE | BALANCE AFT PAYMENT |
|---|---|---|---|---|---|
| 1992 | 1 | 0. | 0 | 0 | 80 |
| | 2 | 0 | 0. | 0 | 159 |
| 1993 | 3 | 0 | 0 | 0 | 777 |
| | 4 | 0 | 0 | 0 | 1395 |
| 1994 | 5 | 0 | 0 | 0 | 16607 |
| | 6 | 0 | 0 | 0 | 31818 |
| 1995 | 7 | 0 | 0 | 0 | 49549 |
| | 8 | 0 | 0 | 0 | 67281 |
| 1996 | 9 | 0 | 0 | 0 | 83443 |
| | 10 | 0 | 0 | 0 | 99606 |
| 1997 | 11 | 4980 | 3735. | 8716 | 94625 |
| | 12 | 4980 | 3548 | 8529 | 89645 |
| 1998 | 13 | 4980 | 3362 | 8342 | 84665 |
| | 14 | 4980 | 3175 | 8155. | 79685. |
| 1999 | 15 | 4980. | 2988. | 7968 | 74704 |
| | 16 | 4980 | 2801. | 7782. | 69724. |
| 2000 | 17 | 4980. | 2615. | 7595. | 64744. |
| | 18 | 4980. | 2428. | 7408. | 59763. |
| 2001 | 19 | 4980. | 2241. | 7221. | 54783. |
| | 20 | 4980. | 2054. | 7035. | 49803 |
| 2002 | 21 | 4980. | 1868. | 6848 | 44822. |
| | 22 | 4980 | 1681. | 6661. | 39842. |
| 2003 | 23 | 4980 | 1494. | 6474. | 34862. |
| | 24 | 4980 | 1307. | 6288 | 29882 |
| 2004 | 25 | 4980 | 1121. | 6101 | 24901 |
| | 26 | 4980 | 934. | 5914. | 19921 |
| 2005 | 27 | 4980 | 747. | 5727 | 14941 |
| | 28 | 4980 | 560 | 5541 | 9960 |
| 2006 | 29 | 4980 | 374. | 5354 | 4980 |
| | 30 | 4980 | 187. | 5167 | 0 |
| 2007 | 31 | 0 | 0. | 0 | 0 |
| | 32 | 0 | 0 | 0 | 0 |
| 2008 | 33 | 0 | 0 | 0 | 0 |
| | 34 | 0 | 0 | 0 | 0 |
| 2009 | 35 | 0 | 0 | 0 | 0 |
| | 36 | 0 | 0 | 0 | 0 |
| 2010 | 37 | 0. | 0 | 0 | 0 |
| | 38 | 0 | 0. | 0 | 0. |
| 2011 | 39 | 0 | 0 | 0 | 0. |
| | 40 | 0. | 0 | 0 | 0. |
| TOTAL | | 99606. | 39220 | 138825 | 0 |