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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION  
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FEASIBILITY STUDY ON THE DEVELOPMENT  
OF CHAU CUONG MARBLE QUARRY  
IN NGHE AN PROVINCE

HANOI, APRIL 1994

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION  
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FEASIBILITY STUDY ON THE DEVELOPMENT  
OF CHAU CUONG MARBLE QUARRY  
IN NGHE AN PROVINCE

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MINERAL DEVELOPMENT COMPANY

HANOI, APRIL 1994

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## INTRODUCTION

It is known that Nghe an province has marble resources, their colour and quality is up to the mark to have been accepted by the domestic and overseas markets. Because of everincreasing of market demand the exploitation of this commodity is intensified in this region especially in Lang Do and Thung Khang areas. To support the production requirement, United Nations Industrial Development Organization has rendered with support Project VIE/89/027 in geological exploration to evaluate the quality and reserve of marble in the area. A detail Geological Survey Report on the marble at the scale of 1/5000 had been completed by the Mineral Development Company (MIDECO) in March 1994.

A feasibility study report has been drafted in accordance with the terms of the contract No.93/250 signed between the MIDECO and UNIDO.

Data source has been collected during the field trips in December 1993 and January 1994 by MIDECO group of specialists lead by Le Thac Chien, Chief geologist of MIDECO. All the related geological informations have been used for compiling geological report on marble of the Quy Hop area which has been submitted to UNIDO in March 1994.

Basing on the obtained results from detailed exploration work and in consultation with the National Project Director VIE/89/027 - Dr. Tran Van Danh, the group of experts has chosen the Chau Cuong area for feasibility study report formulation with following advantages :

- Marble in Chau Cuong area is good in quality and nice colour much more superior to that of Lang Do area which has been accepted by the domestic and foreign markets. Its colour is sugar white, coarse grain, good blockage and rather high recovery during the quarrying production.
- Favourable transport, power, water supply condition for quarrying besides.
- The local manpower is quite available for work mobilization to serve quarrying operation.

In general, the Chau Cuong is considered to have better conditions for production of marble blocks.

## I. MARKET ANALYSIS

Stone industry and production has taken root for a long history. Some countries have been ever-developing dimension stone industry production such as : Italy, France, Germany .... Once a country's economy is developed, there is a need for the ever-increasing in natural facing stone in term of quality and quantity. The utilization of stone as marble or granite products depends on the projected work. In recent years, some foreign companies from Germany, Japan, Malaysia, Netherlands... have purchased marble from Vietnam of which white marble of the Nghe an province have been attracted by many customers because of its beautiful colour, competitive price in comparison with the same product of other countries in the world.

For the last recent years, the Government has reformed the state policies in economy "Open-door-policies", all the sectors of economy would be open to "Corporatisation". All the construction projects of "King size" as banks, hotel, representative offices of various foreign companies, international organisations, villas, private large and mini-hotel, guest houses... badly demand facing stones as natural sources. To meet the market demand, many stone processing plants have been set up by the state-owned enterprises or by the private entities.

A concrete factory of the Vinh City (300km down-south of the Hanoi capital) has been supported by a UNDP project VIE/89/027 "Geological exploration feasibility study of marble and granite, the factory has been provided with a tile production line at the capacity of 20.000 m<sup>2</sup> per year. Some premises from the province of Thanh hoa, Hanoi and some from the south part of Vietnam have purchased at large quantity of white marble blocks quarried from Nghe an (about 1000 m<sup>3</sup>). It is possible that exported capacity of 1000 m<sup>3</sup>/year of the white marble of Nghe an province can be done in a few year if the marble sized blocks are accepted by overseas markets.

The tile processing sectors have the present production of 3-3.5 million square metres in all country, including white marble quantity accounted for 10-15%. It equals approximately to 300,000-525,000 sq.m, so annual demand of th\_ processing sectors needs marble block quantity of 1500-2600 c.m. Tile product is usually used as material for covering floor and wall of hotel, office etc. and even of private buildings. In two next coming years, annual consumption of white marble of 2,500 cub.m is able to be realized. This number will be ever-increased and oversea market consumption of 1000 cub.m per year besides. To have the project be positively feasible, the production of Chau Cuong quarry should be designed as 3000 cub.m per year. In first two years, the quarry capacity is 2000 cub.m only. Nevertheless from third year on it could be increased of 3000 cub.m to supply more to oversea market.

According as colour and quality of marble, the sold price are different. At the present time, some kinds of white marble in areas of Vietnam with equivalent quality or even less are all sold at price of 120-160 USD per cubic metre. In some provinces as in Thanh Hoa, Thai Nguyen, it is exported at 250-270 USD/m<sup>3</sup>, but its amount is still not big because quarrying conditions are difficult, ability of big block quarrying for exportation still restricted in there.

Out of actual circumstances of domestic and foreign markets there is a need to invest in a quarrying line in the Chau Cuong area with the purposes to :

- Supply raw materials for various stone production premises in Vietnam
- Use effectively the natural resources
- Export dimension stone to various foreign countries to earn hard currencies.

For the first two years of quarrying the annual production would be 2000 m<sup>3</sup> to meet the demand of domestic consumption, from the third year onward the annual production would be estimated at 3000 m<sup>3</sup>/year, of which 2000 m<sup>3</sup> for domestic market, and 1000 m<sup>3</sup> for overseas export.

For years the exploitation of marble in Nghe An has been done in not rightway, beside exploitation done on boulders, the explosive also has been used causing cracks in the blocks so the recovery of tiles is very low, which made the production price very high, comparing to the price of marble produced in neighbouring provinces. The improvement of quarrying technics and facility in Nghe an marble quarries is necessary to help the tile producers keep competitive price.

## II. GEOGRAPHY AND TRANSPORTATION

With an area of about 3 sq.km, Chau Cuong area is bounded by the following coordinates :

Longitude : 105° 07' 50" - 105° 09' 10"  
Latitude : 19° 20' 05" - 19° 20' 45"

7 km from Quy Hop town to the west and belongs to the topo-map-sheet 6047-IV series 17014 Ban Dan at the scale 1:50,000, Chau Cuong area is predominant in limestone mountains with elevation from 60 m to 120m above the Quaternary sediment plain in the region. Existing flora is mainly developed as bushes and with sloping angle of the hills 30° - 40°.

) Climate in the area is clearly distinguished as two seasons : dry and rainy season. Rainy season starts from June to November and dry season from December to May of the year, rain fall volume is rather high : from 2500-3000 mm/year. During the dry season the impact of "Lao's wind" rushing from the west over the Truong son range fanning dry and hot air to the area. There is one water spring at the coordinate 21.38.10N - 5.15.25E and Con river flowing through the mining area, those sources can supply water to the quarry.

Transportation facility is rather favourable. There is asphaltic road linking Quy Hop town with National way No.1 at Yen Ly village with a distance of 70km, then turning south to Vinh city about 50km. (Fig.1)

Transportation is smooth during the raining season. Quarrying equipments or mined product can be moved along the asphaltic road from the Quy Hop District to the Ban Hat, through the studied area.

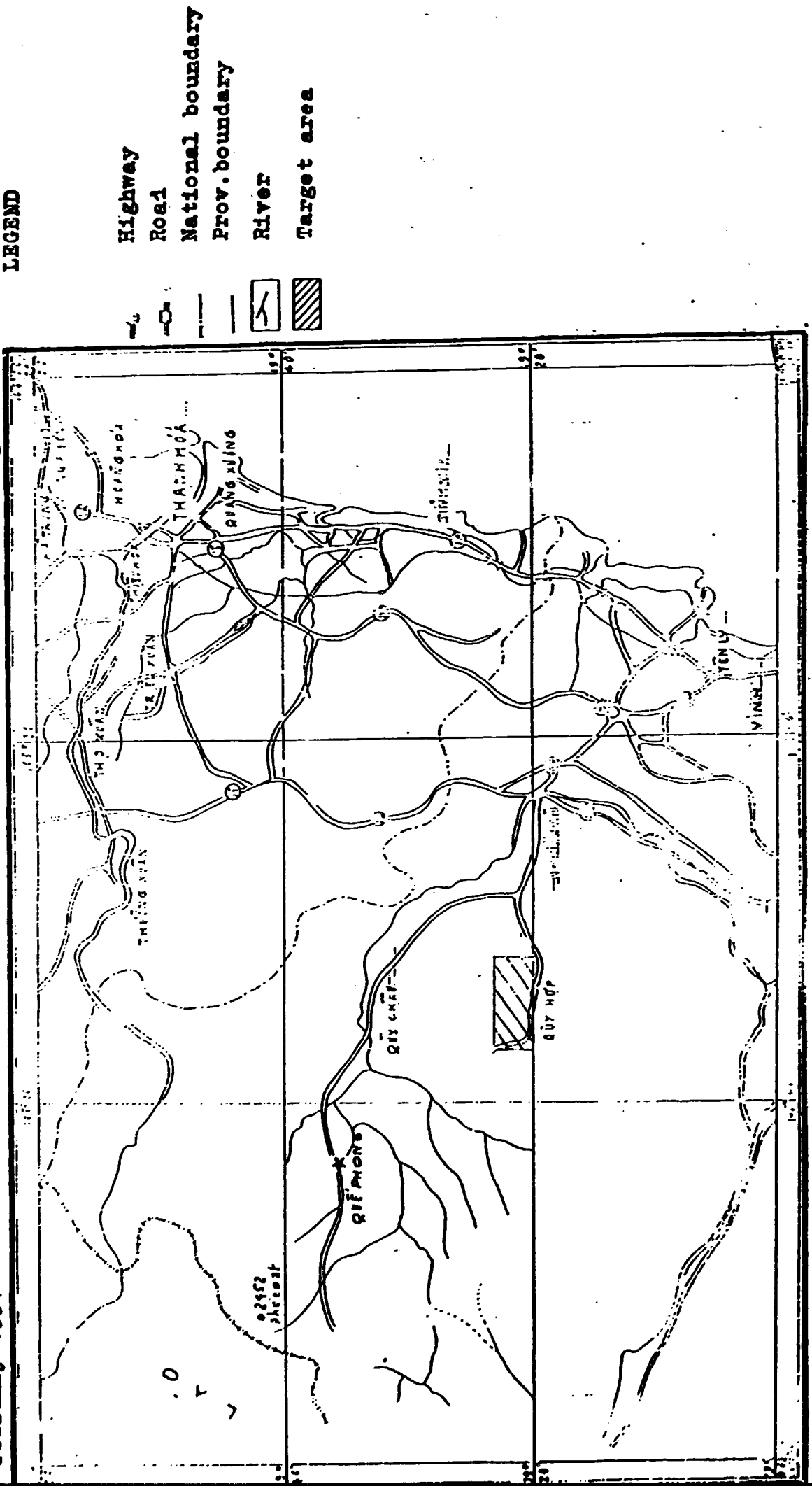
) There is one electric transmission line of 35 KV going through the area near to the quarrying site, and next to exploitation block B2 (ref. reserve map), there is a substation supplying power to local people.



LOCATION MAP OF TARGET AREA

February 1994

Figure 1



### III. GEOLOGICAL SETTING, QUALITY AND RESERVE OF MARBLE

#### III.1. GEOLOGICAL SETTING :

Rocks in Chau Cuong area comprise white-coarse grain marble, white-coarse grain marble with black spots, black marble, all these rocks are of Early Palaeozoic age of the Len Buc Suite, thickly-bedded texture 0.6m-2.5m, homogenous composition 98-100% calcite with various granular properties from 0.5mm to 1.5mm. The thickness of the white marble sequence is about 300m.

Generally, rocks in the area are strongly impacted by the tectonic and weathering activities in the upper part. The crack density varies from 1m to 3.5m, sometimes joints occurred along the strike. However, there are two kinds of joints which must be well differed :

- Tectonic joints : These joints reduce the stone blockage grade, they remain by the system 040/68; 286/70; 230/80.
- Exogenetic joints : This kind of joints do not have the definite direction, they also do not much impact in the product recovery when quarrying is conducted indepth. These only appear on the thin surface crust of the stone. The inclining of the marble beds is 210°/20° dipping to the SWS.

#### III.2. QUALITY :

Quality of the marble in the Chau Cuong is good, colour is beautiful, it can be exploited as facing stone owing to the following properties :

Colour : White sugar, white with black spots, white with green strips parallel to the layered surface.

#### Petrographical properties :

Main composition is calcite, nearly 100%, with grain size 0.5mm - 1.5mm

#### Chemical properties :

High content of CaO, low content of MgO

CaO : 54.72% - 55.02%

MgO : 0.77% - 1.30%

The other oxidic matters are also low : SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, P<sub>2</sub>O<sub>5</sub>

#### Mechanical properties :

It is characterized by the following specifications :

**Mechanical properties of Chau Cuong marble**

**Table 1**

	Specification	Max	Min	Ave- rage	Quantity of sauple	Remark
1	Density g/cm <sup>3</sup>	2800	2700	2750	6	White coarse grain marble
2	Water absorption (%)	0.38	0.07	0.30	12	- do -
3	Abration g/cm <sup>2</sup>	0.43	0.37	0.40	12	- do -
4	Porosity (%)	0.22	0.36	0.97	6	- do -
5	Depth of softening	0.98	0.91	0.95	6	- do -
6	Compressive strength dan/cm <sup>2</sup>	530	437	496		- do -

**III.3. RESERVE :**

Reserve calculation was done basing on the acceptable colour, blockage grade, quality of stone. Chau Cuong marble was divided into 4 block reserve, calculation (Table.2) : Blocks A1; A2; For white coarse grain marble. Blocks B1; B2; For white mixed with black spot, white coarse grain with strips.

Reserve calculation was showing on the following table

Marble reserve of the Chau Cuong area

Table 2

Block	Area (m <sup>2</sup> )	Thick-ness	Quantity (m <sup>3</sup> )	Recovery (%)	Reserve
A1	20,000	20	400,000	20	80,000
	37,500	20	750,000	20	150,000
	62,500	20	1,250,000	20	250,000
	95,000	20	1,900,000	20	380,000
	140,000	20	2,800,000	20	560,000
A2	6,250	20	125,000	20	25,000
	42,000	20	850,000	20	170,000
	57,000	20	1,150,000	20	230,000
	70,000	20	1,400,000	20	280,000
B1	7,500	20	150,000	20	30,000
	22,500	20	450,000	20	90,000
	42,500	20	850,000	20	170,000
	62,000	20	1,250,000	20	250,000
	77,000	20	1,550,000	20	310,000
	102,000	20	2,000,000	20	400,000
B2	6,250	20	125,000	30	37,500

Total : 3,412,500 m<sup>3</sup>

Block A1 and B2 should be given priority exploitation in the first stage owing to the good condition for quarry opening and high recovery.

#### IV. QUARRYING DESIGN PARAMETERS

##### IV.1. QUARRYING CONDITION :

Quarry site needs to be designed where natural condition, transportation, water and power supply is favourable.

- Transport facility is favourable. There is an asphaltic road going to Vinh City for transport of needed equipments for quarrying as well as for marble blocks to processing plant and to sea port of Cua Lo.
- Power supply : At the quarrying site of Chau Cuong there exist a substation of transmission power line of 35KV which is used for electricity supply for local people and enterprises, so our quarry can use that substation for its power demand .

- Water supply : As for drinking water supply, wells should be drilled into the Quaternary sedimentary horizons in the area. The depth of the wells is estimated down to 30-50m. Besides, water from spring can be used.
- Communication and other services : The distance from the quarrying site to the center of the Quy Hop district is only 6km, so a common Liaison line should be established for communication within the country and for telecommunications outside Vietnam.

In general, the infrastructure facilities addressed above is good enough for opening of the quarry in the Chau Cuong area.

#### IV.2. DIMENSION OF THE QUARRIED BLOCKS :

According to the Geological settings, the blockage grade of marble in the Chau Cuong area, dimension classification can be made as follows :

Class 1(st)	2.5mx1.5mx1.2m
Class 2(nd)	1.5-2.0mx1.2mx1.0m
Class 3(rd)	1.0-1.5mx1.0mx1.0m

The first class is for export requirement and for gangsaw cutting, the second and third ones can be used for cutting by block cutters in the processing plants in Vinh City and other.

#### IV.3. DESIGN CAPACITY :

The Quarrying capacity is designed basing on the following factors :

- Domestic requirement for blocks
- Possible Quarried reserve
- Quarrying condition and technics
- Common uses of equipments and machines for quarrying of dimension stones which are popular both in Vietnam and in the world
- Investment possibility
- Highest economic effectiveness

Based on the above mentioned factors, Quarrying capacity is designed at 3000 m<sup>3</sup>/year.

During the first initial two years, the quarrying line is operated not so smoothly and quarrying structures set-up is not so stable causing low production and market demand is still limited so that the capacity of the first and second years is 2000 m<sup>3</sup>/year. From the third year on-ward the quarry capacity will be 3000 m<sup>3</sup>/year.

#### IV.4. WORKING REGIME :

Working regime is subject to the enacted state law :

52 sunday days-off

10 days - holidays-days-off includes New year Festival



## V. QUARRYING

### I. QUARRYING METHODS :

Based on the geological features such as gentle slopes of rock layers and the joint (cracks) systems which are rather developed in the area, the quarrying technology chosen for quarrying operation is air-compressive drilling which is followed by using hydraulic splitter in combination with manual splitting to shape the blocks at the elevation of 50-60m above the foot hill surface. Bulldozers are used to push the blocks along sliding mattress down to the foot of the hill, then move them to the yard where manual method can be used for shaping of the blocks into the square ones. Crane is used to load the blocks on to the truck to transport to relevant factories for processing or to the instructed ports for exportation of blocks.

The quarrying is developed by bench cutting from down part upward of each layer for the block B2, along the inclining of layers to reduce the expense on road making for transportation of the block inside of the quarry. The quarrying step is estimated at 5m high. Once a quarrying area is prepared the exploitation in the form of bench-cutting is conducted from underneath upwards following marble layers. Until the first inclining layer is finished, consecutive quarrying operation should be carried on down to the depth of 5m from the present surface of the Quaternary sediments.

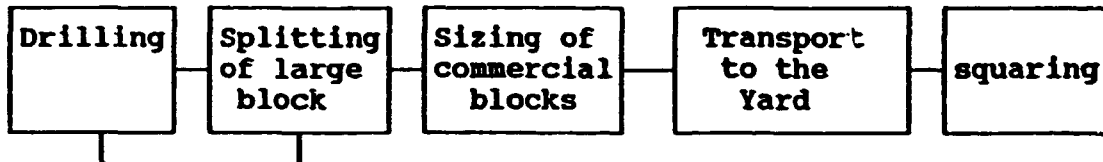
Due consideration of drilling line should be done by quarryman counting the joint systems in order to increase product recovery and making it easier for block splitting. It is recommended that Slim-Bar drilling rig/89 or TB-610 in combination with Russian portable hammer PR-24 should be used to drill the holes along side of the stone block which are much bigger than the commercial dimension size. The dimension of these blocks are as follows :

L. 2.5m x H. 1.5m x W. 1.2m

Where L; H; W; are whole figure

This work is followed by using hydraulic splitter in combination with routine tools to split big blocks then drilling hammers are also used to split those blocks to form smaller blocks of commercial sizes. Classification of the blocks are based on the sizes and on the homogeneity properties of colour of marble. Then Bull-Hydrojack with dragging winch system or bulldozers shall be used to move the blocks to the area within the operation scope of the crane and finally the blocks are lifted and put on the truck for transport to the storage premises. The shaping of these blocks could be done, if necessary.

Quarrying line is conducted by the following steps as bellow :



Drilling parameters obtained during the drilling operation :

- Diameter of bore-hole : 30-35 mm
- Distance between the bore-holes : 100-150 mm
- Depth of the bore holes : 1.2-3m

#### V.2. QUARRYING PROGRESS :

The most suitable quarrying system is to conduct the cutting of the benches along the layers of marble from the East to the West following the inclination of layer, starting from the lowest points up to the highest point of the same layer in order to push the cut blocks sliding down aiming at reducing of the cost of moving the products and waste in the quarry. Due to low recovery of the block the mining waste is of large volume which must be kept in the area next to the quarry for other purposes.

#### V.3. SALVAGE QUARRYING OF BOULDERS :

Although boulders are not of the main objectives of quarrying but during the course of road building, quarry site levelling boulders are also salvaged to recover the natural resource. The quarrying methods applied for exploitation of boulders are drilling with compressed air but there is no need to use full set of drilling machine such as hor-driller. Excavators in combination with drilling and hand splitting methods for the small boulders and in combination with hydrosplitter for the big boulders.

After manual splitting, bulldozer is used to push the blocks to the area where the crane could be used to load the blocks on to lorries.

However, quarrying of the boulders is limited due to high production cost and high rate of the cracks causing low recovery of tiles from those blocks, the consequence is high production cost making the products less competitive.

#### V.4. TRANSPORT FACILITIES :

There are two road systems in the quarrying area.

- Temporary road : This road system is disappeared during quarrying process and it is located inside the boundary of quarry. Its length depends on position of quarrying site .

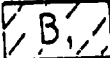









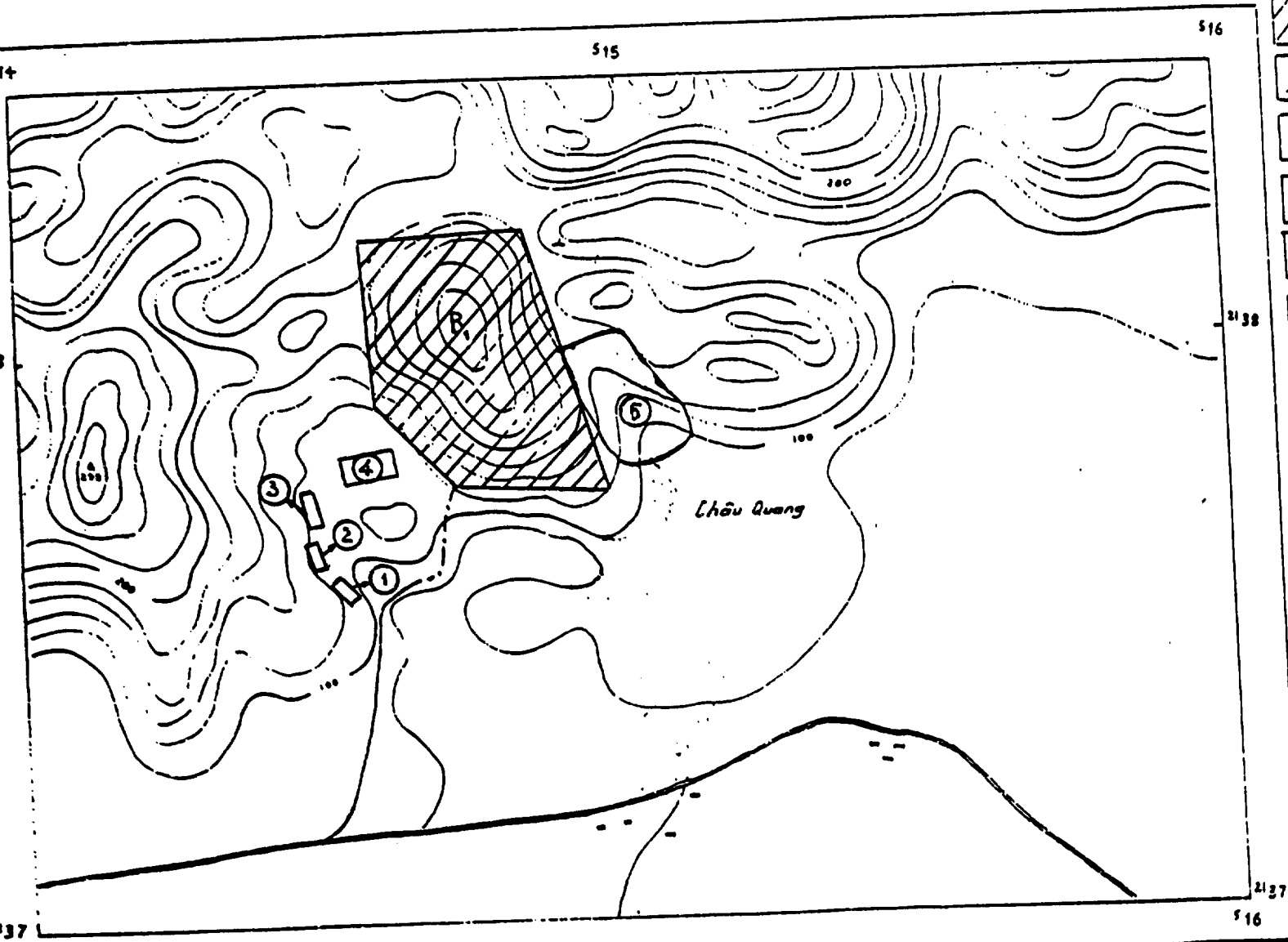


# LAYOUT OF CONSTRUCTED WORKS IN CHAU CUONG - NGHE AN MARBLE QUARRY

SCALE: 1:10,000

## LEGEND

-  Quarrying Area
-  Available Road
-  Road Will Be Upgraded
-  Office House
-  Living House For Workers
-  Mechanical Workshop  
Supplies store, Garage
-  Area For Squaring And Equipments
-  Dump Area



Water is pumped upward to a reservoir for supply to living and pumping machine is used for water supply to the quarrying operation. Drinking water must be analysed to keep the Sanitary standard for the above planned purpose.

- Compressive air supply : Mobile air compressor model PV-10 at the capacity 600m<sup>3</sup>/h is used for producing compressive air.

- + Productivity per shift : 6m<sup>3</sup>/shift
- + Norm of meters in depth for 1m<sup>3</sup> production :  
25m/m<sup>3</sup> x 6m/shift = 150 m/shift
- + Drilling rigs required :  
PR-24L drilling hammer : 5 ; one for reservation  
Drilling system on rail : 1 unit of slim Bar/89  
Air compressors : 2 PV-10

## VI. QUARRYING EQUIPMENT

Equipments for quarrying operation should be selected properly and on the basis of the following principle :

- Quarrying capacity
- Capacity of the requirements
- Chosen quarrying technics
- Possibility of equipment purchased in the domestic markets and import
- The equipment supported by UNIDO Project
- Quality and effectiveness in marble quarrying :

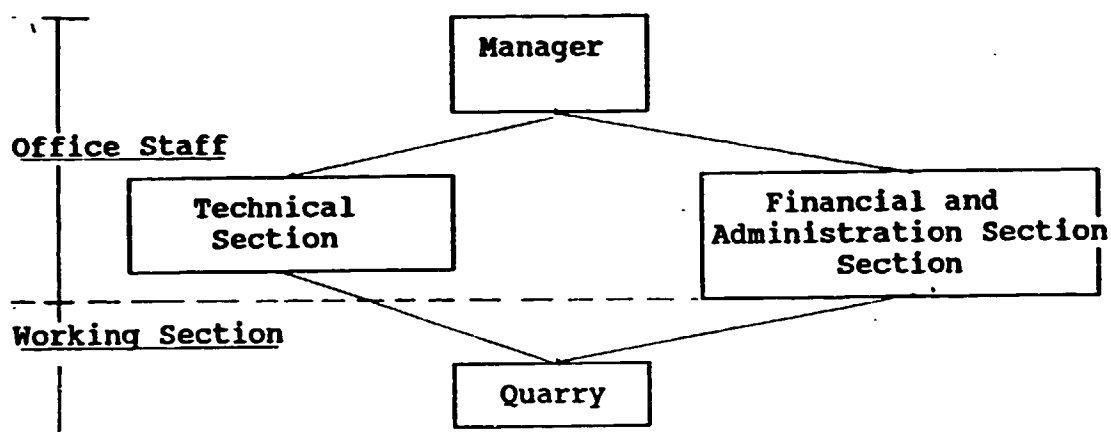
List of equipments/machine needed for  
Chau Cuong marble quarrying

Table 4

No	Specification	Made	Units	Quantit	Remark
1	Bulldozer	Russian	Unit	1	Bought
2	Compressor - PV 10	- do -	-	2	in VN
3	Hydraulic splitter flouspak 186	Italy	-	1	
4	Slim Bar drill	Italy	-	1	Import
5	Dragging winch 50/60T	-	-	1	
6	Hydraulic jack bull	Italy	-	1	
7	Dumping truck	Russian	-	1	Import
8	Mobile crane 25T	Russian	-	1	-
9	Portable drilling hammer	-	-	5	-
10	Plug and feather	Vietnam	set	75	-
11	Excavator EO-3323	Russian	-	1	-
12	Processing machine such as : grinder electric driller	Vietnam	-	1	Purchase in VN
13	Kamaz truck	Russian			
14	Manual splitter	Vietnam			

## VII. ORGANIZATION AND PERSONNEL

The quarry Enterprise is assigned with the task to quarry block marble for selling to the domestic and foreign buyers. This Enterprise has its legal status working under the supervision of a manager and organizational structure is as follows :



ORGANIZATION OF CHAU CUONG ENTERPRISE

Table 5

No	Position	Quantity	Remark
1	<u>Staff section</u>	<u>12</u>	
	Manager	1	
	Deputy Manager	1	
2	<u>Administration and Financial Section</u>	<u>8</u>	
3	<u>Technical section</u>	<u>2</u>	
	- Quarry man	1	
	- Mechanical & electrical	1	
	<u>Working section</u>	<u>46</u>	
4	Mechanical foreman	1	
5	Electrical pumping workers	2	
6	Worker for compressor mechanical worker	2	
7	Mechanic	3	
8	Quarry foreman	2	
9	Drilling splitting workers	<u>21</u>	
10	Squaring workers	5	
11	Travelling crane driver	4	
12	Excavator bulldozer driver	4	
13	Truck driver	2	
	<b>Total</b>	<b>58</b>	

## VIII. ENVIRONMENT PROTECTION AND LABOUR SAFETY

The quarrying operation impacts not so much on the wild animals and flora in the area, because this life is not so flourish here. On the other hand, the quarrying site is located far from the villages, so quarrying work does not impact on the local people's life and the wastes of the quarry does not cause any pollution of water and agriculture.

To ensure safety for the workers and staff working in the quarry, the following principles in the labour safety should be kept :

- Labour safety rules must be formulated by the Enterprise. Subject to the current Law enacted by the Vietnamese Government.
- All the technician must instruct/remind workers, labourers to strictly observe the State Law on labour safety in the mining activities.
- Before entering to work for the Enterprise labour safety regulations must be introduced to the workers, and during quarry operation labour safety control shall be conducted regularly.
- Workers at the quarrying site must sufficiently equipped with labour safety clothes, boots shoes. glasses ...
- The quarrying area must be regularly watered and dust collected.

## IX. FINANCIAL ANALYSIS

### I. ESTIMATION OF OPERATING COST :

Annual capacity of two initial years is 2000 m<sup>3</sup> per year from 3rd year on it is 3000 m<sup>3</sup> per year, so operating cost should be calculated for each basing on the designed capacity. Operating costs are divided into two groups.

I Group : It is including salary, wage, administration management, maintenance costs (The cost of this group are fixed and not depending on annual capacity)

+ Salary and wage cost :

Salary fund : 59 pers. x 12 months x 60 USD/month = 41,760 USD  
 Social Insurance (17% of salary fund) :  
                   41,760 USD x 17% = 7,100 USD  
 -----  
 Total salary cost 48,860 USD

+ Maintenance cost :

For machinery equipment (6% of equipment value)  
                   268,700 USD x 6% = 15,120 USD  
 For construction project (3% of construction value)  
                   57,640 USD x 3% = 1,730 USD  
 -----  
 Total maintenance costs 17,850 USD

+ Administration and Management costs : (20% of total above costs)  
                   66,710 USD x 20% = 13,340 USD

II Group : It is including costs of material spare part, fuel, power, exportation, etc. The costs of this group are depending on annual quarry capacity .

+ Cost of fuel and power : 46,860 USD (see Appendix 8)  
 for single 1st and 2nd years : 46,860 USD x 67% = 31,240 USD

+ Cost of supplies and replacement spare part : 12,760 USD (see Appendix 9),  
 for single 1st and 2nd years : 12,760 USD x 67% = 8,500 USD

+ Cost of exportation : 1000 m3 x 20 USD/m3 = 20,000 USD

There is not this cost in 1st and 2nd years.

**II. ESTIMATION OF REVENUE :**

- Revenue of 1st and 2nd years :  
                   2000 m3 x 120 USD/m3 = 240,000 USD  
 - Revenue of year from the 3rd on ward :  
                   2000 m3 x 120 USD/m3 = 240,000 USD (For domestic sale)  
 and               1000 m3 x 150 USD/m3 = 150,000 USD (for export)

Total revenue : 390,000 USD

**II. ESTIMATION OF REVENUE :**

- Revenue of 1st and 2nd years : Sold product in domestic market  
 + For first and second classes :  $1,000\text{m}^3 \times 150\text{USD}/\text{m}^3 = 150,000 \text{ USD}$   
 + For third classes :  $2,000 \text{ m}^3 \times 120 \text{ USD}/\text{m}^3 = 120,000 \text{ USD}$

Total revenue : 270,000USD

- Revenue of third year on ward :  
 + For exported product (first class) :  
 $600 \text{ m}^3 \times 250 \text{ USD}/\text{m}^3 = 150,000 \text{ USD}$   
 + For sold product in domestic market :  
 $900 \text{ m}^3 \times 150 \text{ USD}/\text{m}^3 = 135,000 \text{ USD}$  (2nd class)  
 $1,500 \text{ m}^3 \times 120 \text{ USD}/\text{m}^3 = 180,000 \text{ USD}$  (3rd class)

-----  
 Total revenue : 465,000 USD

**III. PAYMENT ON INTEREST OF LOAN :**

In first year :

- For fixed capital :  
 + Local capital :  $208,340 \text{ USD} \times 6\% = 12,500 \text{ USD}$   
 + UNIDO capital :  $118,000 \text{ USD} \times 3.6\% = 4,250 \text{ USD}$

Subtotal 16,750 USD

- For working capital :  
 $43,920 \text{ USD} \times 24\% = 10,540 \text{ USD}$

TOTAL REPAYMENT 27,290 USD

In second year :

- For fixed capital :  
 + Local capital :  $168,100 \text{ USD} \times 6\% = 10,090 \text{ USD}$   
 + UNIDO capital :  $118,000 \text{ USD} \times 3.6\% = 4,250 \text{ USD}$

TOTAL REPAYMENT 14,340 USD

In third year :

- For fixed capital :  
 + Local capital :  $75,520 \text{ USD} \times 6\% = 4,530 \text{ USD}$   
 + UNIDO capital :  $118,000 \text{ USD} \times 3.6\% = 4,250 \text{ USD}$

Subtotal 8,780 USD

- For working capital :  $14,630 \text{ USD} \times 24\% = 3,510 \text{ USD}$

TOTAL REPAYMENT 12,290 USD

In fourth year :

- For fixed capital :  
 + UNIDO capital :  $22,550 \text{ USD} \times 3.6\% = 811 \text{ USD}$

1.a : INVESTMENT COST OF EQUIPMENTS FINANCED BY UNIDO  
(TENTATIVE)

No	Type of equipment	Unit	Quantity	Price USD	Amount USD	Remark
1	EO-3323 Excavator	Unit	1	40,000	40,000	Russian-Expor
2	T-130 Bulldozer	-	1	30,000	30,000	-do-
3	Flouspak-186 Hydrosplitter	-	1	9,200	9,200	Italy-exporte
4	TB-610 pneumatic drilling system	-	1	11,500	11,500	-do-
5	BULL Hydrojack	-	1	13,000	13,000	-do-
6	AB 50 <sup>1</sup> / <sub>60</sub> ton Drum Winch	-	1	14,000	14,000	-do-
	Subtotal				117700	

1.b. INVESTMENT COST OF EQUIPMENT FINANCE BY VIETNAM FUND

No	Type of equipment	Unit	Quantity	Price USD	Amount USD	Remark
1	PV-10 compressor	Unit	2	9,000	18,000	Domestic bought
2	PR-24L Drilling hammer	-	5	120	600	-do-
3	Travelling crane 25 T	-	1	30,000	30,000	-do-
4	KAMAZ dump truck 12 Tons	-	1	25,000	25,000	-do-
5	Power station and line system	set	1	15,000	15,000	-do-
6	Grinder for sharpener	unit	1	1,000	1,000	-do-
7	ATH-8 pump	-	1	1,500	1,500	-do-
8	Electrical, gas welders and electrical driller	set	1	2,000	2,000	-do-
9	Forge and accessories OFFICE	-	1	500	500	-do-
10	Vehicle Toyota-4WD	unit	1	25,000	25,000	-do-
11	Computer & printer	set	1	3,000	3,000	-do-
12	Communication system & other office equipment	-	1	5,000	5,000	-do-
	Subtotal				126600	

Total of 1.a and 1.b : 117,700 USD + 126,600 USD = 244,300 USD  
Contingency 10% : 24,400 USD

TOTAL INVESTMENT CAPITAL 268,700 USD



## BASIC CONSTRUCTION CAPITAL

Table 7

No	Item of construction	Unit	Quantity	Price, USD	Amount, USD
1	Earth levelling of quarrying site	m3	2500	3	7,500
2	Upgrading access road	km	0.4	30,000	12,000
3	Earth levelling of dump	m3	1000	3	3,000
4	Office house	m2	70	60	4,200
5	Living house for worker	-	150	50	7,500
6	Mechanical repair workshop and supplies store	-	70	50	3,500
7	Garage and house for compressor	-	100	30	3,000
8	Store and squaring area	1000m3	800	1,500	1,200
9	Drilling wells and pipe	set	1	5,000	5,000
10	Fuel storage (tank and fence)	Lts	10,000	0.2	2,000
11	Reservoir	m3	50	30	1,500
12	Canteen	m2	50	40	2,000
	Subtotal				52,400
	Contingency 10%				5,200
	TOTAL				57,600

## COST OF FUEL AND POWER

Table 8

No	Type of equipment	Qty of equip	Consumpt Norm per shift 1	Consumpt Qty of unit per year	Total qty per year	Price USD/l	Amount USD
1	EO-3323 Excavator	1	120	30,000	30,000	0.25	7,500
2	T-130 Dozer	1	100	25,000	25,000	0.25	16,250
3	DV-10 Compressor	2	70	35,000	70,000	0.25	17,500
4	Kamaz truck	1	40	20,000	10,000	0.25	2,500
5	Travelling crane	1	60	15,000	15,000	0.25	3,750
6	Light car Toyota	1	20	5,000	5,000	0.25	1,250
	Subtotal						38,750
	Lubricating and greasing oil 5%						1,940
7	Power		308kw per/d		77,000	0.08	6,170
	TOTAL						46,860

## COST OF MATERIAL AND SPARE PART

Table 9

No	Kind of spare part	Unit	Consumpt qty/y	Price, USD	Amount, USD
1	Pressured air rubber hose	m	500	5	2,500
2	Drill steel rods length from 0.8-3.6m)	unit	100	12	1,200
3	Bits of all kind	-	500	5	2,500
4	Grinding stone for sharpener	-	100	7	700
5	Forged plug and feather	set	75	25	1,880
6	Explosive material	kg	1800	1.1	1,980
7	Stationery				2,000
	TOTAL				12,760

## SUMMARY TABLE OF OPERATING COST

Table 10

No	Item of cost	Annual working cost, USD	
		For 1st&2nd year	From 3rd year on
1	Total salary	48,860	48,860
2	Maintenance and service	17,850	17,850
3	Administration and Management	13,340	13,340
4	Supplies and spare part	8,500	12,760
5	Fuel and power	31,240	46,860
6	Exportation	-	20,000
	Subtotal	119,780	159,670
	Contingency 10%	11,980	15,970
	TOTAL	131,760	175,640

ECONOMICAL EFFECT ANALYSIS OF INVESTMENT CAPITAL IN 10 OPERATING YEARS

OF CHAU CUONG - NGHE AN MARBLE QUARRY

Capacity: 3000 m3/year (From 3rd year on) and 2000 m3/year (in two first year)

Price: 120USD and 150 USD/m3 (For domestic sale) and 250 USD/m3 (for export);

ITEM OF COST	YEAR										TO	
	0	1	2	3	4	5	6	7	8	9		10
Infrastructure capital	57.640											
Machinery-Equipt. cap.	268.700						134.350					
Total Initial Invest.Cap	326.340											
Demand on working Cap.		43.920		14.630								
Output, m3		2.000	2.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
Revenue		270.000	270.000	465.000	465.000	465.000	465.000	465.000	465.000	465.000	465.000	465.000
Operating cost		131.760	131.760	175.640	175.640	175.640	175.640	175.640	175.640	175.640	175.640	175.640
Revenue tax, 2%		5.400	5.400	9.300	9.300	9.300	9.300	9.300	9.300	9.300	9.300	9.300
Royalty, 3%		8.100	8.100	13.950	13.950	13.950	13.950	13.950	13.950	13.950	13.950	13.950
Const.depreciation,10%		5.760	5.760	5.760	5.760	5.760	5.760	5.760	5.760	5.760	5.760	5.000
Eq.t. depreciation, 20%		53.740	53.740	53.740	53.740	53.740	26.870	26.870	26.870	26.870	26.870	26.870
Total depreciation		59.500	59.500	59.500	59.500	59.500	32.630	32.630	32.630	32.630	32.630	32.630
Payment on Interest of loan		27.290	14.340	12.290	810	0						
Profit before tax		37.950	50.900	194.320	205.800	206.610	233.480	233.480	233.480	233.480	233.480	233.620
Profit tax, 30%		11.390	15.270	58.300	61.760	61.980	70.040	70.040	70.040	70.040	70.040	70.090
Profit after tax		26.560	35.630	136.020	144.060	144.630	163.440	163.440	163.440	163.440	163.440	163.530
Add back-depreciation		66.060	95.130	195.520	203.560	204.130	196.070	196.070	196.070	196.070	196.070	196.020
Fund of reserve		1.900	2.550	9.720	10.290	10.330	11.670	11.670	11.670	11.670	11.670	11.680
(5% of profit before tax)												
Net cash flow	(326.340)	40.340	92.580	170.970	193.270	193.800	50.050	184.400	184.400	184.400	184.400	1.340
Accumulative cash flow	(326.340)	(286.100)	(193.520)	(22.550)	170,720	364.520	414.570	598.970	783.370	967.770	1152.110	

## CONCLUSION AND PROPOSAL

According to the geological exploration results firm conclusion would be made that Chau Cuong marble is beautiful in colour which have attracted domestic and foreign consumers. Moreover, Chau Cuong marble is of large reserve, rather good blockage, favourable condition of quarrying and quarrying technics is not so complicated, on the other hand, the invested capital in quarrying operation is not so high, payback-period is four year short. Equipment/machinery is available partly from UNIDO assistance and part can be bought in Vietnam. It is confident that the investment for this project can bring about the following benefits :

- Financial contribution of remarkable amount to the state and local budgets and to develop local industry and the benefits for the investors.
- Better material supply to various factories where block marble is processed into the tiles and slab for domestic demand and export as well.
- Contribution to the development of quarry technology in Vietnam in general. Good blocks exploited from quarry can lower the production cost of tiles and slabs to make Nghe an marble products of high competitiveness .
- Creating more jobs for the local community.

To execute this project feasibly, the following works should be conducted:

1. To get the mining licence for opening of quarry at the Chau Cuong area as soon as possible to produce marble blocks.
2. Topo-map must be compiled and quarry design must be done which would be approved by the competence authority.
3. Opening the quarry on the basic of mobilization of equipments, labour force, working capital sufficient for carrying-out quarrying operation in 1994.
4. To ensure consumption for block marble, the marketing opportunities should be investigated to have more and more foreign consumers as well as domestic for the products for maximum sale. It can create the basis for increasing annual production.
5. Development of cooperation with domestic companies which are capable in organizing, managing of quarrying work and good access to the market inside and outside Vietnam. The products can be sold at large amount, once the production cost is low and competitive including tiles produced at the factory of the Vinh city and block marble at the quarry.

One of the most cooperative company is MIDECO which is belong the Ministry of Heavy Industry. The cooperation form would be as following :

**A. FOR THE QUARRY :**

**I. MIDECO :MIDECO is responsible for :**

1. Organizing of quarrying operation, appointment of manager and technician staffs and running quarrying work.
2. Marketing of quarry products.
3. Providing working capital for quarry enterprise and additional equipments for quarry and part of building cost of infrastructure for the quarry.

**II. THE TECHNOLOGY AND ENVIRONMENT SERVICE : The Nghe an Province is responsible for :**

1. Supply quarrying equipment which are available for the quarrying line including the UNIDO supplied equipments and part of over-all construction fund.
2. Provision of labour, workers, managing staff, one of which is the Vice Director of the quarrying enterprise.
3. To solve all the formalities for granting of land, natural resources and relation with local authorities, and
4. Being responsible mainly for application for Licence for establishment of joint-venture quarry enterprise.

After fulfilling all the financial obligations to the Government, profit sharing would be made as 50%/50% to each partner.

**B. COOPERATION WITH THE CONCRETE FACTORY AT THE VINH CITY :**  
are as follows :

- MIDECO :**
1. Contribution of working capital and part of equipments if there is a need to increase capacity to meet the demand of the orders contracted by the consumers.
  2. Provision of one Director (or one Vice Director) to manage the factory in term of production and consumption of the products, one accountant and one person to technical staff of the factory.

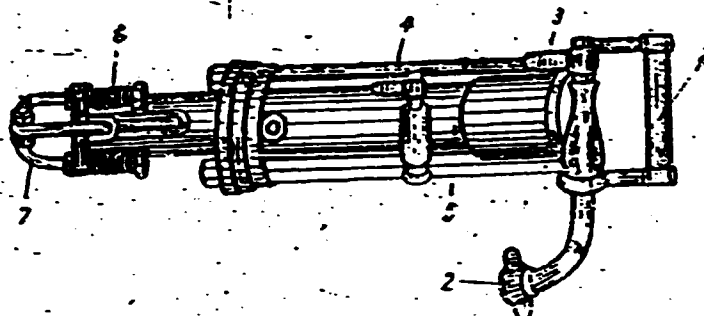
If MIDECO is in place of the Vice Director so the accountant is the chief one.

Profit sharing is based on the contributed assets and capital according to the contributing ratio of the two partners.

**APPENDIX**

**SPECILIZED EQUIPMENTS AND MACHINERIES  
IN CHAU CUONG - NGHE AN MARBLE QUARRY.**

## PR-24L PORTABLE DRILLING HAMMER



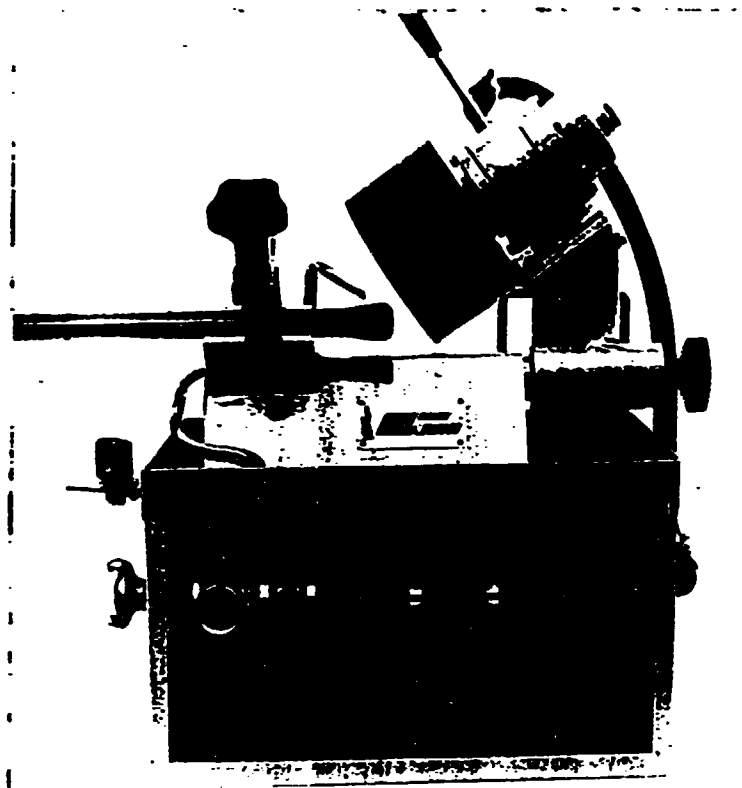
SCHEM OF PR -24L DRILLING HAMMER

1. Handle
2. Pressure air pipe
3. Pressure air opening valve to Rotary rod
4. Air valve for blowing drilling dust
5. Cylinder
6. Bumpy reduction spring
7. Drilling rod keeper

### TECHNICAL PROPERTIES OF AIR CONSUMED PR-24L DRILLING HAMMER

Weight, kg	24
Length, mm	610
Piston Diameter, mm	100
Moving Distance of piston, mm	35
Air pressure, At	4 - 6
Frequency, time per min.	3000
Max. rotary moment, kg cm	200
Air consumption $M^3/Min.$	3 - 3.5
Drilling hole diameter mm	35 - 45
Outer diameter of rod mm	25
Drilling depth m	4.5

## GRINDER FOR DRILLING RODS AND BITS

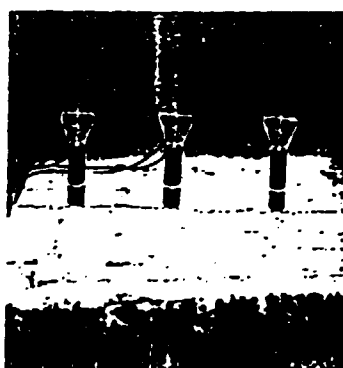
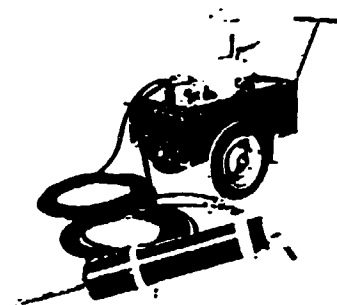


### GRINDERS

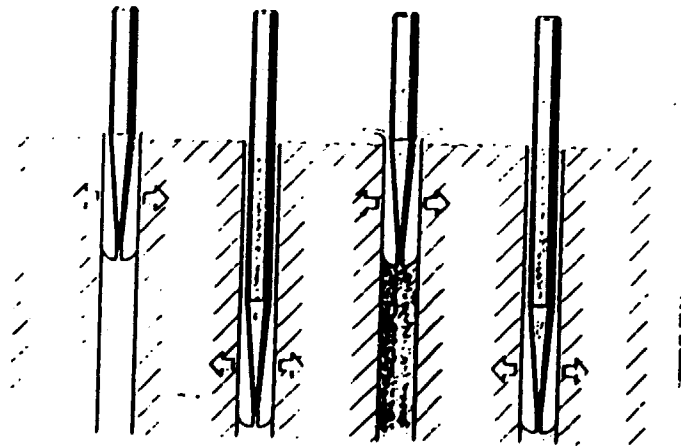
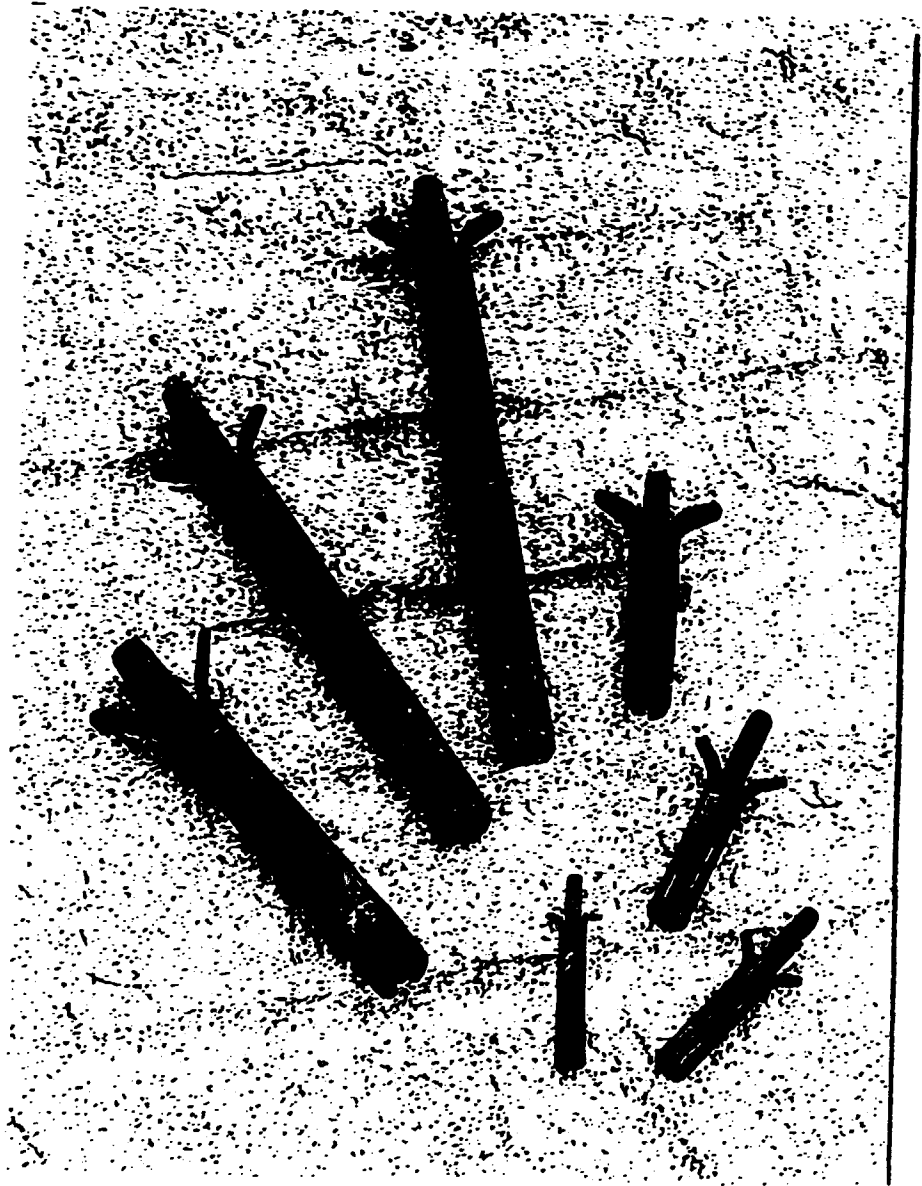
Rotation speed	3500 RPM max
Pneumatic motor	2 HP
Cutting edge angle	110°
Cutting radius	125 mm
Working pressure	6.0 bar
Air consumption at 6 bar	1.5 m <sup>3</sup> /min
Diameter grinding wheel	150 mm
Fixed model weight	36 Kg
Portable model weight	27 Kg



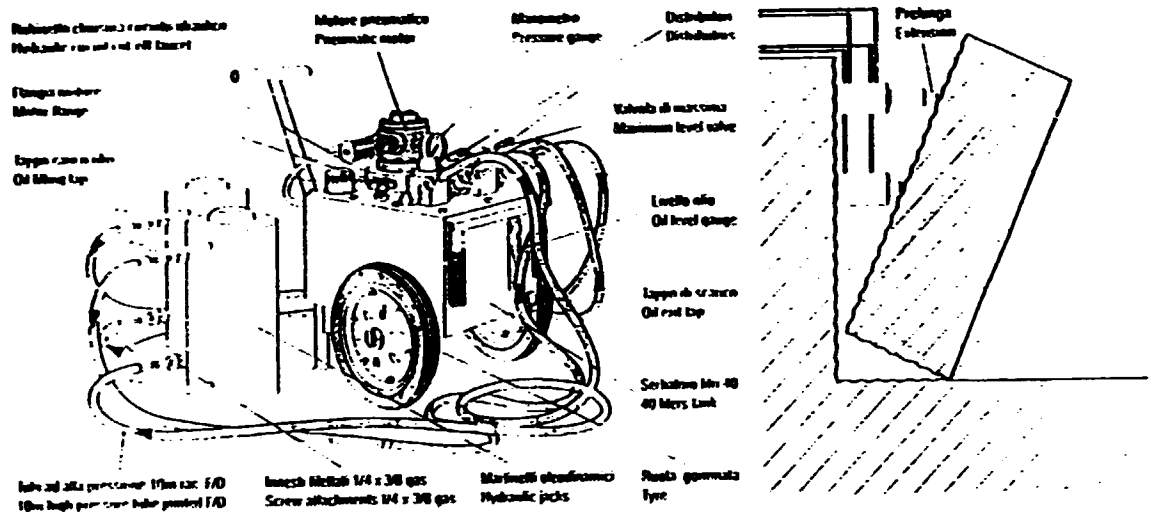
# FLOUSPAK 186 HYDROSPITTER



# PLUG, FEATHER AND ITS WORKING SCHEME



# BULL HYDROJACK



## Technical characteristics

### Power pack

Working pressure 700 bar.  
 Pump with radial pistons.  
 Oil tank of 40 litres.  
 Safety valve at maximum pressure.  
 Hydraulic circuit closing tap.  
 Pressure gauge in glycerine bath 0/1000 bar.  
 Two lateral distributors for direct command of each jack.  
 1/4-3/8 screw joints for very high pressures in both directions.

### Jacks

Hydraulic cylinders with double effect.  
 Stainless steel pistons with special crowned treatment.  
 Guide ring limit switch.  
 Hydraulic seal for high pressures.  
 Safety valve for low and high pressure.  
 Working pressure 700 bar.

# TB.610 AUTOMATIC DRILLING SYSTEM ON RAILS

## TECHNICAL SPECIFICATIONS

Total weight 160 kgs

Track weight only 70 kgs

Trolley weight only 35 kgs

Column weight only 50 kgs

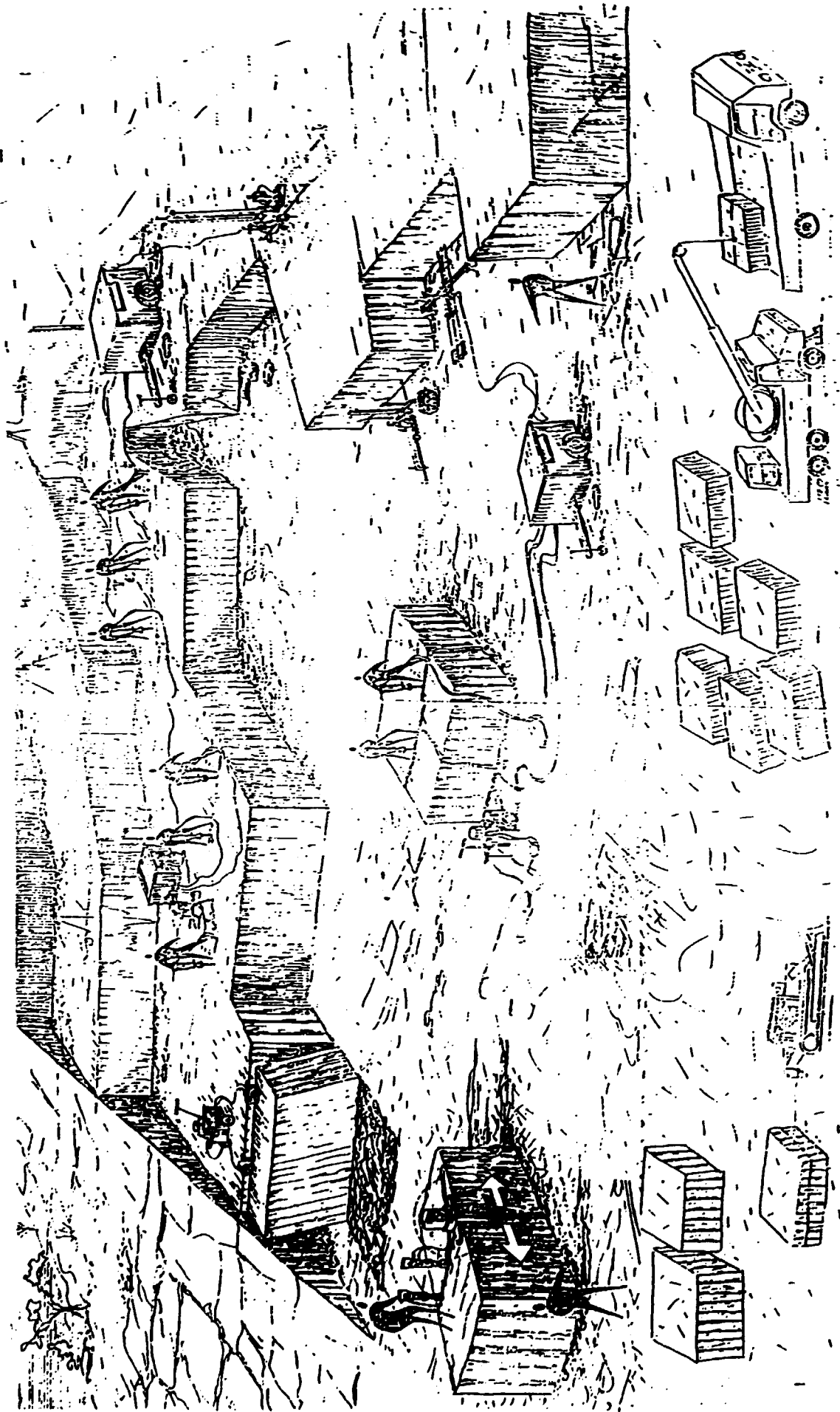
Control panel weight only 5 kgs

Total air consumption 4500 Lts at 7 Bar.

Start drilling with 2 Mts integral drill steel

— — — — — sequence 3.2 - 4.8 - 6.4 Mts.

SCHEME OF MARBLE QUARRYING EQUIPMENTS  
IN CHAU CUONG - NGHE AN



INVESTMENT COSTS - TOTAL			
US DOLLAR			
	Total	Total	
	costruction	production	1994
Total Fixed Investment Costs	326340.00	134350.00	326340.00
Total Pre-Production Expenditures	0.00	0.00	0.00
Increase in Net Working Capital	0.00	63196.67	0.00
<b>TOTAL INVESTMENT COSTS</b>	<b>326340.00</b>	<b>197546.67</b>	<b>326340.00</b>
Foreign share (%)	0.00	0.00	0.00

INVESTMENT COSTS - TOTAL			
US DOLLAR			
	1995	1996	1997
Total Fixed Investment Costs	0.00	0.00	0.00
Total Pre-Production Expenditures	0.00	0.00	0.00
Increase in Net Working Capital	46625.56	0.00	16571.11
<b>TOTAL INVESTMENT COSTS</b>	<b>46625.56</b>	<b>0.00</b>	<b>16571.11</b>
Foreign share (%)	0.00	0.00	0.00

INVESTMENT COSTS - TOTAL			
US DOLLAR			
	1998	1999	2000
Total Fixed Investment Costs	0.00	0.00	134350.00
Total Pre-Production Expenditures	0.00	0.00	0.00
Increase in Net Working Capital	0.00	0.00	0.00
<b>TOTAL INVESTMENT COSTS</b>	<b>0.00</b>	<b>0.00</b>	<b>134350.00</b>
Foreign share (%)	0.00	0.00	0.00

**INVESTMENT COSTS - TOTAL**  
**US DOLLAR**

	2001	2002	2003	2004
Total Fixed Investment Costs	0.00	0.00	0.00	0.00
Total Pre-Production Expenditures	0.00	0.00	0.00	0.00
Increase in Net Working Capital	0.00	0.00	0.00	0.00
<b>TOTAL INVESTMENT COSTS</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
Foreign share (%)	0.00	0.00	0.00	0.00

**ANNUAL COSTS OF PRODUCTS SOLD - TOTAL**

**US DOLLAR**

	Production	Production	Production
	1995	1996	1997
Capacity utilization (%)	66.67	66.67	100.00
Raw materials	0.00	0.00	0.00
Factory supplies	8506.67	8506.67	12760.00
Utilities	0.00	0.00	0.00
Energy	31240.00	31240.00	46860.00
Spare parts consumed	0.00	0.00	0.00
Repair, maintenance, material	17850.00	17850.00	17850.00
Royalties	8100.00	8100.00	13950.00
Labour	48860.00	48860.00	48860.00
Labour overhead costs (taxes etc.)	0.00	0.00	0.00
Factory overhead costs	11980.00	11980.00	15970.00
<b>FACTORY COSTS</b>	<b>126536.67</b>	<b>126536.67</b>	<b>156250.00</b>
Administrative costs	13340.00	13340.00	13340.00
<b>OPERATING COSTS</b>	<b>139876.67</b>	<b>139876.67</b>	<b>169590.00</b>
Depreciation	59500.00	59500.00	59500.00
Financial cost	27290.00	14340.00	12290.00
<b>TOTAL PRODUCTION COSTS</b>	<b>226666.67</b>	<b>213716.67</b>	<b>241380.00</b>
Direct marketing costs	0.00	0.00	20000.00
<b>COSTS OF PRODUCTS SOLD</b>	<b>226666.67</b>	<b>213716.67</b>	<b>261380.00</b>
Foreign share (%)	0.00	0.00	0.00
Variable share (%)	21.11	22.39	28.15



ANNUAL COSTS OF PRODUCTS SOLD - TOTAL			
US DOLLAR			
	Production	Production	Production
	1998	1999	2000
Capacity utilization (%)	100.00	100.00	100.00
Raw materials	0.00	0.00	0.00
Factory supplies	12760.00	12760.00	12760.00
Utilities	0.00	0.00	0.00
Energy	46860.00	46860.00	46860.00
Spare parts consumed	0.00	0.00	0.00
Repair, maintenance, material	17850.00	17850.00	17850.00
Royalties	13950.00	13950.00	13950.00
Labour	48860.00	48860.00	48860.00
Labour overhead costs (taxes etc.)	0.00	0.00	0.00
Factory overhead costs	15970.00	15970.00	15970.00
<b>FACTORY COSTS</b>	<b>156250.00</b>	<b>156250.00</b>	<b>156250.00</b>
Administrative costs	13340.00	13340.00	13340.00
<b>OPERATING COSTS</b>	<b>169590.00</b>	<b>169590.00</b>	<b>169590.00</b>
Depreciation	59500.00	59500.00	32630.00
Financial cost	0.00	0.00	0.00
<b>TOTAL PRODUCTION COSTS</b>	<b>229090.00</b>	<b>229090.00</b>	<b>202220.00</b>
Direct marketing costs	20000.00	20000.00	20000.00
<b>COSTS OF PRODUCTS SOLD</b>	<b>249090.00</b>	<b>249090.00</b>	<b>222220.00</b>
Foreign share (%)	0.00	0.00	0.00
Variable share (%)	29.54	29.54	33.11

ANNUAL COSTS OF PRODUCTS SOLD - TOTAL  
 US DOLLAR

	Production 2001	Production 2002	Production 2003
Capacity utilization (%)	100.00	100.00	100.00
Raw materials	0.00	0.00	0.00
Factory supplies	12760.00	12760.00	12760.00
Utilities	0.00	0.00	0.00
Energy	46860.00	46860.00	46860.00
Spare parts consumed	0.00	0.00	0.00
Repair, maintenance, material	17850.00	17850.00	17850.00
Royalties	13950.00	13950.00	13950.00
Labour	48860.00	48860.00	48860.00
Labour overhead costs (taxes etc.)	0.00	0.00	0.00
Factory overhead costs	15970.00	15970.00	15970.00
<b>FACTORY COSTS</b>	<b>156250.00</b>	<b>156250.00</b>	<b>156250.00</b>
Administrative costs	13340.00	13340.00	13340.00
<b>OPERATING COSTS</b>	<b>169590.00</b>	<b>169590.00</b>	<b>169590.00</b>
Depreciation	32630.00	32630.00	32630.00
Financial cost	0.00	0.00	0.00
<b>TOTAL PRODUCTION COSTS</b>	<b>202220.00</b>	<b>202220.00</b>	<b>202220.00</b>
Direct marketing costs	20000.00	20000.00	20000.00
<b>COSTS OF PRODUCTS SOLD</b>	<b>222220.00</b>	<b>222220.00</b>	<b>222220.00</b>
Foreign share (%)	0.00	0.00	0.00
Variable share (%)	33.11	33.11	33.11

ANNUAL COSTS OF PRODUCTS SOLD - TOTAL	
US DOLLAR	
	Production
	2004
Capacity utilization (%)	100.00
Raw materials	0.00
Factory supplies	12760.00
Utilities	0.00
Energy	46860.00
Spare parts consumed	0.00
Repair, maintenance, material	17850.00
Royalties	13950.00
Labour	48860.00
Labour overhead costs (taxes etc.)	0.00
Factory overhead costs	15970.00
<b>FACTORY COSTS</b>	<b>156250.00</b>
Administrative costs	13340.00
<b>OPERATING COSTS</b>	<b>169590.00</b>
Depreciation	32670.00
Financial cost	0.00
<b>TOTAL PRODUCTION COSTS</b>	<b>202260.00</b>
Direct marketing costs	20000.00
<b>COSTS OF PRODUCTS SOLD</b>	<b>222260.00</b>
Foreign share (%)	0.00
Variable share (%)	33.10

DISCOUNTED CASHFLOW - TOTAL CAPITAL INVESTED			
US DOLLAR			
	1994	1995	1996
TOTAL CASH INFLOW	0.00	270000.00	270000.00
Inflow operation	0.00	270000.00	270000.00
Other income	0.00	0.00	0.00
TOTAL CASH CUTFLOW	326340.00	199502.23	156761.67
Increase in fixed assets	326340.00	0.00	0.00
Increase in net working capital	0.00	46625.56	0.00
Operating costs	0.00	139876.67	139876.67
Marketing costs	0.00	0.00	0.00
Income (corporate) tax	0.00	13000.00	16885.00
NET CASH FLOW	-326340.00	70497.77	113238.33
CUMULATIVE NET CASHFLOW	-326340.00	-255842.23	-142603.90
Net present value	-326340.00	64088.88	93585.40
Cumulative net present value	-326340.00	-262251.12	-168665.72
NET PRESENT VALUE	at 10.00 %	677995.44	
INTERNAL RATE OF RETURN	40.81 %		
NORMAL PAYBACK	at 0.00 %	4	
DYNAMIC PAYBACK	at 10.00	5	
NPV RATIO	0.90		

DISCOUNTED CASHFLOW - TOTAL CAPITAL INVESTED			
US DOLLAR			
	1997	1998	1999
TOTAL CASH INFLOW	465000.00	465000.00	465000.00
Inflow operation	465000.00	465000.00	465000.00
Other income	0.00	0.00	0.00
TOTAL CASH OUTFLOW	267247.11	254363.00	254363.00
Increase in fixed assets	0.00	0.00	0.00
Increase in net working capital	16571.11	0.00	0.00
Operating costs	169590.00	169590.00	169590.00
Marketing costs	20000.00	20000.00	20000.00
Income (corporate) tax	61086.00	64773.00	64773.00
NET CASH FLOW	197752.89	210637.00	210637.00
CUMULATIVE NET CASHFLOW	55148.99	265785.99	476422.99
Net present value	148574.67	143867.91	130789.01
Cumulative net present value	-20091.05	123776.86	254565.87
NET PRESENT VALUE			
INTERNAL RATE OF RETURN			
NORMAL PAYBACK			
DYNAMIC PAYBACK			
NPV RATIO			

DISCOUNTED CASHFLOW - TOTAL CAPITAL INVESTED			
US DOLLAR			
	2000	2001	2002
TOTAL CASH INFLOW	465000.00	465000.00	465000.00
Inflow operation	465000.00	465000.00	465000.00
Other income	0.00	0.00	0.00
TOTAL CASH OUTFLOW	396774.00	262424.00	262424.00
Increase in fixed assets	134350.00	0.00	0.00
Increase in net working capital	0.00	0.00	0.00
Operating costs	169590.00	169590.00	169590.00
Marketing costs	20000.00	20000.00	20000.00
Income (corporate) tax	72834.00	72834.00	72834.00
NET CASH FLOW	68226.00	202576.00	202576.00
CUMULATIVE NET CAHFLOW	544648.99	747224.99	949800.99
Net present value	38511.80	103953.52	94503.20
Cumulative net present value	293077.67	397031.19	491534.39
NET PRESENT VALUE			
INTERNAL RATE OF RETURN			
NORMAL PAYBACK			
DYNAMIC PAYBACK			
INPV RATIO			

<b>DISCOUNTED CASHFLOW - TOTAL CAPITAL INVESTED</b>			
<b>US DOLLAR</b>			
	<b>2003</b>	<b>2004</b>	<b>Scrap 2005</b>
<b>TOTAL CASH INFLOW</b>	<b>465000.00</b>	<b>465000.00</b>	<b>64032.57</b>
Inflow operation	465000.00	465000.00	0.00
Other income	0.00	0.00	64032.57
<b>TOTAL CASH OUTFLOW</b>	<b>262424.00</b>	<b>262424.00</b>	<b>0.00</b>
Increase in fixed assets	0.00	0.00	0.00
Increase in net working capital	0.00	0.00	0.00
Operating costs	169590.00	169590.00	0.00
Marketing costs	20000.00	20000.00	0.00
Income (corporate) tax	72834.00	72822.00	0.00
<b>NET CASH FLOW</b>	<b>202576.00</b>	<b>202588.00</b>	<b>64032.57</b>
<b>CUMULATIVE NET CASHFLOW</b>	<b>1152376.99</b>	<b>1354964.99</b>	<b>1418985.56</b>
Net present value	85912.00	78106.44	22443.03
Cumulative net present value	577446.39	655552.83	677995.86
<b>NET PRESENT VALUE</b>			
<b>INTERNAL RATE OF RETURN</b>			
<b>NORMAL PAYBACK</b>			
<b>DYNAMIC PAYBACK</b>			
<b>NPV RATIO</b>			

PRODUCTION AND SALES PROGRAMME - TOTAL				
US DOLLAR				
	Production	Production	Production	Production
	1995	1996	1997	1998
Stock brought forward	0.00	0.00	0.00	0.00
Quantity produced	2000.00	2000.00	3000.00	3000.00
Stock carried forward	0.00	0.00	0.00	0.00
Quantity sold	2000.00	20000.00	3000.00	3000.00
Gross unit price (average)	137.70	137.70	158.10	158.10
Gross sales revenue	275400.00	275400.00	474300.00	474300.00
Less sales tax	5400.00	5400.00	9300.00	9300.00
Net sales revenue	270000.00	270000.00	465000.00	465000.00
Subsidy	0.00	0.00	0.00	0.00
SALES REVENUE	270000.00	270000.00	465000.00	465000.00
Foreign share (%)	0.00	0.00	0.00	0.00



**PRODUCTION AND SALES PROGRAMME - TOTAL**

**US DOLLAR**

	Production	Production	Production	Production
	1999	2000	2001	2002
Stock brought forward	0.00	0.00	0.00	0.00
Quantity produced	3000.00	3000.00	3000.00	3000.00
Stock carried forward	0.00	0.00	0.00	0.00
Quantity sold	3000.00	3000.00	3000.00	3000.00
Gross unit price (average)	158.10	158.10	158.10	158.10
Gross sales revenue	474300.00	474300.00	474300.00	474300.00
Less sales tax	9300.00	9300.00	9300.00	9300.00
Net sales revenue	465000.00	465000.00	465000.00	465000.00
Subsidy	0.00	0.00	0.00	0.00
<b>SALES REVENUE</b>	<b>465000.00</b>	<b>465000.00</b>	<b>465000.00</b>	<b>465000.00</b>
Foreign share (%)	0.00	0.00	0.00	0.00

**PRODUCTION AND SALES PROGRAMME - TOTAL**  
**US DOLLAR**

	Production	Production
	2003	2004
Stock brought forward	0.00	0.00
Quantity produced	3000.00	3000.00
Stock carried forward	0.00	0.00
Quantity sold	3000.00	3000.00
Gross unit price (average)	158.10	158.10
Gross sales revenue	474300.00	474300.00
Less sales tax	9300.00	9300.00
Net sales revenue	465000.00	465000.00
Subsidy	0.00	0.00
<b>SALES REVENUE</b>	<b>465000.00</b>	<b>465000.00</b>
Foreign share (%)	0.00	0.00

PROJECTED BALANCE SHEET

US DOLLAR

	1994	1995	1996
<b>TOTAL ASSETS</b>	<b>326340.00</b>	<b>356673.33</b>	<b>367254.99</b>
Total current assets	0.00	89833.33	159914.99
Total fixed assets, net of depreciation	326340.00	266840.00	207340.00
Accumulated losses brought forward	0.00	0.00	0.00
Loss in current year	0.00	0.00	0.00
<b>TOTAL LIABILITIES</b>	<b>326340.00</b>	<b>356673.33</b>	<b>367254.99</b>
Total current liabilities	0.00	0.00	0.00
Total long term loans	0.00	0.00	0.00
Total Equity	326340.00	326340.00	326340.00
Reserves, retained profit brought forward	0.00	0.00	1516.66
Net profit after tax	0.00	30333.33	39398.33
Net worth	326340.00	327856.66	329826.57
Ratios (%)			
Equity / total liabilities	100.00	91.50	88.86
Net worth / total liabilities	100.00	91.92	89.81
Long-term debt / net worth	0.00	0.00	0.00
Current assets / current liabilities	0.00	0.00	0.00

PROJECTED BALANCE SHEET

US DOLLAR

	1997	1998	1999
<b>TOTAL ASSETS</b>	<b>472360.57</b>	<b>488090.27</b>	<b>495647.12</b>
Total current assets	324520.57	399750.27	466807.12
Total fixed assets, net of depreciation	147840.00	88340.00	28840.00
Accumulated losses brought forward	0.00	0.00	0.00
Loss in current year	0.00	0.00	0.00
<b>TOTAL LIABILITIES</b>	<b>472360.57</b>	<b>488090.27</b>	<b>495647.12</b>
Total current liabilities	0.00	0.00	0.00
Total long term loans	0.00	0.00	0.00
Total Equity	326340.00	326340.00	326340.00
Reserves, retained profit brought forward	3486.57	10613.27	18170.12
Net profit after tax	142534.00	151137.00	151137.00
Net worth	336953.27	314510.12	352066.97
Ratios (%)			
Equity / total liabilities	69.09	66.86	65.84
Net worth / total liabilities	71.33	70.58	71.03
Long-term debt / net worth	0.00	0.00	0.00
Current assets / current liabilities	0.00	0.00	0.00

PROJECTED BALANCE SHEET			
US DOLLAR			
	2000	2001	2002
<b>TOTAL ASSETS</b>	<b>522012.97</b>	<b>530510.27</b>	<b>539007.57</b>
Total current assets	397452.97	432580.27	473707.57
Total fixed assets, net of depreciation	130560.00	97930.00	65300.00
Accumulated losses brought forward	0.00	0.00	0.00
Loss in current year	0.00	0.00	0.00
<b>TOTAL LIABILITIES</b>	<b>522012.97</b>	<b>530510.27</b>	<b>539007.57</b>
Total current liabilities	0.00	0.00	0.00
Total long term loans	0.00	0.00	0.00
Total Equity	326340.00	326340.00	326340.00
Reserves, retained profit brought forward	25726.97	34224.27	42721.57
Net profit after tax	169946.00	169946.00	169946.00
Net worth	360564.27	369061.57	377558.87
Ratios (%)			
Equity / total liabilities	62.52	61.51	60.55
Net worth / total liabilities	69.07	69.57	70.05
Long-term debt / net worth	0.00	0.00	0.00
Current assets / current liabilities	0.00	0.00	0.00

PROJECTED BALANCE SHEET		
US DOLLAR		
	2003	2004
<b>TOTAL ASSETS</b>	<b>547504.87</b>	<b>555974.17</b>
Total current assets	514834.87	555974.17
Total fixed assets, net of depreciation	32670.00	0.00
Accumulated losses brought forward	0.00	0.00
Loss in current year	0.00	0.00
<b>TOTAL LIABILITIES</b>	<b>547504.87</b>	<b>555974.17</b>
Total current liabilities	0.00	0.00
Total long term loans	0.00	0.00
Total Equity	326340.00	326340.00
Reserves, retained profit brought forward	51218.87	59716.17
Net profit after tax	169946.00	169918.00
Net worth	386056.17	394552.07
Ratios (%)		
Equity / total liabilities	59.61	58.70
Net worth / total liabilities	70.51	70.97
Long-term debt / net worth	0.00	0.00
Current assets / current liabilities	0.00	0.00

**NET INCOME STATEMENT**  
**USD DOLLAR**

	Production	Production	Production
	1995	1996	1997
Sales revenue	270000.00	270000.00	465000.00
Less variable costs	47846.67	47846.67	73570.00
<b>VARIABLE MARGIN</b>	<b>222453.33</b>	<b>222153.33</b>	<b>391430.00</b>
In % of sales revenue	82.28	82.28	84.18
Less fixed costs	151530.00	151530.00	175520.00
<b>OPERATIONAL MARGIN</b>	<b>70623.33</b>	<b>70623.33</b>	<b>215910.00</b>
In % of sales revenue	26.16	26.16	46.43
Interest on securities			
Financial costs	27290.00	14340.00	12290.00
<b>GROSS PROFIT FROM OPERATIONS</b>	<b>43333.33</b>	<b>56283.33</b>	<b>203620.00</b>
In % of sales revenue	16.05	20.85	43.79
Extraordinary income	0.00	0.00	0.00
Extraordinary loss	0.00	0.00	0.00
Depreciation allowances	0.00	0.00	0.00
<b>GROSS PROFIT</b>	<b>43333.33</b>	<b>56283.33</b>	<b>203620.00</b>
Investment allowances	0.00	0.00	0.00
<b>TAXABLE PROFIT</b>	<b>43333.33</b>	<b>56283.33</b>	<b>203620.00</b>
Income (corporate) tax	13000.00	16885.00	61086.00
<b>NET PROFIT</b>	<b>30333.33</b>	<b>39398.33</b>	<b>142534.00</b>
In % of sales revenue	11.23	14.59	30.65
Dividends payable	28816.67	37428.42	135407.30
<b>RETAINED PROFIT</b>	<b>1516.66</b>	<b>1969.91</b>	<b>7126.70</b>
<b>Ratios (%)</b>			
Net profit / equity capital	0.00	0.00	0.00
Net profit / Net worth	9.25	11.95	42.30
Net profit + interest / investment	65.06	84.50	225.54

**INET INCOME STATEMENT**
**USD DOLLAR**

	Production	Production	Production
	1998	1999	2000
Sales revenue	465000.00	465000.00	465000.00
Less variable costs	73570.00	73570.00	73570.00
<b>VARIABLE MARGIN</b>	<b>391430.00</b>	<b>319430.00</b>	<b>391430.00</b>
In % of sales revenue	84.18	84.18	84.18
Less fixed costs	175520.00	175520.00	148650.00
<b>OPERATIONAL MARGIN</b>	<b>215910.00</b>	<b>215910.00</b>	<b>242780.00</b>
In % of sales revenue	46.43	46.43	52.21
Interest on securities	0.00	0.00	0.00
Financial costs	0.00	0.00	0.00
<b>GROSS PROFIT FROM OPERATIONS</b>	<b>215910.00</b>	<b>215910.00</b>	<b>242780.00</b>
In % of sales revenue	46.43	46.43	52.21
Extraordinary income	0.00	0.00	0.00
Extraordinary loss	0.00	0.00	0.00
Depreciation allowances	0.00	0.00	0.00
<b>GROSS PROFIT</b>	<b>215910.00</b>	<b>215910.00</b>	<b>242780.00</b>
Investment allowances	0.00	0.00	0.00
<b>TAXABLE PROFIT</b>	<b>215910.00</b>	<b>215910.00</b>	<b>242780.00</b>
Income (corporate) tax	64733.00	64733.00	72834.00
<b>NET PROFIT</b>	<b>151137.00</b>	<b>151137.00</b>	<b>169946.00</b>
In % of sales revenue	32.50	32.50	36.55
Dividends payable	143580.15	143580.15	161448.70
<b>RETAINED PROFIT</b>	<b>7556.85</b>	<b>7556.85</b>	<b>8497.30</b>
<b>Ratios (%)</b>			
Net profit / equity capital	0.00	0.00	0.00
Net profit / Net worth	43.87	42.93	47.13
Net profit + interest / investment	239.15	239.15	86.03

**INET INCOME STATEMENT**  
**IUSD DOLLAR**

	Production	Production	Production
	2001	2002	2003
Sales revenue	465000.00	465000.00	465000.00
Less variable costs	73570.00	73570.00	73570.00
<b>VARIABLE MARGIN</b>	<b>391430.00</b>	<b>319430.00</b>	<b>391430.00</b>
In % of sales revenue	84.18	84.18	84.18
Less fixed costs	148650.00	148650.00	148650.00
<b>OPERATIONAL MARGIN</b>	<b>242780.00</b>	<b>242780.00</b>	<b>242780.00</b>
In % of sales revenue	52.21	52.21	52.21
Interest on securities	0.00	0.00	0.00
Financial costs	0.00	0.00	0.00
<b>GROSS PROFIT FROM OPERATIONS</b>	<b>242780.00</b>	<b>242780.00</b>	<b>242780.00</b>
In % of sales revenue	52.21	52.21	52.21
Extraordinary income	0.00	0.00	0.00
Extraordinary loss	0.00	0.00	0.00
Depreciation allowances	0.00	0.00	0.00
<b>GROSS PROFIT</b>	<b>242780.00</b>	<b>242780.00</b>	<b>242780.00</b>
Investment allowances	0.00	0.00	0.00
<b>TAXABLE PROFIT</b>	<b>242780.00</b>	<b>242780.00</b>	<b>242780.00</b>
Income (corporate) tax	72834.00	72834.00	72834.00
<b>NET PROFIT</b>	<b>169946.00</b>	<b>169946.00</b>	<b>169946.00</b>
In % of sales revenue	36.55	36.55	36.55
Dividends payable	161448.70	161448.70	161448.70
<b>RETAINED PROFIT</b>	<b>8497.30</b>	<b>8497.30</b>	<b>8497.30</b>
<b>Ratios (%)</b>			
Net profit / equity capital	0.00	0.00	0.00
Net profit / Net worth	46.01	45.01	44.02
Net profit + interest / investment	86.03	86.03	86.03

NET INCOME STATEMENT	
USD DOLLAR	
	Production
	2004
Sales revenue	465000.00
Less variable costs	73570.00
VARIABLE MARGIN	391430.00
In % of sales revenue	84.18
Less fixed costs	148690.00
OPERATIONAL MARGIN	242740.00
In % of sales revenue	52.20
Interest on securities	0.00
Financial costs	0.00
GROSS PROFIT FROM OPERATIONS	242740.00
In % of sales revenue	52.20
Extraordinary income	0.00
Extraordinary loss	0.00
Depreciation allowances	0.00
GROSS PROFIT	242740.00
Investment allowances	0.00
TAXABLE PROFIT	242740.00
Income (corporate) tax	72822.00
NET PROFIT	169918.00
In % of sales revenue	36.54
Dividends payable	161422.10
RETAINED PROFIT	8495.90
Ratios (%)	
Net profit / equity capital	0.00
Net profit / Net worth	43.07
Net profit + interest / investment	86.01



**CASH FLOW FOR FINANCIAL PLANNING - TOTAL**  
**US DOLLAR**

	1994	1995	1996
<b>TOTAL CASH INFLOW</b>	0.00	270000.00	270000.00
Inflow funds	0.00	0.00	0.00
Inflow operation	0.00	270000.00	270000.00
Other income	0.00	0.00	0.00
<b>TOTAL CASH OUTFLOW</b>	326340.00	255608.90	208530.09
Increase in current assets	326340.00	0.00	0.00
Increase in current assets	0.00	46625.56	0.00
Operating costs	0.00	139876.67	139876.67
Marketing costs	0.00	0.00	0.00
Income (corporate) tax	0.00	13000.00	16885.00
Financial costs	0.00	27290.00	14340.00
Loan repayment	0.00	0.00	0.00
Dividends payable	0.00	28816.67	37428.42
Equity capital refund	0.00	0.00	0.00
<b>SURPLUS (DEFICIT)</b>	-326340.00	14391.10	61469.91
<b>CUMULATIVE CASH BALANCE</b>	-326340.00	-311948.90	-2500478.99
Foreign surplus (deficit)	0.00	0.00	0.00
Local surplus (deficit)	-326340.00	14391.10	61469.91
Foreign cumulative cash balance	0.00	0.00	0.00
Local cumulative cash balance	-326340.00	-311948.00	-250478.00
<b>Net flow of funds</b>	0.00	- 28816.67	- 37428.42

**CASH FLOW FOR FINANCIAL PLANNING - TOTAL**  
**US DOLLAR**

	1997	1998	1999
<b>TOTAL CASH INFLOW</b>	<b>465000.00</b>	<b>465000.00</b>	<b>465000.00</b>
Inflow funds	0.00	0.00	0.00
Inflow operation	465000.00	465000.00	465000.00
Other income	0.00	0.00	0.00
<b>TOTAL CASH OUTFLOW</b>	<b>414944.41</b>	<b>398753.15</b>	<b>397943.15</b>
increase in current assets	0.00	0.00	0.00
Increase in current assets	16571.11	0.00	0.00
Operating costs	169590.00	169590.00	169590.00
Marketing costs	20000.00	20000.00	20000.00
Income (corporate) tax	61086.00	64773.00	64773.00
Financial costs	12290.00	810.00	0.00
Loan repayment	0.00	0.00	0.00
Dividends payable	135407.30	143580.15	143580.15
Equity capital refund	0.00	0.00	0.00
<b>SURPLUS (DEFICIT)</b>	<b>50055.59</b>	<b>66246.85</b>	<b>67056.85</b>
<b>CUMULATIVE CASH BALANCE</b>	<b>-200423.40</b>	<b>-134176.55</b>	<b>- 67119.70</b>
Foreign surplus (deficit)	0.00	0.00	0.00
Local surplus (deficit)	50055.59	66246.85	67056.85
Foreign cumulative cash balance	0.00	0.00	0.00
Local cumulative cash balance	-200423.40	-134176.55	- 67119.70
<b>Net flow of funds</b>	<b>-135407.30</b>	<b>-143580.15</b>	<b>-143580.15</b>

**CASH FLOW FOR FINANCIAL PLANNING - TOTAL  
US DOLLAR**

	2000	2001	2002
<b>TOTAL CASH INFLOW</b>	<b>465000.00</b>	<b>465000.00</b>	<b>465000.00</b>
Inflow funds	0.00	0.00	0.00
Inflow operation	465000.00	465000.00	465000.00
Other income	0.00	0.00	0.00
<b>TOTAL CASH OUTFLOW</b>	<b>558222.00</b>	<b>423872.70</b>	<b>423872.70</b>
Increase in current assets	134350.00	0.00	0.00
Increase in current assets	0.00	0.00	0.00
Operating costs	169590.00	169590.00	169590.00
Marketing costs	20000.00	20000.00	20000.00
Income (corporate) tax	72834.00	72834.00	72834.00
Financial costs	0.00	0.00	0.00
Loan repayment	0.00	0.00	0.00
Dividends payable	161448.70	161448.70	161448.70
Equity capital refund	0.00	0.00	0.00
<b>SURPLUS (DEFICIT)</b>	<b>- 93222.00</b>	<b>41127.30</b>	<b>41127.30</b>
<b>CUMULATIVE CASH BALANCE</b>	<b>-160341.70</b>	<b>-119214.40</b>	<b>- 67119.70</b>
Foreign surplus (deficit)	0.00	0.00	0.00
Local surplus (deficit)	- 93222.00	41127.00	41127.30
Foreign cumulative cash balance	0.00	0.00	0.00
Local cumulative cash balance	-160341.70	-119214.00	- 78087.10
<b>Net flow of funds</b>	<b>-161448.70</b>	<b>-161448.70</b>	<b>-161448.70</b>

CASH FLOW FOR FINANCIAL PLANNING - TOTAL			
US DOLLAR			
	2003	2004	Scrap 2005
<b>TOTAL CASH INFLOW</b>	<b>465000.00</b>	<b>465000.00</b>	<b>64032.57</b>
Inflow funds	0.00	0.00	0.00
Inflow operation	465000.00	465000.00	0.00
Other income	0.00	0.00	64032.57
<b>TOTAL CASH OUTFLOW</b>	<b>423872.70</b>	<b>423680.70</b>	<b>0.00</b>
increase in current assets	0.00	0.00	0.00
Increase in current assets	0.00	0.00	0.00
Operating costs	169590.00	169590.00	0.00
Marketing costs	20000.00	20000.00	0.00
Income (corporate) tax	72834.00	72822.00	0.00
Financial costs	0.00	0.00	0.00
Loan repayment	0.00	0.00	0.00
Dividends payable	161448.70	161448.70	0.00
Equity capital refund	0.00	0.00	0.00
<b>SURPLUS (DEFICIT)</b>	<b>41127.30</b>	<b>41139.30</b>	<b>64032.57</b>
<b>CUMULATIVE CASH BALANCE</b>	<b>- 36959.80</b>	<b>4175.50</b>	<b>68212.07</b>
Foreign surplus (deficit)	0.00	0.00	0.00
Local surplus (deficit)	41127.30	41139.30	64092.57
Foreign cumulative cash balance	0.00	0.00	0.00
Local cumulative cash balance	- 36959.80	4179.50	68212.07
<b>Net flow of funds</b>	<b>-161448.70</b>	<b>-161448.70</b>	<b>0.00</b>