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# ASSISTANCE IN THE EXPANSION OF PRODUCTION OF ALKYD RESIN AND POLYVINYL ACETATE

SI/SYR/84/802

SYRIAN ARAB REPUBLIC

Syria.

Terminal report*

Pre-feasibility study for the production of alkyd resin, PVA dispersion and paint

Prepared for the Government of the Syrian Arab Republic
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of J. Bucek, H. Bukowiecki and H. G. Meisterhofer, experts in resins, paints, adhesives, raw material, equipment and plant construction, and E. Brunner and D. K. Kosati, experts in financial and economic analysis

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Vienna

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# C O N T E N T S

# I. EXECUTIVE SUMMARY

## 1. Project background and history

The project concept is to plan, erect and operate an industrial plant to produce Alkyd Resin, Polyvinyl Acetate and on that basis various types of oil and emulsion paints. The project combines production of intermediate products for paint manufacturing and also paint production. The main objective of the project is to cover domestic market needs in the Syrian Arab Republic with some possibilities of marginal exports.

The promoter of the project is the Syrian state-owned firm known as the Paints & Chemicals Industries - Omayad Paint Co., controlled by the Ministry of Industry.

The project was initiated by presidential decree No 73 of Dec. 13.1980. It was planned to be financed by the Syrian Government. In 1985 UNIDO was requested to act as a consultant to the Government, specifically with a task to evaluate the viability of setting-up a new plant to produce paint and intermediate raw material.

## 2. Market and demand study

It has been agreed that a full-fledged market study would not be undertaken by the UNIDO experts and main data on market and demand conditions will be taken from a pre-feasibility report, prepared by PCI in 1982. On the basis of the information available the current level of demand for resins, dispersion and paint has been estimated.
Total domestic consumption of paints in 1984 was ca 6 millions US gallons. From observed trends a potential market volume for the years 1985-2003 has been assessed to be as follows.

| | |
|---|---|
| - Alkyd Resin | - from 7500 t in 1985 to 21500 t in 1998 and beyond |
| - PVAcetate | - from 6100 t in 1985 to 15600 t in 1995 and beyond |
| - Oil paints (Alkyd based) | - from 2 200 000 gal in 1985 to 5 600 000 gal in 1995 and beyond |
| - Emulsion paints (PVA based) | - from 4 100 000 gal in 1985 to 10 400 000 gal in 1995 and beyond |
| - Industrial paints (Alkyd based) | - from 540 000 gal in 1985 to 1 400 000 gal in 1995 and beyond. |

Taking into account the data given above and also a desired product mix, the planned capacity for the plant has been set as follows:

- Alkyd Resin - 21 400 t/year (70% solid)
- PVA - 14 400 t/year (54% solid)
- Alkyd paints - 4 100 000 gal/year
- PVA paints - 2 700 000 gal/year

Pricing of final products has been based both on current observations of international markets and pricing policy applied by PCI on Syrian market.

For the evaluation of sales revenues the selling prices net of distribution costs have been applied:

- for Alkyd Resin - 5 229 SyL/ton
- for PVA - 3 468 SyL/ton
- for Alkyd paint (local) - 50 094 SyL/gal
- for Alkyd paint (export) - 29,09 SyL/gal
- for PVA paint - 22,79 SyL/gal.

## 3. Material and inputs

In the production process mainly imported raw materials will be used, their proportion in total material costs varying from 100% for PVA and 87% for Alkyd Resin, to 97% for PVA Paint and 80% for Alkyd Paint. Main material inputs are soya oil for resins and monomers for PVA.

Total raw material cost per unit of output have been estimated to be approximately (depending on the technology used):

- for Alkyd Resin - 3 442 SyL/t
- for PVA - 2 458 SyL/t
- for Alkyd paint - 4 654 SyL/t
for PVA paint - 1 706 SyL/t.

## 4. Location and site

PCI has the option to select between 2 pieces of land which are located approx. 20 km south of Damascus on the road No 5 to Amman. The closest village is Kisway which is about 4 km north of both pieces of land. The first site is on a rocky soil and on a slope and is named Al-Manee, the second is on agricultural soil and flat and named Al-Majdiah.

Both sites do not meet the optimal conditions for the plant under review, either due to specific natural configuration of the terrain (Al-Manee), or due to shortcomings of infrastructural facilities. However, if the experts had to select one site out of the two, the Al-Majdiah site would be the better one.

## 5. Project engineering

The production process will be based on imported equipment, purchased together with a related Know-How from an internationally recognized supplier.
In the selection of technology account has been taken of locally available raw materials, climatic conditions and level of technical skills of manpower.
For Alkyd Resin production the two-steps azeotropic process using oil is recommended. For PVA dispersion a batch process is to be selected because of its versatility. Paints will be manufactured using a standard technology.
The procurement of Know-How satisfying technical requirements and also allowing the exports of products to other countries will cost approx. 4 mill. US $.

The corresponding production equipment will cost approx. 9,5 mill. US $.
In addition to that a diversified auxiliary equipment has to be purchased, including transportation means, energy generators, water treatment plant, workshop and laboratory, at the total cost of ca 12 mill. US $.
At a specific request of the PCI separate storage facilities for raw materials and intermediates will have to be built at cost of 4,5 mill. US $.

The civil engineering works will include site preparation and development of an area of ca 200 000 m², erection of buildings of solid concrete or brick with steel structure, roads, landscaping, fencing etc.
These works are to be carried out by a local contractor at estimated cost of 29,88 mill. SyL.
In addition to this the engineering service will have to be paid (ca 0,3 mill. US $).

## 6. Plant organization and overhead costs

The whole plant will be divided into 4 departments, each headed by a manager.

I - Administration
II - Marketing and sale
III - Production
IV - Development, Research, Application.

Factory and administration overheads will include cost of repair and maintenance (by own trained personnel), wear and tear parts, utilities costs for office activities, administration personnel cost, effluent disposal. Total cost has been estimated at 11,78 SyL per year.

## 7. Manpower

The plant will employ 303 persons (workers, clerks, salesmen, accountants, administration personnel), thereof 206 will be employed within the Production Department. Total cost of manpower per year will be approx. 8,2 mill. SyL, of it 50% will be direct manpower.

## 8. Implementation schedule

It is assumed that the project will be implemented within approx. 30 months. It will be realized under the supervision and responsibility of a general contractor who will be the only liable party. The fee for the supervision will be 300 000 US $.

## 9. Financial analysis

The total initial investment cost of the project amount approx. to 275 mill. SyL and is divided as follows.

| | in SyL '000 |
|---|---|
| Land, site preparation and development | 5 500 |
| Buildings and civil works | 33 150 |
| Plant machinery and equipment | 87 112 |
| Auxiliary and service facilities | 81 418 |
| Incorporated fixed assets (Know-How) | 20 440 |
| Pre-production expenses | 15 265 |
| Working Capital (initial) | 9 340 |
| Interest during pre-production | 23 487 |
| Total investment | 275 712 |

Of this amount, ca 74% is of foreign origin.

It is planned that these expenditures will be covered by equity funds of 20 mill. SyL provided by PCI and the balance of 255 mill. SyL by a loan from government sources. This idea assumes that large outside financing by outside sponsors will be available in spite o the extremely high debt equity ratio, surpassing 90/10. Additional short-term borrowing will have to be made to cover a build-up of working capital at the beginning of operation up to the amount of ca 42 mill. SyL.

As a result of high proportion of borrowed funds used, the project will be charged with substantial debt service payment within the first seven years of operation. However, the net cash-flow generated by the project is sufficient enough to cover all financial obligations either directly from sales revenues, or from retained profits (in two years only).

Annual sales revenues at full capacity will reach 360 mill. SyL,whereas production costs would not exceed 240 mill. SyL, yielding gross taxable profit of more than 130 mill. a year. i.e. ca 37% of sales. However,net profitability will be much less impressive because of unusally high taxes which have to be paid in Syria, totalling 84,5% of gross profit.

As a result, internal rate of return on total invested capital, is almost 19% and net present value of the project at 10% discounting factor is ca 114 mill. SyL. Return on equity is obviously much higher exceeding 46% due to a low share of equity financing.

Pay-back period of the project is 4 years.

## 10. Conclusions and recommendations

a) The project will certainly contribute to economic development in Syria through increase of supplies of large variety of paints and adhesives, creation of many new job opportunities, and further integration of Syrian industrial infrastructure.

b) The project output will substitute for imports of intermediate products used for paint manufacturing.

c) The overall profitability of the project measured by IRR and NPV can be seen as satisfactory.

d) The project is highly dependent on imported inputs - both capital equipment and production raw materials. More than 80% of production

costs is of foreign origin. On the other hand the output is almost entirely sold locally on domestic market. Therefore in terms of foreign currency the project generates a continuous deficit ranging from 125 mill. to 190 mill. SyL per year. It must be noted that the parallel rate of exchange of 5,45 SyL/US $ has been applied throughout the whole evaluation, whereas the real, or "shadow" exchange rate is estimated to be twice as high. If the real rate is used for calculations, the project turns out to be non-profitable and generates losses varying from 25 mill. to 65 mill. SyL per year.

e) The financial structure of the project does not respond to internationally accepted standards, because of very high debt/equity ratio of more than 90/10. Under regular conditions this may discourage potential outside sponsors from joining the project because of substantial risk which is normally connected with such high D/E ratio. However, in this case, the risk seems to be actually much lower because of the Syrian government involvment in the project. Being supported by the government and owned by public sector company (PCI), the project will certainly be protected against any risk which might incur due to the high debt/equity ratio.

f) Sensitivity analysis run for most important parameters confirms that the project heavily depends on the valuation of foreign currency inputs. The present report has been prepared under the assumption that a parallel rate of foreign exchange of 5,45 SyL/US $ is used to convert all foreign currency components into local currency. But in the presence of high inflation and strict currency regulations in the Syrian market it is believed that the parallel rate seriously underestimates the real value of foreign exchange. Therefore the final recommendation should be to implement the project only if there is a strong evidence that the parallel rate will be applied to convert all imports (both investment equipment and raw materials) into domestic currency. When higher more realistic rate is applied, the profitability of the project deteriorates considerably and to avoid losses, the share of exports would have to be largely increased to match import expenditures in terms of foreign currency and/or raise considerably the selling prices in the local market of all products.

## II. PROJECT BACKGROUND AND HISTORY

### 1. Project background

The project concept is to plan, procure, erect and operate an industrial resin and paint production complex for the PCI - Omeyad Paint Co. in the Syrian Arab Republic (S.A.R.).

The central objective of the project is to cover domestic market needs and also satisfy export contracts for various types of paints and for main by - products used for paint manufacturing. The desired output structure at full capacity is the following

a) Polyvinyl acetate dispersions of various types - total 14400 tons per year (54% solid)

b) Resins of different types - total 21400 tons per year (70% solid).

From the intermediate PVA and Resins the following types of paints will be produced (in '000 US gallons per year)

c) Oil paints (Resin based) - 2700

d) Emulsion paints (PVA based) - 2700

e) Industrial paints (Resin based) - 1400

The above mentioned figures for paints are for full capacity one-shift operation output. Should the market capacity increase and/or new export opportunities emerge, two-shifts or three-shifts operation can be introduced and the corresponding output figures for paints could be increased as follows (in '000 US gal.).

- oil paints - up to 6950
- emulsion paints - up to 6950
- industrial paints - up to 3475.

However within the scope of the present study only one-shift operation variant is examined and discussed.

## 2. Economic benefits of the project (general description)

The realisation of the project creates numerous important benefits for the Syrian Arab Republic.

a) Substantial savings of foreign currency due to local production of the intermediate products like resins and PVA, which are currently imported for the fabrication of paints.

b) Additional income of foreign currency due to exports of the finished products (paints) and intermediate products (Resins, PVA, adhesives). The project will allow to fulfill export obligations stipulated in government contract between the S.A.R. and the U.S.S.R. to supply large quantities of white gloss enamel up to 1991 with possibility of extention. Essentially however the project is domestic market oriented and the output will mainly substitute for imports.

c) Exploitation and further development of an industrial area south of Damascus.

d) Promotion of all industries using resins, paints and adhesives throughout the country.

e) Creation of approximately 200-300 new job opportunities, subsequently improving the overall balance of manpower in the region.

f) Independence from foreign raw material imports.

g) Versatility of new installations will allow to produce other products than those described within this study.

All above mentioned merits notwithstanding the UNIDO experts feel that this is their responsibility to point out also some shortcomings of the project idea

a) The bulk of required investment equipment and ca 75% of raw material inputs for production process will have to be imported. This makes project heavily dependent on foreign exchange inputs - the overall foreign exchange effect will be negative.

b) For the erection of the plant, two sites have been made available for PCI. Both are in the Dair Ali area in Kisway, approx. 20 km south of Damascus, where natural and infrastructural conditions cannot be regarded as optimal.

## 3. Project promoters and initiators

The project was initiated by presidential decree No 73 dated December 13, 1980. It is being promoted by the Ministry of Industry and the Project Management for the development of Paint and Chemical Industries (PCI), Damscus, S.A.R.
PCI is a government-owned company producing various types of paints. It is the largest single manufacturer of paints in Syria, supplying ca 50% of paints in the domestic market. In 1984 PCI employed 204 workers and employees and reached the sales level of ca 65 mill. SyL. The existing paint plant owned by PCI has been in operation for 7 years. Its capacity is about 5 mill. US gallons per year (1 shift generation) produced with conventional equipment. The average output composition has been 32% of oil paints, 60% of emulsion paints and 8% of industrial paints. As it is envisaged essentially the similar product structure should be continued for the new plant.

It was planned to finance the project through the S.A.R. Government, but simultaneously other financing schemes are under investigation using international financial sources, including Arabian financing arrangements. The role of the promoter is spelled out in the decree No 73.

## 4. Project and history

1980 - Presidential decree No 73

1982 - A pre-feasibility study was prepared by a committee of specialists, covering various aspects of the project. This study was available in Arabic language only. The chapter on the market and demand has been translated into English and is reproduced as Appendix II.

1983 - The S.A.R. government called for a tender for which a number of foreign companies delivered their offers and technical/commercial proposals. These offers should allow the government to evaluate various technologies and equipment versus price and delivery conditions, and subsequently feasibility terms.

1985 - UNIDO was requested to act as a consultant to all the parties involved so far, specifically with respect to the evaluation of technologies, new products, market analysis and plant capacity determination financial analysis and commercial profitability evaluation.

## 5. Sources of information

For the preparation of this study, the experts wish to express their appreciation to following persons for their cooperation

| | |
|---|---|
| Dr. Sherif Mastok | (Ministry of Industry) |
| Mr. M.R. Karawani | (The State Planning Commission Director of manufacturing, industrial planning) |
| Dr. Neal Kurbe | (GCEIP), Director Project Dept. |
| Dipl. Eng. Muwaffak Sawan | (GCEIP) |
| Prof. Ghadir Zayzafoon | Consultant to GCEIP |

| | |
|---|---|
| Mr. Hayder Rayyes | General Director PCI/Omayad Paint Co. |
| Mr. Tahsin S. Askari | Deputy Gen. Mgr. PCI/Omayad Paint Co. |
| Mr. Mohammed Mouallem | Techn. Mgr. PCI/Omayad Paint Co. |
| Eng. Sufia El Hadt Khuder ) | Refinery Homs |
| Eng. Mahmmoud Saada ) | |
| Mr. Ah A.S. Bedwi | Deputy Resident Representative UNDP Damascus |
| Dr. Yahya Kassab | Programme Officer UNDP Damascus |
| Mr. Ibrahim Jamel | Director of General Relations at Latakia General Port Company |
| Mr. Hariri | Deputy General Director GECI |
| Dipl. Eng. W. Sukker | Technical Director GECI |
| Mr. Imad Al Aash | Ministry of Finance, Director of Income Dept. |
| Dipl. Eng. Aboul Kader Baravi | GECI |
| Dr. Ing. Abdallah Sallouta | Deputy Minister of Industry |

The following documents were used as reference:

- PCI's call for tender, issue 1983
- GCEIP's third document, issued Nov. 1984 (unpublished)
- The technical and commercial offers of 11 foreign companies from 9 different countries
- A pre-feasibility study for a Paint Plant in Syria (in Arabic). July 1982.

Visits were made to the following places:

- The Ministry of Industry
- The General Company for the Execution of Industrial Projects (GCEIP)
- The Paints and Chemical Industry Co. (PCI) and the Omayad Paint Co.
- Planning Commission
- The AL MANEE and the AL MAJDIAH plant site
- The Homs refinery
- The Port Authority Latakia
- a number of private paint and adhesive producing and using companies in the Damascus and Aleppo area.

## III. MARKET AND DEMAND STUDY

### 1. Scope of the study

This study covers the present msrket situation and provides estimates of future demand for four main products::alkyd resins, PVA dispersion, alkyd paints and emulsion paints in Syria. It should be noted that UNIDO experts were not expected to develop a full-fledged market study based on an extensive survey of market conditions as it was not within their terms of reference. So the present study combines data and information provided by different Syrian Ministeries and organizations, like Planning Commission, GECI, GCEIP. Also PCI supplied experts with its own market study (see Appendix 2) prepared in Arabic in July 1982.

The present analysis provides data for consumption covering the period of the last ten years and on that basis a forecast of market volume is produced for the period of the next 15 years (i.e. till the year 2000).

The following product groups were considered

a) Alkyd resin (of 70% solid)
b) Polyvinyl acetate (dispersions of 54% solid)
c) Alkyd resin based paints - like oil paints both decorative and industrial
d) PVA based emulsion paints.

### 2. Current demand

a) Alkyd resin

In Syria alkyd resin is exclusively used for oil paint production. The entire required quantities of alkyd resin have been imported since domestic production has not been developed yet. Imports of alkyd resin into Syria grew from 1242 tons in 1971 to 3239 tons in 1980 and ca 6000 tons in 1983 with an average rate of growth of ca 14% per annum. The share of PCI in the total imports was about 50%.

b) PVA

While trade statistics on imported Alkyds are reasonably accurate, the same cannot be said for PVA, because it is used for various purposes other than paint industry and therefore recording of PVA imports has been included with other articles. For this reason, an indirect approach had to be applied in determining the market demand for PVA (see Appendix 2). The total imported quantity of PVA into Syria reached about 4500 t in 1983, of which 2500 tons were used in the paint industry and 2000 t in the production of adhesives.

c) Alkyd paints and PVA paints

As alkyd resin is used only for oil paints production, it has been possible to derive figures on paint consumption in Syria. The technical coefficients are as follows:

| | Emulsion Paint | Oil Paint | Industrial Paint |
|---|---|---|---|
| Alkyd resin | - | 0,65 kg/kg | 0,45 kg/kg |
| PVA | 0,2 kg/kg | - | - |

with 3427 tons of alkyd resin ca 5272 tons of alkyd paints have been produced in 1980, which equals roughly 1 172 000 US gallons (precisely 1 US gallon is 4,56 kg of alkyd paint). According to market experiences it was then determined that the local production of alkyd paints is about 32% of total local paints consumption. It was also derived from market data that the proportion of alkyd paints to emulsion paints sold in the market was 1:1,86 and that about 8% of total consumption were industrial paints. With these assumptions it was easy to calculate a cross section for 1980.

| Item | 1980 | % share in total paint consumption | 1984 |
|---|---|---|---|
| Alkyd resin imports (moving average) in tons | 3427 | - | - |
| Corresponding production of oil paints in tons | 5272 | - | 8810 |
| in '000 gallons | 1172 | 32% | 1932 |
| Estimated production of emulsion paint | | | |
| in 'gallons | 2177 | 60% | 3623 |
| Estimated production of industrial paints | | | |
| in '000 gallons | 293 | 8% | 483 |
| Total local consumption of paints | | | |
| in '000 gallons | 3642 | 100% | 6038 |

In the last column an estimate for 1984 is given assuming annual rate of growth of 13,5% for the period 1980-1984 (for details, see Appendix 2).

d) Quality observations

The quality of the imported Resin and PVA and of the paints produced therefrom is of inferior standard compared to the same products sold in neighbouring countries. The reasons are:

- procurement at lowest possible price, thus accepting lowest quality;
- insufficient control of raw materials and finished products.

It is understood that future expansion of domestic sales and of exports is possible only when the quality is substantially upgraded.

e) Present PCI position in the market

PCI currently produces following products:

- building surface paints, mainly glossy and flat, alkyd based and PVA based;
- fast drying resin in small quantities;
- sealers and lacquers for wood industry, nitrocellulose based, also in small quantities;

Markets for industrial paints and adhesives are not developed yet by PCI. In total, the PCI production of oil paints in 1981 was 923 000 US gallons.

3. Potential market volume for years 1985-2003

Demand estimates for paints and their raw materials can be derived from statistical data for the years 1971-1983. However, the average growth rate of 14% annually which prevailed during that period is not expected to continue in the future. It has been assumed that domestic consumption of paints after 1983 will grow at a rate decreasing by an average of 0,5 percentage point annuallt until it reaches the level of 7,6% in 1995. Afterwards the consumption level will stabilize or grow slowly - but since it will surpass certainly the projected capacity of a new plant, it will not constitute a constraint to the production programme.

On the basis of projected paint consumption the required quantities of alkyd resin and PVA dispersions could be derived under the assumption that technical coefficient for alkyd paints will be lowered from 0,65 kg of resin for 1 kg of oil paint to 0,6 kg/kg due to more efficient equipment to be used.

It has been estimated by the UNIDO experts that a potential market for alkyd resins in 1984 was at least 6800 t and also 4500 t of PVA. If the market for adhesives based on PVA is added and the above mentioned growth rates are applied, the following forecast is obtained, for total demand in the Syrian market (see Appendix 2).

Projected demand for Alkyd Resins, PVA and paints in Syria

| | Alkyd resin in tons | PVA in tons | Oil paints in '000 gal. | PVA paints in '000 gal. | Industrial paints in '000 gal. |
|---|---|---|---|---|---|
| 1985 | 7500 | 6100 | 2200 | 4100 | 540 |
| 1986 | 8370 | 6900 | 2400 | 4600 | 610 |
| 1987 | 9230 | 7700 | 2700 | 5100 | 680 |
| 1988 | 10370 | 8600 | 3000 | 5800 | 760 |
| 1989 | 11400 | 9400 | 3300 | 6300 | 840 |
| 1990 | 12600 | 10400 | 3700 | 6900 | 920 |
| 1991 | 13800 | 11400 | 4000 | 7600 | 1000 |
| 1992 | 15100 | 12400 | 4400 | 8300 | 1100 |
| 1993 | 16400 | 13400 | 4800 | 9000 | 1200 |
| 1994 | 17800 | 14500 | 5200 | 9700 | 1300 |
| 1995 | 19100 | 15600 | 5600 | 10400 | 1400 |
| 1996 | 19600 | 15600 | 5600 | 10400 | 1400 |
| 1997 | 20900 | 15600 | 5600 | 10400 | 1400 |
| 1998 | 21500 | 15600 | 5600 | 10400 | 1400 |
| 1999 | 21500 | 15600 | 5600 | 10400 | 1400 |
| 2000 | 21500 | 15600 | 5600 | 10400 | 1400 |
| 2001 | 21500 | 15600 | 5600 | 10400 | 1400 |
| 2002 | 21500 | 15600 | 5600 | 10400 | 1400 |
| 2003 | 21500 | 15600 | 5600 | 10400 | 1400 |

There is no sufficient evidence to try to assess the potential export possibilities for syrian products in the future, except for the long term contract with the USSR, under which a supply of 5000 tons per year of white gloss enamel is to be forwarded. However there is an opinion that there will be good opportunities for exporting surplus production over and above the domestic needs, although no sales promotion or marketing strategy exists at the moment.

## 4. Production programme and plant capacity

a) Desired product mix

It is suggested by PCI Co that essentially the same product-mix should be manufactured in the new plant as it has been in the existing plant. The desired volume of output in terms of number of gallons of paints should therefore be split as follows:

| | |
|---|---|
| - alkyd (oil) paints | 32% |
| - PVA (emulsion) paints | 60% |
| - industrial alkyd paints | 8% |

First two groups consist of very homogeneous types of paint and therefore further break-down is not necessary. However, within "industrial paints" group different qualities can be produced and their respective prices can differ considerably. Therefore it is important to determine a desired structure of industrial paint production. According to the study of PCI Co, the following product mix is envisaged (for industrial paints only):

| | |
|---|---|
| - Thermally treated paint for refrigerators and other uses | 14% |
| - L.P.G. Cylinder Paints | 4% |
| - Car paint | 12% |
| - Pencil paint | 1% |
| - Road paint | 12% |
| - Aluminium paint | 11% |
| - Quick lacquer paint | 2% |
| - Slow lacquer paint | 3% |
| - Quick sealer paint | 10% |
| - Quick paints of various types | 12% |
| - Dark Spray paints | 5% |
| - Light Spray paints | 4% |
| - Above water marine paints | 3% |
| - Under water lead red marine paints | 2% |
| - Light reflector paints and special paints | 5% |
| Total | 100% |

In the experts' opinion the proposed product mix does not exploit all conceivable possibilities for paint production. For instance, newly developed products which are now being introduced into the market at a growing pace have not been considered. A much wider range of potential customers can be identified, foremost among them being:

- can coating industry
- plastic industry (fibre reinforced polyester, foam materials injection moulding, electrical insulation etc.)

- electrical industry (wire coating, transformer sheets etc.)
- textile industry (printing ink, impregnations, carriers etc.)
- leather industry (synthetic leather, leather coating, tannery)
- paper industry (sizing, printing ink)
- foundries
- adhesive industries (wood and furniture incl. plywood and chipboard, paper, packing, shoes, cigarettes, foams, pencil construction like tiles, wood surfaces, foils paper hangings)
- furniture industries
- plywood and chipboard industries
- fire retardant coatings
- corrosion resistant coatings
- marine industries and shipyards
- car paints (patching, primers, stoving and drying enamels)
- domestic appliances (refrigerators, washing machines etc.)
- military (infrared-reflecting, camouflaging etc.).

However, for the introduction of new products new technologies are required. They are only obtainable from experienced foreign licensors; currently used technologies and know-how cannot secure better quality and cannot allow for larger variety of products and new types of paints and adhesives. Furthermore exports are only possible if the production range is more diversified and superior in quality. Since good quality will be the key condition in international competition and also will permit to increase domestic sales, an internationally reputated production licence is a must. So, any expansion to be considered, has to be based on a modern technology purchased from an experienced producer.

b) Production programme

The potential market size sets up a ceiling for a new plant capacity. On the other hand technological considerations (see Chapter VI) determine lower limits to efficient and technically feasible production volume. A planned capacity should be placed within this range. Additional considerations also must be taken into account.
They are as follows.

i) If investment can be started in 1986, the first possible year of production would be 1989. The whole life period for operation is assumed to be 15 years.

ii) Full capacity production cannot be achieved from the very beginning of the operation period and a start-up stage must be forseen to extend for ca 2 years. It is assumed that the PCI will have to pass through a learning process: planning and organizing four product lines with higher capacities in paints and only moderate increases of staff, handling rapidly growing sales from SyL 65 mill. in 1984 to more than Sy 300 mill. in 1994, developing the market for larger variety of products. This learning process, however, is not likely to take a long time, because PCI has already acquired a substantial experience in paint production and sales. It is therefore assumed

that a full capacity level of production will be reached after 2 years in case of alkyd paints and PVA paints. As for alkyd resin and PVA dispersion production it will have to adjust to market demand and will grow gradually over 8 years before it reaches full capacity level, matching corresponding demand figures from 1996 onwards.

iii) The new plant will be an integrated unit within which by-products (alkyd resin and PVA) are used for paint production (final product). However not entire output of resins and PVA will be consumend by the new plant; a considerable surplus of both by-products will have to be sold independently in the domestic market to other private paint and adhesives manufacturers. Specifically, only about 52-53% of alkyd resin and 20% of PVA will be used internally, the remainder being sold outside. These proportions were fixed by PCI, but they raise doubts about the desirability and purposefulness of the projected alkyd resin and PVA plant capacity. In the experts' opinion, high level of both by-products output is justified only if a strong evidence exists for a large future market demand for resins and PVA.

iv) It has been assumed that alkyd resin and PVA plant will be operating in 3 shifts system, whereas paint plant - in 1 shift.

All these considerations and conditions have finally led to the following production programme.

## PRODUCTION PROGRAMME

| Year | Alkyd resin 70% solid | | PVA dispersion 54% solid | | Alkyd Paints (oil) | | | Total Alkyd Paints | PVA Paint emulsion |
|---|---|---|---|---|---|---|---|---|---|
| | total output t/y | of it internal use t/y | total output t/y | of it internal use t/y | Non-industrial 1000 gal. | Industrial 1000 gal. | Exports 1000 gal. | 1000 gal. | 1000 gal. |
| 1989 | 10344 | 7852 | 6270 | 2220 | 1900 | 530 | 440 | 2870 | 2025 |
| 1990 | 11933 | 10629 | 7350 | 2850 | 2695 | 750 | 440 | 3885 | 2600 |
| 1991 | 13669 | 11220 | 8000 | 2960 | 2890 | 770 | 440 | 4100 | 2700 |
| 1992 | 14500 | 11220 | 8660 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 1993 | 15500 | 11220 | 9460 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 1994 | 16500 | 11220 | 10435 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 1995 | 18000 | 11220 | 11360 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 1996 | 20000 | 11220 | 12360 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 1997 | 21400 | 11220 | 14385 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 1998 | 21400 | 11220 | 14385 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 1999 | 21400 | 11220 | 14385 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 2000 | 21400 | 11220 | 14385 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 2001 | 21400 | 11220 | 14385 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 2002 | 21400 | 11220 | 14385 | 2960 | 3275 | 825 | - | 4100 | 2700 |
| 2003 | 21400 | 11220 | 14385 | 2960 | 3275 | 825 | - | 4100 | 2700 |

Note: For alkyd paints 1 US gallon = 4,56 kg
For PVA paints 1 US gallon = 5,48 kg

5. Sales revenues

a) Sales volume

Four different products will actually be sold in the future operation: total output of alkyd paints and PVA paints and the surplus of alkyd resin and PVA dispersion over and above internal use.

b) Selling price

Assuming the quality output will allow entry into the international markets, international competitive prices C&F Syrian port Latakia have been taken as a basis for selling price calculation for alkyd resin and PVA dispersion. As observed in 1984 these prices are:

- Alkyd resin: 1 000 US $/t equivalent to SyL 5450 per ton at the parallel exchange rate 5,45 SyL/1 US $
- PVA: 650 US $/t equivalent to SyL 3542 per ton (at the rate 5,45).

These prices are gross selling prices which must be adjusted for import costs (duties, transportation to ports, handling, loading, distribution, commissions) which amount in total to ca 12% of gross selling price.

For alkyd paints and PVA paints pricing is oriented to PCI's 1985 prices obtained at domestic market. A retail market price is much higher because of continuous shortage of paints, which allows retailers to push-up prices. On the other hand, ex-factory selling prices are fixed by the government on the basis of "cost-plus-10%". As a result, a differential between ex-factory price and retail market price can be as high as 30-40%. Normally this differencial includes also commissions of intermediate agents or wholesalers. In case of PCI Co. almost entire paint production is distributed by an exclusive agent OMRAN, which is an organization belonging to the Ministry of Supply. OMRAN charges a commission of 10% on top of the gross price.

Deducting all indirect costs of sales and distribution, the following net selling prices are obtained and then used in further calculations (in SyL).

| Product | Unit | Gross price | Sales and distribution costs | Net selling price |
|---|---|---|---|---|
| Alkyd Resin | t | 6104 | 875[a] | 5229 |
| PVA | t | 3968 | 500[a] | 3468 |
| Alkyd Paint (local) | 1000 g | 56200 | 6106[b] | 50094 |
| Alkyd Paint (export) | 1000 g | 34050 | 4960[c] | 29090 |
| PVA Paint (local) | 1000 g | 28000 | 5210[b] | 22790 |

a) packaging only
b) packaging and commission
c) distribution and commission

## IV. MATERIAL AND INPUTS

### 1. Types of material inputs

a) For the production of Alkyd Resins:

Oils : Linseed, Soya, Sunflower, Cottonseed, Castor, Groundnut, Talloil, Coconut - or their fatty acids;

Polyalcohols: Glycerine, Trimethylopropane, Pentaeritrol, Diethyleneglycol;

Acids and Anhydrates: Maleic, Phthalic, Isophtalic - anhydrates Fumaric, Adipic, Benoic - acids;

Solvents :White Spirit, Xylene, Toluene.

b) For the production of PVA:

Monomers: Vinylacetate, Versatic ester, Buthylacrylate, Acrylnitryl, Monostyrene, Metacrylamide
2. ethylhexyacryiate, dibuthylmaleinate

Emulsifyers, Surfactants and other Additives: Polyvinylalcohol, hydroxyethylcellulose, Ionogen and Nonionogen surfactants, chainstoppers, redox agents.

Water: The requirements are :Conductivity max: 50 S, free chlorides and sulfur, low hardness.

Acids : Formic, Metacrylic - acids

c) For the production of paints:

Resins: drying and nondrying made from the raw material as listed under 1.a and 1.b plus
Polyester, Epoxyde, Acrylic, Urea-Formaldehyde, Melamine-Formaldehude, Phenol-Formaldehyde, Urea-Melamine-Formaldehyde, Acrylphenolic, Terpenicphenolic etc.

Pigments: (inorganic) :Titaniumdioxie, Zincoxide, Ironoxide, (yellow, red, brown, black), Chromeoxide (yellow), Zinctetraoxychromate, Chroneyellow and orange, Molybdad-red, Lithopone

Pigments (organic): in misc. colours

Fillers: Bariumsulfate, Chinaclay, Talcum, Calcites, Clay, Quartzsand

Solvents: Benzine, White Spirit, Benzine 60/80, 80/120, 100/140, Toluene, Xylene, Shellsol A, AB
Acetone, Methylethylketon (MEK), Methylisobuthylketon (MIBK)
Ethylacetate, Isobuthylacetate, Buthylacetate,
Ethylglycol, Buthylglycol
Ethylglycolacetate, Buthylglycolacetate
Ethanol, Isopropylalcohol, Isobuthanol, Buthanol,
Diacetonaealcohol.
Ethylenechloride, Trichloroethylene, 1.1.1. Trichlotoethane and some more special solvents

Additives: Cobalt, lead, manganese, circonium, calcium, octoates and naptenates,
antiskinning - antisettling - flewing - agent etc.

## 2. Manufacturers of Raw Materials

The following list of manufacturers contains mainly those companies which are well introduced in the Middle East market. For a more complete list of manufacturers, please consult the following handbook which was also used as reference:

Karsten, Lackrohstofftabellen (German, Engl., French, Italian)
7th edition 1981, Edition Curt R. Vincentz Verlag, F.R. Germany

a) Manufacturers of Resins

BASF - F.R. Germany
Bayer - F.R. Germany
Bakelite - F.R. Germany
Budalakk - Hungary (user of Hoechst technology)
Chromos - Yugoslavia (user of Hoechst technology)
Ciba Geigy - Switzerland
Color - Yugoslavia (user of Hoechst technology)
Copalin - Greece
Cray Valley - England
Duga - Yugoslavia (user of Hoechst technology)
Dai Nippon - Japan
Dyrup - Denmark
Hendricks & Sommer - F.R. Germany
Hoechst - F.R. Germany
Huttenes Albertus - F.R. Germany
ICI - England
Krems Chemie - Austria (using Bayer license, belonging to Bayer)
Polychem - Poland (user of Hoechst technology)
Reichold - Austria & Switzerland
Resia - Spain
Rohm & Haas - F.R. Germany & Yugoslavia
Sigma - Belgium & Netherlands
Scado - F.R. Germany
Shell - Netherlands
Sadolin - Denmark
Synres (DSM Resins) - Netherlands
Synthese - Netherlands
Synthopol - F.R. Germany
Vianova - Austria (owned by Hoechst)
Wegscheider/Wegin - Austria
Worlee - F.R. Germany

b) Manufacturers of PVA

ANIC - Italy
Dyno Industries - Norway
Ebnoether - Switzerland
Hendricks + Sommer - F.R. Germany

Hoechst - F.R. Germany
Rhone Poulenc - France
Montedison - Italy
Sadolin - Denmark
Reichold - Austria
Synres (DSM Resins) - Netherlands
Wacker Chemie - F.R. Germany
Wegscheider/Wegin - Austria

3. Raw Material Data

a) The data sheets of the listed raw materials under para. 1 (page 19) will be dispatched separately

b) The list of suppliers of raw materials and their prices for the ones as listed under para. 1 are shown on pages 32 - 35.

The domestic market can supply and provide the following raw materials produced at the Homs refinery:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - Benzine 45/100 | costs: | Sy | 2.000/ton | ex | works | in | bulk |
| - Benzine 100/140 | " | Sy | 2.000/ton | " | " | " | " |
| - White Spirit 150/200 | " | Sy | 1.500/ton | " | " | " | " |
| - Xylene | " | Sy | 2.800/ton | " | " | " | " |

The above raw material specification will be given to PCI/Omayad Paint Co. by Homs Refinery.

It is expected that Syria will be able to produce the following raw materials in the near future:
- Calcium carbonate
- Quartzsand
- Cotton seed oil
- Soya oil

c) Packaging material

Both intermediate products and paints are sold to other customers. The sale is carried out in drums in case of by-products and in cans in case of paints. Annual consumption of drums and cans can be estimated in aggregate form as follows.

- Alkyd resin: For an output of 10 700 t/y ca 53500 steel drums of 200 kg each are necessary; this is equivalent to ca 180 drums per day;
- PVA dispersion: For an output of 12 040 t/y plastic drums of 120 kg; 50 kg and 30 kg are required. Detailed distribution of packing cannot be given at this stage;
- Alkyd and industrial paints: They will be sold mainly in 1 US Gallon cans to the domestic market, but 1 Quart, 1 Pint, 1/2 Pint packing is also planned . Exports supplies will be done only in steel drums of ca 240 kg each;
- PVA paints : They will be sold to the domestic market only, mainly in 1 US Gallon Cans. For an output of 2.7 mill. US gal. an average daily consumption will be ca 9 000 cans p/d.

As yet packaging material is acquired from outside supplier. However the fabrication of metal cans and tins for Alkyd paints from metal sheets and for PVA paints from coated metal sheets within the plant can easily be attained at reasonable cost. It can therefore be considered as the next optional installation.

The steel drums for resins will be reconditionned whereas the raw material drums will be used. The approx. incoming quantity of drums is 330 per day, but ca 180 will be used for alkyd resin packing. The surplus can be sold outside. (Drum reconditioning plant should be considered as additional installation).

Actual prices for steel drums are given below

- New steel drum, standard unpainted make: SyL 155 each;
- New steel drum, galvanized steel: SyL 175 each;
- Reconditioned standard steel drum, unpainted (market value) ca SyL 70 each.

## 4. Supply programme (Utilities, Consumables)

The only available utilities on the plant site are water, electricity and fuel oil. All other utilities which might be needed for the process, for the service and maintenance of the plant and its infrastructure will have to be generated and produced within the plant itself.

### 4.1. Available Utilities:

a) Water: It must be pumped from the undersurface waterwells and requires treatment to meet the production specification.

- The cooling water only needs a simple treatment
- The process water requires a careful treatment and its chemical properties must be continously controlled. Water must be free od sulfur and chlorides, low in hardness and its conductivity above 50 S.
- Drinking water must meet the governmental regulations.
- Estimated quantity of water required for the plant is ca 93 000 ltrs per day (net).

b) Fuel: Only liquid fuel is available. It is supplied by road tankers to the plant.

Prices and values:

- Light fuel oil (domestic or diesel), LHV = 10.200 kcal/kg
  SyL 1.000/m³ free site
- Heavy fuel oil (bunker), LHV = 9.600 kcal/kg
  Sy L 870/m³ free site

4.2. Utilities which will have to be provided and generated within the plant. They will be specified in quantity and quality by the contractor and subsequently the process licenser. These are (a selection):

- Cooling water
- Chilled water
- Process water
- Drinking water
- Domestic water
- Fire water
- Hot water
- Steam
- Hot oil heating
- Compressed air
- Instrument air
- Inert gas (N2 or CO2)
- others as will be specified by process licenser

4.3. Consumables, which must be provided during plant operation, production and maintenance:

- process related consumables
- recorder paper
- filter materials and additives
- agent for water treatment

Maintenance related consumables

- lubricants and grease
- cleaning agents, paper, textiles
- caustic and acids for cleaning
- sealing agents

4.4. Production losses in % of the total production capacity:

a) Raw Materials:

| | |
|---|---|
| Solid raw materials from drums: | 0,5 - 1,0 % |
| " " " from big bags: | 0,1 - 0,2 % |
| " " " from 25 kg bags: | 0,2 % |

Liquid raw materials from drums

| | | |
|---|---|---|
| Solid resins: | 1,0 - 2,0 % | |
| Liquid resins: | 0,5 - 1,0 % | |
| Solvents: | 0,5 - 3,0 % | +) |
| Monomers: | 0,2 - 2,0 % | |
| Oils, Glycols: | 0,2 - 0,5 % | |

+) depending on boiling point

Liquid raw materials in bulk

| | |
|---|---|
| Solvents: | 0,2 - 0,3 % |
| Oils: | 0,1 - 0,2 % |

b) Intermediate and finished products:

| | |
|---|---|
| Intermediates (Alkyd and PVA) incl. lost batches (geled batches) which cannot be reprocessed: | 1,0 % |
| Finished products (paints, adhesives): | 0,2 % |

5. Storage measures and capacities

PCI wishes to have the following storage capacities available within the production plant:

5.1. For the 15.000 tpy (100% solid) Alkyd production (equivalent to 21400 t/y 70% solid)

- Oil storage (4 months) approx: 3.500 tons (liquid)
  (considered are Alkyds in different oil lengths)
- Acid, respectively Anhydrate storage (4 months) approx: 1.360 tons (solid)
- Esterifying agents storage (4 months) approx: 540 tons (liquid)

5.2. For the 15.000 tpy (54% solid) PVA production:

- Monomer storage (4 months) approx: 2.500 tons (liquid)
- Emulsifyers storage (4 months) approx: 200 tons (solid)

5.3. For the 4.100.000 US gal/year (18.700 tons/year) Industrial and Alkyd Paint plus the 2.700.000 US gal/year (14.800 tons/year) PVA based paint production:

- Pigments & Fillers (foreign import) storage (4 months) approx: +) 2.300 tons (solid)
- Pigments & Fillers (domestic supply) storage (1 month) approx: +) 370 tons (solid)

+) based on white colour for Alkyd and PVA based paints

5.4. Solvents

- to dilute 15.000 tpy of 100% solid Alkyd to 70% solid, storage (1 month) domestic supply, approx: 530 tons (liquid)
- For 4.100.000 US gal/year Industrial and Alkyd based paints, storage (1 month) domestic supply, approx: 240 tons (liquid)
- For 4.000.000 US gal/year Industrial and Alkyd based paints, storage (4 months) foreign import, approx: 170 tons (liquid)

5.5. Intermediate product storage

- Alkyd resin, 70% solid 10.700 tpy, storage (2 months) approx: 1.800 tons (liquid)
- PVA, 54% solid 12.000 tpy, storage (2 months) approx: 2.000 tons (liquid)

5.6. Finished product storage

- no storage is foreseen as product goes immediately into distribution.

This concept is based on the production figures as outlined in chapter II.

5.7. Observation

It is the opinion of the experts, that an efficient management of raw material procurement and sales organisation for the intermediate products can reduce the storage capacities to 2 months for raw materials and to 1 month for intermediate products. This is already common practice in the surrounding countries of the Middle East.

5.8. Cost Estimates

1. Alkyd Resin cost

(The following estimated prices are for an average chemical formulation The product mix is of international quality standard). The additives required for the Alkyd Resin Production are insignificant in quantity and price and not considered herein.

| | US$ | SY L | Loss |
|---|---|---|---|
| OILS (Soya) imported in drums<br>9430 tpy + 0.5% losses<br>US$ 767,5/ton C + F Latakia | 7.274.000 | | 1% |
| ACIDS & ANHYDRATES, imported mainly in bags<br>7.870 tpy + 0.2% losses<br>US$ 538/ton C + F Latakia | 2.164.000 | - | |
| **ESTERIFYING AGENTS, imported** mainly in bags<br>2.160 tpy + 0.2% losses<br>US$ 1.070/ton C + F Latakia | 2.316.000 | - | |
| Raw material costs for 15.000 tpy of 100% solid Alkyd resin | 11.754.000 | | |
| Unit price for 1 ton | (783,60) | | |
| SOLVENT (White Spirit), domestic supplied in bulk<br>6.400 tpy + 0.3% losses<br>Sy 1.500/ton ex refinery Homs | - | 9.629.000 | |
| Total raw material costs for 21.400 tpy Alkyd Resin, 70% solid | 11.754.000 | + 9.629.000 | |
| Total per 1 ton of output | (549) | + (450) | |

Note: The following costs are not included:

- transportation cost
- customs and taxes
- insurance
- port administration fee.

2 :Alkyd Resin Paint - Cost estimation

(Estimated prices and chemical formulations are average:
The product mix is of international quality standard.

Included in this calculation are additives like dryers, anti-skinning, antisettling, anticoagulators etc., but they are not shown as individual cost figures)

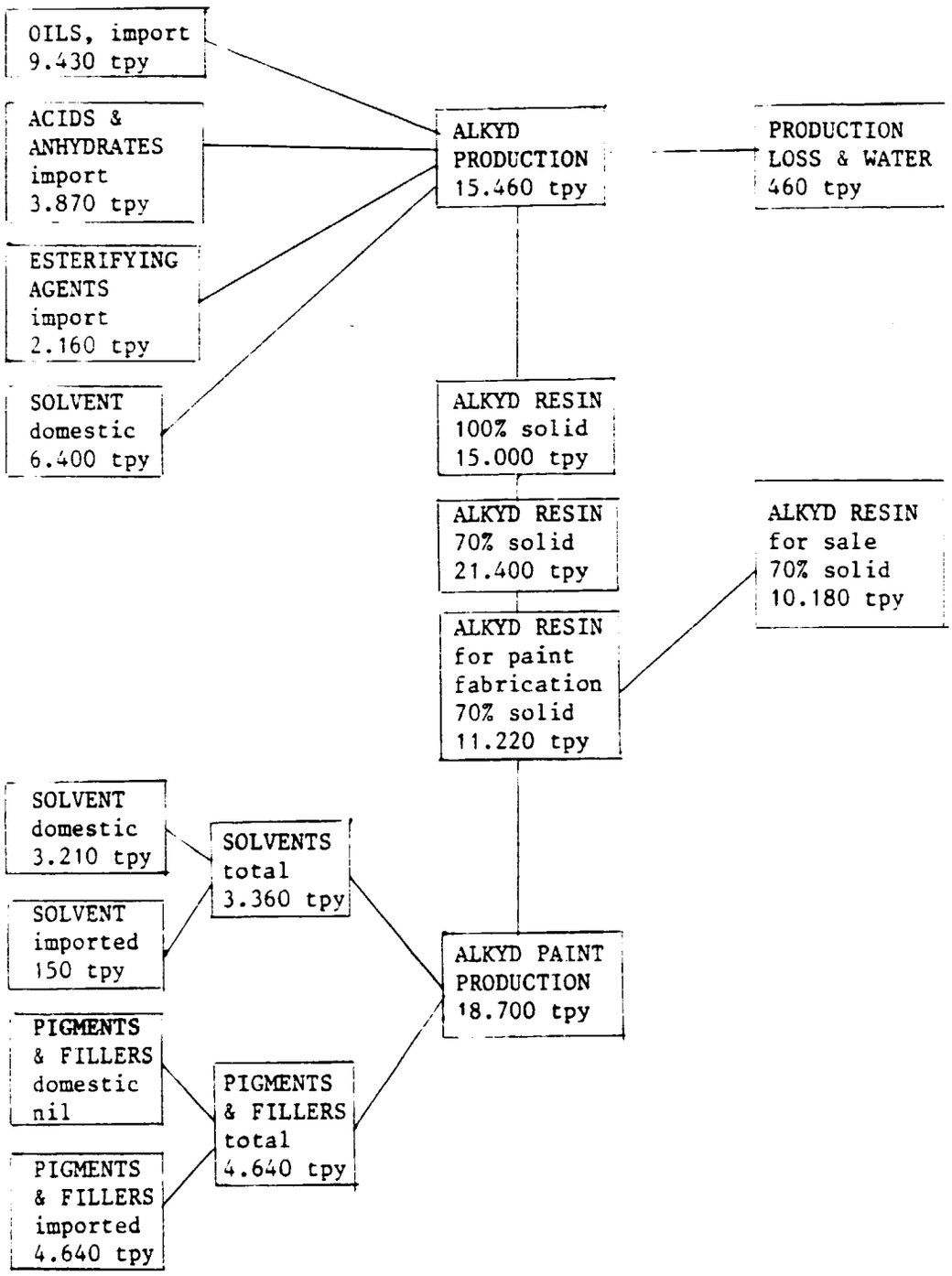
| Definition | US$ | SYL |
|---|---|---|
| ALKYD RESIN 70% solid<br>11 220 tpy ex factory PCI<br>US$ 549/ton plus SyL 450/ton | 6.159.780 | 5.049.000 |
| Fabrication cost of above<br>Manpower only<br>SyL100/ton (estimated) | | 1.234.200 |
| Fabrication cost of above<br>Utilities only<br>SyL 50/ton (estimated) | | 561.000 |
| Overhead costs for insurance, taxes transport, port fee for the raw materials for Alkyd resin production above average 10% of the raw material costs (applied rate of exchange<br>1 US$ = 5,45 Sy L) | | 3.862.000 |
| SOLVENT, domestic, White Spirit in bulk<br>2.860 tpy + losses (0.3%)<br>SyL 1.500/ton ex refinery Homs | | 4.303.000 |
| SOLVENT, domestic, Xylene in bulk<br>350 tpy + 0.3% losses<br>Sy L 2,800/ton ex refinery Homs | | 985.000 |
| SOLVENTS, imported in drums<br>150 tpy + 3% losses<br>US$ 605/ton C + F Latakia | 93.000 | |
| PIGMENTS & FILLERS, imported in bags<br>4.640 tpy + 0.2% losses<br>US$ 1.460/ton C + F Latakia | 6.788.000 | |

| | | |
|---|---|---|
| Total raw material costs for 18.700 tpy Alkyd Paint | 13.040.780 + | 15.994.200 |
| Total per 1 ton of output | (697)+ | (855) |

Note: The following costs are not included for raw materials other than alkyd resin:

- transportation
- customs & taxes
- insurance
- port administration fee

ALKYD RESINS & PAINTS PRODUCTION PATTERN




The production of 18.700 tpy is equivalent to approx. 4.100.000 US gallons/year

tpy = metric tons per year

3: PVA Dispersion cost estimation

(Estimated prices and chemical formulations are average, the process mix is of international quality standard).

| | US$ | SYL |
|---|---|---|
| PROCESS WATER (treated)<br>6.900 tpy<br>Treatment costs are insignificant | - | - |
| ADDITIVES etc. imported in bags and drums<br>600 tpy + losses (0.2%)<br>US$ 1.860/ton C+F Latakia | 1.118.200 | - |
| MONOMERS, imported in drums<br>7500tpy + 3% losses<br>US$ 767/ton C + F Latakia | 5.925.000 | - |
| Total raw material cost for 15.000 tpy PVA Dispersion 54% solid | 7.041.000 | - |
| Unit price for 1 ton | (469) | - |
| PROCESS WATER (treatened)<br>600 tpy<br>Treatment costs are insignificant | - | - |
| Total raw material costs for 15.600 tpy PVA Dispersion 50% solid | 7.043.200 | - |
| Total per 1 ton | (451) | - |

Note: PCI is presently importing 50% solid PVA whilst the production in the new plant is based on 54% solid

For other notes and additions see page 27 .

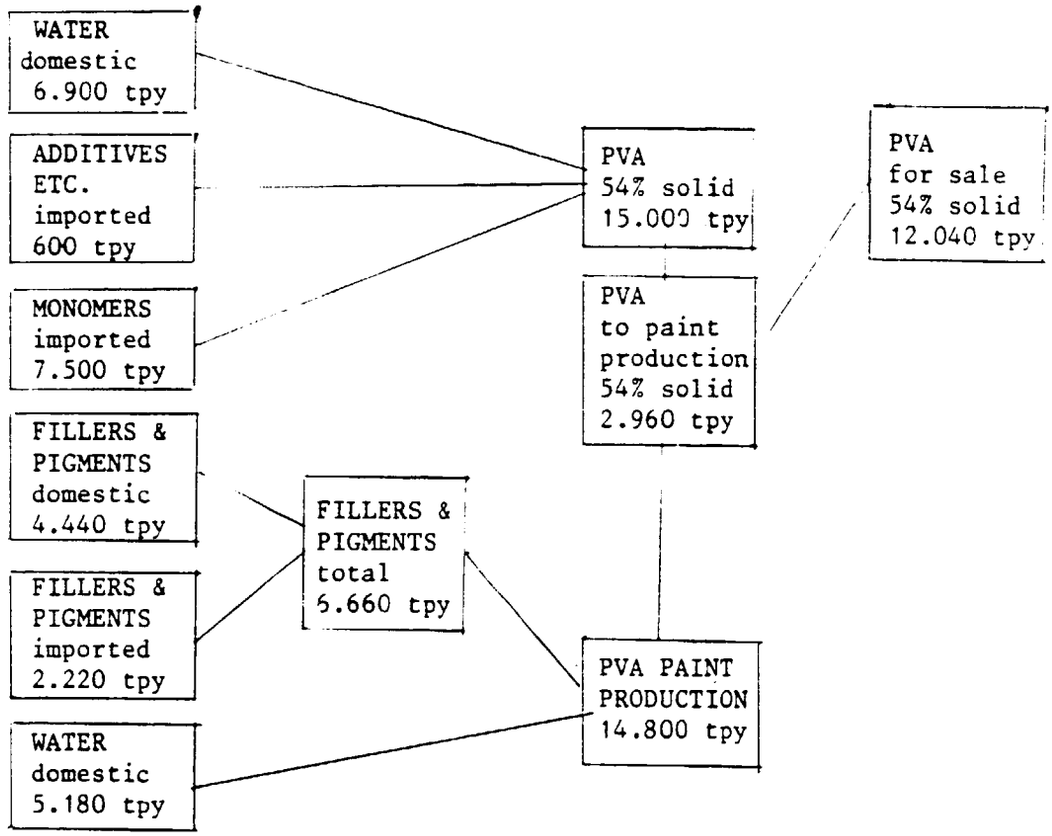
4: PVA Paint - Cost estimation

(Estimated prices and chemical formulations are average, the product mix is of international quality standard. Included in this calculation are additives like thickener, dispersion agent, antifoaming agent, fungicydes etc.)

| | US$ | SY L |
|---|---|---|
| PVA Dispersion, 54% solid<br>2.960 tpy as factory PCI<br>US$ 469/ton | 1.388.000 | - |
| Fabrication cost of above<br>Manpower only<br>SyL 35/ton (estimated) | - | 104.000 |
| Fabrication costs of above<br>Utilities only<br>SyL 20/ton (estimated) | - | 59.000 |
| PIGMENTS (eg. TiO2)<br>imported in bags<br>2.220 tpy + 0.2% losses<br>US$ 1.460/ton C&F Latakia | 3.248.000 | - |
| FILLERS, domestic in bags<br>4.440 tpy + 0.2% losses<br>SyL 382/ton free factory PCI | - | 1.699.000 |
| PROCESS WATER, treatened<br>5.180 tpy<br>Treatment costs insignificant | - | - |
| **Total raw material costs for 14.800 tpy PVA paint** | **4.636.000** | **+ 1.862.000** |
| Total per 1 ton | (313) | + (126) |

Note: same as on page 27 .

PVA & PAINTS PRODUCTION PATTERN




The production of 14.800 tpy is equivalent to approx 2.700.000 US Gallons/year

tpy = metric tons per year

| PRODUCT | AS/kg | SUPPLIERS | PACKING | TRANSPORTATION BY |
|---|---|---|---|---|
| Phtalic acid anhydrid | 11,-- | Chemie Linz AG, Ver-Chemie München, Scheller Zürich, Croda DLS Chemie, Wr. Neudorf | Paper bag | Truck, Rail |
| Maleic Acid Anhydrid | 25,-- | Chemie Linz, Scheller Zürich, Klöckner Chemie | ,, | ,, ,, |
| Penta Erythritol | 22,60 | Degussa - Frankfurt, Celanese AG Brüssel, Perstorp Austria Wien, Montedison Mailand | ,, | ,, ,, |
| Trimethyl Propane | 22,70 | Bayer Leverkusen, Celanese AG Brüssel, Perstorp Austria Wien, Montedison-Mailand | ,, | ,, ,, |
| Clycerine | 44,50 | Busetti, Neuber, Haitinger & Dick | Iron Drums | ,, ,, |
| Wood Oil | 33,50 | Pompe, Joli, Schwarz | ,, | ,, ,, |
| Soya Varnish | 17,25 | Unimills, Unichema Vereinigte Ürdinger Ölwerke | loose | Roadtank |
| Varnish Linseed Oil | 17,60 | ,, ,, ,, | ,, | ,, |
| Peanut Oil Fatty Acid | 21,30 | Joli, Haitinger & Dick, Unichema, Henkel | Iron Drums | Truck, Rail |
| Tall Oil Fatty Acid | 18,90 | Joli, Pompe, Unichema, Henkel | ,, | ,, ,, |
| Soya Oil Fatty Acid | 29,10 | ,, ,, ,, ,, | ,, | ,, ,, |
| Soya Oil Lecithin | 15,60 | Dr. Werba, Pompe | ,, | ,, ,, |
| Safacid UDF | 14,75 | Jahres Norwegen | ,, | ,, ,, |
| Castor Oil | 27,90 | Unimills, Unichema ICI, Oleo-Chemie | loose | Roadtank, railwaytank truck |
| Coconut Fatty Acid | 25,-- | Schärdinger | Drum | Truck, Rail |
| Liquid resin | 6,70 | Vialit | loose | Roadtank |
| Tall Oil 27% resin | 13,20 | Bergvik, Schweden | ,, | ,, |

| PRODUCT | AS/kg | SUPPLIERS | PACKING | TRANSPORTATION BY |
|---|---|---|---|---|
| Vinyl Acetate Monomer | 12,60 | Phillips Petroleum Genf, Celanese AG Brüssel, Rhone - Poulenc, Paris, Union Carbide Wien | loose | Roadtank, railway tank truck |
| Veova 10 | 24,-- | Shell, | ,, | Roadtank |
| Butylacrylate | 22,20 | BASF, Rhone-Poulenc | ,, | ,, |
| 2-Ethylhexylacrylate | 24,30 | BASF, Union-Carbide, Prochema | ,, | ,, |
| Dibutyl maeic | 24,-- | Hoechst, Chemie Linz, Montedison | ,, | ,, |
| Polyvinyl alcohol div. | 38,--bis 44,-- | Hoechst, Wacker-Chemie, GEFU Hamburg Bencolor | Paper bag | Truck, Rail |
| Cellobond ) | 70,-- | BP-Chemicals | ,, | ,, ,, |
| Cellosize ) | 70,20 | Union Carbide | ,, | ,, ,, |
| Methocell ) Methyl- | 66,-- | Dow-Chemicals | ,, | ,, ,, |
| Tylose ) cellulose | 72,--bis 78,-- | Hoechst | ,, | ,, ,, |
| Hydroxyethyl Cellulose | 63,-- | Hoechst, Wacker Chemie, Union Carbide | ,, | ,, ,, |

Prices as of June 1985 in Austrian Shillings (AS) 1 US$ = 21,50 AS

All prices are ex works

| Product | AS/kg | SUPPLIERS | Packing | Transportation by |
|---|---|---|---|---|
| Acetone | 10,-- | Shell, Hoechst, BP-Chemicals, Montedison Lasnausky | loose | Roadtank, Railwaytank, Truck |
| Methyl ethyl Keton | 11,20 | Lasnausky, Shell, Neuber, Chemodroga,Zis. | Iron Drums | Truck, Rail |
| Methyl Isobutylketon | 16,20 | Shell, Neuber, Lasnausky, Hüls-Chemie, Zis. | ,, | ,, ,, |
| Ethyl Acetate 99% | 13,20 | Shell, Hoechst, BP-Chemicals, Montedison, Lasnausky | loose | Roadtank, Railwaytank, Truck |
| Isobutyl Acetate 98% | 11,70 | Chemolimpex, BASF, Hoechst, Shell | ,, | ,, ,, |
| Butyl Acetate 98% | 13,60 | Hoechst, Shell, Lasnausky | ,, | ,, ,, |
| Ethyl Alcohol | 10,-- | Branntweinmonopol | Iron Drums | Truck, Rail |
| Isopropyl Alcohol | 10,50 | Chemodroga, Neuber, RAAB-Kärchen, Shell, Lasnausky | ,, | ,, ,, |
| Isobutanol | 7,30 | Chemie Linz, Hoechst, Neuber, Prochema | loose | Roadtank, Railwaytank, Truck |
| Butanol | 13,50 | BASF, Hoechst, Shell | ,, | ,, ,, |
| Ethyl Glycol | 14,30 | Shell, Croda Dls Chemie, Aktiv, Lasnausky | ,, | ,, ,, |
| Ethylene Glycol | 10,10 | Chemodroga, Neuber, Zis-Chemie | Iron Drums | Truck, Rail |
| Ethyl Glycol Acetate | 16,-- | Lasnausky, Chemodroga | ,, | ,, ,, |
| Special Benzin 40/65 | 9,-- | Shell | loose | Roadtank, Railwaytank Truck |
| Special Benzin 60/95 | 9,-- | Shell | ,, | ,, ,, |
| Special Benzin 80/110 | 7,30 | Shell, Aktiv-ÖMV, Mobiloil | ,, | ,, ,, |

| PRODUCT | AS/kg | SUPPLIERS | PACKING | TRANSPORTATION BY |
|---|---|---|---|---|
| Heptan | 9,-- | Shell | loose | Truck, Railwaytank Roadtank |
| Special Benzine 100/140 | 9,-- | Shell, Mobiloil | ,, | ,, ,, |
| White Spirit | 7,35 | Aktiv-ÖMV, Shell, Klöckner-Chemie, Lasnausky | ,, | ,, ,, |
| Shellsol A | 7,30 | Shell | ,, | ,, ,, |
| Trichlor Ethylene | 8,50 | Wacker-Chemie, ICI, Neuber,Lasnausky | Iron Drums | Truck, Rail |
| 1,1,1,- Trichlor Ethylene | 13,50 | Dow, Chemodroga, Wacker-Chemie | loose | Roadtank, Railwaytank Truck |

Prices as of June 1985

All prices are ex works

| PRODUCT | 1981/AS/kg | 1982/AS/kg | 1983/AS/kg | 1984/AS/kg |
|---|---|---|---|---|
| Phtalic anhydrid | 12,60 | 12,80 | 11,60 | 11,-- |
| Maleic anhydrid | 13,50 | 16,-- | 19,-- | 21,50 |
| Penta Erythritol | 24,50 | 23,80 | 21,-- | 21,70 |
| Trimethyl Propane | 27,20 | 30,50 | 23,50 | 19,70 |
| Glycerine | 24,50 | 26,40 | 27,80 | 33,-- |
| Wood Oil | 28,-- | 21,50 | 37,80 | 74,-- |
| Soya Oil | 10,10 | 11,30 | 11,20 | 16,30 |
| Linseed Oil | 11,63 | 12,91 | 9,60 | 13,80 |
| Castor Oil | 18,80 | 17,40 | 17,80 | 33,90 |
| Peanut Fatty Acid | 14,60 | 18,50 | 13,50 | 20,75 |
| Tall Fatty Acid | 13,50 | 15,60 | 16,-- | 16,-- |
| Soya Fatty Acid | 14,70 | 15,80 | 16,50 | 21,-- |
| Soya Lecithin | 8,90 | 9,50 | 9,30 | 14,50 |
| Coconut Fatty Acid | 18,90 | 18,90 | 20,40 | 22,45 |
| Safacid UDF | 9,35 | 10,20 | 10,50 | 12,45 |
| Vinyl Acetat Monomer | 8,90 | 9,10 | 9,70 | 12,30 |
| Veova 10 | 20,-- | 23,60 | 22,70 | 23,85 |
| Butylacrylate | 20,80 | 22,-- | 23,20 | 23,20 |
| 2-Ethylhexylacrylate | 22,70 | 25,20 | 24,30 | 24,40 |
| Dibutyl maleinat | 22,-- | 22,50 | 23,-- | 24,20 |
| Polyvinyl alcohol | 30,50 | 30,50 | 32,53 | 36,42 |
| Methylcellulose | 61,-- | 62,30 | 61,70 | 66,-- |
| Hydroxyethyl Cellulose | 64,-- | 64,-- | 64,-- | 63,-- |

## V. LOCATION AND SITE

### 1. General information

PCI has the option to select between 2 pieces of land which were shown to the experts. Both pieces of land are located approx. 20 km south of Damascus on the road No. 5 to Amman. The closest village is Kisway which is about 4 km north of both pieces of land.
The first piece of land is on a rocky soil and on a slope and is named AL MANEE, the second piece of land is on agricultural soil and flat and named AL MAJDIAH.

### 2. Climate

Being close to Damascus, the Damascus meteorological data applies to both pieces of land.

2.1. Air temperature, humidity, sunshine & wind conditions, precipitations - see table on page 44.

2.2. Dust and fumes: There are no reports available on drifting sand. Dust and air pollution not recordable since no industry in this area yet.

2.3. Flooding: No report available. Since a semi arid area, no floods to be expected.

### 3. Site and terrain

3.1. Location of site: Both sites are located approx. 4 km south of the village of Kisway in the DAIR ALI area.

a) The location AL MANEE is on a rocky slope. The entire site including the neighbouring territories are without buildings and belong to the state. On top of the mountain range at a distance of approx. 1 km are military installations, also at a distance of approx. 2 km in direction southwest. The site is situated 3-4 km from Damascus - Amman highway.
The location can be considered as a non agricultural area.

b) The location on AL MAJDIAH is in a flat valley area. The highway Damascus - Amman forms one boundary of the location whilst the other surrounding areas are private properties. The highway is under construction; the location is on the left side of the highway when coming from Damascus. Opposite the location, on the other side of the highway, are military installations.
The location can be considered as agricultural area since plantations are visible.

3.2. Site description:

a) AL MANEE:

Dimensions: Approx. 200.000 m², max. length: 500 m, max. width: 595 m, hight above sea level between 720 and 765 m.
For further details see enclosure (9).
Geographic orientation see 3.1.a.
Topography: slope with a max. difference of hight of 45 m
Existing rights: Already proporty of PCI
Soil bearing test: see enclosure (7)
Price and real estate: Given to PCI free of costs by the Ministry of Agriculture for the setup of the Paint and Resin Production Complex. In case land is not used for this purpose, it will have to be returned to the Ministry.

b) AL MAJDIAH:

The exact position of the site is not defined yet, also undefined is the dimension.
Hight above sea level approx. 700 m
Geographic orientation: see 3.1.b.
Topography: flat
Existing rights: Presently, land is private property. PCI has the possibility to acquire the quantity of land required.
Soil bearing tests: Not executed and not existing
Price of real estate: average 25 SyL /m².

4. Transport facilities

Since both locations are at a distance of approx. 2 km from each other, the facts hereafter apply for the both.

4.1. Roads:

Transport between site and a seaport is essential. For import, export and domestic traffic, a good road network exist. The principal roads are highways with up to 3 parallel tracks each direction, the secondary roads leading to the site have a hard surface and allow the passage of two trucks.

Width of road and bridges: average 6 m with occasional bottlenecks.

Bearing capacity: suitable for usual truck loads (50 tons).

Clearance under bridges: 4,9 m

Type of road: All weather asphalted roads; no close down due to seasonal conditions.

The road between Latakia and Homs is suffering from heavy and dense traffic. Due to permanent construction works on the road, narrow passages exist below 5 m lane width. The road has many curves and occasionally the traffic is paralized by standing car queues. (Dangerous for drummed material which should not be exposed to sun radiation).

Road network: see map, enclosure (2).

4.2. Railway:

The network is under construction. A single line exists between the capital and seaport and extends further to a place approx. 4 km away from the two sites into the village of Kisway. This network may be used in a very limited way for the transportation of materials and goods between the site and seaport. An unloading station with its facilities will have to be built for this particular purpose. The reliability of the timetable was reported to be precise, transportation time for same distance, compared to truck transport, was said to be about 50% slower. For railway network see enclosure (2).

Loading capacity:

Transportation tariff:

There is railway connection between Latakia and Damascus via Aleppo. Railway tankers do not exist at all, thus arriving liquid matter in drums or bulk cannot be filled in such tankers.
No possibility exists for the liquid material storage in port tanks. Tanks do not exist and will not exist even in the remote future.
A storage facility for inflammable materials in drums is available.

4.3. Port facilities

The two main seaports of the S.A.R., LATAKIA and TARTUS are available. They are international seaports with all their infrastructure which will be required, except not to have facilities of unloading liquid bulk materials from boats into road tankers.

Distances from seaports to site: From Latakia: approx. 400 km
From Tartus : approx. 310 km

Since all raw materials will go through the bottleneck of one of the 2 seaports, the experts have investigated the actual situation on the spot. Discussions were held with the person in charge for loading and unloading.

The delay in unloading of arriving ships depends on port congestion and can vary between a few days and a few weeks.

For further transportation, goods are mostly loaded on trucks, other surface transportation is of inferior importance.

For geographical orientation see enclosure (2).

4.4. Air transport:

The international airport of Damascus with all its infrastructure and facilities for passengers and goods is available. The city of Damascus must not necessarily be entered when going from airport to the site.

4.5. Passenger transport system:

The area of Dair Ali (Kisway) can be reached from Damascus by bus, taxi or railway.

## 5. Water supply

### 5.1. Characteristics:

For chemical and biological analysis see enclosures (3), (4), (5) and (6) which are the reports of the drillings 1 and 2 of the AL MANEE site only. The analysis of drillings on the AL MAJDIAH are not yet made. The temperature of the well water was not taken. The well water pressure is nil, pumping to the surface is required.

### 5.2. Sources:

Principally only under surface water is available; the well drillings have given the following results:

a) For the AL MANEE site: Two drillings were made. Results:
Drilling No: 1 Depth 200 m, capacity 7.000 litres/hour
Drilling No: 2 Depth 300 m, capacity 7.000 litres/hour

b) For the AL MAJDIAH site: Four drillings were made. Results :

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Drilling No: | 1 | Depth | 80 | m, | capacity | 21.000 | litres/hour | |
| " | " 2 | " | " | " | | 14.000 | " | " |
| " | " 3 | " | " | " | | 80.000 | " | " |
| " | " 4 | " | " | " | | 120.000 | " | " |

Drilling No. 1 was made directly on the prospective site, the others were made within a radius of approx. 1 km from the prospective site.

## 6. Power Supply

### 6.1. Electricity:

Within the convenient reach of the two sites is a 66 kV power line. A 6 kV power line is also within a distance of approx. 10 m from the road on the AL MANEE site.
**Voltage (Syrian standard): 20 kV - 6 kV, 380/220 V, 50 Hz, 3/1 phase**
Price for industrial electricity:
20 kV: Consumption up to 350.000 kwh = 0,25 SyL /kwh
20 kV: Consumption above 350.000 kwh = 0,20 SyL /kwh

As a minimum charge, the equivalent to 10.000 kwh at 0,25 SyL /kwh (2500 SyL ) will be charged, regardless whether electricity is consumed or not.

### 6.2. Fuel oil, gas oil and other combustibles:

The S.A.R. produces mineral oils and operates two refineries at HOMS and BANIYAS. The required quantity and quality will have to be brought to the site from these refineries or must be imported via seaport.

The distances from the refineries to the site are as follows:
From Homs: 185 km
From Baniyas : 350 km.

Price for heavy fuel oil, type Bunker (LHV 9.600 kcal/kg):
870 SyL /m³ free site
Price for light fuel oil, type Diesel (LHV 10.200 kcal/kg):
1.000 SyL /m³ free site.

6.3. Steam:

Steam is necessary for the process and will have to be generated within the plant.

6.4. Communication System (Current situation)

The nearest telephone is in Kisway village (semi automatic). Telex is not existing, the nearest telex post is in Damascus.

7. Waste Disposal

Based on the experience gained from similar installations, approx. 4% of the total production capacity is waste water. This waste water is composed from production effluents and cleaning effluents. It contains approx. 0,5% (vol) pollution substances.

Approx. 0,5% of the total raw material input can be considered as evaporation and ventilation loss during charging, refilling and production.

Liquid and solid raw materials in paper and/or plastic bags, in metallic and/or non-metallic drums or other packings as well - and product residues itself in the filterbase - remain as waste.
Dumps, sewage and sewage treatment system do not exist and must be provided within the production plant. Such installation shall meet the governmental regulations.

8. Manpower

General: All employed persons must be capable to write and read and to do simple calculations; this as a minimum requirement.

8.1. Employees

The new and existing staff with adequate training will come from Damascus and will have to be recruited there.

8.2. Labour

The labour force will have to be recruited from the close by villages. These villages presently depend on agriculture and small home production of misc. goods for the daily life. Training will have to be provided on site. Duration of training of course depends on the qualification of the labour force.

For salaries and wages see chapter VIII.

## 9. Construction, erection, maintenance facilities

### 9.1. Contractors:

They are available for the civil works. For electrical and mechanical contractors, assistance from an experienced foreign contractor should be provided. A maintenance contractor will have to be trained on site during erection.

### 9.2. Building material:

For civil works, material is locally available. Other materials will have to be imported. Iron bars partially locally available.

## 10. Living conditions

Within the location areas an infrastructure such as housing, food, recreation, schools, place of worship, shopping facilities and medical welfare exist. Since the living standard of employees and some workers may require extended commodities and comfort at elevated standard, it is recommended to plan this simultaneously with the construction of the production complex.

## 11. Definition of an ideal site location for this purpose

For selecting an optimal site, the following should be observed::

- Shortest possible distances to domestic suppliers and customers
- Shortest possible distances to a seaport through which the raw material will be imported and the finished products exported.
- Availability of infrastructures
  a) Technical/Water supply, electrical power, communication, waste disposal road and railway connection
  b) Manpower: Sufficient personnel, also with elevated skill and education
  c) Social::Housing; shopping and food, schools, medical welfare, recreation and worshipping
- Topography: Flat land with good soil bearing, required size 120.000 m²
- Safety: Since the process uses inflammable and toxic raw materials, the transportation distances should be kept to a minimum. Transport of such raw materials should not go through cities and villages and should by-pass populated areas.

  Certain raw materials change their characteristics during long transportation and exposure to elevated temperatures, caused by intense sun radiation (eg. polymerization and complete destruction, also explosion).

CONCLUSION: Both the sites which were shown to the experts do not meet the optimal conditions as spelled out above. If the experts have to select one site out of the two, the AL MAJDIAH site is the better one.

12. References and sources of information, enclosures

(1) Table of meteorological data
(2) Syrian map, showing distances, roads and railway system
(3) Chemical and Biological water analysis
(4) ditto
(5) ditto
(6) ditto
(7) Soil bearing test
(8) Seismic data (presently only in arab language available)
(9) Site map

SYRIAN ARAB REPUBLIC

MINISTRY OF DEFENCE

METEOROLOGICAL DEPARTMENT
DAMASCUS

STATION: DAMASCUS

Latitude: 33° 29' N  Longitude: 36° 14' E  Elevation: 729 mts

| Element | JAN. | FEB. | MAR. | APR. | MAY | JUN. | JUL. | AUG. | SEP. | OCT. | NOV. | DEC. | YEARLY | Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MEAN TEMPERATURE C | 7.1 | 8.6 | 11.8 | 16.2 | 21.0 | 25.1 | 26.8 | 26.9 | 24.1 | 20.0 | 13.8 | 8.6 | 17.5 | 1951 - 1976 |
| MEAN MAXIMUM TEMPERATURE C | 12.1 | 14.1 | 17.8 | 22.8 | 28.5 | 33.2 | 35.5 | 35.7 | 32.4 | 27.1 | 19.8 | 13.7 | 24.4 | 1951 - 1977 |
| MEAN MINIMUM TEMPERATURE C | 2.4 | 3.3 | 5.4 | 8.8 | 12.4 | 15.9 | 17.2 | 17.3 | 15.3 | 12.2 | 7.6 | 3.6 | 10.1 | 1951 - 1977 |
| ABSOLUTE MAXIMUM TEMPERATURE C | 22.7 | 25.0 | 31.3 | 35.5 | 38.4 | 40.9 | 43.6 | 44.0 | 42.0 | 36.6 | 29.7 | 26.1 | 44.0 | 1951 - 1977 |
| ABSOLUTE MINIMUM TEMPERATURE C | -8.3 | -5.3 | -3.7 | -3.3 | 3.7 | 9.2 | 10.8 | 10.8 | 8.7 | 3.8 | -4.4 | -6.4 | -8.3 | 1951 - 1977 |
| MEAN RELATIVE HUMIDITY % | 71 | 65 | 55 | 46 | 38 | 34 | 36 | 38 | 41 | 45 | 58 | 71 | 50 | 1951 - 1976 |
| MEAN OF THE TOTAL PRECIPITATION MM | 50.6 | 36.0 | 26.5 | 16.1 | 6.5 | 0.1 | T | T | 0.2 | 8.3 | 28.2 | 48.4 | 220.9 | 1950 - 1980 |
| PREVAILING WIND DIRECTION | W | W | W | WNW | WNW | NW | WNW | WNW | WNW | E | E | W | WNW | 1951 - 1979 |
| MEAN WIND SPEED MTS/SEC | 2.7 | 3.3 | 4.0 | 4.3 | 4.1 | 4.1 | 4.9 | 4.2 | 3.0 | 2.5 | 2.1 | 2.2 | 3.5 | 1956 - 1976 |
| MAXIMUM WIND SPEED MTS/SEC | 28 | 23 | 28 | 23 | 24 | 24 | 21 | 21 | 20 | 20 | 27 | 27 | 28 | 1951 - 1979 |
| HIGHEST RELATIVE HUMIDITY % | 100 | 100 | 100 | 100 | 99 | 94 | 98 | 98 | 97 | 100 | 100 | 100 | 100 | 1951 - 1977 |
| LOWEST RELATIVE HUMIDITY % | 4 | 10 | 5 | 2 | 1 | 1 | 1 | 2 | 1 | 3 | 10 | 5 | 1 | 1951 - 1977 |
| DAILY AVERAGE EVAPORATION MM. | 1.7 | 2.5 | 4.2 | 5.9 | 8.4 | 11.3 | 12.0 | 11.0 | 8.0 | 5.8 | 3.3 | 1.8 | 6.3 | 1956 - 1977 |
| MAXIMUM FALL IN ONE DAY MM. | 44.2 | 37.0 | 72.3 | 28.3 | 18.9 | 2.3 | 0.6 | T | 5.0 | 12.2 | 41.4 | 41.7 | 72.3 | 1956 - 1980 |
| DAILY SUNSHINE IN HOURS | 5.5 | 6.7 | 8.1 | 9.0 | 10.9 | 12.5 | 12.7 | 12.0 | 10.8 | 9.2 | 7.5 | 5.7 | 9.2 | 1958 - 1977 |
| | | | | EL KESWEH | | | | | 710 mts | | | | | |
| MEAN OF THE TOTAL PRECIPITATION MM | 31.4 | 33.1 | 21.1 | 8.3 | 4.1 | 0.0 | 0.0 | 0.3 | 4.4 | 23.4 | 31.5 | 157.6 | 72 | 1972 - 1980 |

## VI. PROJECT ENGINEERING

### 1. Project Layout

In 1983, PCI prepared a tender document and called for international offers for the design, supply and erection of a synthetic resin and paint factory,including the related production Know-How on the basis of a license arrangement. This tender document was based on the production and sales figures up to 1995.

The selection of equipment and subsequently the Know-How was left to the offering contractor's discretion as PCI simultaneously intended to procure the fabrication license and rights for resins and paints. (For the production and supply programme see Chapter II para. 1). Since the AL MANEE location was specified as the PCI preferred site, all civil layouts of the offering contractors had considered it in their plot planning.

All offering contractors had considered that all civil works are performed locally whilst the civil engineering and planning was included in their scope of supply.

Appendix IV gives a brief analysis of the offering contractors with a recommendation regarding technologies.

A detailed project layout has not been performed by the experts because it had been assumed that the supplier of the plant would be charged to prepare the project layout. Before the technology for resin and PVA production is selected and final decision is taken on site selection the project layout cannot be above in details anyway.

### 2. Technologies

Several similar technologies can be used for the manufacturing of Alkyd resins, PVA and the paints and adhesives made therefrom. The main difference is in the use of different raw materials and the technological process itself.

2.1. For Alkyd Resins, the following principal technologies correspond to latest technical standard
   a) Single step process, based on fatty acid
   b) Two-step process, based on oil

c) Azeotropic distillation with the use of aromates for the elimination of condensation waters

d) Vacuumdistillation for the distillation of condensation waters

e) Batch process

f) Continuous process

2.2. For PVA Dispersions, the following principal technologies correspond to the latest technical standards

a) Oxydation Process: For products of average quality, mainly used for the production of homopolymers, medium and crude particle size which are generally used for adhesives

b) Redox Process: The most modern one which covers the entire range of homo- and copolymers, acrylic dispersion, acrylstyrene and acrylnitril. It allows the use of chain stoppers, thus homogenous dispersions are achieved.
Equipment for the realisation of the redox process allows the use of the oxydation process but not vice versa.

2.3. Paint Industries generally apply the same technology worldwide, only the equipment used differs and recipes are not alike.

2.4. Selection of technology. It takes into consideration the products which are presently made by PCI, the raw materials which are locally available or will be available and the workers are acquainted with them. Furthermore it takes into consideration the local and climatic conditions.

a) Alkyd Resins:

The two-step azeotropic process using oil as raw material is recommended. Oil is locally available in the near future and the process itself is less difficult to manage. A batch process is compulsory due to the envisaged product mix.

b) PVA Dispersions:

The Redox batch process is to be selected as it is the most versatile one and allows the production of all Dispersions and all adhesives. The achieved qualities are of superior standard and production time is much shorter.

c) Paints:

They are processed using a standard technology. The optimum implementation of the technology is the use of large machines with higher productivity per worker and which would be operated in two shifts.

d) Know-How:

The procurement of Know-How should legally allow the export of products to other countries, regardless if a licenser has different market strategy arguments for the exports of this product to such countries.

The Alkyd resin and PVA Dispersion Know-How should be acquired from companies which already supply superior quality products into the S.A.R. and which are acquainted with the local market situation.

The Paint Know-How should be acquired from such companies which already are introduced in those markets where PCI intends to export. The legal use of a licensers brand name is an asset.

Production equipment and Know-How shall come from the same contractor to avoid inevitable guarantee argumentation. The Know-How seller will give the guarantee that his product will meet the quality requirements because he has been responsible for selection of the equipment.

The Know-How shall not be limited to the transfer of formulations and recipes but also to a continuous collaboration regarding training, introduction of new products, exchange of experience and assistance in application, even if such Know-How contract is on a lump sum basis only.

e) Approximate Know-How costs:

They are principally linked in a certain relation to the costs of equipment. As an international parameter, the Know-How costs are about 7 - 10% of the total project investment costs.

A further consideration in estimating the cost of the Know-How is the magnitude of the syrian market, the number of formulations which are given and the extent of collaboration sought from the licensee.

The experts have valued the costs of the Know-How for this project (based on their international experience in license contracting) to be US$ 3.5 - 4.000.000 lump sum basis.

3. Equipment (key equipment and parameters only)

3.1. Alkyd production: 15.000 tpy, 100% solid, 300 days/year, 3 shifts

The following basic equipment is recommended for the envisaged product mix and versatility of the plant:

5 Reactors 12 m³ geometric volume, incl. agitator, column condenser etc.

1 Reactor 8 m³ geometric volume, incl. agitator, column condenser etc.

1 Reactor 4 m³ geometric volume, incl. agitator, column condenser etc.

Material for product wetted parts DIN Mat. No. 1.4301 or better

2 Thinner 20 m³ geometrical volume, incl. agitator and condenser
3 Thinner 27 m³ geometrical volume, incl. agitator and condenser
1 Thinner 18 m³ geometrical volume, incl. agitator and condenser
1 Thinner 9 m³ geometrical volume, incl. agitator and condenser

Material for product wetted parts DIN Mat. No. 1.4301. This allows a later use for making acrylates.

Instrumentation and process control semi-automatic and completely manual (emergency case). Charging of liquid raw materials with quantity preselectors and maters, charging of solid raw materials manually from bags via hoppers.

3.2. PVA Dispersion production: 15.000 tpy, 54% solid, 300 days/year 3 shifts.

The following basic equipment is recommended for the envisaged product mix.

3 Reactors, 10 $m^3$ each geometrical volume with agitator, column and condenser, Material DIN Mat. No. 1.4435 with high internal electrolytic polishing.

3 Blending Tanks, 12 $m^3$ geom. vol. each with agitator Mat. No. 1.4301 or better

3 Monomer Tanks 6 $m^3$ geom. vol. each Mat. No. 1.4301 or better

3 Premix Tanks 6 $m^3$ geom. vol. each with agitator, Mat. No. 1.4301 or better

3 Emulsifying Tanks 6 $m^3$ geom. vol. each, with agitator Mat.No. 1.4301 or better

2 x 3 = 6 Oxydation Tanks 1 $m^3$ geom. vol. each with agitators Mat. No. 1.4435 or 1.4571

2 x 3 = 6 Reduction Tanks 1 $m^3$ geom. vol. each with agitators Mat. No. 1.4435 or 1.4571.

Product pumps from stainless steel and pneumatic driven. Instrumentation and process control semi-automatic and completely manual (emergency case). Charging of liquid raw materials with quantity preselector and meter.

3.3. Alkyd and industrial paint production:

18.700 tpy (4.100.000 US gpy) 300 days/year, 1 shift

The following basic equipment is recommended for the envisaged product mix:

3 Dyno mills or equivalent, 50 litres each
1 Dyno mill or equivalent, 100 litres
2 Tripple rollers, width 1000 mm with lifting device
4 Vibration screen filters
2 Dissolvers, serving 3 mixing containers, 2 $m^3$ each
1 Filling machine, capacity approx: 1.700 US gph
1 Packing Unit
2 Balances 50 kg
2 Balances 500 kg
1 Platform balance 2.000 kg
3 Platform elevators 3.000 kg
2 Portable electr. pumps
2 Manual pumps

3.4. PVA paint production

14.800 tpy (2.700.000 US gpy) 300 days/year, 1 shift

The following basic equipment is recommended for the envisaged product mix:.

1 Dissolver serving 2 mixing containers, 2 m³ each
1 Dissolver with 1 mixing container, 1 m³
3 open containers on wheels, 1,2 m³ each
1 filter 4 tons/hour, 100 um
1 filling machine, capacity approx. 1.120 US gph
1 packing unit
1 water meter
1 dispersion meter
1 balance 50 kg
1 balance 300 kg
1 drum pump
1 drum cleaning machine
1 vibration screen filter

4. Auxiliary Equipment (within the plant)

4.1. Transport:

6 fork lift trucks, 2 tons
20 manual pallet movers

4.2. Energies:

Given data are average installed values

| | | |
|---|---|---|
| a) Electricity: | Alkyd Resin Plant | 400 kW |
| | PVA Emulsion Plant | 100 kW |
| | Alkyd Paints | 400 kW |
| | PVA Paints | 200 kW |
| | other infrastruct. | 400 kW |
| b) Steam Generator: | | 10 t/hour, 8 bar |
| c) Cooling Water System: | | 2.000.000 kcal/hour |
| d) Chilled Water System: | | 300.000 kcal/hour |
| e) Hot Oil Heater(s) | | 3.500.000 kcal/hour |
| f) Inert gas generator | | 50 Nm³/hour, 12 bar |
| g) Compressor | | ) Nm³/hour, 6 bar |
| h) Emergency diesel: | | 2 x 300 kVA (not serving fire water pump. One fire water pump must have a diesel motor) |
| j) Process water treatment | | 50 m³/day |

Above data may differ from one technologie and Know-How to another.

4.3. Workshop for electrical and mechanical maintenance, combined with the management of the spare parts.
A reasonable selection of machinery is to be recommended by the contractor for either supply through him or for local procurement.

4.4. Laboratory. For detailed list of laboratory equipment see Appendix 7 to this report (page ).

4.5. Storage and Warehouse

Raw materials, intermediate products, consumables and spares will be stored on site.
Liquid material arriving in bulk, will be stored in tanks, the one arriving in drums remains stored in drums.
For the production, intermediate tanks are provided which hold the quantities needed for 1 week production.
Solid material arrives in bags and is stored on site in bags.

Storage conditions:

a) Oils for Alkyd resins must be stored above $+8^{0}C$

b) Solid material must be stored away from humidity in a roofed area.

c) PVA storage temperature not to exceed $+35^{0}C$ and not to be below $+5^{0}C$.

d) Alkyd storage temperature not to exceed $+45^{0}C$ and not to be below $+10^{0}C$.

For the design of the tank farm, the water protection regulations must be followed, also the fire fighting concept must be integrated simultaneously.

Storage quantities: Raw materials and finished products

a) Big Tanks

| Material/Product stored | Storage capacity in tons | No. of tanks | Volume e.a.m³ | Diamet. Tank(m) | Type of Buildg. +) |
|---|---|---|---|---|---|
| White Spirit | 770 | 8 | 100 | 4,0 | e |
| Alkyd Resin | 1.800 | ( 7 | 200 | 5,0 | e |
| " " | | ( 4 | 50 | 3,2 | e |
| " " | | ( 8 | 25 | 2,6 | e |
| PVA Dispersion | 2.200 | (13 | 100 | 4,0 | c |
| " " | | (14 | 50 | 3,2 | c |

b) Raw materials for 1 week production (Raw material is filled from drums into these tanks to allow automatic withdrawal of liquids through meters)

| | | | | | |
|---|---|---|---|---|---|
| Monomers | 175 | 2 | 60 | 3,6 | c |
| " | | 4 | 30 | 3,0 | c |
| Oils | 220 | 4 | 60 | 3,6 | e |
| Alcohols | 50 | 1 | 60 | 3,6 | d |
| other Solvents than white spirits | 12 | 2 | 10 | 2,2 | d |

c) Raw materials in drums (4 drums on 1 pallet, 3 pallets = 1 pile, size of pallet 1,2 x 1,2 m)

| Raw material | total tons | No.of drums | No.of piles | type of buildg. +) |
|---|---|---|---|---|
| Oils | 3.500 | 17.500 | 1.460 | e |
| Alcohols | 340 | 1.400 | 120 | d |

| | | | | |
|---|---|---|---|---|
| Monomers | 2.500 | 14.100 | 1.180 | d |
| other Solvents than White Spirit | 170 | 1.000 | 80 | d |

e) Raw materials in bags (1.000 kg on 1 pallet, 3 pallets = 1 pile, size of pallet 1,2 x 1,2 m)

| Raw material | total tons | no. of piles | type of buildg. +) |
|---|---|---|---|
| Acids and Anhydrates | 1.360 | 450 | d |
| Emulsifyers | 200 | 67 | d |
| Pigments & Fillers | 2.670 | 890 | d |

+) For the identification of the type of building refer to this Chapter para 5.2 (Buildings and civil works)

f) Utilities, water

Water shall be stored in a minimum 1.000 m³ tank or open basin to serve all water needs of the plant. A special system must be provided to keep the tank full all the time.

Tank for liquid fuel oils for various parts of the plant shall have at least a capacity to hold the consumption for 1 week.

## 4.6. Intercommunication etc.

A telephone system between all principal rooms and areas must be provided. Automatic dial telephone is compulsory. Plant telephone to be connected to the public telephone system. Telex is indispensable.
A wireless paging system for staff members and formen is of advantage.
A loudspeaker system in selected areas will be required for announcing of events and alarms.

## 4.7. Heating, Ventilation, Airconditioning

Heating shall be provided in offices and working areas, also within the production plant and the process control room.

Ventilation must be provided in closed areas where volatile and inflammable materials are handled, where dust can cause disturbances and in explosion proof areas. The air flows always to the outside. About 6 airchanges per hour would represent an average. Distribution of fresh air should be homogenous.

Ventilation of laboratories to the outside without going through other areas. 6 airchanges per hour plus emergency purging approx. 15 airchanges per hour with an independent ventilation system.

Ventilation of process control room: Clean and filtered air to be blown [illegible] the room from outside, generating an overpressure of a few mm [illegible]tercolumn pressure. Control room is not explosion proof althoug[illegible] connected to the process area by an air lock (gate).

Air conditioning to be provided for those offices which require it. Furthermore, the process control room requires airconditioning.

4.8. Packing, loading, unloading

A loading arm should be provided to allow filling of road tankers of liquid containers, at least one for PVA and one for Alkyd resin.

Packing material requirements have been discussed in Chapter IV. Both the fabrication of metal cans and tins, as well as drum reconditioning plant are considered herein as later optional installations and their cost is not included in the further analysis.

4.9. Waste treatment and elimination of off-products (Process only!)

Since no installation exists at all to collect treat, or even eliminate any waste, such installations must be provided within the plant as part of the installation.

a) Elimination of liquid wastes water:

Liquids must be collected and separated in organic and inorganic waste tanks. Inorganic wastes can be treatened by addition of agents and neutralizers before release to the sewer, organic waste water shall be separated from less polluted waters by decantation. The decanted water requires a treatment whereas the floating lighter residues shall be incinerated and simultaneously energy for heating (hot oil heater) is to recover.

Since the radiation of sun in the S.A.R. allows surface evaporation, provisions shall be taken to make full use of this circumstance.

b) Elimination of solid wastes:

These wastes are mainly residues from cleaning (tissues), filtration and packing material such as bags, cans, tins of different materials. Empty bags must be baled and packed properly. Solid wastes shall be deposited in a dump which cause no damage to surface and undersurface waters, which is protected from winds and which is at least 10 km away from populated areas. Solid wastes shall not be burned in an open fire in the open air since explosion hazard exists. Handling requires human protection (Eyes, skin, respiration).

c) Elimination of dust, gases, fumes and blow offs:

They are mainly released to the atmosphere whereas boosters shall blow out such matters through a stack or pipe. Provisions must be taken to reduce deposits of dusts inside the area to a minimum. Mist blow off from the cooling tower shall not humidify the plant and cause corrosion. For recovery of solid raw material from dust during filling, a filter is recommended. Vent pipes, carrying organic gases shall not be lead over hot areas.

4.10. Water Treatment Plant

Water will be used from underground wells and is pumped to the surface into the main water tank (Fire water tank). Direct feed of well water to the process is possible. To avoid formation of biological organism, the content of the main water tank should be circulated or changed frequently. All water needed for the plant will come from this tank and is treated depending on its use.

a) Process water: It must be freed from chlorides and sulfur, its hardness to reduce to a minimum and its conductivity must be above 50 S.

b) Cooling water :Can be used directly from the water well or from the main water tank. This makeup water to the circulating cooling water system should contain agents to avoid the formation of biological organism.

c) Drinking water::A separate well and treatment unit shall be used whereas the regulation of the government regarding quality is binding.

d) Steam Generator: The makeup water to compensate the consate losses to come from the process water branch.

e) Fire water: directly connected to the main water tank without any further treatment.

f) Domestic water: If not on same branch like drinking water, it can be slightly chlorinated and taken directly from main water tank. It must then be marked as not drinkable water!

All water qualities require a continuous control by the laboratory.

4.11. Fire Protection

Principally all open fires and smoking must be strictly prohibited inside the plant. Explosion proof motors (ex-e-G3/T3) must be used in the hazardous areas and no spark producing equipment and electrostatic current generating material is allowed. Good grounding to earth is compulsory.

Fire protection organisation. The entire system requires the approval of the local fire fighting authority. The list hereafter is to be considered as recommendation only and represents by all means not an approved concept.

a) in the field :fire hydrants

b) Tank farms: foam guns

c) Drum storage: fire hydrants and hose reels

d) Solid bag storage: CC2 powder extinguishers on caddies

e) Production building: hose reels and wall extinguishers CO2

f) Control room: Halon system

g) Administration building, repair shop: hose reels and wall extinguishers CO2

h) Energy building: hose reel and CO2 extinguishers on caddy

j) All purpose fire fighting truck with water tank trailer.

4.12. Service equipment

This covers the locally provided equipment for offices, canteen, medical service, plant security, plant cleaning, clothing for the workers and others more.

4.13. Cost estimates (Equipment only)

Although requested by the experts the prices of the offering contractors were not unveiled and kept separated from the technical offers. For the reason of a feasibility, the experts had to calculate the prices, whereas the following references were used:

- price of steel
- size of plant and areas
- volume of process building
- throughput and storage of raw materials
- extent of engineering
- internationally applied standards for projects
- production capacities
- the high standard or the selected technical offers
- proposed way of execution of the project
- scope of supply
- project implementation
- experience of the experts in Resin and Paint Plant desing and construction as well as the experience in operating such installations.

| Machinery and equipment (ex factory cost) | Price in US$ | |
|---|---|---|
| a) Alkyd resin production plant | 5.500.000,- | |
| b) PVA Dispersion plant | 2.000.000,- | |
| c) Alkyd and Industrial and PVA Paint production plant | 2.000.000,- | +) |
| d) Product Storage facilities for Raw materials and Intermediates | 4.500.000,- | |
| e) Utility installations auxiliaries, off sites | 12.000.000,- | |
| f) Spare parts for 2 years, wear parts and special tools only | 1.500.000,- | |
| **Total estimated equipment cost, not considering the utilisation of the equipment of the existing paint factory of PCI** | 27.500.000,- | |

+) In case the PCI paint production equipment is to be used (even as started equipment) in the new plant, the cost of c) is reduced by US$ 1.000.000,-, thus investment total is reduced to US$ 26.500.000,-

This is a list of the PCI available equipment for paint fabrication:

- 1 Dissolver, Drais RSV 95 95 hp + 4 containers 2 m³ each. (PVA paint)
- 1 Filling machine De Vree 136.N (approx. 20 gpm) (PVA paint)
- 2 Motormills 50 litres Eiger Engineering
- 1 Pearlmill, hydraulic, 1000 x 400
- 1 Pearlmill, mechanical type
- 1 Dissolver, Drais, 24 hp
- 1 Dissolver, Netzsch, 40 hp (brand new)

- 3 Wall stirrers, 10 hp
- 1 Filling machine, De Vree 136.N (approx. 20 gpm)
- 2 ground mouted stirrers, 50 hp, 2 m³
- 1 Dynomill 20 litres
- 1 Diaf dissolver 40 hp
- 1 Wall stirrer 10 hp
- 1 Drum cleaning machine Rio beer
- 5 Lift trucks

## 5. Civil Engineering

The basis considered is a flat piece of land with good soil bearing.

### 5.1. Site preparation and development

This includes, but is not limited to the land survey, cleaning of the site area, grading, road and access facilities, walkways, railroad connection, fencing, parking areas, paving of areas and landscaping.
Furthermore preparation and development of outdoor works such as Water well organisation and transport to site in a pipeline is necessary.
A railway terminal might be biult when it becomes advantageous to use rail transport.

For tendering, PCI offered an area of over 200.000 m² which most of the offering contractors have used completely in a very generous way. The estimated land requirements are much less and are calculated in the next paragraph.

### 5.2. Building and civil works

There is no underground storage foreseen since it is not required. This concept would allow the reduction of storage capacities and the proposed layout of the Alkyd Resin and PVA production plant for the capacities as spelled out in this chapter para. 3

a) Solid concrete or brick building, 2 or more floors, solid basement

- Administration building, main laboratory research, social section, canteen guard house and truck weighing — Built area: 1.400 m²

b) Solid concrete or in combination with steel structure or steel structure only for heavy duty industry with solid basement, 2 floors

- Alkyd resin production plant incl. control room (Reaction-Distillation only) — Built area: 800 m²
- PVA Production plant incl. control room — Built area: 550 m²
- Energy building for heaters, inert gas compressors, emergency diesel etc. — Built area: 1.500 m²
- Electrical substantion and main transformer house — Built area: 100 m²

c) Steel structure with roof and closed on all sides, ventilated and/or conditioned (Concrete structures possible)

- Alkyd resin production plant (Thinning, Filtration only) — Built area: 600 m²
- Alkyd Paint production plant and packing — Built area: 2.500 m²
- PVA Paint & Adhesive production plant and packing — Built area: 900 m²
- Repair and Maintenance shop (elect. and mechan.) Spare parts warehouse — Built area: 200 m²
- Liquid raw material storage tanks (Monomers and some others) — Built area: 450 m²
- Finished product storage tanks (PVA) — Built area: 1.800 m²
- Fire brigade car and material depot incl. standby room for fire fighting shift — Built area: 200 m²
- Drum reconditioning plant (option) — Built area: 600 m²
- Can and bin manufacturing plant incl. sheet metal storage (option) — Built area: 500 m²

d) Steel structure with roof, all sides open, concrete structures possible (For shade and ambient protection only)

- Liquid raw material storage, tanks — Built area: 180 m²
- Liquid raw material storage, drums — Built area: 6.600 m²
- Solid raw material storage, bags — Built area: 6.600 m²

e) Open area storage with flat hard surface (concrete) or for tanks within a basin, no superstructures except stairs and catwalks

- Liquid raw material storage, tanks — Built area: 700 m²
- Liquid raw material storage, drums — Built area: 7.000 m²
- Finished products (intermediate) Alkyd resins, tanks — Built area: 1.800 m²
- Fire water tank, open air basin or tank from concrete or steel — Built area: 200 m²
- open air waste water pit and tanks — Built area: 100 m²
- empty drum storage (used and reconditioned), drum handling — Built area: 1.000 m²

f) Roads, truck turnabouts, truck and car parking, weighing bridge average 100% of the total built area as under a) through e)
Built area: 36.000 m²

g) Landscaping, greens and planted area with integrated irrigation, unused surfaces, average 150% of the total built area as under a) through e) — Built area: 50.000 m²

Summary: a) 1.400 m²
b) 2.950 m²
c) 7.750 m² (including options)
d) 13.380 m²
e) 10.800 m²
f) 36.000 m²
g) 50.000 m²

Total required area rounded off to 120.000 m².

For purpose of this study the price of real estate is SyL 25-/m².

5.3. Engineering cost and services

The contractor provides within his duties the following:

- Plot layout
- Architectural concept
- Layout and construction drawings
- Dynamic and static calculations
- Bill of quantities

These engineering services are estimated by the experts to be US$ 300.000,-

The execution of the work incl. supply of material is provided locally. For expenses for supervision and other services see chapter IX (Implementation scheduling)

5.4. Cost estimate of civil works (Local supply)
(see 5.2 for definition of civil works)

| Type of civil work | built area (m²) | unit price SyL /m² | total cost Sy L |
|---|---|---|---|
| a) | 1.400 | 2.500 | 3.500.000 |
| b) | 2.950 | 1.500 | 4.420.000 |
| c) | 7.750 | 1.000 | 7.750.000 |
| d) | 13.380 | 600 | 8.030.000 |
| e) | 10.800 | 100 | 1.080.000 |
| f) | 36.000 | 100 | 3.600.000 |
| g) | 50.000 | 30 | 1.500.000 |
| Total estimate for built area of 120.000 m² | | Sy L | 29.880.000 |

## VII. PLANT ORGANISATION AND OVERHEAD COSTS

### 1. Organisation

The Resin and Paint Plant shall be divided into 4 departments, each headed by a manager

Department I : Administration
II : Marketing and Sales
III : Production
IV : Development, Research, Application

The organisation as proposed by the experts is illustrated in the chart on page 60 each post corresponds to an individual cost center.

It is recommended to introduce a vertical structure whereas the individual cost centers can be subdivided or supplemented where required.

### 2. Overhead costs (based on 300 working days/year, 24 hours/day)

a) Wages and salaries see chapter VIII

b) Utilities

| | | Alkyd Resin (70% solid) | PVA Dispersion (54% solid) | Alkyd Paint | PVA Paint |
|---|---|---|---|---|---|
| electrical consumption for production | | 115 kWh/t | 32 kWh/t | 120 kWh/t | 46 kWh/t |
| for utilities | 1) | 48 kWh/t | 29 kWh/t | 4 kWh/t | 5 kWh/t |
| Heavy fuel oil | 2) | 7,4 kg/t | 2,0 kg/t | - | - |
| Light fuel oil | 3) | - | - | - | - |
| **Water treatment** agent | 4) | - | 1,0 US$/t | - | 0,8 US$/t |

Remark 1) it includes cooling tower, compressor station, water pumps and other motors, ventilation etc.

2) since the hot oil heater will be above 1.000.000 kcal/hr a heavy fuel oil burner will be used

3) very small quantities only for emergency diesel; for the standby fire water pump and may be one or two very small occasional users.

4) the costs for water is included in the costs for utility electricity as water must be pumped from a well.

c) Repair and maintenance overheads:

Own trained personnel will be used, their costs are considered in Chapter VIII

The quantity of spares consumed will be less in the first years of production but increasing during continuous operation.

The annual consumption of wears and spares can be calculated as follows:

20% of initial spare parts stock as spare parts
+ 5% of initial spare parts stock as wear and tear parts

The consumption of spares will increase with approx. 10% per year (Sy L 187.000 p/y).
The consumption of wears and tears will remain constant.

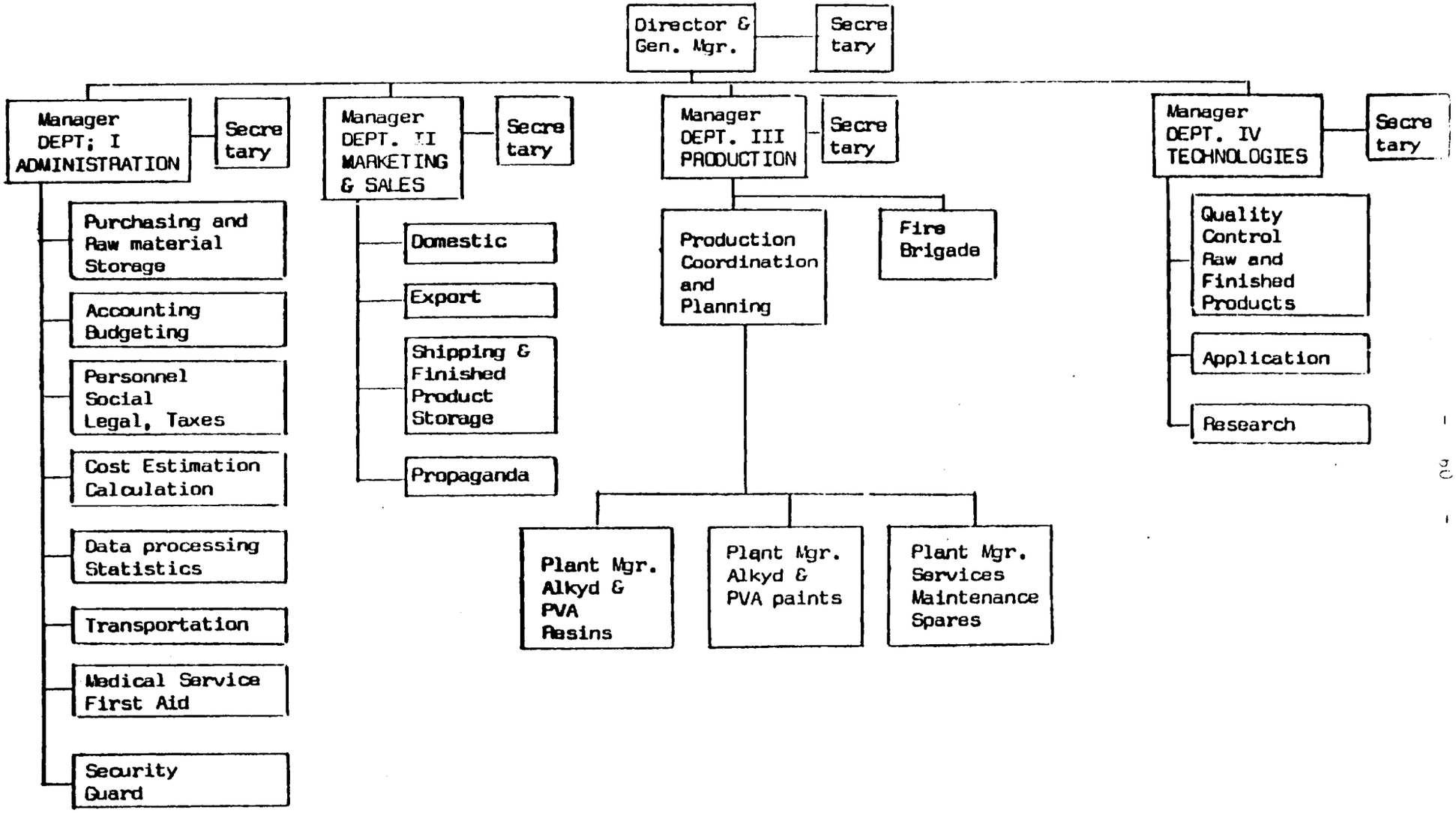
d) Effluent disposal overheads:

Effluents are treatened within the plant itself. The equipment costs are included in Chapter VI para 5 e (Utility installations). Operating personnel is included in Chapter VIII.

e) Administration overheads:

Wages and salaries see Chapter VIII.

ORGANISATION CHART



## VIII. MANPOWER

The number and qualifications of manpower as described hereafter is to administrate and to maintain the plant and to produce the quantities of intermediate and finished products as spelled out in previous chapters. The workforce considered ensures an efficient operation and organisation.

The numbers as given hereafter consider a product mix as suggested in Chapter III, page

1: Qualification requirements and cost of personnel

Code a) University education, PhD, MSc, professional or licensed engineer or chemist, foreign education in internationally recognized institutes with diploma

Code b) Technical or commercial education from a nationally recognized institute, eg: BSc, Engineer-certificate, graduation testimonia

Code c) Technical or commercial education from training and practical experience in similar posts

Code d) Specialist with industrial experience

Code e) Skilled worker with training on site

Code f) Unskilled worker

Cost of personnel, paid 12 times per year
(for more detailed cost break down, see pre-feasibility study, Appendix 12 )

| | | |
|---|---|---|
| For qualification code a: | SyL | 2.700/month |
| b: | | 2.400 |
| c: | | 2.000 |
| d: | | 1.800 |
| e: | | 1.800 |
| f: | | 1.800 |

2: Manning table

Number of personnel required for the production under consideration of the organisation chart of Chapter VII

2.1. General Management

| No. | Title and function | Qualification code | Shifts per day |
|---|---|---|---|
| 1 | General Director | ... | 1 |
| 1 | Assistant to Gen. Director | ... | 1 |
| 2 | Secretaries | b | 1 |
| 4 | Total manpower per day | | |

2.2. Department I

| No. | Title and function | Qualification code | Shifts per day |
|---|---|---|---|
| 1 | Administration manager | b | 1 |
| 1 | Secretary to manager | c | 1 |
| 2 | Purchasing | c | 1 |
| 1 | Secretary to purchasing | c | 1 |
| 2 | Raw material storage administration | c | 1 |
| 2 | Assistant to RM storage administration | c | 1 |
| 1 | Chief accountant | b | 1 |
| 4 | Assistants to chief accountant | b | 1 |
| 1 | Personnel administrator | b | 1 |
| 1 | Assistant to personnel administrator | c | 1 |
| 1 | Cost calculation | b | 1 |
| 1 | Data processing engineer | b | 1 |
| 1 | Transportation administrator | c | 1 |
| 6 | Bus drivers | e | 1 |
| 2 | Car drivers | e | 1 |
| 10 | Fork lifting operators | e | 1 |
| 3 | Truck drivers | e | 1 |
| 1 | Medical doctor (temporary assignment) | a | 1 |
| 1 | Nurse | b | 1 |
| 1 | Security supervisor | e | 3 |
| 2 | Guard men | f | 3 |
| 4 | Cleaning | f | 1 |
| 55 | Total manpower per day | | |

2.3. Department II

| | | | |
|---|---|---|---|
| 1 | Sales & Marketing Manager | b | 1 |
| 1 | Export Administrator | b | 1 |
| 2 | Assistant to export administrator | b | 1 |
| 2 | Secretaries | b | 1 |
| 1 | Domestic Administrator | b | 1 |
| 1 | Representative of domestic administrator | c | 1 |
| 3 | for handling of orders | c | 1 |
| 2 | Secretaries | c | 1 |
| 5 | Market representatives (Travellers) | c | 1 |
| 1 | Propaganda specialist | b | 1 |
| 19 | Total manpower per day | | |

2.4. Department III

| No. | Title and function | Qualification code | Shifts per day |
|---|---|---|---|
| 1 | Production manager | a | 1 |
| 1 | Secretary to production manager | b | 1 |
| 1 | Production coordinator and planning manager | b | 1 |
| 1 | Plant Manager for the Alkyd Resin and PVA Dispersion production | b | 1 |
| 1 | Foreman Resins | d | 3 |
| 10 | Skilled workers, Resins (7xAlkyd, 3xPVA) | e | 3 |
| 20 | Helpers, Resins (14xAlkyd, 6xPVA) | f | 3 |
| 1 | Assistant chemist, Resins & Paints | c | 3 |
| 1 | Control room engineer, Resins, Paints | c | 3 |
| 1 | Plant Manager for the Alkyd and PVA Paint production | b | 1 |
| 6 | Foremen, Paint (5xAlkyd, 1xPVA) | d | 1 |
| 47 | Skilled workers, Paint (26xAlkyd, 21xPVA) | e | 1 |
| 20 | Helpers, Paint (14xAlkyd, 6xPVA) | f | 1 |
| 1 | Plant manager for Service, maintenance and spares administration | b | 1 |
| 1 | Foreman, electrical | c | 1 |
| 1 | Foreman, mechanical | c | 1 |
| 1 | Electrician, Resins | c | 3 |
| 1 | Mechanic, Resins | c | 3 |
| 2 | Electricians, Paints | c | 1 |
| 3 | Mechanics, Paints | c | 1 |
| 6 | Cleaning | f | 1 |
| 1 | Fire master | d | 3 |
| 2 | Fire fighters | e | 3 |
| 206 | Total manpower per day | | |

2.5. Department IV

| | | | |
|---|---|---|---|
| 1 | Manager, technologies | a | 1 |
| 1 | Assistant to manager | b | 1 |
| 1 | Secretary to manager | b | 1 |
| 1 | Chief chemist Raw Material and Finished products control | b | 1 |
| 3 | Assistants to chief chemist | b | 1 |
| 1 | Application chief engineer | b | 1 |
| 5 | Assistants to chief engineer | c | 1 |
| 1 | Research engineer | a | 1 |
| 3 | Chemists | b | 1 |
| 2 | Assistants | c | 1 |
| 19 | Total manpower per day | | |

2.6. Summary of manpower

| | |
|---|---|
| The General Management | 4 persons |
| The Department I (Administration) | 55 persons |
| The Department II (Sales & Marketing) | 19 persons |
| The Department III (Production) | 206 persons |
| The Department IV (Technologies) | 19 persons |
| Total manpower for one day of 24 hrs | 303 persons |

3. Foreign Manpower

It will be required during the first period of production for the training of locally recruited personnel. The costs for such foreign personnel shall be included in the scope of the general contractor; the costs are visualized in Chapter IX, page 60 (Implementation).

## IX. IMPLEMENTATION SCHEDULING

A project of this magnitude shall be realized within approx. 30 months. An approximate time diagramme with key activities is enclosed hetero. It must be the responsibility of the general contractor to keep up with the implementation schedule.

The split of duties within this project (eg. license, equipment, service, engineering, erection, startup) into individual orders and responsibilities will lead to a delay in completion, difficulties in judgement ofresponsibilities, friction between the individual suppliers and subsequently it will lead to higher implementation costs.

### 1. Implementation costs

| | | |
|---|---|---|
| a) Purchase of Land (Chapter VI para 5) | | SyL 3.000.000,- |
| b) Supervision of civil works, site management (provided by Gen. Contractor) | US$ 300.000,- | |
| c) Erection of equipment, piping, testing (provided by Gen. Contractor) | US$ 1.500.000,- | |
| d) Startup and commissioning (provided by Gen. Contractor) | US$ 200.000,- | |
| e) Training of customers specialists at Licensers facilities (provided by Gen. Contractor) | included in Know-How costs Chapter VI para 2.4.d | |

### 2. Arrangement of financing

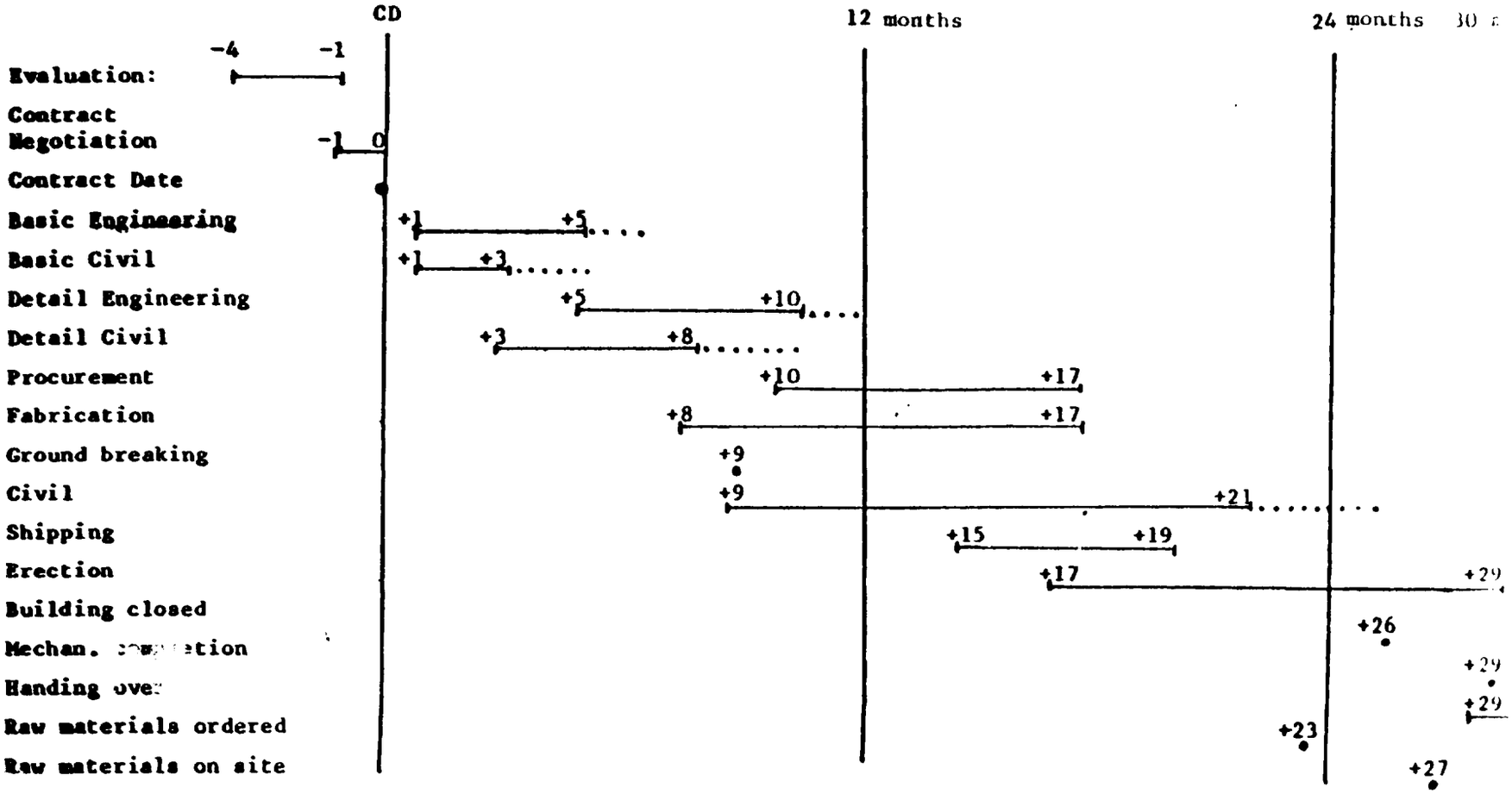
The import of services, equipment and technology will be financed by an international loan the details of which are not the subject of this report.

A General Contractor will make his financial concept on the basis that the full contractual amount is paid to him upon the date of commissioning, whereas a guarantee bond over a certain period is subject to an agreement between the Government and the General Contractor.

Guarantee on equipment shall not be less than 1 year after handover.

The General Contractor will request a certain payment scheme which to the opinion of the experts and according to internationally applied practise could be the following:

| | | |
|---|---|---|
| 20% | Downpayment at contract date (CD) | |
| 20% | Upon start of fabrication of equipment | : 10 months after CD |
| 10% | After shipping of key equipment | : 19 months after CD |
| 15% | After 50% of erection is completed | : 24 months after CD |
| 15% | At date of mechanical completion | :: 29 months after CD |
| 20% | At handover (commissioning) date | : 30 months after CD |
| 100% | total contract value | |




3. Time diagramme of project implementation

# X. FINANCIAL ANALYSIS

The financial analysis of the project is done in several major steps. First, cost estimates will be examined both for investment and for operation. Next, sales revenues have to be assessed and compared with costs. This will allow to develop a proper financial plan for the project based on careful examination of all sources and allocations of funds. Finally, routine financial statements will be prepared and familiar measures of commercial profitability will be computed. At the end of this chapter some elements of risk analysis will be presented; specifically sensitivity analysis will be run for most important parameters.

All calculations have been done on COMFAR (Computer Model for Feasibility Analysis and Reporting) at UNIDO Headquarters in Vienna and all relevant printouts are attached to this report in Appendix 1.

## 1. Total investment costs

Total investment costs can be divided into initial investment and investment during production,and these in turn can be split into fixed investment, pre-production capital expenditures and working capital. Initial fixed investment includes expenditures for:

- Land
- Site preparation and development
- Structures and civil works (including engineering and supervision)
- Plant machinery and equipment, auxiliary and service equipment and storage facilities
- Incorporated fixed assets.

### 1.1. Land

It has been mentioned already that PCI has the possibility to select between 2 alternative sites, both located approx. 20 km south of Damascus, near the village of Kisway.

Both sites are not ideal from techno-economic point of view, their disadvantages being discussed in Chapter V. AL MANEE would require high expenses for site preparation because of rocky soil and slopy terrain, also water supply there is insufficient. AL MAJDIACH in turn would have to be purchased from a private land-lord and the price can be high because an agricultural production there would have to be foregone. For both sites transport of raw materials have to be done over a long distance by road, which would mean an excessive exposure of sensitive chemicals to the sunshine, high temperature and mechanical shocks.

However, unless a different decision is taken, the experts have to take into consideration one of the above mentioned sites.

The total required area will be approx. 120.000 m² (see Chapter V). The prices of land in Syria for industrial purposes vary at present between 15 and 35 SyL /1 m². Despite the fact that the site AL MANEE is already PCI's property, a reasonable land price of 25 SyL /m² has been applied by the experts for the purpose of this study. Therefore the total cost of land of 3.000.000 SyL has been assumed.

1.2. Site preparation and development

Normally the rule "the cheaper the land, the higher the costs for site preparation and development" holds. These costs in Syria range from 5 to 15 SyL per 1 m². (E.g. PCI estimated that ca SyL 3 mln will be needed to prepare and develop AL MANEE with a size of 200 000 m². This yields a unit cost of 15 SyL /m²). As AL MANEE is not a recommendable site, a rate of 10 SyL /m² is applied to estimate main components of the costs. In addition, two drillings (200 m and 300 m deep) were made already in AL MANEE and four drillings (each 80 m deep) in AL MAJDIAH for a cost of 1.000 SyL /m. Hence, total cost of drillings amounts to SyL 820.000,-

For unforseeable events an amount of 480.000 SyL is provisioned, raising the total for the site preparation and development to SyL 2.500.000,- This amounts to 0,9% of total initial investment cost. A deviation of ± 15% will have no sizable effect on the economic viability of the project.

1.3. Structures and civil works (including engineering and supervision)

As it has been stressed elsewhere this project definitely must be executed only under the responsibility of a single contractor who will be the only liable party . Otherwise responsibility will be passed around and it might be difficult or even impossible to make a contractor legally liable. 1/ Three main items enter this cost:

- Supervision of civil works and site management: 2/

  The civil works itself will be executed and supplied by a local contractor. But this must be done under the supervision of the general contractor. The costs of this supervision are estimated to be US$ 300.000 (Sy L 1.635.000).

- The general contractor has to provide the engineering services for the civil works: 3/
  plot layout, architectural concept, layout and construction drawings, dynamic and static calculations, bill of quantities, etc.

The costs for this are estimated to be US$ 300.000 (Sy L 1.635.000).

- Cost estimates of civil work (structures, buildings):

  The total costs are approx. Sy L 29.880.000. A detailed explanation and break down can be found in Chapter VI, pages . This estimate is based on the fact, that at present an average unit cost per m² for a factory in solid concrete/steel structure is Sy L 1.500/m².

Nevertheless before signing the contract the fixed price offered by the local contractor should be compared with the assumed costs of Sy L 29.880.000. If it is higher than 10% PCI should ask UNIDO to run a new financial calculation.

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1/ See Chapter I para.5.

2/ See Chapter IX, para. 1.2.

3/ See Chapter VI, para. 5.3.

About 25% of the value will be indirectly of foreign origin. As the execution of work and the material will be provided by a local construction company (contractor), the costs are assumed to be 100% local.

The lenght of construction phase is planned to be approx. 30 months (2 1/2 years), see Chapter IX.

1.4. Plant machinery and equipment, auxiliary equipment and storage facilities.

Prices and other technical and economic parameters for machinery and equipment have been estimated by the experts on the basis of their general orientation in the market. Unfortunately prices given in offers obtained by the Syrian government for the supply of the equipment had not been disclosed and the experts had to make their own judgements. It must be kept in mind, however, that since all costs are related to a particular Know-How, a final selection of a technology may introduce some minor changes in the cost structure suggested below.

Four production lines were envisaged:

- Alkyd resin: 21400 t/y (70% solid), 300 days/year, 3 shifts
- PVA dispersion: 14400 t/y (54% solid), 300 days/year, 3 shifts
- Alkyd and industrial paint: 4100000 US gal/year, 300 days/year, 1 shift
- PVA paint: 2700000 US gal/year, 300 days/year, 1 shift.

The estimated cost of the production equipment is US$ 9.5 mln ex factory, a cost of Know-How not included. In addition, an auxiliary equipment must be purchased, including transport equipment, power and steam generators, water supply and treatment plant, compressors, workshop, laboratory, communication systems, heating, ventillation, waiste disposal, packing and loading - as specified in detail in Chapter VI.

Cost of storage facilities has been entered as a separate line to visualize its relatively high value. This is due to specific requirements by PCI as to a very large amount of raw materials stock to be maintained throughout the whole life period of the project. As a result the cost of storage facilities amounts to ca 50% of the production equipment cost.

The transport equipment will include trucks, cars, fork lifts and manual pallet movers. Together with other auxiliary equipment it will amount to ca US$ 13 175 000 ex factory, and major part of this will imported. Some parts of transport equipment are available locally and therefore PCI does not need to pay customs and other fees, normally required for import supplies. In addition to that, if the existing transport equipment of PCI, now being in operation, can be partly used and partly sold, the PCI can save investment costs of approx. Sy L 1 450 000.

Service equipment, includes furniture and some components of office equipment procured locally at the price of Sy£ 1 mill. with the rest

of the office equipment to be imported for the amount of SyL 930 000.

In the table below a break-down of the total cost of machinery and equipment is given, including additional expenses for transportation, insurance, customs and taxes. The estimated cost of the equipment (production, auxiliary and service) amounts to SyL 168 530 000, which is more than 60% of the total initial investment cost.

Table 10.1. Cost of machinery and equipment in 1 000 SyL or 1 000 US$.

Table (see next page)

It is clear from the above, that due to a high proportion of the cost of equipment in the total investment, even a minor price increase can have a considerable impact on the overall prifitability of the venture.

It is suggested, that if the cost of equipment will turn out to be higher by 10% or more, PCI Co. should ask UNIDO to run a new financial calculation.

Table 10.1. Cost of machinery and equipment (in 1 000 Sy L or 1 000 US$)

| Type of the equipment | Price ex-factory US$ | Transport FOB US$ | Transport[2] (C & F) Sy L | Subtotal 2+3+4 Sy L | Custom 1% Tax 6% Insur. 1,2% Sy L | Total (3, 4) Sy L | of it foreign Sy L |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| I. Production equipment | | | | | | | |
| 1.1. Alkyd resin plant | 5.500 | 165 | 750 | 31.625 | 2.600 | 34.225 | 30875 |
| 1.2. PVA dispersion plant | 2.000 | 60 | 275 | 11.502 | 942 | 12.444 | 11.227 |
| 1.3. Alkyd paint plant and PVA paint plant | 2.000 | 60 | 275 | 11.502 | 942 | 12.444 | 11.227 |
| II. Auxiliary equipment transport, utilities etc.[1] | 13.175 | 360 | 1.635 | 75.397 | 5.667 | 81.064 | 73.762 |
| III. Raw materials and intermediate products storage facilities | 4.500 | 135 | 615 | 25.876 | 2.123 | 27.999 | 25.261 |
| IV. Service equipment | - | - | - | - | - | 354 | 171 |
| Total | 27.175 | 680 | 3.550 | | | 168.530 | 152.523 |

1/ of it Sy L 6 400 000 is the cost of locally purchased transport equipment

2/ Probably with Syrian Shipping Company MAR

3/ Applied official exchange rate: 5,45 Sy L /1 US$

4/ Includes transport in Syria.

1.5. Incorporated fixed assets

As it was mentioned in Chapter VI, the estimated cost of the Know--How for the purpose of this study is assumed to be US$ 3 750 (SyL 20 440 000).

1.6. Pre-production capital expenditures

In this project the pre-production expenses include the following items::

a) Erection of the equipment, piping, testing (provided by general contractor,(see Chapter IX) - US$ 1 500 000,-

b) Start-up and commissioning (see Chapter IX) - US$ 200 000,-

c) Personnel costs (travelling, per diem, training fees), product promotion costs, material and utilities for test runs - SyL 6 000 000,-

d) Interest during pre-production at 9% - SyL 23478 240,-

Total - SyL 38 743 240,-

1.7. Working capital

The working capital requirements for the production phase are calculated by COMFAR programme where it is assumed that the working capital must be made available in the first year of production. In reality, however, some expenses might occur already in the last half year of construction period to cover the necessary raw material stock. As it will be paid a latter of credit it may require some effective payments before the production starts.Nevertheless it has been assumed for simplicity that the only working capital component to be provisioned during the investment phase is a purchase of a selected and well sorted stock of spare and ware parts and special tools. The value of this inventory is estimated at US$ 1 500 000 (see Chapter VI). This equals approx. SyL 9 340 000 including customs, unified tax, transport and insurance. It is assumed that this initial amount of spares will be used completely during the life period of the project.

For the purpose of COMFAR programme calculations, some assumptions have been made as to minimum coverage periods (in days) for all current assets and liabilities. The complete schedule for Working Capital requirements given in Appendix 1 (COMFAR Schedules).

1.8. Investment during production

No replacements for plant machinery and equipment are foreseen in the production period. It is planned, however, that a certain part of the transport equipment to be used in the new plant will be transferred from the existing plant. This old equipment, which accounts for approx. 20% of the initial value of all transportation means, will have to be replaced in the sixth year of operation at a cost of SyL 1 250 000. The remaining part of the transport equipment will be purchased brand new and is expected to operate for 10 years. Therefore this equipment will have to be replaced in the 11th year at cost of SyL 5 150 000.

1.9. Investment cost - summing up

The schedule containing total investment costs is given below. It is apparent that the project will initially cost ca SyL 295 mill. which is to be spent over a period of 30 months. The proportion of foreign

Table: Total investment cost

| Description | Pre-production | | | Production | | |
|---|---|---|---|---|---|---|
| | Local in SyL '000 | Foreign in SyL '000 | Total in SyL '000 | Local in SyL '000 | Foreign in SyL '000 | Total in SyL '000 |
| 1. Land | 3000 | - | 3000 | - | - | - |
| 2. Site preparation and development | 2500 | - | 2500 | - | - | - |
| 3. Buildings and civil works | 29880 | 3270 | 33150 | - | - | - |
| 4. Production equipment | 5784 | 53329 | 59113 | - | - | - |
| 5. Auxiliary equipment | 7302 | 73762 | 81064 | - | 6300 | 6300 |
| 6. Storage facilities | 2738 | 25261 | 27999 | - | - | - |
| 7. Service equipment | 183 | 171 | 354 | - | - | - |
| 8. Incorporated fixed assets | - | 20440 | 20440 | - | - | - |
| 9. Total fixed investment (1 - 8) | 51387 | 176233 | 227620 | - | 6300 | 6300 |
| 10. Pre-production expenditures | 6000 | 9265 | 15265 | - | - | - |
| 11. Interest during construction | 23487 | - | 23487 | - | - | - |
| 12. Initial working capital | - | 9340 | 9340 | - | - | - |
| 13. Total investment (9 - 12) | 80877 | 194838 | 275712 | - | 6300 | 6300 |

currency inputs will be ca 70%, indicating that the project will rely heavily on imported equipment and services. A high share of foreign components raises also a vital issue of sensitivity of the project to unexpected changes of the foreign exchange rate. Throughout the study an parallel rate of 5,45 SyL /1 US$ has been applied, but it must be stressed that unofficial rate is much higher, perhaps between 11 and 12 Sy L /US$.

The dependence of the project performance on foreign exchange rate variations will be examined further within the scope of sensitivity analysis. At this point however, the experts have decided to use the official rate, for the following reasons::

- PCI as a government-owned company can expect to be charged the official rate for the foreign currency needed for imports
- Even if the parallel rate was not realistic, there would be extremely difficult to determine the appropriate "shadow" exchange rate, and its consistent application for this study would raise a lot of methodological and practical questions.

## 2. Total production costs

Total production costs include the following six major categories:

Factory Costs including the following sub-items:

a Materials, utilities, energy

b Manpower (direct for production)

c Maintenance (except labour), wear and tear parts

d Factory overheads

Administrative Overheads

a Labour

b Other costs

Marketing/Distribution Overheads

a Labour

b Other costs (indirect)

Financial Costs

Depreciation

### Factory Costs

The main bulk of costs in producing paints and intermediates like alkyd resin and PVA are the raw material costs.
Appendix 9, page compares the cost structure of PCI's existing paint production plant with the new plant under evaluation.
This comparison reveals clearly the dominance of raw material costs (year 1993: 74,7%, new plant). Depreciation (year 1993: 12,1% new plant) is of next importance followed by financial costs (year 1989: 11,8%, year 1993: 4.1%), labour (3.5%), marketing overheads (exc. labour, 2,3%), factory overheads (exc. labour, 2.5%), spares (1.4%), administrative overheads (exc. labour, 1.2%), energy and utilities (0.6%) (see COMFAR Schedules, Appendix 1).

### 2.1. Raw material, utilities and energy

The following costs per unit of product has been calculated and are used in the COMFAR model. A detailed calculation can be found in Appendix 10 (for raw material) page and Appendix 11 (for energy and utilities) page :

costs per unit of product in Sy L

| Product | | unit | raw material foreign | raw material local | inter-mediates | energy/utilities foreign | energy/utilities local |
|---|---|---|---|---|---|---|---|
| Alkyd resin (70% solid) | | 1 t | 3 354 | 465 | - | - | 47.2 |
| PVA dispersion (54% solid) | | 1 t | 2 834 | - | - | - | 23.0 |
| Alkyd paint (decorative, industrial) | (1) | 1 t | 2 250 | 292 | 2 616 | - | 31.0 |
| | | 1000g | 10 260 | 1 332 | 11 932 | - | 141.5 |
| PVA paint | (2) | 1 t | 1 342 | 115 | 635 | - | 17.3 |
| | | 1000g | 7 355 | 630 | 3 479 | - | 94.8 |

(1) Alkyd resin at a cost of 4360 Sy L /t

(2) PVA at a cost of 3173 Sy L /t

g US gallons

Sources:

Chapter Iv.5.7., cost estimates and material flow charts

Chapter IV.4.4., production losses

Experts own investigations on insurance costs, customs, unified tax, fees, transport costs. These informations were gathered in PCI, GECI and Ministry of Finance (see Annex VIII, IX).

All raw material costs are calculated with 1% customs duties and 6% unified tax for imported material (basis: invoice value) which are minimum rates.

Annex 4 page lists considerably higher rates for selected material which will be used in paint industry. But it has been (according to PCI and GECI) the rule that materials which will be industrially processed in Syria can be imported at the minimum rates for duties (1%) and unified tax (6%).
PCI is supposed to insure its imports with a Syrian insurance company. It has to be remarked that the rates (1.66% for materials in drums, 3.77% for materials in bags) are considerably higher than those internationally applied.

## 2.2. Manpower costs for production

The personnel costs for production consist of two parts:

- direct personnel costs for employees which are manufacturing the products
- indirect personnel costs for employees which have a managerial or service function in the production department

The direct personnel costs are not considered as to be variable.

This is based on three findings:

- PCI employs at present about 125 workers in the production department. In the new factory with two additional product lines the number of direct production workers (foremen, skilled workers, helpers) should be 166.
  Only 73 of them will produce paints.

- In the first years the employees will have to learn how to run the new factory. Overmanning will only be numerical.

- Normally employees are not fired when production decreases.

To calculate both direct and indirect personnel costs for production the data from Chapter VIII have been used for number of personnel required and level of wages and salaries for particular posts and qualifications.

The following figures have been obtained (in Sy L per year).

| | Number of employees | Amount of costs |
|---|---|---|
| 1. General management | 4 | 57 600 |
| 1.1. General director*) | 1 | - |
| 1.2. Deputy general director*) | 1 | - |
| 1.3. Secretaries | 2 | 57 600 |
| 2. Department I (Administration) | 54 1/3 | 1 276 800 |
| 2.1. 9 x code b | 9 | 259 200 |
| 2.2. 10 x code c | 10 | 240 000 |
| 2.3. 24 x code e | 24 | 518 400 |
| 2.4. 10 x code f | 10 | 216 000 |
| 2.5. 1 1/3 x code a | 1 1/3 | 43 200 |
| 3. Department II (Marketing & Sales) | 19 | 498 000 |
| 3.1. 1 x code a | 1 | 32 400 |
| 3.2. 7 x code b | 7 | 201 600 |
| 3.3. 11 x code c | 11 | 264 000 |
| 4. Department III (Production) | 206 | 4 542 000 |
| 4.1. 1 x code a | 1 | 32 400 |
| 4.2. 5 x code b | 5 | 144 000 |
| 4.3. 19 x code c | 19 | 456 000 |
| 4.4. 12 x code d | 12 | |
| 4.5. 83 x code e | 83 | 3 909 600 |
| 4.6. 86 x code f | 86 | |
| 5. Department IV (Technology) | 19 | 520 800 |
| 5.1. 2 x code a | 2 | 64 800 |
| 5.2. 10 x code b | 10 | 288 000 |
| 5.3. 7 x code c | 7 | 168 000 |
| Total: | 302 1/3 | 6 895 200 |
| + 13% contingency | | 7 800 000 |

*) Included in overhead costs

The planned direct (but not variable) and indirect personnel costs for production have been increased by a contingency of 13% to avoid an underestimation of these costs. In the following two tables a detailed structure of personnel cost is given for particular departments. The number of employees and their qualifications required have been taken from the manning table, derived in Chapter VIII.

Table I summarizes number and cost of employees for three departments

- administration, marketing and sales, technology, and also for general management.

Table II gives a similar information for the production department. Corresponding figures in particular tables may differ slightly because of rounding.

To calculate separately direct and indirect personnel cost the following assumptions have been adopted:

a) Direct manpower embodie's personnel employed in Dept. III, except for production overheads, i.e.:

| | | | |
|---|---|---|---|
| - Alkyd resin | : | 65,5 men at cost | 1 602 750 |
| - PVA | : | 28,5 men at cost | 699 650 |
| - Alkyd paint | : | 45,5 men at cost | 1 114 650 |
| - PVA paint | : | 28,5 men at cost | 699 650 |
| | | Total direct manpower (incl. 13% contingency) | 4 116 700 |

b) Indirect cost embodie's cost of personnel employed in Depts II (Marketing and Sales) and IV (Technology) and also production overheads from Dept. III (Production).

| | | |
|---|---|---|
| - Department II | - 19 men at cost | 562 800 |
| - Department IV | - 19 men at cost | 588 500 |
| - Prod. overheads (Dept.III) | - 38 men at cost | 1 015 700 |
| | Total indirect manpower (incl. 13% contingency) | 2 167 000 |

This amount will be entered into the category "factory overhead cost"..

c) Administration and management cost include cost of personnel employed in Department I (Administration) and in the office of General Director.

| | | |
|---|---|---|
| - Dept. I | - 55 men at cost | 1 442 800 |
| - General Management | - 2 men at cost | 65 100 |
| | Total administration personnel (incl. 13% contingency) | 1 507 900 |

This amount will be entered into the category "administration overheads".

Personnel cost-table I

| Qualification: code description | General Management No. | pers.costs | Department I ADMINISTRATION No. | pers.costs | Department II MARKETING & SALES No. | pers.costs | Department IV TECHNOLOGIES No. | pers.costs |
|---|---|---|---|---|---|---|---|---|
| General director | 1 | included in | | | | | | |
| Deputy Gen.Director | 1 | overhead costs | | | | | | |
| a University education | - | | 1<br>1/3 | 32 400<br>1o 8oo | 1 | 32 400 | 2 | 64 8oo |
| b Technical or commercial education (recognized inst.) | 2 | 57 6oo | 9 | 259 2oo | 7 | 2o1 6oo | 1o | 288 ooo |
| c Technical or commercial education (training or practice) | - | | 1o | 24o ooo | 11 | 264 ooo | 7 | 168 ooo |
| d Specialists with industrial experience | - | | - | | - | | - | |
| e Skilled workers | - | | 24 | 518 4oo | - | | - | |
| f Unskilled workers | - | | 1o | 216 ooo | - | | - | |
| Total | 2 | 57 6oo | 55 | 1 276 800 | 19 | 498 000 | 19 | 52o 8oo |
| incl. 13% contingency | | 65 1oo | | 1 442 800 | | 562 800 | | 588 5oo |

Source: Manning table, chapter VII.
ANNEX 12 containing the breakdown and calculation of personnel costs per qualification level

Personnel cost-table II

| Qualification code description | Production-overhead | | Department III PRODUCTION | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Alkyd resin | | PVA | | Alkyd paint | | PVA pain | |
| | No. | pers.costs | No. | pers.costs | No. | pers.costs | No. | pers.costs | No. | pers.co |
| General Director Deputy Gen.Director | | | | | | | | | | |
| a University education | 1 | 32 4oo | - | | - | | - | | - | |
| b Technical or commercial education (recognized inst.) | 3 | 86 4oo | 1 | 28 8oo | | | 1 | 28 8oo | | |
| c Technical or commercial education (training or practice) | 19 | 356 ooo | - | | - | | - | | -- | |
| d Specialists with industrial experience | 3 | 64 8oo | 2 | 43 2oo | 1 | 21 6oo | 5 | 1o8 ooo | 1 | 21 6oo |
| e Skilled workers | 6 | 129 6oo | 21 | 453 6oo | 9 | 194 4oo | 26 | 561 6oo | 21 | 453 6oo |
| f Unskilled workers | 6 | 129 6oo | 42 | 9o7 2oo | 18 | 388 8oo | 14 | 3o2 4oo | 6 | 129 6oo |
| Total | 38 | 898 8oo | 65 +1/2 | 14o4 ooo | 28 +1/2 | 6o4 8oo | 45 +1/2 | 972 ooo | 28 +1/2 | 6o4 8oo |
| including 13% contingency | | | | 28 8oo | | | | 28 8oo | | |
| | | 1o15 7oo | | 1586 5oo | | 683 4oo | | 1o98 4oo | | 683 4oo |
| | | | | 32 5oo | | | | 32 5oo | | |

Source: see Personnel cost-table I

As a result, the following manpower cost structure is obtained (figures have been rounded for simplicity)

| | |
|---|---|
| Direct manpower | 4 120 000 Sy L |
| Indirect manpower | 2 170 000 Sy L |
| Administration | 1 510 000 Sy L |
| Total manpower | 7 800 000 Sy L |

2.3. Maintenance and repair

This category includes only the cost of spare, wear and tear parts. The cost of own trained personnel is already included in the indirect cost of production (this cost amounts to Sy L 385 000 per year, incl. 13% contingency).

Initial stock of spare parts is Sy L 9 340 000 (see para. 1.3. of this chapter) and it is assumed that annual consumption at the beginning of operation will be ca 20% of the initial stock, i.e. Sy L 1 868 000 per year.

It is also estimated by the technical expert that in the first year the consumption of wear and tear parts will be ca 5% of the initial stock of spares, i.e. Sy L 467 000,-

Over 10 first years of operation consumption of spares, and wears will increase gradually by ca Sy L 187 000 per year. Therefore annual costs of spares and wears can be summarized as follows (in Sy L '000)

| Year of production | Cost of spares, wears & tears consumption: spares | wears & tears |
|---|---|---|
| 1 | 1 868 | 467 |
| 2 | 2 522 | |
| 3 | 2 709 | |
| . | . | |
| . | . | |
| . | . | |
| . | . | |
| 11 - 15 | 4 205 | |

2.4. Factory overheads

The factory overheads costs include the following items:

- Insurance cost (building, equipment, raw materials, intermediates, work-in-progress);
- Running costs for transportation equipment;
- Fuel for heating:
- Electricity (not for production);
- Tools;

- Office utilities and services;
- Various fees;
- Materials for Technology Department;
- Training costs for staff.

The total cost for these items has been estimated at SyL 5 500 000 per year.

After having added the cost of indirect personnel (see previous paragraph) of 2 170 000, a final amount for factory overheads is obtained of: Sy L 7 670 000,- per year.

2.5. Administration overheads

They include:

- office utilities;
- communications;
- insurance;
- running costs for cars and transportation;
- electricity and fuel;
- repair cost;
- travelling;
- miscellaneous.

In addition cost of administration personnel is entered into this category and the following amount for administration overheads is obtained

| | | | |
|---|---|---|---|
| Non-labour | 2 600 000 | Sy L | |
| Labour | 1 510 000 | Sy L | |
| Total | 4 110 000 | Sy L | per year |

2.7. Financial costs

They include interest payments on loans. The financial plan of the project is presented in para. 4 of this chapter. It can be seen from there, that assuming 9% interest, financial cost ranges from Sy L 20 900 300 in 1989 (first year of production) to Sy L 2 985 750 in 1995. For details see paragraph 4.

2.8. Depreciation

In Syria depreciation rates for fixed assets are subject of government regulations. In the case of the project under evaluation, the following rates apply:

- Site preparation and development - 10%
- Engineering services - 10%
- Buildings and civil works - 3%
- Plant machinery & equipment - 5%

| | |
|---|---|
| - Storage facilities | 6,67% |
| - Auxiliary and service equipment | 10 % |
| - Licence and Know-How | 20 % |
| - Supervision of erection | 20 % |
| - Pre-production expenses | 20 % |

Straight line depreciation plan is used and corresponding depreciation values have been calculated by COMFAR programme. They vary from Sy L 26 275 080 in 1989 to Sy L 4 820 630 in 2003.

For the purpose of COMFAR calculations, the depreciation has been split among products proportionally to the value of machinery and equipment engaged in particular product lines, i.e.

58% - alkyd resin
21% - PVA dispersion
11% - alkyd paints
10% - PVA paints

100% - Total depreciation

2.9. Distribution of costs among products

The structure and availability of basic data have not allowed for a detailed decomposition of costs among four main products. It has been assumed for COMFAR calculation that only cost of direct raw materials, utilities and manpower would be attached to particular products. Remaining cost items are integrated for the whole plant.

## 3. Sales revenues

3.1. Amount of sales

Both volume of output and selling prices for four products have been determined in Chapter III, paragraphs 4 and 5. On the basis of those data the amount of sales revenues for full capacity level utilization can be summarized as follows:

| | Output sold outside | Selling price Sy L per unit | Net sales revenues in Sy L '000 |
|---|---|---|---|
| a) Alkyd resin 70% solid, t/y | 10 180 | 5 229 | 53 231,2 |
| b) PVA dispersion 54% solid, t/y | 11 425 | 3 468 | 39 621,9 |
| c) Alkyd paints locally sold, '000 US gallons | 4 100 | 50 094 | 205 385,4 |
| d) PVA paints '000 US gallons | 2 700 | 22 790 | 61 533,0 |
| | | Total sales p/y in Sy L '000 | 359 771,5 |

3.2. Direct sales costs

It must be noted that sales revenues are calculated at net selling prices, and all sales costs are not included. However for the sake of completeness of the analysis, these costs are briefly discussed below.

a) Taxes

No sales taxes have to be paid in Syria for paints and intermediate products.

b) Commissions

Since October 1984 PCI distributes 96% of its production via OMRAN.
OMRAN is a state owned distribution organization for building materials and belongs to the MINISTRY of SUPPLY. OMRAN gets 7% commission from the FOB price and bears the transport costs. Only the paints required by companies which belong to the MINISTRY of INDUSTRY are sold by PCI directly to these customers. They do not get a commission or discount. Prices are FOB customers truck.

c) Packaging materials

For the different PCI products the following packaging will be mainly used, especially at the beginning :

| Product | type of packaging | costs per t or US gallon |
|---|---|---|
| Alkyd resin | 200 kg steel drum Sy L 175,-/drum | SyL 875,-/t |
| PVA | 120 kg, 50 kg, 30 kg plastic drums | SyL 500,-/t (estimated only) |
| Alkyd paint (local) | 1 US gal. can | Sy L 3.25/US gal. |
| Alkyd paint (export) | 240/200 kg steel drum Sy L 175,-/drum | Sy L 875,-/t |
| PVA paint | 1 US gal. can | Sy L 3.25/US gal. |

d) Transport/distribution costs

Only for the export transport costs have to be beared by PCI.

The delivery terms are normally FOB Latakia/Tartus:

| | |
|---|---|
| custom fees | Sy L 16/t |
| sealing of containers | Sy L 153/t |
| transport | Sy L 75/t |
| | Sy L 244/t |

For simplicity all the respective cost elements are deducted from price ex factory or FOB price.
Therefore net sales prices (gross sales prices minus direct sales costs) are applied throughout the whole study.

Possibilities to reduce direct sales costs are not considered in calculation but PCI should make use of it in reality:

- selling alkyd resin/PVA in containers
- using reconditioned drums
- selling the surplus of reconditioned drums

## 4. Financial plan

### 4.1. Sources of finance

The project will be financed partly by equity capital and partly by local loan. PCI expects to be able to provide approx. 20 000 000 SyL as equity, which is called retained income for investment purposes. For the rest of investment outlays (ca 93%) no clear financing plan has been provided by the Syrian authorities involved. The main idea suggested by PCI was that the balance will come from government investment funds at 9% interest. In the experts' opinion such a capital structure will make debt/equity ratio for the company excessively high and will result in substantial debt service payments in the operation period.

In addition to the approx. needed SyL 275 millions for the initial fixed investment, there might be a need to fill up the initial raw material stock (working capital) of SyL 43 millions during the last half year of the investment phase. This would increase the debt/equity ratio even more, and may make the company highly vulnerable to future variations of sales revenues.

Under normal conditions this capital structure could be hardly accepted by outside sponsors and they would probably insist that it should be changed to increase the proportion of equity capital or at least to soften conditions of borrowed capital. In most cases the debt/equity ratio of 75/25 is regarded as maximum. However in this particular case such an unusual capital structure could be accepted mainly because the Syrian government is supporting the project and the main promoter, PCI Co., is a government-owned enterprise. Moreover, as it is shown further by financial analysis of cash-flow and balance sheets, the project is financially viable and the liquidity is secured throughout the whole life period.

In COMFAR calculations it has been assumed that the equity of 20 000 000 SyL will be available from the very beginning of the implementation phase, whereas the loan will be extended subsequently from the second half year period onwards according to needs. This means that assumed debt/equity ratio is ca 90/10.

### 4.2. Payment scheme

The general contractor will request a certain payment scheme which - to the opinion of the experts and according in internationally applied practise - could be the following:
(see also technical report, Chapter IX)

| | | No of half year period |
|---|---|---|
| 20% Downpayment at contract date (CD) | | 1 |
| 20% Upon start of fabrication of equipment | : 10 month after CD | 2 |
| 10% After shipping of key equipment | : 19 month after CD | 3 |
| 15% After 50% of erection is completed | : 24 month after CD | 4 |
| 15% At date of mechanical completion | : 29 month after CD | |
| 10% At handover (commissioning) date | : 30 month after CD | 5 |

100% total contract value

It is suggested that this scheme will be applied to pay:[1)]

a) Engineering for civil works, supervision (foreign, local) of civil works, site preparation and development

b) Civil works (local)

c) All plant, utility/auxiliary equipment and storage facilities (foreing)

d) Erection of equipment by general contractor (foreign)

The costs for start up and commissioning (SyL 1 090 000) should be paid after the (successful) test runs.

For simplicity and to have a certain freedom in organizing funds and in financing the same time schedule as above is used in the model for these payments.

The time schedule for all payments during the investment (construction) phase can be found in COMFAR Schedules 1 and 2.

4.3. Repayment of loan

It has been assumed in the basic version that the loan will be repaid over 7 years in equal annual installments with decreasing interest paid annually at the end of the year on outstanding balance. No grace period has been assumed, i.e. repayments start in the first year of production (1989). The specific amounts of the debt service are calculated by COMFAR programme (see Appendix 1).

## 5. Financial evaluation

Financial evaluation of an industrial project requires the preparation of three main financial statements - projected balance - sheet, projected net income statement and cash-flow table. These documents have been calculated by COMFAR programme and are presented in form of familiar schedules (see Appendix 1). In addition, several important measures of financial (commercial) profitability have also been calculated by COMFAR, i.e. internal rate of return on investment (IRR), internal rate of return on equity (IRRE) and net present value of the project (NPV).

5.1. Balance sheet

The capital structure of the project is dominated by extremely high proportion of debt financing; the ratio of equity to all liabilities (long - and short term) is very low throughout the whole operation period varying from 5% to 8 %. In spite of this financial position of the company seems to be healthy enough, mainly due to high retained profits accumulated during first three years.

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1) This regulation has to be achieved by negotiations

Fixed assets amount to SyL 240 mill. at the beginning of operation decreasing gradually to SyL 43 mill. at the end. High proportion of total assets is immobilized in inventories; their value reaches the level of SyL 71 millions. In the debt structure central position is taken by long term loan, and after it is repaid, assets are covered mainly by retained profits with negligible proportion of short term liabilities.

5.2. Net income statement

Net income statement reveals that gross taxable profit yielded by the project constitutes a substantial portion of sales revenues (more than one third for full capacity). In terms of net profit the project is viable from the first year of operation throughout. From the fourth year onwards the corporate tax is paid, reducing annual profits from SyL 76 millions to ca SyL 20 millions, but this amount still represents comfortable 5,5% of sales. One could notice, that if the tax rate could be reduced from extremely high level of 84,5%, the net profit after tax would secure the annual rate of return on invested capital of ca 15 - 18%, which would be satisfactory by any standards.

5.3. Cash-flow table

Cash-flow table compares financial inflows and financial outflows connected with the project in particular years. It can be seen that outflows are matched by inflows in all but three years. In the first year the build-up of inventories requires temporary loan financing of approx. SyL 19 millions in form of bank overdraft. This amount could be reduced substantially, if required stock of raw materials were fixed at lower level and also minimum coverage period for accounts payable were increased. The deficit of funds which appears in years six and seven is due to a coincidence of high debt repayments and corporate tax obligations and is covered from cumulated cash balance. No extra loan is required.

When cumulated net cash-flow is examined it is seen that it turns positive in the fourth year of operation and this means that a pay-back period for the project is four years. When cash-flows are analyzed in terms of origin, it is seen immediately, that the project is a heavy consumer of foreign currency. Imported equipment and overwhelming reliance on imported materials produce as a result a continuous deficit of foreign exchange, rising from ca SyL 50 millions per year during construction to almost 190 millions at full capacity operation level. This is definitely one of the weakest points of the project.

5.4. Ratio analysis

It is always a good practice to examine financial ratios for a project, but this kind of analysis gains a particular importance in our case, because of the unusual capital structure proposed for the project under review. There are essentially four types of financial ratios:

- Profitability ratios
- Capital structure ratios
- Liquidity ratios
- Debt service ratios.

Profitability ratios have been discussed earlier (see para. 5.2. - Net Income Statement). Both "gross profit to sales" ratio and "net profit to sales" ratio are to be seen as satisfactory. The first ratio varies around 35%, while the second ratio fluctuates between 5% and 6% for full capacity.
Capital structure is dominated by high proportion of debt. Long--term-debt to equity ratio at the beginning of operation reaches 94/6, but goes down later as loans are repaid.
Debt-to-net-worth ratio, also diminishes very quickly from the initial level of ca 80/20 in 1989 to 33/67 in 1993 and to negligible 2/98 at the end of the life period.

Liquidity ratios reveal no financial squeeze whatsoever. For 1993 the current ratio is above 10, and the acid-test ratio is 2,5. These values comply to most demanding banking requirements.

Finally, the debt-service ratio can also be computed from the cash-flow table and net income statement. Only in the first year of operation this ratio slightly exceeds one (1,04) (due to a substantial increase of working capital an extra financing is necessary). In the second year already cash generation is much higher than debt service - the ratio drops down to 0,61. It goes up again in 1992, when the tax has to be paid for the first time and takes value of 1,2 - 1,3 for next two years. The debt is serviced, however, without difficulties, because the marginal deficit (current cash generation is lower than debt repayments plus interest) is covered from retained profits.

5.5. Profitability measures

As computed by COMFAR programme numerical values of the measures are as follows:

a) Return on equity:

NPV at 10% is SyL 127 millions
IRRE is 46,94%

b) Return on investment:

NPV at 10% is SyL 113,9 millions
IRR is 18,91%.

High value of IRRE is explained by a small proportion of equity capital, in overall financing and illustrates a powerful leverage effect. On the other hand the IRR on total investment is 18,9% and can be seen as acceptable. On the whole the project seems to be viable under given assumptions.

## 6. Sensitivity analysis

Sensitivity analysis has been carried out for most important financial parameters.As it has been mentioned the project seemed to be excessively dependant on imported inputs. To examine this point, two simulations have been run in order to check the sensitivity of the project to variations of foreign exchange rate.

In the first simulation the foreign exchange rate has been increased by 100% from 5,45 SyL /1$ to 10,9 SyL/1$. In the second simulation the foreign exchange rate has been increased by 50% only to 8,2 SyL/1 $. In

both cases the hypothesis of high sensitivity to foreign currency inputs has been solidly confirmed, because the project turned out to be highly unprofitable with negative IRR and NPV values. In the first case (see Appendix 13) annual net cash-flow is negative (ca SyL 5 millions), and in the second case annual net cash-flows are positive in more distant years but they do not match high deficits occuring at the beginning of the life period. As a result, cummulative net cash-flow is also negative, and IRRE and NPV values are negative as well, except for IRR on investment, which is 3,78%. For details see Appendix 13, where results for sensitivity analysis are presented.

In the third simulation it was assumed that the old equipment owned by PCI would be used instead of a new one, reducing the total investment cost by SyL 2,45 millions (see Chapter X, para. 1.4). This change improved slightly financial indicators, pushing IRRE to 50,51% and IRR to 19,17%.

The impact of increasing the foreign exchange rate by 100% and the selling prices of all products in the local market by 30% was examined in the fourth simulation. This variation resulted in the IRRE at 3,08% and the IRR at 4,22%.

In the next simulation (Alternative 5) an impact of interest rate change has been tested. Under the assumption that the interest rate on long term loan increases from 9% to 12%, the project's profitability barely changes - IRRE is 40,42% and IRR is 19,34%.

As it has been mentioned in Chapter III, the selling price level for intermediate products (alkyd resin and PVA) can be affected by government regulation. If therefore an official price were to be set for intermediates, it would be most likely derived on a "cost-plus-10%" basis. This assumption has been introduced into alternative 6, but it did not affect the project profitability too much. IRRE is 45,86%, IRR is 18,65%. Last two simulations refer to a lower capacity utilization ratio. If only 90% of installed capacity is used, IRR decreases slightly to 18,31% (Alternative 7); if 80% rate is used, IRR drops to 16,82% (Alternative 8). Anyway it seems, that the project is not very sensitive to capacity level utilisation rate variations.

Sensitivity analysis (summarized in Appendix 13) reveals that the project is highly sensitive to foreign exchange rate variations and, to a lesser extent, to selling price variations. In view of this the experts would recommended to carry out a more detailed analysis of the future foreign exchange rate situation in Syria to determine the most likely level of this rate to be applied for the project. Also future price policy of the company should be designed more carefully to assure that assumed selling prices will not go down under normal market conditions.

One final remark is necessary while commenting the results of COMFAR calculations. COMFAR assumes that interest during pre-production period is to be covered by bank overdraft which itself bears no interest. This has to be seen as some oversimplification of the analysis, since for the approx. amount of SyL 23,5 millions, the amount of interest capitalized over two and a half years would be ca 2,3 mill. SyL.*/

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*/ If total deficit due to interest during pre-production is, say, A, then the amount needed to cover this deficit plus interest on it is $T=\frac{A}{1-r}$, where r is interest rate (9%). For three years of construction we have $A_1$ =240, $A_2$=6697, $A_3$=16541, and respectively: $T=T_1+T_2+T_3$=25800 (thousands SyL).

# APPENDICES

Appendix 1

Printout of COMFAR Schedules basic version

COMFAR 2.0 - IO/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM)

Paints & Chemicals Project, Syria
25 March 1986, by D.Rosati
basic version

3 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: '000 SyL

## Total initial investment during construction phase

| | | |
|---|---|---|
| fixed assets: | 266363.80 | 69.641 % foreign |
| current assets: | 9340.00 | 100.000 % foreign |
| total assets: | 275703.80 | 70.670 % foreign |

## Source of funds during construction phase

| | | |
|---|---|---|
| equity & grants: | 20000.00 | 82.069 % foreign |
| foreign loans : | 0.00 | |
| local loans : | 232225.50 | |
| total funds : | 252225.50 | 6.508 % foreign |

## Cashflow from operations

| Year: | 1 | 2 | 3 |
|---|---|---|---|
| operating costs: | 129675.70 | 157354.00 | 169903.30 |
| depreciation : | 26275.08 | 26275.08 | 26275.08 |
| interest : | 20900.30 | 17914.54 | 14928.78 |
| production costs | 176851.00 | 201543.70 | 211107.10 |
| thereof foreign | 68.78 % | 72.66 % | 74.63 % |
| total sales : | 207753.80 | 267052.10 | 287961.20 |
| gross income : | 30902.78 | 65508.41 | 76854.05 |
| net income : | 30902.78 | 65508.41 | 76854.05 |
| cash balance : | -18867.47 | 48698.88 | 65521.94 |
| net cashflow : | 35207.91 | 99788.48 | 113625.80 |

Net Present Value at: 10.00 % = 113925.20
Internal Rate of Return: 18.91 %
Return on equity1: 85.52 %
Return on equity2: 46.94 %

## Index of Schedules produced by COMFAR

Total initial investment
Total investment during production
Total production costs
Working Capital requirements
Cashflow Tables
Projected Balance
Net income statement
Source of finance




## Total Initial Investment in '000 SyL

| Year | 1986.1 | 1986.2 | 1987.1 | 1987.2 | 1988.1 | 1988.2 |
|---|---|---|---|---|---|---|
| Fixed investment costs | | | | | | |
| Land, site preparation, development | 0.00 | 5500.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Buildings and civil works | 0.00 | 7138.00 | 8597.00 | 7797.00 | 6303.00 | 3315.00 |
| Auxiliary and service facilities | 0.00 | 8141.80 | 16283.60 | 20354.50 | 20355.00 | 16283.60 |
| Incorporated fixed assets | 0.00 | 0.00 | 20440.00 | 0.00 | 0.00 | 0.00 |
| Plant machinery and equipment | 0.00 | 8710.30 | 20377.60 | 21778.50 | 18823.00 | 17422.60 |
| Total fixed investment costs | 0.00 | 29490.10 | 65698.20 | 49930.00 | 45481.00 | 37021.20 |
| Pre-production capital expenditures | 0.00 | 1440.53 | 3186.26 | 8975.86 | 11440.32 | 13700.27 |
| Net working capital | 0.00 | 0.00 | 0.00 | 0.00 | 4000.00 | 5340.00 |
| Total initial investment costs | 0.00 | 30930.63 | 68884.47 | 58905.86 | 60921.32 | 56061.47 |
| Of it foreign, in % | 0.00 | 53.07 | 79.46 | 70.49 | 70.41 | 70.05 |

COMFAR 2.0 UNIDO

---------- COMFAR 2.0 - ID/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM) -----

## Total Current Investment in '000 SyL

| Year | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|---|
| Fixed investment costs | | | | | | |
| Land, site preparation, development | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Buildings and civil works | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Auxiliary and service facilities | 0.00 | 0.00 | 0.00 | 0.00 | 1250.00 | 0.00 |
| Incorporated fixed assets | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Plant, machinery and equipment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total fixed investment costs | 0.00 | 0.00 | 0.00 | 0.00 | 1250.00 | 0.00 |
| Preproduction capitals expenditures. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Working capital | 42870.25 | 9909.54 | 4432.11 | 1890.93 | 2276.67 | 2469.10 |
| Total current investment costs | 42870.25 | 9909.54 | 4432.11 | 1890.93 | 3526.67 | 2469.10 |
| Of it foreign, % | 91.97 | 96.18 | 95.81 | 96.45 | 97.71 | 96.69 |

Paints & Chemicals Project, Syria --- 25 March 1986, by D.Rosati

---------- COMFAR 2.0 - ID/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM) -----

## Total Current Investment in '000 SyL

| Year | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|
| Fixed investment costs | | | | | |
| Land, site preparation, development | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Buildings and civil works | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Auxiliary and service facilities | 0.00 | 0.00 | 0.00 | 5150.00 | 0.00 |
| Incorporated fixed assets | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Plant, machinery and equipment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total fixed investment costs | 0.00 | 0.00 | 0.00 | 5150.00 | 0.00 |
| Preproduction capitals expenditures. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Working capital | 3099.87 | 3868.10 | 4172.31 | 25.45 | 25.45 |
| Total current investment costs | 3099.87 | 3868.10 | 4172.31 | 5175.45 | 25.45 |
| Of it foreign, % | 96.14 | 95.91 | 97.17 | 100.00 | 100.00 |

Paints & Chemicals Project, Syria --- 25 March 1986, by D.Rosati

## Total Production Costs in '000 SyL

| Year | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|---|
| % of nom. capacity (single product). | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Raw material 1 | 70433.31 | 83528.89 | 92722.79 | 97766.82 | 103853.00 | 110435.20 |
| Other raw materials | 41287.44 | 55398.07 | 58311.20 | 58311.20 | 58311.20 | 58311.20 |
| Utilities | 808.89 | 961.31 | 1067.67 | 1122.08 | 1187.68 | 1257.31 |
| Energy | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Labour, direct | 3031.03 | 3163.76 | 3312.61 | 3398.23 | 3501.45 | 3610.02 |
| Repair, maintenance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Spares | 2335.00 | 2522.00 | 2709.00 | 2896.00 | 3083.00 | 3270.00 |
| Factory overheads | 7670.00 | 7670.00 | 7670.00 | 7670.00 | 7670.00 | 7670.00 |
| Factory costs | 125565.70 | 153244.00 | 165793.30 | 171164.30 | 177606.10 | 184553.70 |
| Administrative overheads | 4110.00 | 4110.00 | 4110.00 | 4110.00 | 4110.00 | 4110.00 |
| Indir. costs, sales and distribution | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Direct costs, sales and distribution | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Depreciation | 26275.08 | 26275.08 | 26275.08 | 26275.08 | 26275.08 | 14563.43 |
| Financial costs | 20900.30 | 17914.54 | 14928.78 | 11943.03 | 8957.27 | 5971.51 |
| Total production costs | 176851.00 | 201543.70 | 211107.10 | 213492.40 | 216948.70 | 209198.60 |
| Costs per unit ( single product ) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Of it foreign, % | 68.78 | 72.66 | 74.63 | 76.07 | 77.54 | 80.64 |
| Of it variable,% | 64.18 | 69.96 | 72.64 | 74.26 | 75.96 | 82.01 |
| Total labour | 4541.03 | 4673.76 | 4822.61 | 4908.23 | 5011.45 | 5120.02 |




## Total Production Costs in '000 SyL

| Year | 1995 | 1996 | 1997 | 1998 | 1999-2000 | 2001- 2 |
|---|---|---|---|---|---|---|
| % of nom. capacity (single product). | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Raw material 1 | 118785.10 | 129257.10 | 140342.60 | 140342.60 | 140342.60 | 140342.60 |
| Other raw materials | 58311.20 | 58311.20 | 58311.20 | 58311.20 | 58311.20 | 58311.20 |
| Utilities | 1349.39 | 1466.79 | 1579.45 | 1579.45 | 1579.45 | 1579.45 |
| Energy | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Labour, direct | 3756.43 | 3944.49 | 4116.70 | 4116.70 | 4116.70 | 4116.70 |
| Repair, maintenance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Spares | 3457.00 | 3644.00 | 3831.00 | 4018.00 | 4205.00 | 4205.00 |
| Factory overheads | 7670.00 | 7670.00 | 7670.00 | 7670.00 | 7670.00 | 7670.00 |
| Factory costs | 193329.10 | 204293.60 | 215850.90 | 216037.90 | 216224.90 | 216224.90 |
| Administrative overheads | 4110.00 | 4110.00 | 4110.00 | 4110.00 | 4110.00 | 4110.00 |
| Indir. costs, sales and distribution | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Direct costs, sales and distribution | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Depreciation | 14563.43 | 14563.43 | 14563.43 | 10367.50 | 6359.58 | 6234.58 |
| Financial costs | 2985.75 | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 |
| Total production costs | 214988.30 | 222967.00 | 234524.40 | 230515.40 | 226694.50 | 226569.50 |
| Costs per unit ( single product ) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Of it foreign, % | 82.12 | 82.54 | 83.95 | 83.89 | 83.84 | 83.83 |
| Of it variable,% | 83.79 | 85.63 | 86.26 | 87.76 | 89.24 | 89.28 |
| Total labour | 5266.43 | 5454.49 | 5626.70 | 5626.70 | 5626.70 | 5626.70 |

## Total Production Costs in '000 SyL

| | |
|---|---|
| Year | 2003 |
| % of nom. capacity (single product). | 0.00 |
| Raw material 1 | 140342.60 |
| Other raw materials | 58311.20 |
| Utilities | 1579.45 |
| Energy | 0.00 |
| Labour, direct | 4116.70 |
| Repair, maintenance | 0.00 |
| Spares | 4205.00 |
| Factory overheads | 7670.00 |
| Factory costs | 216224.90 |
| Administrative overheads | 4110.00 |
| Indir. costs, sales and distribution | 0.00 |
| Direct costs, sales and distribution | 0.00 |
| Depreciation | 4820.63 |
| Financial costs | 0.00 |
| Total production costs | 225155.50 |
| Costs per unit ( single product ) | 0.00 |
| Of it foreign, % | 83.79 |
| Of it variable,% | 89.85 |
| Total labour | 5626.70 |

COMFAR 2.0 - IO/PEAS Vienna, (IBM,Siem-PCD,WANG-IBM)

## Net Working Capital in '000 SyL

| Year | adc | coto | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|
| Coverage | | | | | | | |
| Current assets & | | | | | | | |
| Accounts receivable | 15 | 24.0 | 5403.15 | 6556.42 | 7079.30 | 7303.10 | 7571.51 |
| Inventory and materials | 112 | 3.2 | 43971.67 | 52393.77 | 56135.57 | 57720.30 | 59632.79 |
| Energy | 0 | --- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Spares | 0 | --- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Work in progress | 19 | 20.0 | 6278.28 | 7662.20 | 9289.66 | 8558.22 | 8880.32 |
| Finished products | 1 | 360.0 | 360.21 | 437.09 | 471.95 | 486.87 | 504.77 |
| Cash in hand | 30 | 12.0 | 1428.84 | 1455.48 | 1483.47 | 1506.19 | 1530.37 |
| Total current assets | | | 57442.16 | 68504.97 | 73459.95 | 75574.68 | 78119.77 |
| Current liabilities and | | | | | | | |
| Accounts payable | 15 | 24.0 | 5231.90 | 6385.17 | 6908.05 | 7131.85 | 7400.26 |
| Net working capital | | | 52210.25 | 62119.80 | 66551.91 | 68442.83 | 70719.50 |
| Increase in working capital | | | 42870.25 | 9909.54 | 4432.11 | 1890.93 | 2276.67 |
| Net working capital, local | | | 3444.61 | 3822.79 | 4008.66 | 4075.78 | 4156.58 |
| Net working capital, foreign | | | 48765.64 | 58297.01 | 62543.25 | 64367.05 | 66562.92 |

Note: adc = minimum days of coverage ; coto = coefficient of turnover .



COMFAR 2.0 - IO/PEAS Vienna, (IBM,Siem-PCD,WANG-IBM)

## Net Working Capital in '000 SyL

| Year | adc | coto | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|
| Coverage | | | | | | | |
| Current assets & | | | | | | | |
| Accounts receivable | 15 | 24.0 | 7860.99 | 8226.63 | 8683.48 | 9165.04 | 9172.83 |
| Inventory and materials | 112 | 3.2 | 61710.59 | 64319.53 | 67577.70 | 71110.10 | 71110.10 |
| Energy | 0 | --- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Spares | 0 | --- | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Work in progress | 18 | 20.0 | 9227.68 | 9666.46 | 10214.68 | 10792.55 | 10801.90 |
| Finished products | 1 | 360.0 | 524.07 | 548.44 | 578.90 | 611.60 | 611.52 |
| Cash in hand | 30 | 12.0 | 1555.00 | 1582.79 | 1614.04 | 1643.98 | 1659.56 |
| Total current assets | | | 80878.32 | 84343.85 | 88668.80 | 93322.66 | 93355.91 |
| Current liabilities and | | | | | | | |
| Accounts payable | 15 | 24.0 | 7689.74 | 8055.38 | 8512.23 | 8993.79 | 9001.58 |
| Net working capital | | | 73188.58 | 76288.47 | 80156.56 | 84328.88 | 84354.33 |
| Increase in working capital | | | 2469.08 | 3099.89 | 3868.09 | 4172.31 | 25.45 |
| Net working capital, local | | | 4238.33 | 4358.05 | 4516.43 | 4634.42 | 4634.42 |
| Net working capital, foreign | | | 68950.27 | 71930.41 | 75640.13 | 79694.45 | 79719.91 |

Note: adc = minimum days of coverage ; coto = coefficient of turnover .

## Net Working Capital in '000 SyL

| Year | adc | coto | 1999 | 2000- 3 |
|---|---|---|---|---|
| Coverage | | | | |
| Current assets & | | | | |
| Accounts receivable | 15 | 24.0 | 9180.62 | 9180.62 |
| Inventory and materials | 112 | 3.2 | 71110.10 | 71110 10 |
| Energy | 0 | --- | 0.00 | 0.00 |
| Spares | 0 | --- | 0.00 | 0.00 |
| Work in progress | 18 | 20.0 | 10811.25 | 10811.25 |
| Finished products | 1 | 360.0 | 612.04 | 612.04 |
| Cash in hand | 30 | 12.0 | 1675.14 | 1675.14 |
| Total current assets | | | 93389.15 | 93389.15 |
| Current liabilities and | | | | |
| Accounts payable | 15 | 24.0 | 9009.37 | 9009.37 |
| Net working capital | | | 84379.77 | 84379.77 |
| Increase in working capital | | | 25.45 | 0.00 |
| Net working capital, local | | | 4634.42 | 4634.42 |
| Net working capital, Foreign | | | 79745.36 | 79745.36 |

Note: adc = minimum days of coverage ; coto = coefficient of turnover .




## Source of Finance, construction in '000 SyL

| Year ..... | 1986.1 | 1986.2 | 1987.1 | 1987.2 | 1988.1 | 1988.2 |
|---|---|---|---|---|---|---|
| Equity, ordinary .. | 0.00 | 20000.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Equity, preference. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Subsidies, grants . | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loan A, foreign . | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loan B, foreign.. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loan C, foreign . | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loan A, local.... | 0.00 | 10690.10 | 66898.20 | 54195.00 | 53781.00 | 46661.20 |
| Loan B, local.... | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loan C, local.... | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total loan ..... | 0.00 | 10690.10 | 66898.20 | 54195.00 | 53781.00 | 46661.20 |
| Current liabilities | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bank overdraft .... | 0.00 | 240.53 | 1986.26 | 4710.85 | 7140.33 | 9400.27 |
| Total funds ..... | 0.00 | 30930.63 | 68884.46 | 58905.85 | 60921.33 | 56061.47 |

COMFAR

---------- COMFAR 2.0 - IO/FEAS Vienna, (IBM.Siem-PCD.WANG-IBM) -----

## Source of Finance, production in '000 Syl

| Year ..... | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|---|
| Equity, ordinary .. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Equity, preference. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Subsidies, grants . | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loan A, foreign . | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loan B, foreign.. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loan C, foreign . | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loan A, local.... | -33175.07 | -33175.07 | -33175.07 | -33175.07 | -33175.07 | -33175.07 | -33175.06 |
| Loan B, local.... | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loan C, local.... | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total loan ..... | -33175.07 | -33175.07 | -33175.07 | -33175.07 | -33175.07 | -33175.07 | -33175.06 |
| Current liabilities | 5231.90 | 1153.26 | 522.89 | 223.79 | 268.42 | 289.47 | 365.64 |
| Bank overdraft .... | 19867.48 | -42345.72 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total funds ..... | -9075.69 | -74367.53 | -32652.19 | -32951.28 | -32906.66 | -32885.60 | -32809.42 |

Paints & Chemicals Project, Syria --- 25 March 1986, by D.Rosati

---------- COMFAR 2.0 - IO/FEAS Vienna, (IBM.Siem-PCD.WANG-IBM) -----

## Source of Finance, production in '000 Syl

| Year ..... | 1996 | 1997 | 1998-99 |
|---|---|---|---|
| Equity, ordinary .. | 0.00 | 0.00 | 0.00 |
| Equity, preference. | 0.00 | 0.00 | 0.00 |
| Subsidies, grants . | 0.00 | 0.00 | 0.00 |
| Loan A, foreign . | 0.00 | 0.00 | 0.00 |
| Loan B, foreign.. | 0.00 | 0.00 | 0.00 |
| Loan C, foreign . | 0.00 | 0.00 | 0.00 |
| Loan A, local.... | 0.00 | 0.00 | 0.00 |
| Loan B, local.... | 0.00 | 0.00 | 0.00 |
| Loan C, local.... | 0.00 | 0.00 | 0.00 |
| Total loan ..... | 0.00 | 0.00 | 0.00 |
| Current liabilities | 456.85 | 481.56 | 7.79 |
| Bank overdraft .... | 0.00 | 0.00 | 0.00 |
| Total funds ..... | 456.85 | 481.56 | 7.79 |

Paints & Chemicals Project, Syria --- 25 March 1986, by D.Rosati

COMFAR 2.0 UNIDO

COMFAR 2.0 - IO/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM)

## Cashflow Tables, construction in '000 SyL

| Year | 1986.1 | 1986.2 | 1987.1 | 1987.2 | 1988.1 | 1988.2 |
|---|---|---|---|---|---|---|
| Total cash inflow | 0.00 | 30690.10 | 66898.20 | 54195.00 | 53781.00 | 46661.20 |
| Financial resources | 0.00 | 30690.10 | 66898.20 | 54195.00 | 53781.00 | 46661.20 |
| Sales, net of tax | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total cash outflow | 0.00 | 30930.63 | 68884.47 | 58905.86 | 60921.32 | 56061.47 |
| Total assets | 0.00 | 30690.10 | 66898.20 | 54195.00 | 53781.00 | 46661.20 |
| Operating costs | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cost of finance | 0.00 | 240.53 | 1986.26 | 4710.86 | 7140.32 | 9400.27 |
| Repayment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Corporate tax | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Dividends paid | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Surplus ( deficit ) | 0.00 | -240.53 | -1986.27 | -4710.86 | -7140.32 | -9400.27 |
| Cumulated cash balance | 0.00 | -240.53 | -2226.79 | -6937.65 | -14077.97 | -23478.24 |
| Inflow, local | 0.00 | 14276.30 | 66898.20 | 54195.00 | 53781.00 | 46661.20 |
| Outflow, local | 0.00 | 14516.83 | 14146.86 | 17382.36 | 18029.32 | 16789.87 |
| Surplus ( deficit ) | 0.00 | -240.53 | 52751.34 | 36812.64 | 35751.68 | 29871.33 |
| Inflow, foreign | 0.00 | 16413.80 | 0.00 | 0.00 | 0.00 | 0.00 |
| Outflow, foreign | 0.00 | 16413.80 | 54737.60 | 41523.50 | 42892.00 | 39271.60 |
| Surplus ( deficit ) | 0.00 | 0.00 | -54737.60 | -41523.50 | -42892.00 | -39271.60 |
| Net cashflow | 0.00 | -30690.10 | -66898.20 | -54195.00 | -53781.00 | -46661.20 |
| Cumulated net cashflow | 0.00 | -30690.10 | -97588.30 | -151783.30 | -205564.30 | -252225.50 |

COMFAR 2.0 - IO/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM)

## Cashflow tables, production in '000 SyL

| Year | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|---|
| Total cash inflow | 212985.70 | 268205.30 | 288484.10 | 304060.90 | 312108.90 | 320740.30 |
| Financial resources | 5231.90 | 1153.26 | 522.89 | 223.79 | 268.42 | 289.47 |
| Sales, net of tax | 207753.80 | 267052.10 | 287961.20 | 303837.10 | 311840.50 | 320450.80 |
| Total cash outflow | 231853.20 | 219506.50 | 222962.10 | 298848.40 | 307827.30 | 324576.90 |
| Total assets | 48102.15 | 11062.81 | 4954.99 | 2114.72 | 3795.08 | 2758.57 |
| Operating costs | 129675.70 | 157354.00 | 169903.30 | 175274.30 | 181716.30 | 188663.70 |
| Cost of finance | 20900.30 | 17914.54 | 14928.78 | 11943.03 | 8957.27 | 5971.51 |
| Repayment | 33175.07 | 33175.07 | 33175.07 | 33175.07 | 33175.07 | 33175.07 |
| Corporate tax | 0.00 | 0.00 | 0.00 | 76341.25 | 80183.59 | 94008.10 |
| Dividends paid | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Surplus ( deficit ) | -18867.47 | 48698.86 | 65521.94 | 5212.53 | 4281.59 | -3836.63 |
| Cumulated cash balance | -42345.71 | 6353.15 | 71875.09 | 77087.62 | 81369.21 | 77532.59 |
| Inflow, local | 195868.60 | 254372.10 | 275221.20 | 303859.10 | 311866.90 | 320477.70 |
| Outflow, local | 84488.56 | 80513.41 | 78706.00 | 152431.50 | 153940.10 | 165423.30 |
| Surplus ( deficit ) | 111380.00 | 173858.70 | 196515.20 | 151427.60 | 157926.90 | 155054.30 |
| Inflow, foreign | 17117.10 | 13833.21 | 13262.87 | 201.86 | 242.01 | 262.67 |
| Outflow, foreign | 147364.60 | 138993.00 | 144256.10 | 146416.90 | 153887.30 | 159153.60 |
| Surplus ( deficit ) | -130247.50 | -125159.80 | -130993.20 | -146215.00 | -153645.30 | -158890.90 |
| Net cashflow | 35207.90 | 99788.48 | 113625.80 | 50330.64 | 46413.93 | 35309.96 |
| Cumulated net cashflow | -217017.60 | -117229.10 | -3603.31 | 46727.32 | 93141.26 | 128451.20 |

Paints & Chemicals Project, Syria --- 25 March 1986, by D.Rosati

COMFAR 2.0 UNIDO

COMFAR 2.0 - IO/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM)

## Cashflow tables, production in '000 SyL

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|
| Total cash inflow | 331867.90 | 345885.10 | 360253.10 | 359779.30 | 359779.30 | 359771.50 |
| Financial resources | 365.64 | 456.85 | 481.56 | 7.79 | 7.79 | 0.00 |
| Sales, net of tax | 331502.20 | 345428.20 | 359771.50 | 359771.50 | 359771.50 | 359771.50 |
| Total cash outflow | 335519.80 | 316208.30 | 330448.60 | 334552.60 | 332818.30 | 332785.00 |
| Total assets | 3465.52 | 4324.96 | 4653.86 | 5183.24 | 33.24 | 0.00 |
| Operating costs | 197439.20 | 208403.60 | 219960.90 | 220147.90 | 220334.90 | 220334.90 |
| Cost of finance | 2985.75 | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 |
| Repayment | 33175.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Corporate tax | 98454.24 | 103479.70 | 105833.90 | 109221.40 | 112450.10 | 112450.10 |
| Dividends paid | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Surplus ( deficit ) | -3651.88 | 29676.81 | 29804.47 | 25226.75 | 26961.06 | 26986.53 |
| Cumulated cash balance | 73880.71 | 103557.50 | 133362.00 | 158588.80 | 185549.80 | 212536.30 |
| Inflow, local | 331541.20 | 345479.70 | 359810.50 | 359771.50 | 359771.50 | 359771.50 |
| Outflow, local | 167869.90 | 138021.20 | 141258.30 | 144488.80 | 147717.50 | 147717.50 |
| Surplus ( deficit ) | 163671.30 | 207458.50 | 218552.20 | 215282.70 | 212054.00 | 212054.00 |
| Inflow, foreign | 326.64 | 405.38 | 442.56 | 7.79 | 7.79 | 0.00 |
| Outflow, foreign | 167649.80 | 178187.10 | 189190.30 | 190063.70 | 185100.70 | 185067.50 |
| Surplus ( deficit ) | -167323.20 | -177781.80 | -188747.80 | -190055.90 | -185092.90 | -185067.50 |
| Net cashflow | 32508.95 | 29676.79 | 29804.44 | 25226.76 | 26961.07 | 26986.53 |
| Cumulated net cashflow | 160960.20 | 190637.00 | 220441.40 | 245668.20 | 272629.30 | 299615.80 |

Paints & Chemicals Project, Syria --- 25 March 1986, by D.Rosati

COMFAR 2.0 UNIDO

---------- COMFAR 2.0 - ID/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM) -----

## Cashflow tables, production in 000 SyL

| Year . . . . . | 2001 | 2002 | 2003 |
|---|---|---|---|
| Total cash inflow . . | 359771.50 | 359771.50 | 359771.50 |
| Financial resources . | 0.00 | 0.00 | 0.00 |
| Sales, net of tax . . | 359771.50 | 359771.50 | 359771.50 |
| Total cash outflow . . | 332890.60 | 332890.60 | 334085.40 |
| Total assets . . . . | 0.00 | 0.00 | 0.00 |
| Operating costs . . . | 220334.90 | 220334.90 | 220334.90 |
| Cost of finance . . . | -0.00 | -0.00 | -0.00 |
| Repayment . . . . . | 0.00 | 0.00 | 0.00 |
| Corporate tax . . . | 112555.70 | 112555.70 | 113750.50 |
| Dividends paid . . . | 0.00 | 0.00 | 0.00 |
| Surplus ( deficit ) . | 26880.91 | 26880.91 | 25686.13 |
| Cumulated cash balance | 239417.30 | 266298.20 | 291984.30 |
| Inflow, local . . . . | 359771.50 | 359771.50 | 359771.50 |
| Outflow, local . . . . | 147823.20 | 147823.20 | 149017.90 |
| Surplus ( deficit ) . | 211948.40 | 211948.40 | 210753.60 |
| Inflow, foreign . . . | 0.00 | 0.00 | 0.00 |
| Outflow, foreign . . . | 185067.50 | 185067.50 | 185067.50 |
| Surplus ( deficit ) . | -185067.50 | -185067.50 | -185067.50 |
| Net cashflow . . . . . | 26880.91 | 26880.91 | 25686.13 |
| Cumulated net cashflow | 326496.70 | 353377.60 | 379063.70 |

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## Cashflow Discounting:

a) Return on Equity 1:
Net present value ..... 173244.30 at 10.00 %
Internal Rate of Return (IRRE1) .. 85.52 %

b) Return on Equity 2:
Net present value ..... 127047.50 at 10.00 %
Internal Rate of Return (IRRE2) .. 46.94 %

c) Internal Rate of Return on total investment:
Net present value ..... 113925.20 at 10.00 %
Internal Rate of Return ( IRR ) .. 18.91 %

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

COMFAR 2.0 UNIDO

---------- COMFAR 2.0 - IO/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM) -----

## Net Income Statement in '000 SyL

| Year | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|
| Total sales, incl. sales tax | 207753.80 | 267052.10 | 287961.20 | 303837.10 | 311840.50 |
| Less: variable costs, incl. sales tax. | 113502.30 | 140993.70 | 153355.90 | 158540.00 | 164795.00 |
| Variable margin | 94251.51 | 126058.40 | 134605.30 | 145297.10 | 147045.50 |
| As % of total sales | 45.37 | 47.20 | 46.74 | 47.82 | 47.15 |
| Non-variable costs, incl. depreciation | 42448.43 | 42635.45 | 42822.44 | 43009.45 | 43196.43 |
| Operational margin | 51803.08 | 83422.95 | 91782.83 | 102287.70 | 103849.10 |
| As % of total sales | 24.93 | 31.24 | 31.87 | 33.67 | 33.30 |
| Cost of finance | 20900.30 | 17914.54 | 14928.78 | 11943.02 | 8957.27 |
| Gross profit | 30902.78 | 65508.41 | 76854.05 | 90344.67 | 94891.83 |
| Allowances | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Taxable profit | 30902.78 | 65508.41 | 76854.05 | 90344.67 | 94891.83 |
| Tax | 0.00 | 0.00 | 0.00 | 76341.25 | 80183.59 |
| Net profit | 30902.78 | 65508.41 | 76854.05 | 14003.42 | 14708.23 |
| Dividends paid | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Undistributed profit | 30902.78 | 65508.41 | 76854.05 | 14003.42 | 14708.23 |
| Accumulated undistributed profit | 30902.78 | 96411.19 | 173265.20 | 187268.70 | 201976.90 |
| Gross profit, % of total sales | 14.87 | 24.53 | 26.69 | 29.73 | 30.43 |
| Net profit, % of total sales | 14.87 | 24.53 | 26.69 | 4.61 | 4.72 |
| ROE, Net profit, % of equity | 154.51 | 327.54 | 384.27 | 70.02 | 73.54 |
| ROI, Net profit+interest, % of invest. | 17.55 | 27.35 | 29.66 | 8.33 | 7.52 |

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COMFAR 2.0 - ID/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM)

## Net Income Statement in '000 SyL

| Year | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|
| Total sales, incl. sales tax | 320450.80 | 331502.20 | 345428.20 | 359771.50 | 359771.50 |
| Less: variable costs, incl. sales tax. | 171555.30 | 180143.80 | 190921.30 | 202291.60 | 202291.60 |
| Variable margin | 148895.50 | 151358.40 | 154507.00 | 157480.00 | 157480.00 |
| As % of total sales | 46.46 | 45.66 | 44.73 | 43.77 | 43.77 |
| Non-variable costs, incl. depreciation | 31671.80 | 31858.79 | 32045.78 | 32232.78 | 28223.86 |
| Operational margin | 117223.70 | 119499.60 | 122461.20 | 125247.20 | 129256.10 |
| As % of total sales | 36.58 | 36.05 | 35.45 | 34.81 | 35.93 |
| Cost of finance | 5971.51 | 2985.75 | -0.00 | -0.00 | -0.00 |
| Gross profit | 111252.20 | 116513.90 | 122461.20 | 125247.20 | 129256.10 |
| Allowances | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Taxable profit | 111252.20 | 116513.90 | 122461.20 | 125247.20 | 129256.10 |
| Tax | 94008.10 | 98454.24 | 103479.70 | 105833.90 | 109221.40 |
| Net profit | 17244.09 | 18059.65 | 18981.48 | 19413.32 | 20034.70 |
| Dividends paid | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Undistributed profit | 17244.09 | 18059.65 | 18981.48 | 19413.32 | 20034.70 |
| Accumulated undistributed profit | 219221.00 | 237280.60 | 256262.10 | 275675.40 | 295710.10 |
| Gross profit, % of total sales | 34.72 | 35.15 | 35.45 | 34.81 | 35.93 |
| Net profit, % of total sales | 5.38 | 5.45 | 5.50 | 5.40 | 5.57 |
| ROE, Net profit, % of equity | 86.22 | 90.30 | 94.91 | 97.07 | 100.17 |
| ROI, Net profit+interest, % of invest. | 7.32 | 6.57 | 5.85 | 5.91 | 6.00 |

## Net Income Statement in '000 SyL

| Year | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|
| Total sales, incl. sales tax | 359771.50 | 359771.50 | 359771.50 | 359771.50 | 359771.50 |
| Less: variable costs, incl. sales tax. | 202291.60 | 202291.60 | 202291.60 | 202291.60 | 202291.60 |
| Variable margin | 157480.00 | 157480.00 | 157480.00 | 157480.00 | 157480.00 |
| As % of total sales | 43.77 | 43.77 | 43.77 | 43.77 | 43.77 |
| Non-variable costs, incl. depreciation | 24402.94 | 24402.94 | 24277.94 | 24277.94 | 22864.00 |
| Operational margin | 133077.00 | 133077.00 | 133202.00 | 133202.00 | 134616.00 |
| As % of total sales | 36.99 | 36.99 | 37.02 | 37.02 | 37.42 |
| Cost of finance | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 |
| Gross profit | 133077.00 | 133077.00 | 133202.00 | 133202.00 | 134616.00 |
| Allowances | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Taxable profit | 133077.00 | 133077.00 | 133202.00 | 133202.00 | 134616.00 |
| Tax | 112450.10 | 112450.10 | 112555.70 | 112555.70 | 113750.50 |
| Net profit | 20626.94 | 20626.94 | 20646.31 | 20646.31 | 20865.48 |
| Dividends paid | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Undistributed profit | 20626.94 | 20626.94 | 20646.31 | 20646.31 | 20865.48 |
| Accumulated undistributed profit | 316337.10 | 336964.00 | 357610.30 | 378256.60 | 399122.10 |
| Gross profit, % of total sales | 36.99 | 36.99 | 37.02 | 37.02 | 37.42 |
| Net profit, % of total sales | 5.73 | 5.73 | 5.74 | 5.74 | 5.80 |
| ROE, Net profit, % of equity | 103.13 | 103.13 | 103.23 | 103.23 | 104.33 |
| ROI, Net profit+interest, % of invest. | 6.18 | 6.18 | 6.19 | 6.19 | 6.25 |




## Projected Balance Sheets, construction in '000 SyL

| Year | 1986.1 | 1986.2 | 1987.1 | 1987.2 | 1988.1 | 1988.2 |
|---|---|---|---|---|---|---|
| Total assets | 0.00 | 30930.63 | 99815.09 | 158721.00 | 219642.30 | 275703.80 |
| Fixed assets, net of depreciation | 0.00 | 0.00 | 30930.63 | 99815.09 | 158721.00 | 215642.30 |
| Construction in progress | 0.00 | 30930.63 | 68884.47 | 58905.86 | 56921.32 | 50721.47 |
| Current assets | 0.00 | 0.00 | 0.00 | 0.00 | 4000.00 | 9340.00 |
| Cash, bank | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cash surplus, finance available | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loss carried forward | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loss | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total liabilities | 0.00 | 30930.63 | 99815.09 | 158721.00 | 219642.30 | 275703.80 |
| Equity capital | 0.00 | 20000.00 | 20000.00 | 20000.00 | 20000.00 | 20000.00 |
| Reserves, retained profit | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Profit | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Long and medium term debt | 0.00 | 10690.10 | 77588.30 | 131783.50 | 185564.30 | 232225.50 |
| Current liabilities | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bank overdraft, finance required | 0.00 | 240.53 | 2226.79 | 6937.64 | 14077.97 | 23478.23 |
| Total debt | 0.00 | 10930.63 | 79815.09 | 138721.00 | 199642.30 | 255703.80 |
| Equity, % of liabilities | 0.00 | 64.66 | 20.04 | 12.60 | 9.11 | 7.25 |

Paints & Chemicals Project, Syria --- 25 March 1986, by D.Rosati

COMFAR 2.0 - ID/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM)

## Projected Balance Sheets, Production in '000 SyL

| Year | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|---|
| Total assets | 297530.80 | 288671.70 | 332873.60 | 313925.70 | 295727.30 | 280085.80 |
| Fixed assets, net of depreciation | 240088.70 | 213813.60 | 187538.50 | 161263.40 | 134988.40 | 121674.90 |
| Construction in progress | 0.00 | 0.00 | 0.00 | 0.00 | 1250.00 | 0.00 |
| Current assets | 56013.32 | 67049.48 | 71976.49 | 74068.50 | 76589.40 | 79323.34 |
| Cash, bank | 1428.84 | 1455.48 | 1483.47 | 1506.19 | 1530.37 | 1555.00 |
| Cash surplus, finance available | 0.00 | 6353.19 | 71875.09 | 77087.59 | 81369.13 | 77532.53 |
| Loss carried forward | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loss | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total liabilities | 297530.80 | 288671.70 | 332873.60 | 313925.70 | 295727.30 | 280085.80 |
| Equity capital | 20000.00 | 20000.00 | 20000.00 | 20000.00 | 20000.00 | 20000.00 |
| Reserves, retained profit | 0.00 | 30902.78 | 96411.19 | 173265.20 | 187268.70 | 201976.90 |
| Profit | 30902.78 | 65508.41 | 76854.05 | 14003.42 | 14708.23 | 17244.09 |
| Long and medium term debt | 199050.40 | 165875.40 | 132700.30 | 99525.20 | 66350.13 | 33175.05 |
| Current liabilities | 5231.90 | 6385.17 | 6908.05 | 7131.85 | 7400.26 | 7689.74 |
| Bank overdraft, finance required | 42345.72 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total debt | 246628.10 | 172260.50 | 139608.30 | 106657.00 | 73750.39 | 40864.79 |
| Equity, % of liabilities | 6.72 | 6.93 | 6.01 | 6.37 | 6.76 | 7.14 |

Paints & Chemicals Project, Syria --- 25 March 1986, by D.Rosati

COMFAR 2.0 - ID/FEAS Vienna, (IBM,Siem-PCD,WANG-IBM)

## Projected Balance Sheets, Production in '000 SyL

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|
| Total assets | 265336.00 | 284774.30 | 304669.20 | 324711.70 | 345346.40 | 365973.40 |
| Fixed assets, net of depreciation | 107111.50 | 92548.05 | 77984.61 | 67617.11 | 66407.52 | 60047.94 |
| Construction in progress | 0.00 | 0.00 | 0.00 | 5150.00 | 0.00 | 0.00 |
| Current assets | 82761.07 | 87054.77 | 91678.70 | 91696.37 | 91714.03 | 91714.03 |
| Cash, bank | 1582.79 | 1614.04 | 1643.98 | 1659.56 | 1675.14 | 1675.14 |
| Cash surplus, finance available | 73880.66 | 103557.50 | 133361.90 | 158588.70 | 185549.70 | 212536.30 |
| Loss carried forward | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Loss | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total liabilities | 265336.00 | 284774.30 | 304669.20 | 324711.70 | 345346.40 | 365973.40 |
| Equity capital | 20000.00 | 20000.00 | 20000.00 | 20000.00 | 20000.00 | 20000.00 |
| Reserves, retained profit | 219221.00 | 237280.60 | 256262.10 | 275675.40 | 295710.10 | 316337.10 |
| Profit | 18059.65 | 18981.48 | 19413.32 | 20034.70 | 20626.94 | 20626.94 |
| Long and medium term debt | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 | -0.01 |
| Current liabilities | 8055.38 | 8512.23 | 8993.79 | 9001.58 | 9009.37 | 9009.37 |
| Bank overdraft, finance required | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total debt | 8055.37 | 8512.22 | 8993.78 | 9001.57 | 9009.36 | 9009.36 |
| Equity, % of liabilities | 7.54 | 7.02 | 6.56 | 6.16 | 5.79 | 5.46 |

Paints & Chemicals Project, Syria --- 25 March 1986, by D.Rosati

COMFAR 2.0 - IO/PEAS Vienna, (IBM,Siem-PCD,WANG-IBM) -----

## Projected Balance Sheets, Production in '000 Svl

| Year | 2001 | 2002 | 2003 |
|---|---|---|---|
| Total assets | 386619.70 | 407266.00 | 428131.50 |
| Fixed assets, net of depreciation | 53813.35 | 47578.77 | 42758.14 |
| Construction in progress | 0.00 | 0.00 | 0.00 |
| Current assets | 91714.03 | 91714.03 | 91714.03 |
| Cash, bank | 1675.14 | 1675.14 | 1675.14 |
| Cash surplus, finance available | 239417.20 | 266298.10 | 291984.20 |
| Loss carried forward | 0.00 | 0.00 | 0.00 |
| Loss | 0.00 | 0.00 | 0.00 |
| Total liabilities | 386619.70 | 407266.00 | 428131.50 |
| Equity capital | 20000.00 | 20000.00 | 20000.00 |
| Reserves, retained profit | 336964.00 | 357610.30 | 378256.60 |
| Profit | 20646.31 | 20646.31 | 20865.48 |
| Long and medium term debt | -0.01 | -0.01 | -0.01 |
| Current liabilities | 9009.37 | 9009.37 | 9009.37 |
| Bank overdraft, finance required | 0.00 | 0.00 | 0.00 |
| Total debt | 9009.36 | 9009.36 | 9009.36 |
| Equity, % of liabilities | 5.17 | 4.91 | 4.67 |

# PRE-FEASIBILITY STUDY ON THE DEVELOPMENT OF THE PAINT INDUSTRY AND ITS RAW MATERIALS

General Company for Paints and Chemical Industries
General Organization for Chemical Industries
Ministry of Industry

July 1982

MARKET STUDY

## I. DEFINITION OF PAINTS AND THEIR USES

1. Oil Paints Group
   - Alkyd Paints
   - PVA Paints

2. Industrial Paints Group

   Main Uses
   - Cars and Metal Furniture
   - Refrigerators, Tractors, Gas Cylinders
   - Ships and Marine Installations
   - Metallic Surfaces
   - Pencils and Some Wooden Products

## II. DEVELOPMENT OF CONSUMPTION: 1971 - 1980

Information on the consumption of paint is not adequate for the following reasons:

- Foreign trade statistical bulletins do not classify paints as a separate article, and are included with other articles;
- Demand for certain types of paint has not been satisfied as there is evidence that smuggling is taking place from neighbouring countries, e.g. car paints;
- Adequate records are not available on the paint production in the private sector. The Study Committee has ascertained that the licenses authorised do not reflect actual production. Thus, total nominal capacity in 1972 of registered plants exceeded six million gallons; whereas the Annual Statistical Bulletin for 1980 showed production for that year equal to one-sixth the nominal capacity. Moreover, this is not compatible with the quantity of imported

raw materials as it appears in the official foreign trade statistics;

- The trade statistics on imported Alkyds are reasonably accurate because this commodity is used exclusively for the production of paint, whereas the same cannot be said for PVA which can be used for puposes other than the paint industry. Moreover, the recording of PVA imports has been included with other articles which explains the reason for the considerable fluctuation in the statistics under this code.

For the above-mentioned reasons, the Study Committee had to resort to unconventional approaches in determining the market demand. The following procedure was followed:

1. The estimated demand for oil paints was based on the quantity of Alkyd raw material which is exclusively used for paint production.
2. It was assumed that domestic consumption of oil paint during the period 1971 - 1980 consisted of 35 percent of total paint produced locally. The balance, i.e. 65 percent of domestic production consisted of emulsion (PVA) paint. It was also assumed that imported industrial paint amounted to 25 percent of the quantity of decorative oil paint produced locally.
3. Oil paints are chiefly consumed in the housing construction sector. Therefore, it was assumed that a direct relationship existed between the rate of increase in actual housing construction and that of oil paint consumption.

## A. DEVELOPMENT OF ALKYD RESIN CONSUMPTION: 1971 - 1980

| Year | Quantity Imported in Tons | Moving Average |
|---|---|---|
| 1971 | 1242 | - |
| 1972 | 1231 | 1237 |
| 1973 | 1623 | 1427 |
| 1974 | 1300 | 1461 |
| 1975 | 2089 | 1695 |
| 1976 | 3062 | 2075 |
| 1977 | 2837 | 2950 |
| 1978 | 3663 | 3250 |
| 1979 | 3615 | 3639 |
| 1980 | 3239 | 3427 |

On the basis of the above figures, average annual growth of Alkyd Resin consumption would be 13,6 percent.

## B. DEVELOPMENT OF PAINT CONSUMPTION: 1971 - 1980

As Aklyd Resin constitutes 65 percent by weight of oil paints, the paint produced from imported Alkyd Resin is easily calculated and converted into gallons of 4,5 kg each. From this figure, it becomes easy to calcula.e the quantity of emulsion paint and the quantity of imported industrial paint.

Estimated Production and Imports of Various Paints 1972 - 1980

| Year | Alkyd Resin Imports in T. Moving Av. | Corresponding production of Oil paint in T. | Production of Oil paint in '000 gallons | Estimated Production of emulsion paint '000 gallons | Estimated Production of Industrial paint '000 gallons | Total Consumption of paint '000 gallons |
|---|---|---|---|---|---|---|
| | (1) | (2) = $\frac{(1)}{0,65}$ | (3) = $\frac{(2)}{4,5}$ | (4) = $\frac{(3)}{0,35}$ x0,65 | (5) = (3)x0,25 | (6) = (3)+(4)+(5 |
| 1972 | 1237 | 1904 | 423 | 786 | 106 | 1310 |
| 1973 | 1427 | 2195 | 488 | 906 | 122 | 1516 |
| 1974 | 1461 | 2248 | 500 | 928 | 125 | 1553 |
| 1975 | 1695 | 2608 | 579 | 1075 | 145 | 1799 |
| 1976 | 2575 | 3962 | 880 | 1634 | 220 | 2734 |
| 1977 | 2950 | 4538 | 1008 | 1822 | 252 | 3132 |
| 1978 | 3250 | 5000 | 1111 | 2063 | 278 | 3452 |
| 1979 | 3639 | 5598 | 1244 | 2310 | 311 | 3865 |
| 1980 | 3427 | 5372 | 1172 | 2177 | 293 | 3643 |

C. Demand Estimates for Paint and its Raw Materials until 1995. The average growth of 13,6 percent annually which prevailed during the period 1971 - 1980 is not expected to continue until 1995. The Study Committee expects this growth to continue until 1983 and begin decreasing thereafter by an average of 0,5 percent annually until it reaches the level of 7,6 percent by 1995.

Projected Demand for Paint until 1995

| Year | Av. Annual Growth in percent | Estimated Demand in '000 gal. | Demand by Type of Paint | | |
|---|---|---|---|---|---|
| | | | Oil Paints 32 percent | PVA Paints 60 percent | Industrial Paints 8 percent |
| 1981 | 13,6 | 4137 | 1324 | 2482 | 331 |
| 1982 | 13,6 | 4700 | 1504 | 2820 | 376 |
| 1983 | 13,6 | 5339 | 1709 | 3203 | 427 |
| 1984 | 13,1 | 6038 | 1932 | 3623 | 483 |
| 1985 | 12,6 | 6799 | 2176 | 4079 | 544 |
| 1986 | 12,1 | 7622 | 2439 | 4573 | 610 |
| 1987 | 11,6 | 8506 | 2722 | 5104 | 680 |
| 1988 | 11,1 | 9450 | 3024 | 5760 | 765 |
| 1989 | 10,6 | 10452 | 3344 | 6270 | 836 |
| 1990 | 10,1 | 11508 | 3683 | 6905 | 920 |
| 1991 | 9,6 | 12612 | 4036 | 7567 | 1009 |
| 1992 | 9,1 | 13760 | 4403 | 8256 | 1101 |
| 1993 | 8,6 | 14943 | 4782 | 8966 | 1195 |
| 1994 | 8,1 | 16154 | 5169 | 9692 | 1292 |
| 1995 | 7,6 | 17382 | 5562 | 10429 | 1391 |

The Study Committee believes that there are good opportunities for exporting surplus production over and above the domestic needs.

The demand for Alkyd Resins is derived from the demand for Oil Paint and Industrial Paint. As Alkyd constitutes 65 percent of Oil Paint by weight and less than that, but varying quantities, in Industrial Paint, it was assumed that an average of 45 percent of Industrial Paint by weight is Alkyd Resins.

Projected Demand for Alkyd Resins until 1995 (in tons)

| Year | Quantity required for Oil Paint | Quantity required for Industrial Paint | Total Demand |
|---|---|---|---|
| 1985 | 6385 | 1102 | 7487 |
| 1986 | 7134 | 1235 | 8369 |
| 1987 | 7962 | 1377 | 9339 |
| 1988 | 8842 | 1531 | 10373 |
| 1989 | 9781 | 1693 | 11474 |
| 1990 | 10773 | 1861 | 12634 |
| 1991 | 11805 | 2043 | 13848 |
| 1992 | 12879 | 2230 | 15109 |
| 1993 | 13987 | 2420 | 16407 |
| 1994 | 15119 | 1616 | 17835 |
| 1995 | 16269 | 2817 | 19086 |

Concerning the projected demand for the PVA, it is based on the assumption that PVA constitutes 30 percent of the Emulsion Paint by weight.

Project Demand for PVA: 1985 - 1995

| Year | Estimated demand for Emulsion Paint in '000 gallons | Estimated demand for PVA in tons |
|---|---|---|
| 1985 | 4079 | 6118 |
| 1986 | 4573 | 6860 |
| 1987 | 5104 | 7656 |
| 1988 | 5760 | 8640 |
| 1989 | 6270 | 9405 |
| 1990 | 6905 | 10357 |
| 1991 | 7567 | 11351 |
| 1992 | 8256 | 12384 |
| 1993 | 8966 | 13449 |
| 1994 | 9692 | 14538 |
| 1995 | 10429 | 15644 |

It is worth mentioning that the demand for PVA exceeds the needs of the Paint industry because it is also used in making adhesives for certain wood and paper industries.

## D. PLANT CAPACITY

Plant acpacity took into account the following factors:

1. Developing and expanding the Paint industry in order to meet local demand for the various types of Paint based on a study of the market.
2. Establishing a plant for the manufacture of Alkyd in order to satisfy the needs of the Oil Paint industry and the Industrial Paint industry both in the public and in the private sectors.
3. Establihing a plant for the manufacture of PVA with a capacity to satisfy the needs of the Emulsion Paint industry both in the public and in the private sectors, taking into account the possibility of meeting the needs of other industries for this commodity.

First: Capacity of the paint plant

In 1977, there were 53 registered Oil Paint processing plants in the private sector plus the plant of the General Company for Paint. The total registered capacity of these plants exceeds 7 million gallons. However, official statistics show that total production in the private sector just exceeded 1 million gallons. This production figure is not compatible with the known quantity of imported raw material. The Study Committee does not believe that the production figures are correct. It is also known that the Government stopped giving licenses for establishing new plants in the private sector in order to allow the General Company for Paint to grow. Therefore, the production figure in 1981 for the private sector should be the difference between total market demand for Oil Paint and the production of the Company for that year. Therefore:

| | in '000 gallons |
|---|---|
| Total estimated market demand in 1981 | 4137 |
| Minus estimated imports of Industrial Paint | 331 |
| | 3806 |
| Minus production of the General Company | 923 |
| Therefore, production of private sector | 2883 |

The Study Committee believes that production of the private sector could reach 3 000 000 gallons and remain at this level until 1995. Therefore, it is foreseen that the General Company should raise its production as follows:

| | '000 gallons |
|---|---|
| in 1985 | 3799 |
| 1990 | 8508 |
| 1995 | 14382 |

The Study Committee recommends the establishment of a new plant to meet projected demand utilising also the equipment and machinery of the old plant because: (1) the old plant will not be able to meet projected demand and (2) the costs of rehabilitation are too high.

Second: Capacity of the Alkyd Resin Plant

It was stated earlier that the Alkyd Resin material constitutes 65 percent of Oil Paint by weight and an average of 45 percent of Industrial Paint by weight. The Alkyd Resin plant operates in three shifts and its capacity is raised in stages by adding new reactors, etc. The following schedule shows the projected demand:

| Year | Demand in Tons |
|---|---|
| 1985 | 7487 |
| 1986 | 8369 |
| 1987 | 9339 |
| 1988 | 10373 |
| 1989 | 11474 |
| 1990 | 12634 |
| 1991 | 13848 |
| 1992 | 15109 |
| 1993 | 16407 |
| 1994 | 17835 |
| 1995 | 19086 |

Third: Capacity of the PVA plant

This material is used in the mnaufacture of Emulsion Paint and in adhesives. Although the new plant will not produce adhesives, the possibility of adding an adhesive unit should be considered in the future. The plant operates in three shifts and its capacity is raised in stages by adding new reactors, etc. The following schedule shows the projected demand:

| Year | Demand in Tons |
|---|---|
| 1985 | 6118 |
| 1986 | 6860 |
| 1987 | 7656 |
| 1988 | 8640 |
| 1989 | 9405 |
| 1990 | 10357 |
| 1991 | 11351 |
| 1992 | 12384 |
| 1993 | 13449 |
| 1994 | 14538 |
| 1995 | 15644 |

APPENDIX 3

## PRODUCTIONAL APPLICATION PROPOSALS FOR PCI

### RESINS

On the international market there is a trend to replace alkyds with other resins. It is the opinion of the experts that PCI should take this trend also into consideration, then they should plan a new plant and find new markets.

| | |
|---|---|
| POLYESTER | furniture industry<br>glasreinforced plastic<br>automotive putties and fillers |
| ACRYLSTYROLRESINS | roadmarking paints<br>industrial coatings<br>leather industry |
| FURAN RESINS | foundry industry |
| ISOCYANATE- OR STYRENE-MODIFIED ALKYDS | foundry industry<br>furniture industry<br>industrial coatings<br>automotive paints<br>leather industry |
| UREA- AND MELAMINE RESINS | furniture industry<br>paper industry<br>leather industry<br>stoving enamels<br>acid curing systems<br>formaica<br>plywood industry |
| PHENOLIC RESINS | foundry industry<br>paper industry<br>can coating<br>plywood<br>electrical isolation |
| STANDOILS | |

For the equipment of the new resin plant it is very important that PCI can produce all these types of resins. Therefore boiler material, stirring speed boiler shape, stirrer shape etc. must be suitable for all types of resins.

## EMULSIONS

Besides the normal PVA homo- and copolymers for the paint industry there are many other similar products and new application areas for emulsions.

| | |
|---|---|
| PVA-EMULSION (FINE PARTICLE SIZE) | paper industry<br>textile industry<br>leather industry<br>gloss paints |
| PVA-EMULSIONS (BIG PARTICLE SIZE) | waterresistant wood glue<br>adhesives for construction industry<br>adhesives for cigarettes<br>packing industry |
| VINYLACETAT/ACRYLIC EMULSION | adhesives<br>roughest adhesives for paper |
| ACRYLONITRILEMULSIONS | PVC |

## NEW APPLICATION AREAS AND MARKETS

| | |
|---|---|
| AUTOMOTIVE INDUSTRY | fillers, putties, paints based on nitrocellulose, polyester or synthetic resins |
| FURNITURE INDUSTRY/WOOD INDUSTRY | sealers, lacquers,<br>acid curing systems<br>polyester paints<br>thirotropic paints<br>PU-systems<br>stains<br>adhesives<br>glues, etc. |
| PLASTIC INDUSTRY | glasreinforced polyester<br>synthetic marmor<br>foam material |
| FOUNDRY INDUSTRY | furan resins<br>phenolic resins<br>modified alkyds |
| CONSTRUCTION INDUSTRY | wood marking paints<br>solventfree 2 component acrylics<br>etc. |
| ISOLATION INDUSTRY | |
| SHOE INDUSTRY | shoesole foam<br>shoesole adhesives<br>leather finish, etc. |

| | |
|---|---|
| LEATHER INDUSTRY | paints,<br>synthetic leather |
| PAPER INDUSTRY | emulsions<br>adhesives |
| TEXTILE INDUSTRY | coatings<br>adhesives<br>finish |
| CORROSION PROTECTION | |
| FILLERS AND PUTTIES | for concrete furniture<br>automotive |
| CAN COATING PAINTS | |
| SPRAYS | industry<br>automotive |
| ADHESIVES | |

APPENDIX 4

**BRUSSEL GATT TARIFF NUMBERS**

| | | cost/duties | unified tax | sum/per centage |
|---|---|---|---|---|
| TITANDIOXYD | 28.25 (003/A2) | 1 | 6 | 7 |
| ALKYD RESIN | 39.01D5B (900/A7) | 7 | 13 | 20 |
| PVA | 39.02D2 (900/A0) | 7 | 13 | 20 |
| SOYA OIL | 15.07C1 (370/A8) | 20 | 15 | 35 |
| SAFFLOWER OIL | 15.07C1 (390/A9) | 20 | 15 | 35 |
| CASTOR OIL | 15.07A (120/A1) | 20 | 15 | 35 |
| GLYCERINE | 15.11B (200/A1) | 1 | 6 | 7 |
| PENTAERYTRIT | 29.04D (950/A9) | 15 | 14 | 29 |
| TRIMETHYLOLPROPAN | 29.04D (950/A9) | 15 | 14 | 29 |
| MALEIN ACID ANHYDRID | 29.15E (901/A6) | 20 | 15 | 35 |
| VINYLACETATE MONOMER | 29.14B2B (290/A7) | 1 | 6 | 7 |
| VERSATICESTHER | 29.14H (903/A9) | 7 | 13 | 20 |

**QUESTIONNAIRE AS GIVEN TO THE MINISTRY OF PLANNING REGARDING THE POSSIBLE FUTURE AVAILIBILITY OF RAW MATERIALS FOR THE PRODUCTION OF RESINS AND PAINTS**

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1. According to the information as received by the experts, the following raw materials for the Resin and Paint production are locally available

   - White Spirit, Xylene, Benzine 45/100 & 100/140
   - Calcium Carbonate
   - Quartzsand
   - Cotton seed oil

2. The following is a list of raw materials which are needed for the production of Resins and Paints. The ministry was asked if it is planned to produce some of these raw materials - and if yes - what, in which quantity and when?

| | |
|---|---|
| a) Solvents | Toluene,<br>Acetone, Methylethylketone, Methylisobutylketone<br>Ethanol, Isopropylalcohol, Butanol, Isobutanol<br>Furfurylalcohol, Monoethyleneglycol, Butyleneglycol<br>Ethylenglycolacetate, Butylenglycol<br>Ethyleneglycolacetate, Butyleneglycolacetate<br>Methylenechloride, Ethylenechloride<br>Trichlorethylene, 1,1,1 Trichlorethane<br>Benzine 60/80, 80/120, 100/140<br>Shellsol A, AB |
| b) Monomers | Vinylacetate, Dibutylmaleinate<br>Versatic Esther, Ethylacrylate, Butylacrylate<br>2-Ethylhexylacrylate, Monostyrene<br>Acrylnitril |
| c) Oils & Fats | Linseed, Soya, Cottonseed, Castor, Groundnut,<br>Safflower and others |
| d) Polyalcohols | Glycerine, Pentaeritrol, Trimethylolpropane<br>Diethyleneglycol |
| e) Acids and Anhydrates | Fumaric-, Adipic acid<br>Maleic-, Phthalic-, Isophthalic anhydrate |
| f) Phenols, Formaldehyde, Urea, Melamine | |
| g) Additives (Dryers) | Cobalt, lead, manganese; calcium<br>zinc, circonium,<br>Naphtenates or Octoates |
| (Pigments) | Lithopone, Titaniumdioxyde; Zincoxyde<br>Chrome-yellow-orange, Oxydegreen<br>Ironoxydes (yellow, red, brown, black)<br>Organic pigments in misc. colours |
| (Fillers) | Bariumsulfate, Chinaclay, Talcum |

3. According to the information received by the experts, the following products are manufactured by PCI/Omayad Paint Co.

   - Building Paints (Enamel and wall paints, interior and exterior, primers)
   - Wood laquers and sealers
   - Road marking paint
   - stoving enamels
   - fast drying industrial paints

4. The following is a list of further application and use. The ministry was asked if it is planned to found, expand or to introduce new products in companies of the following character, all using the newly produced resins as base material. If yes in which industries and what capacities and when:

   - can coating industry
   - Plastic industry (fiber reinforced polyesters, synthetic marmor, foam materials, injection moulding, rock reinforcement, electrical insulation, etc.)
   - Electrical industry (wire and transformer sheet coating)
   - Textile industry (printing ink, impregnations, carriers)
   - Leather industry (synthetic leather and coating of leather, tannery)
   - Paper industry (sizing, printing ink)
   - Founderies
   - Adhesives (wood & furniture incl. ply and chipboard, shoes, paper, packing, cigarette paper, foams (Polyurethane & Polystyrene), pencils, construction (eg. tiles and wood surfaces, frieze, wall paper))
   - Furniture industry
   - Plywood chipboard industry
   - Fire retardant coatings
   - Corrosion resistant coatings
   - Marine industry (moulding and paint)
   - Car repair (patching, primers, stoving and drying enamels)
   - Domestic appliances (Refrigerators, washers, etc)
   - Military (infrared, camouflage, fluorescent).

APPENDIX 6

## LIST OF CONTRACTORS WHICH HAVE SUBMITTED A PROPOSAL WHICH WAS ACCEPTED BY A COMMITTEE

According to unconfirmed informations, further contractors than those which are listed hereafter have entered their proposals but could not be considered because of noncompliance with the prescribed bidding formalities.

The officially received proposals (which are kept locked up at the General Company for the Execution of Industrial Projects "GCEIP") are the following (in alphabetic order by the country of the contractor)

| | |
|---|---|
| 1. AUSTRIA | Universale Vienna, Contractor<br>Thalhammer Graz, Engineering, Equipment<br>Reichold Vienna, License |
| 2. AUSTRIA | VEW - Vereinigte Edenstahlwerke, Constractors, Engineering, Equipment<br>Vianova (Hoechst), License Alkyd resins<br>WEGIN - Wegscheider Farben, License PVA, PVA paints<br>Stollack (Hoechst), License Alkyd Paints |
| 3. BULGARIA | CHIMKOMPLEKT Sofia, Constractor<br>Lakprom, Licenser |
| 4. DENMARK | DYRUP CO., Contractor, Licenser<br>Borregard (Norway), Engineering<br>CoWi-Consultant<br>Monberg & Thorsen (Norway), Engineering |
| 5. FRANCE | SPEICHIM, Contractor<br>C.I.R.P, Engineering, Subcontractor<br>Astral, License Paint<br>AKZO, License Resin |
| 6. GREAT BRITAIN | MITCHELL COTTS/APV, Contractor<br>Howard Humphrey, Engineering<br>Mac Pherson, License |
| 7. HUNGARY | CHEMIMAS, Contractor<br>Chimcomplex, Engineering<br>ICI-Grt. Britain, License |
| 8. POLAND | POLYMEX CEKOP, Contractor<br>Prosynchem, Subcontractor |
| 9. POLAND | PROSYNCHEM, Contractor |
| 10. ROMANIA | IPROCHIM, Contractor<br>Polycarbon, License |
| 11. YUGOSLAVIA | SMELT, Contractor<br>Color Medvode, License (Hoechst second hand) |

APPENDIX 7

**ANALYSIS AND EVALUATION OF TECHNOLOGIES AND EQUIPMENT OF THE SUBMITTED PROPOSALS**

---

1. STATISTICS

| | | | | |
|---|---|---|---|---|
| 6 | proposals | were | received | from eastern european and COMECON countries |
| 3 | " | " | " | " EC countries |
| 2 | " | " | " | " EFTA countries |
| 11 | " | " | " | in total |

2. TECHNOLOGIES INTRODUCED

The following is a selection of offered licenses whereas the licensers themselves supply to the syrian market simultaneously and are familiar with the local requirements and market conditions

- DYRUP-Denmark
- ICI -England
- REICHOLD - Austria
- VIANOVA (Hoechst) - Austria
- WEGIN, Wegscheider Farben - Austria

3. TERRITORIAL LIMITATION OF LICENSES

DYRUP and REICHOLD limit the territory of the license to the S.A.R. only ICI, VIANOVA, WEGIN offer a license allowing unlimited export.

4. PLANT DESIGN

No one of the offering contractors has a layout or design similar to another. The production capacities not always coincide with the prescribed quantities.These proposals were eliminated from closer evaluation and not considered for comparison. Furthermore inadequate technologies (eg. induction heating) or processes which are not suitable for the local conditions or which are using an old or not original Know-How (eg. single step Alkydprocess and oxydates process for PVA) were not considered.
Thus, number of compared proposals was reduced to 3.

5. COMPARATIVE ANALYSIS

The following 3 contractors are considered

1) DYRUP - Denmark
2) SPEICHIM - France
3) VEW - Austria

APPENDIX 7

Parameters for judgment are:

a) Number, size, material of reactors and subequipment
b) Production capacity
c) Energies & Utilities consumption
d) Versatility of license and restrictions
e) What other products can be made under same license
f) Process control system
g) Raw material handling
h) Layout of utilities
i) Waste treatment systems
j) Consideration of not specified but required supplementary equipment

6. COMPARISON OF SELECTED CONTRACTORS

| | 1 DYRUP | 2 SPEICHIM | 3 VEW |
|---|---|---|---|
| No. of Alkyd Reactors | 3 | 4 | 5 |
| Sizes of Alkyd Reactors ($m^3$) | 2x12 + 1x6 | 2x15 + 2x5 | 5x16,3 |
| Total Alkyd reactor volume ($m^3$) | 30 | 40 | 81,5 |
| Material, Alkyd reactor | 316.S.S. | S.S. | 1,4571 |
| Condenser Alkyd ($m^2$) | 2x35 + 1x25 | 2x60 + 2x20 | 5x60 |
| Total Alkyd Condenser ($m^2$) | 95 | 160 | 300 |
| No. of Alkyd Thinners | 3 | 4 | 10 |
| Size of Thinners ($m^3$) | 2x30 + 1x10 | 2x37 + 2x16 | 10x32 |
| Total Alkyd Thinners ($m^3$) | 70 | 106 | 320 |
| Material Alkyd Thinners | C.St. | C.St. | C.St. |
| No. of PVA Reactors | 3 | 4 | 2 |
| Size of PVA Reactors ($m^3$) | 3x12 | 2x10 + 1x5 + 1x1 | 2x10,7 |
| Total Volume PVA Reactors ($m^3$) | 36 | 26 | 21,4 |
| Material PVA Reactors | 316.S.S. | S.S. | 1,4571 |
| Condensers, PVA ($m^2$) | 3x45 | 2x60 + 1x20 + 1x5 | 2x50 |
| Total PVA Condensers ($m^2$) | 135 | 145 | 100 |
| No. of PVA Blenders | 3 | 4 | 2 |
| Size of PVA Blenders ($m^3$) | 3x12 | 2x12 + 1x7,2 + 1x2,5 | 2x20 |
| Total Volume PVA Blenders ($m^3$) | 36 | 33,7 | 40 |
| Material PVA Blenders | 304 S.S | S.S. | 1,4571 |

APPENDIX 7

| | | | |
|---|---|---|---|
| **Production capacities: Resins** | | | |
| **300 days/year** | | | |
| **3 shifts/day** | | | |
| Alkyd Resin 100% solid (tpy) | - | - | 15.000 |
| 70% solid (tpy) | 15.000 | - | 21.400 |
| 60% solid (tpy) | - | 15.000 | - |
| PVA Dispersion (tpy) | 12.000 | 12.000 | 14.400 |
| solid content % | ? | ? | 54 |
| **Production capacities: Paints** | | | |
| **300 days/year** | | | |
| **1 shift/day** | | | |
| Alkyd paints ($x10^6$ us gal/year) | - | not offered | 1,5 |
| PVA paints ($x10^6$ us gal/year) | - | not offered | 2,9 |
| Total Alkyd+PVA paints ($x10^6$) | 6,8 | - | 4,4 |
| Installed Utilities | | | |
| Hot oil heater ($x10^6$ kcal/hr) | 2,6 | 5,0 | 3,6 |
| Cold water system ($x10^6$ kcal/hr) | 4,4 | 6,2 | 4,0 |
| Process control system: | semi autom. | ? | semi autom. |
| Waste treatment systems | incl. | incl. | incl. |
| Alkyd process (design) | single step | single step | two step |
| PVA process (design) | oxidation | oxidation | redox |
| Adhesive production considered | no | yes | yes |

APPENDIX B

## LABORATORY EQUIPMENT

A ..... Adhesive Laboratory
P ..... Paint Laboratory
S ..... Resin Laboratory
G ..... General Laboratory
PVA ..... PVA Laboratory

| | |
|---|---|
| Shore pencil Durometer | P |
| Pencil Hardness | P |
| König pendulum hardness DIN 53157 Erichsen model 399 | P |
| Wasag Applicator Erichsen model 268 | P |
| Rosmann Dry Film Thickness Gauge Erichsen model 233 | P |
| Universal Drying Erichsen model 338 | P |
| Cross Hatch Cutter DIN 53161 | P |
| Ball Jet Shaft DIN 53154 model 273 | P |
| Variable Impact Tester model 304 | P |
| Cold Check Tester model 339 | P + G |
| Inflammability Tester model 362 | P + G |
| Abrasion Resistance Tester model 317 | P |
| Universal Cupping Test Machine model 325 | P |
| Brookfield Viskosimeter | P + G |
| Gardner Viskosimeter | S |
| DIN Dip Viscosity Cup 4,6,8 mm model 321 | S + P |
| Stormer Viscosimeter ASTM model 302 | PVA |
| Iodine Colorimeter | S |
| Gardner Colorimeter | S |
| Automatic titration | G |
| Kofler melting point equipment | S + G |
| pH- and Potentiometer | S + G |
| Blue M Economy utility oven | G |
| Frigidaire | PVA + G |
| Flow Cups to BS, DIN, ASTM, G, NF, SNV, mod. 243 | G |
| Biddle Duplex Film Applicator, mod. 238/1 | P |
| Biddle Triplex Film Applicator, mod. 238/2 | P |
| Accelerated Exposure and weathering machine (Weather-o-meter) | P + PVA |

APPENDIX B

| | |
|---|---|
| Day light lamp | P + PVA |
| Glossmeter | P + PVA |
| Conical Mandrel Bending Tester, mod. 312 | P |
| Xenotest ISO | P |
| Magnetic stirrer | G |
| Digitalthermometer | G |
| Flocculation tester | PVA, G, A |
| Laboratory stirrers | G |
| Fineness Grindometer of Grind Gauges | P + PVA |
| Refractometer | G |
| Washability and scrub resistance Tester | PVA |
| Strength Bond machine | A |
| Pressing machine | A |
| UV and IR equipment | G |
| Gaschromatograph | G |
| Analytical Balance | G |
| Microscope | G |
| Definition of white point | A + PVA |
| Oxygen bomb | A |
| Glass equipment | G |
| 3 l laboratory resin reactor | S |
| 3 l laboratory polymerisation reactor | PVA |
| Laboratory sieves | G |
| Cryptometer black and white | PVA + P |
| Impact Tester | P |
| Vacuum pump | S |
| Heating mantles pilz | S |
| Filler flexibility tester | G |
| Garmsen grind gauge | P |
| Beller Gloss standards | P + PVA |
| Colour computer | P + PVA |
| 1000°C oven | G |
| Traffic paint drying time wheel | P |
| Multiple clearance Film applicator | P |
| Spraying machine and spraying gun | P |
| Gauge holder | P |
| Curtain cooler | P |
| Laboratory triple roller | P |
| Bunsen burner | |

## Production costs structures

| | PCI's existing paint factory year 1984 | PCI's new factory (intermed.+paints) year 1993 |
|---|---|---|
| Raw material costs | 82.2 % | 68.8 % |
| Depreciation | 2.3 % | 14.8 % |
| Financial costs | negligible | 4.4 % |
| Labour: personnel costs | 1o.5 % | 3.5 % |
| Marketing overheads (exc.labour) | 1.5 % | 2.6 % |
| Factory overheads (exc.labour) | 1.8 % | 2.5 % |
| Spares, weares (exc. labour for maintenance) | o.8 % | 1.4 % |
| Administrative overheads (exc.labour) | o.9 % | 1.2 % |
| Energy and utilities (for production) | included in factory overheads | o.8 % |
| | 1oo.o % | 1oo.o % |
| Total production costs (exc.direct packaging material) | Sy £ 49.8 million | 222.9 million |

APPENDIX 10/1

Raw Material Costs

Product: A - Alkyd resin for sale
B - Alkyd resin for intermediate use (⟶ alkyd paint)

Unit: 1000 t of alkyd resin (70 % solid)

| Raw material group | quantity(t) per unit | US $/t or Sy £/t | exchange rate 1) | costs in Sy £ per unit | origin packaging | insu-rance | 1% customs 6% unified tax | harbours admin. fee | transport | total costs in Sy £ |
|---|---|---|---|---|---|---|---|---|---|---|
| OILS (Soya) | 445.06 | $ 767.5 | 5.45 | 1 861 630.3 | foreign drums | 30 903.- | 130 314.- | | 33 380.- | |
| ACIDS & ANHYDRATES | 181.20 | $ 558.- | 5.45 | 551 047.3 | foreign bags | 20 775.- | 38 573.- | | 19 026.- | |
| ESTERIFYING AGENTS | 101.14 | $ 1070.- | 5.45 | 589 797.9 | foreign bags | 22 235.- | 41 286.- | | 10 620.- | |
| foreign raw material | 727.40 | ($ 757.37) | | 3 002 475.5 | | 73 913.- | 210 173.- | 3637.- | 63 026.- | 3 353 225.- |
| SOLVENT (white spirit) | 100.00 | Sy£1500.- | - | 450 000.- | local bulk | - | - | | 14 250.- | 464 250.- |
| foreign + local raw material | 1027.40 | | | 3 452 475.5 | | 73 913.- | 210 173.- | 3637.- | 77 276.- | 3 817 475.- |

1) equal or parallel rate Sy £ per US $

Calculations: E.Brunner

See chapter IV.5.

Raw Material Costs

APPENDIX 10/2

Product: C - PVA/Adhesives for sale
D - PVA for intermediate use ( PVA paint)

Unit: 1000 t of PVA (54 % solid)

| Raw material group | quantity(t) per unit | US $/t or Sy £/t | exchange rate 1) | costs in Sy £ per unit | origin packaging | insurance | 1% customs 6% unified tax | harbours admin. fee | transport | total costs in Sy £ |
|---|---|---|---|---|---|---|---|---|---|---|
| ADDITIVES | 40.4 | $ 1860.- | 5.45 | 409 535.- | foreign bags/drums 1) | 11 119.- | 28 668.- | | 3 636.- | |
| MONOMERS | 515.0 | $ 767.- | 5.45 | 2 152 778.- | foreign drums | 35 737.- | 150 695.- | | 38 625.- | |
| foreign raw material | 555.4 | Ø $ 846.5 | 5.45 | 2 562 313.- | | 46 856.- | 179 363.- | 2777.- | 42 261.- | 2 833 570.- |
| PROCESS WATER (treatened) | 460.0 | treatment costs insignificant | - | - | local | - | | | | |
| foreign + local raw material | 1015.4 | | | 2 562 313.- | | 46 856.- | 179 363.- | 2777.- | 42 261.- | 2 833 570.- |

1) equal or parallel rate in Sy £ per US $

Calculations: E.Brunner

See chapter IV.5.

Raw Material Costs

Product: E - Alkyd resin paint (decorative & industrial)

Unit: 1000 t of alkyd resin paint

| Raw material group | quantity(t) per unit | US $/t or Sy £/t | exchange rate 1) | costs in Sy £ per unit | origin packaging | insu-rance | 1% customs 6% unified tax | harbours admin. fee | transport | total costs in Sy £ |
|---|---|---|---|---|---|---|---|---|---|---|
| ALKYD RESIN (70 % solid) | 572.2 | Sy£ 3818.- | - | 2 184 660.- | ex factory | - | - | - | - | |
| SOLVENT (Import) | 8.3 | $ 605.- | 5.45 | 27 367.- | foreign drums | 455.- | | | 623.- | |
| PIGMENTS & FILLERS | 248.7 | $ 1460.- | 5.45 | 1 978 906.- | foreign bags | 74 605.- | | | 26 114.- | |
| foreign raw material | | | | 2 006 273.- | | 75 060.- | 140 440.- | 1285.- | 26 737.- | 2 249 795.- |
| SOLVENT (White Spirit) | 153.4 | Sy£ 1500.- | - | 230 100.- | local bulk | - | - | | | |
| SOLVENT (Xylene) | 18.9 | Sy£ 2800.- | - | 52 920.- | local bulk | - | - | | 8 185.- | |
| local raw material | | | | 283 020.- | | | | | 8 185.- | 291 205.- |
| foreign + local raw material | | | | 2 289 293.- | | 75 060.- | 140 440.- | 1285.- | 34 922.- | 2 541 000.- |

1) equal or parallel rate Sy £ per US $

Calculations: E.Brunner

see chapter IV.5.

Raw Material Costs

Product: F - PVA (dispersion, emulsion) paint

Unit: 1000 t of PVA-paint

| Raw material group | quantity(t) per unit | US $/t or Sy £/t | exchange rate 1) | costs in Sy £ per unit | origin packaging | insu-rance | 1% customs 6% unified tax | harbours admin. fee | transport | total costs in Sy £ |
|---|---|---|---|---|---|---|---|---|---|---|
| PVA dispersion (54 % solid) | 200.0 | Sy£ 2834.- | - | 566 800.- | ex factory raw mat.tank | - | - | - | - | 566 800.- |
| FILLERS & PIGMENTS | 150.3 | $ 1460.- | 5.45 | 1 195 937.- | foreign bags | 45 087.- | 83 716.- | 752.- | 15 782.- | 1 341 274.- |
| foreign raw material | 150.3 | $ 1460.- | 5.45 | 1 195 937.- | | 45 087.- | 83 716.- | 752.- | 15 782.- | 1 341 274.- |
| FILLERS & PIGMENTS | 300.6 | Sy£ 382.- | - | 114 829.- | local bags | - | - | - | - | 114 829.- |
| PROCESS WATER (treatened) | 350.0 | treatment cost insignificant | - | - | | - | - | - | - | - |
| foreign + local raw material | 1000.0 | | | 1 877 566.- | | 45 087.- | 83 716.- | 752.- | 15 782.- | 2 022 903.- |

1) equal or parallel rate Sy £ per US $

Calculations: E.Brunner

See chapter IV.5.

Overhead costs

APPENDIX 11/1

Utilities for Product: Alkyd resin (7o % solid) unit: 1ooo t
(Products A and B)

| | quantity per unit | costs per ... | total costs in Sy £ |
|---|---|---|---|
| Electrical consumption | | | |
| for production | 115 ooo kWh | Sy £ o.25/kWh | 2875o.- |
| for utilities | 48 ooo kWh | Sy £ o.25/kWh | 12ooo.- |
| Heavy fuel oil | 7 4oo kg | Sy £ 87o.-/m$^3$<br>o.87/kg | 644o.- |
| Light fuel oil | - | Sy £ 1ooo.-/m$^3$ | - |
| Water treatment agent | - | - | - |
| Utility/energy costs per 1ooo t Alkyd resin (7o % solid) | | | 4719o.- |

See chapters VII.2. and IV.4.

Overhead costs

APPENDIX 11/2

Utilities for Product: PVA dispersion (54 % solid) unit: 1ooo t
(Products C and D)

| | quantity per unit | costs per ... | | total costs in Sy ₺ | |
|---|---|---|---|---|---|
| Electrical consumption | | | | | |
| for production | 32 ooo kWh | Sy ₺ | o.25/kWh | 8 ooo.- | |
| for utilities | 29 ooo kWh | Sy ₺ | o.25/kWh | 7 25o.- | |
| Heavy fuel oil | 2 ooo kg | Sy ₺ | 87o.-/$m^3$<br>o.87/kg | 1 74o.- | |
| Light fuel oil | - | | | - | |
| Water treatment agent | 1 ooo US $ | Sy ₺ | 5.45/ $ | 6 ooo.- | including: customs, unified tax, transp., insurance (1o %) |
| Utility/energy costs per 1ooo t PVA dispersion (54 % solid) | | | | 22 99o.- | |

See chapters VII.2. and IV.4.

Utilities for Product: E - Alkyd paint (decorative & industrial)

unit: 1ooo t

| | quantity per unit | costs per ... | total costs in Sy ₤ |
|---|---|---|---|
| Electrical consumption | | | |
| for production | 12o ooo kWh | Sy ₤ o.25/kWh | 3o ooo.- |
| for utilities | 4 ooo kWh | Sy ₤ o.25/kWh | 1 ooo.- |
| Heavy fuel oil | - | - | |
| Light fuel oil | - | - | |
| Water treatment agent | - | - | - |
| Utility/energy costs per 1ooo t alkyd paint | | | 31 ooo.- |

See chapters VII.2. and IV.4.

Overhead costs

Utilities for Product: F - PVA paint unit: 1ooo t

| | quantity per unit | costs per ... | total costs in Sy Ł | |
|---|---|---|---|---|
| Electrical consumption | | | | |
| for production | 46 ooo kWh | Sy Ł o.25/kWh | 11 25o.- | |
| for utilities | 5 ooo kWh | Sy Ł o.25/kWh | 1 25o.- | |
| Heavy fuel oil | - | | - | |
| Light fuel oil | - | | - | |
| Water treatment agent | 8oo US $ | Sy Ł 5.45/$ | 4 8oo.- | including: customs, unified tax, transp., insurance (1o %) |
| Utility/energy costs per 1ooo t PVA paint | | | 17 3oo.- | |

See chapters VII.2. and IV.4.

APPENDIX 12

Personnel costs per educational level

| Code | Educational level | gross salary | incen-tives | specialis. wage | insurance[1] paid by PCI | naturals, services[2] | total aver. personnel costs |
|---|---|---|---|---|---|---|---|
| a | University education, PhD, Msc, professional or licensed engineer, etc. | 1145 | 6oo | 3oo | 29o | 34o | 27oo |
| b | Technical/commerc. educ. from nationally recognized institut | 99o | 6oo | 2oo | 25o | 34o | 24oo |
| c | Technical/commerc. educ. from training and practice | 8oo | 6oo | - | 2oo | 34o | 2ooo |
| d | Specialists with industrial experiences<br>Skilled workers<br>Unskilled workers | 7oo | 6oo | - | 18o | 34o | 18oo |

1) 14 %

2) medical services; fuels, food, clothes, transport, social services; family expenses

## APPENDIX 13: SENSITIVITY ANALYSIS

Alternative 1 : Foreign exchange rate increased by 100% to 10,9 SyL/US$

Alternative 2 : Foreign exchange rate increased by 50% to 8,175 SyL/US$

Alternative 3 : Old equipment is used for the new plant, reducing investment cost by 2,45 millions of SyL

Alternative 4 : Selling price for all products decreased by 10%

Alternative 5 : Interest rate on loan increase from 9% to 12%

Alternative 6 : Selling price for alkyd resin and PVA fixed by the government at the level of "cost-plus-10%"

Alternative 7 : Capacity utilization rate down to 90%

Alternative 8 : Capacity utilization rate down to 80%

Text Variables

| | |
|---|---|
| Project Name: | Paints & Chemicals Project, Syria |
| Date: | 25 March 1986, by D.Rosati |
| Name of Alternative: | foreign exch.rate up by 100% to 10.95L/$ |
| Accounting currency: | '000 SyL |
| Name of Product (A): | Alkyd Resin,70% solid, in tons |
| Name of Product (B): | Polyvinyl Acetate,54% solid, in tons |
| Name of Product (C): | Alkyd Paints, in '000 US gallons |
| Name of Product (D): | PVA Emulsion Paints, in '000 US gallons |

(L)eave, (Q)uit

, (Q)uit

Cashflow Discounting:

a) Return on Equity 1:
Net present value .....-572001.90 at 10.00 %
Internal Rate of Return (IRRE1) .. not found

b) Return on Equity 2:
Net present value .....-565302.70 at 10.00 %
Internal Rate of Return (IRRE2) .. not found

c) Internal Rate of Return on total investment:
Net present value .....-578424.90 at 10.00 %
Internal Rate of Return ( IRR ) .. not found

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

Text Variables

| | |
|---|---|
| Project Name: | Paints & Chemicals Project, Syria |
| Date: | 25 March 1986, by D.Rosati |
| Name of Alternative: | foreign exchange rate up by 50% to 8.175 |
| Accounting currency: | '000 SyL |
| Name of Product (A): | Alkyd Resin,70% solid, in tons |
| Name of Product (B): | Polyvinyl Acetate,54% solid, in tons |
| Name of Product (C): | Alkyd Paints, in '000 US gallons |
| Name of Product (D): | PVA Emulsion Paints, in '000 US gallons |

(L)eave, (Q)uit

, (Q)uit

Cashflow Discounting:

a) Return on Equity 1:
Net present value ..... -85797.95 at 10.00 %
Internal Rate of Return (IRRE1) .. not found

b) Return on Equity 2:
Net present value .....-105546.80 at 10.00 %
Internal Rate of Return (IRRE2) .. 2.15 %

c) Internal Rate of Return on total investment:
Net present value .....-118669 20 at 10.00 %
Internal Rate of Return ( IRR ) .. 3 78 %

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

Text Variables

| | |
|---|---|
| Project Name: | Paints & Chemicals Project, Syria |
| Date: | 25 March 1986, by D.Rosati |
| Name of Alternative: | old equipment used, reducing inv.by 2.45 |
| Accounting currency: | '000 SyL |
| Name of Product (A): | Alkyd Resin,70% solid, in tons |
| Name of Product (B): | Polyvinyl Acetate,54% solid, in tons |
| Name of Product (C): | Alkyd Paints, in '000 US gallons |
| Name of Product (D): | PVA Emulsion Paints, in '000 US gallons |

(L)eave, (Q)uit

, (Q)uit

Cashflow Discounting:

a) Return on Equity 1:
Net present value ..... 175912.40 at 10.00 %
Internal Rate of Return (IRRE1) .. 92.57 %

b) Return on Equity 2:
Net present value ..... 128835.50 at 10.00 %
Internal Rate of Return (IRRE2) .. 50.51 %

c) Internal Rate of Return on total investment:
Net present value ..... 115713.20 at 10.00 %
Internal Rate of Return ( IRR ) .. 19.17 %

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

Text Variables

| | |
|---|---|
| Project Name: | Paints & Chemicals Project, Syria |
| Date: | 25 March 1986, by D. Rosati |
| Name of Alternative: | exch. rate up by 100%, selling price up 30% |
| Accounting currency: | '000 SyL |
| Name of Product (A): | Alkyd Resin, 70% solid, in tons |
| Name of Product (B): | Polyvinyl Acetate, 54% solid, in tons |
| Name of Product (C): | Alkyd Paints, in '000 US gallons |
| Name of Product (D): | PVA Emulsion Paints, in '000 US gallons |

(L)eave, (Q)uit

(Q)uit

Cashflow Discounting:

a) Return on Equity 1:
Net present value ..... -131050.70 at 10.00%
Internal Rate of Return (IRRE1) ..... not found

b) Return on Equity 2:
Net present value ..... -124351.40 at 10.00%
Internal Rate of Return (IRRE2) ..... 3.08%

c) Internal Rate of Return on total investment:
Net present value ..... -137473.60 at 10.00%
Internal Rate of Return (IRR) ..... 4.22%

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

Text Variables

| | |
|---|---|
| Project Name: | Paints & Chemicals Project, Syria |
| Date: | 25 March 1986, by D.Rosati |
| Name of Alternative: | interest rate increased from 9% to 12% |
| Accounting currency: | '000 SyL |
| Name of Product (A): | Alkyd Resin,70% solid, in tons |
| Name of Product (B): | Polyvinyl Acetate,54% solid, in tons |
| Name of Product (C): | Alkyd Paints, in '000 US gallons |
| Name of Product (D): | PVA Emulsion Paints, in '000 US gallons |

(L)eave, (Q)uit

, (Q)uit

Cashflow Discounting:

a) Return on Equity 1:
Net present value ..... 156568.00 at 10.00 %
Internal Rate of Return (IRRE1) .. 77.21 %

b) Return on Equity 2:
Net present value ..... 115274.90 at 10.00 %
Internal Rate of Return (IRRE2) .. 40.42 %

c) Internal Rate of Return on total investment:
Net present value ..... 119685.30 at 10.00 %
Internal Rate of Return ( IRR ) .. 19.34 %

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

Text Variables

| | |
|---|---|
| Project Name: | Paints & Chemicals Project, Syria |
| Date: | 25 March 1986, by D.Rosati |
| Name of Alternative: | prod.A&B sold at cost-plus-10% |
| Accounting currency: | '000 SyL |
| Name of Product (A): | Alkyd Resin,70% solid, in tons |
| Name of Product (B): | Polyvinyl Acetate,54% solid, in tons |
| Name of Product (C): | Alkyd Paints, in '000 US gallons |
| Name of Product (D): | PVA Emulsion Paints, in '000 US gallons |

(L)eave, (Q)uit

. (Q)uit

Cashflow Discounting:

a) Return on Equity 1:
Net present value ..... 169589.80 at 10.00 %
Internal Rate of Return (IRRE1) .. 84.63 %

b) Return on Equity 2:
Net present value ..... 123393.00 at 10.00 %
Internal Rate of Return (IRRE2) .. 45.86 %

c) Internal Rate of Return on total investment:
Net present value ..... 110270.60 at 10.00 %
Internal Rate of Return ( IRR ) .. 18.65 %

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

Text Variables

| | |
|---|---|
| Project Name: | Paints & Chemicals Project, Syria |
| Date: | 25 March 1986, by D.Rosati |
| Name of Alternative: | capacity utilisation rate down to 90% |
| Accounting currency: | '000 Syl |
| Name of Product (A): | Alkyd Resin,70% solid, in tons |
| Name of Product (B): | Polyvinyl Acetate,54% solid, in tons |
| Name of Product (C): | Alkyd Paints, in '000 US gallons |
| Name of Product (D): | PVA Emulsion Paints, in '000 US gallons |

(L)eave, (Q)uit

, (Q)uit

Cashflow Discounting:

a) Return on Equity 1:
Net present value ..... 160485.80 at 10.00 %
Internal Rate of Return (IRRE1) .. 84.06 %

b) Return on Equity 2:
Net present value ..... 116622.70 at 10.00 %
Internal Rate of Return (IRRE2) .. 45.38 %

c) Internal Rate of Return on total investment:
Net present value ..... 103500.40 at 10.00 %
Internal Rate of Return ( IRR ) .. 18.31 %

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

Text Variables

| | |
|---|---|
| Project Name: | Paints & Chemicals Project, Syria |
| Date: | 25 March 1986, by D.Rosati |
| Name of Alternative: | capacity utilisation rate down to 80% |
| Accounting currency: | '000 SyL |
| Name of Product (A): | Alkyd Resin,70% solid, in tons |
| Name of Product (B): | Polyvinyl Acetate,54% solid, in tons |
| Name of Product (C): | Alkyd Paints, in '000 US gallons |
| Name of Product (D): | PVA Emulsion Paints, in '000 US gallons |

(L)eave, (Q)uit

. (Q)uit

Cashflow Discounting:

a) Return on Equity 1:
Net present value ..... 137743.30 at 10.00 %
Internal Rate of Return (IRRE1) .. 79.01 %

b) Return on Equity 2:
Net present value ..... 96550.17 at 10.00 %
Internal Rate of Return (IRRE2) .. 39.56 %

c) Internal Rate of Return on total investment:
Net present value ..... 83427.84 at 10.00 %
Internal Rate of Return ( IRR ) .. 16.82 %

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return