Ethylene (Gas Base)

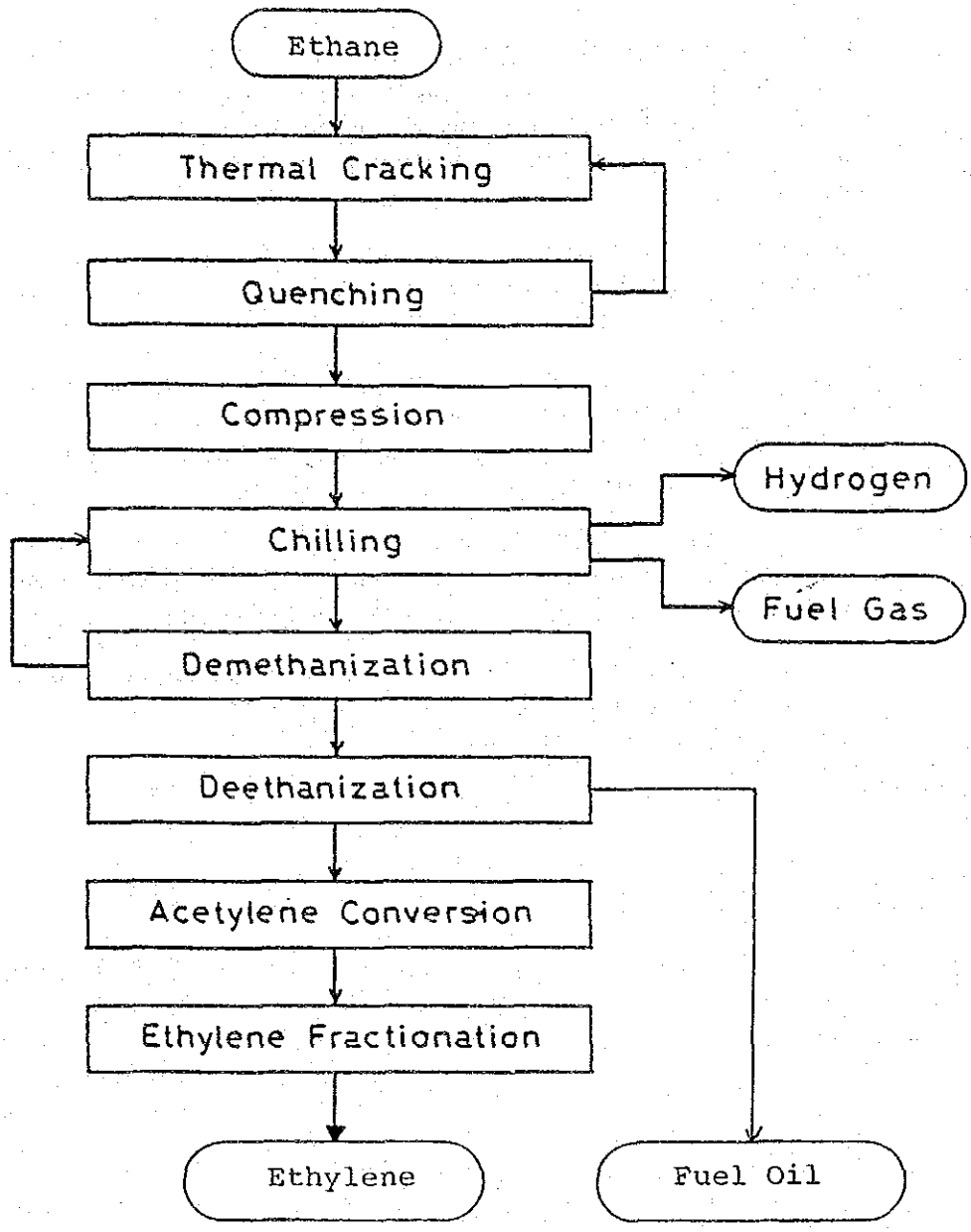

Fig. 4.5 PROCESS BLOCK FLOW DIAGRAM

b) Propylene Plant

– General

The capacity of the propylene plant is set as follows:

Case 1 & 4	Propylene	53,000 T/Y
Case 2 & 5	Propylene	75,000 T/Y
Case 3 & 6	Propylene	106,000 T/Y

When ethylene is produced from ethane, only minute amounts of propylene are produced, and they are not sufficient for commercial scale undertakings. If propylene only is to be produced, an effective method is to dehydrogenate propane. In this study used of a process for dehydrogenation of propane is assumed as the method of producing propylene.

– Process Description of the Propylene Plant

Raw material	:	Propane
Products	:	Propylene

The fresh feed propane is mixed with unconverted recycle and hydrogen-rich recycle gas. The combined feed is then heated to reaction temperature and converted in a series of stacked reactors.

The reaction is endothermic and, therefore, activity is maintained by supplying the heat of reaction through interheaters. The catalytic system employs continuous catalyst regeneration technology, whereby the bed of catalyst, slowly flowing concurrently with the reactant, is removed from the reactors and regenerated in a separate section to be returned to the top reactor in the stack.

Since the catalyst regeneration section is completely isolated and independent from the reactor section, a continuous long term operation can be achieved without any interruption from the regeneration section and the catalyst can be maintained at a high level of activity and selectivity throughout the operation.

The effluent from the last reactor exchanges heat against the combined feed, and then by a series of exchange and compression, is sent to the separator after cooling. The hydrogen-rich gas from the separator is sent to a turbo expander where energy is recovered and the gas is further cooled down. After being utilized as a refrigerant, some of the hydrogen-rich gas is recycled back to the reactor section while the reminder is removed from the unit as off gas.

Hydrogen purity in the off-gas stream is about 85 mol. %, the balance consisting only of methane and other light hydrocarbons. This hydrogen may be exported for use in other units without any further treatment or may be consumed as fuel.

The liquid from the separator is then pumped to a deethanizer where components lighter than C_3 are removed overhead and the bottoms sent to a propane/propylene splitter where product propylene is recovered overhead and the unconverted propane in the bottoms recycled back to the reactor section.

Propylene

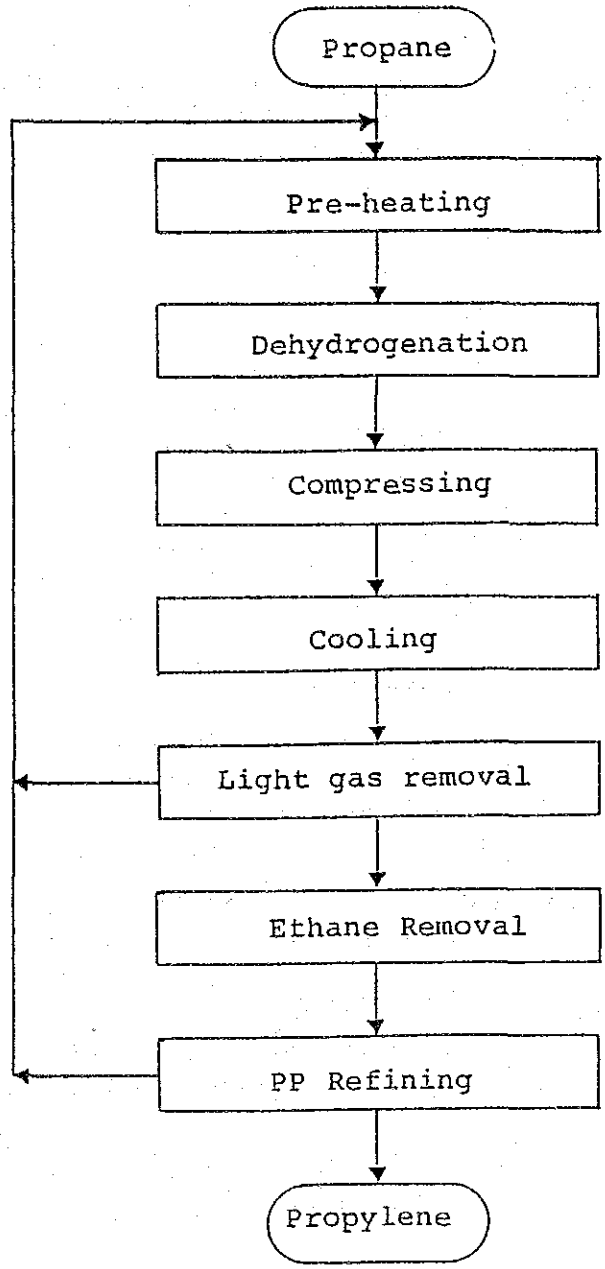

Fig. 4.6 PROCESS BLOCK FLOW DIAGRAM

c) Linear Low Density Polyethylene Plant

– General

The capacity of the linear low density polyethylene plant (LLDPE) is set as follows.

Case 1 & 4	LLDPE	78,000 T/Y
Case 2 & 5	LLDPE	111,000 T/Y
Case 3 & 6	LLDPE	156,000 T/Y

Because the production of LLDPE does not require a high temperature or a high pressure it is requires less energy than the process for making LDPE, and this technology is evaluated as worthy of use given the high cost of energy in the world today.

– Process Description of the Linear Low Density Polyethylene Plant

Raw materials	:	Ethylene, Butene-1
Product	:	Linear Low Density Polyethyelene (LLDPE)
Basic Chemistry	:	nC_2H_4 -----$(C_2H_4)n$

LLDPE is produced through gas phase, solution or slurry state polymerization at low or medium pressure. The resins manufactured by these processes have a linear molecular structure similar to that of HDPE (therefore called linear LDPE) but with some relatively short chain branching of comonomers such as butene-1, hexene-1 or octene-1.

Here, the gas phase polymerization method was adopted. Ethylene, butene-1 and catalyst are fed to a fluidized bed reactor where polyethylene granules are formed and withdrawn through special valves.

The chromium-based catalyst is processed and activated in the catalyst preparation section before being fed to the reactor. To keep the growing polymer particles fluidized and to remove the heat of reaction, the reactor gas is recycled to the reactor through a gas cooler and recycle gas blower.

The withdrawn polymer is accompanied by a small portion of the reactor gas, of which the major part is returned to the recycle gas loop with the remainder being purged. The polymer is fed to a pelletizer after addition of an antioxidant and other additives. The finished pellets are homogenized in blending bins and bagged as product LLDPE.

The polymerization system is operated under a pressure of about 20 Kg/cm^2 G and therefore considered to be a safer. Consequently there is practically no safety or environmental problem.

Lenear Low Density Polyethylene

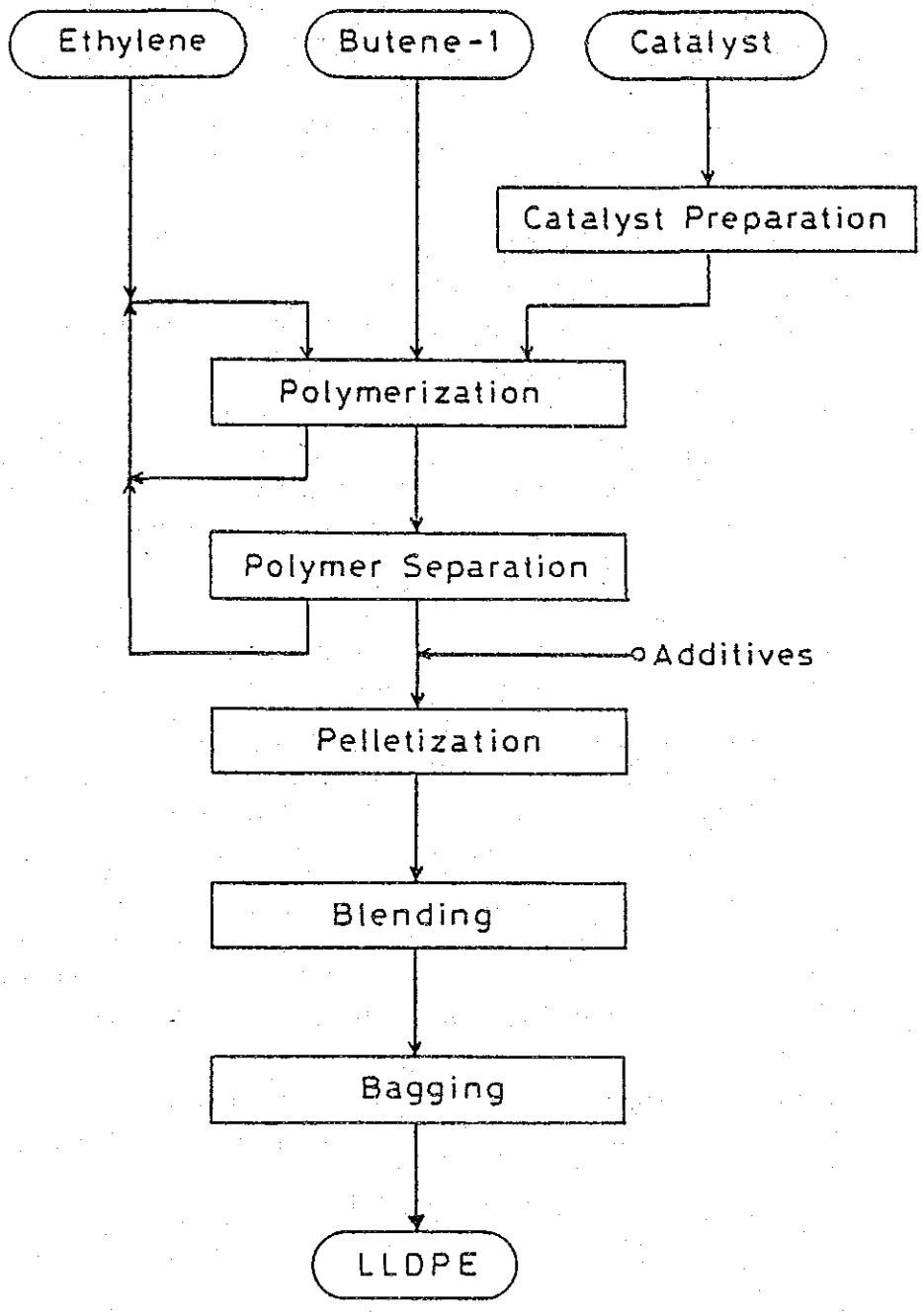

Fig. 4.7 PROCESS BLOCK FLOW DIAGRAM

d) High Density Polyethylene Plant

– General

The capacity of the high density polyethylene (HDPE) plant is set as follows.

Case 1 & 4	HDPE	53,000 T/Y
Case 2 & 5	HDPE	77,000 T/Y
Case 3 & 6	HDPE	106,000 T/Y

Recently it has become possible to greatly reduce energy consumption in high density polyethylene plants, through use of superactive catalyst technology. Further, because special materials and equipment are not needed, the cost of constructing a plant is relatively low. For this study it is assumed that the superactive catalyst will be used.

– Process Description of the High Density Polyethylene Production

Raw materials	:	Ethylene
Product	:	High Density Polyethylene

Ethylene, a small quantity of hydrogen, catalysts and comonomer (if used) are fed to the polymerization system where polymerization is carried out in slurry phase in a saturated hydrocarbon diluent.

Use of superactive catalyst eliminates the catalyst removal stage. The density, melt flow rate and molecular weight distribution are easily controlled over a broad range by changing the operating conditions.

The heat of polymerization is removed by ordinary cooling water. No deposit of polymers occurs on the internal wall of the polymerization reactor.

Slurry containing the polymer and solvent is fed to a centrifuge where it is separated into a wet cake of polymer and solvent. The wet cake of polymer is forwarded to a dryer where it is dried completely into powder.

The greater part of the solvent separated in the centrifuge is recycled as it is into the polymerization system and the rest, or smaller part of it, is forwarded to the solvent recovery section for low molecular weight polymer removal. The dried powder is mixed with stabilizers, the mixture is then pelletized by an extruder. The pellets are transferred to silos and automatically packed in paper bags.

– Waster and effluent

No harmful material is used in the process, so an ordinary environmental protection system for waste effluent treatment is enough.

High Density Polyethylene

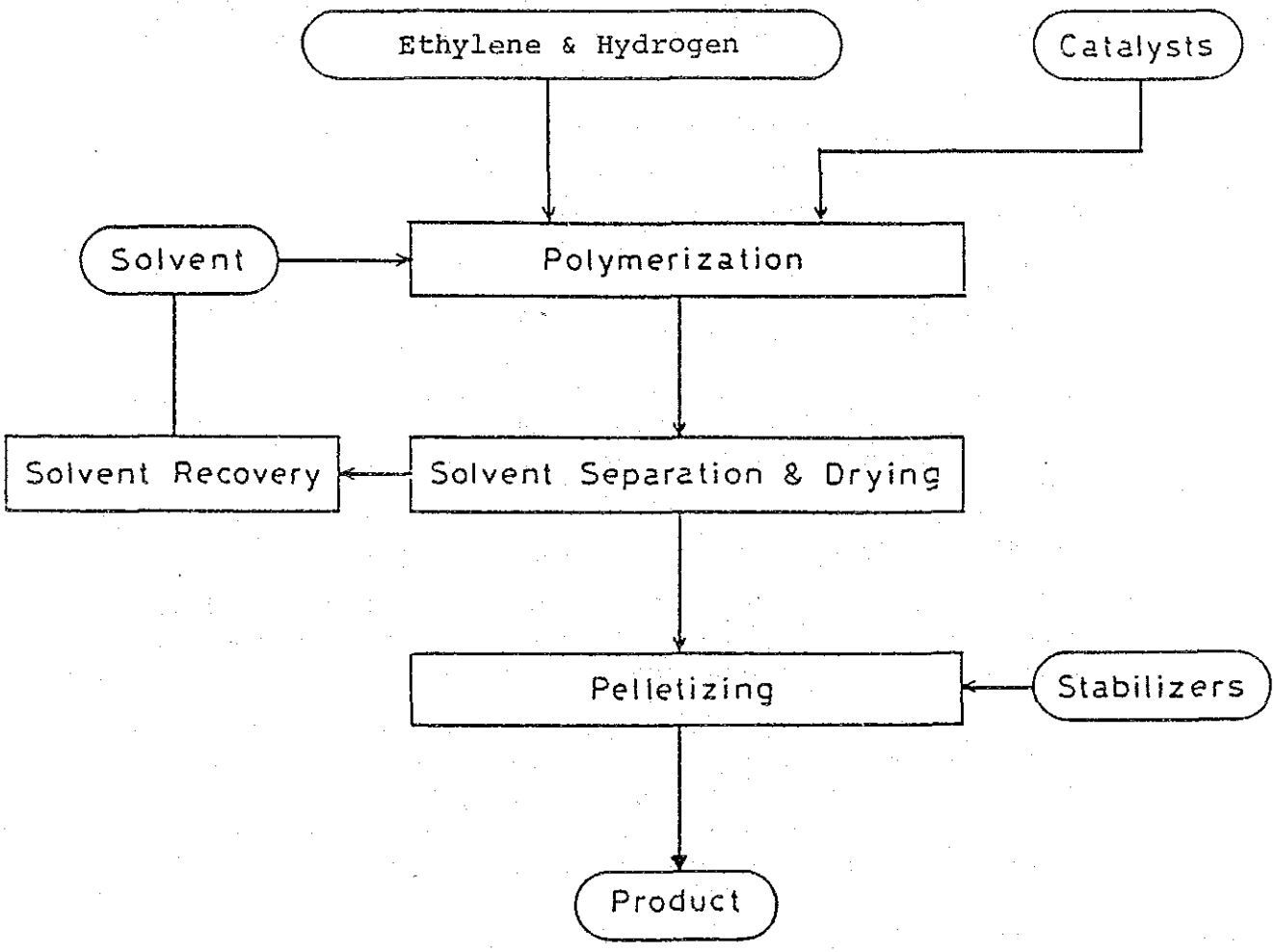

Fig. 4.8 PROCESS BLOCK FLOW DIAGRAM

e) Vinyl Chloride Monomer Plant

– General

The capacity of the vinyl chloride monomer (VCM) plant is set as follows.

Case 1 & 4	VCM	68,000 T/Y
Case 2 & 5	VCM	97,000 T/Y
Case 3 & 6	VCM	136,000 T/Y

Several alternate methods of VCM production exist, including ethylene chlorination, ethylene oxychlorination and ethylene dichloride pyrolysis. For this study it is assumed that a combination of the most commonly used oxychlorination process and EDC pyrolysis process is used.

– Process Description of the Vinyl Chloride Monomer Plant

Raw materials : Ethylene, Ethylene dichloride, Oxygen
Product : Vinyl chloride monomer (VCM)
Basic Chemistry : Pyrolysis of EDC $C_2H_4Cl_2$ ----- $C_2H_2Cl + HCl$
Oxychlorination $C_2H_4 + 2HCl + ½O_2$ --- $C_2H_4Cl_2 + H_2O$

In recent years, some EDC has been made in regions where cheap ethylene is available and has been transported from another region to make vinyl chloride. In view of this, for this study it is assumed that EDC is imported for processing to make VCM.

The vinyl chloride plant consists of an EDC pyrolysis unit and an oxychlorination unit. The imported EDC is cracked to VCM by thermal decomposition. The hot effluent from the cracker is quenched, hydrogen chloride is removed to be recycled to the oxychlorination reactor and further, uncracked EDC is recovered to be recycled to the EDC purification section.

The distillate of the EDC recovery tower is sent to the succeeding refining section to obtain VCM of product specifications.

Another stream of ethylene, oxygen and recycled hydrogen chloride which is recovered through the cracking of EDC is fed to an oxychlorination reactor.

The ethylene is oxychlorinated to EDC on the fluidized catalyst (Ca-Al) in the reactor. The reaction mixtures from the reactor are quenched and scrubbed, successively in the quencher and the caustic scrubber. The scrubber overhead is added to the small chlorination reactors. The chlorinated product can be added to the condensate. The condensate is dehydrated to obtain oxychlorinated EDC.

This stream together with the imported EDC and the recycle EDC recovered in the EDC pyrolysis section are purified to meet the specifications of the EDC. In the waste water system, hydrochloric acid from the oxychlorination section and the EDC purification section is neutralized and then biologically treated. High boiling organic compounds discharged from the EDC are incinerated and neutralized.

VCM is highly flammable and toxic. Further, it has been identified as a cause of liver cancer. Therefore sufficient care should be required for its processing and handling.

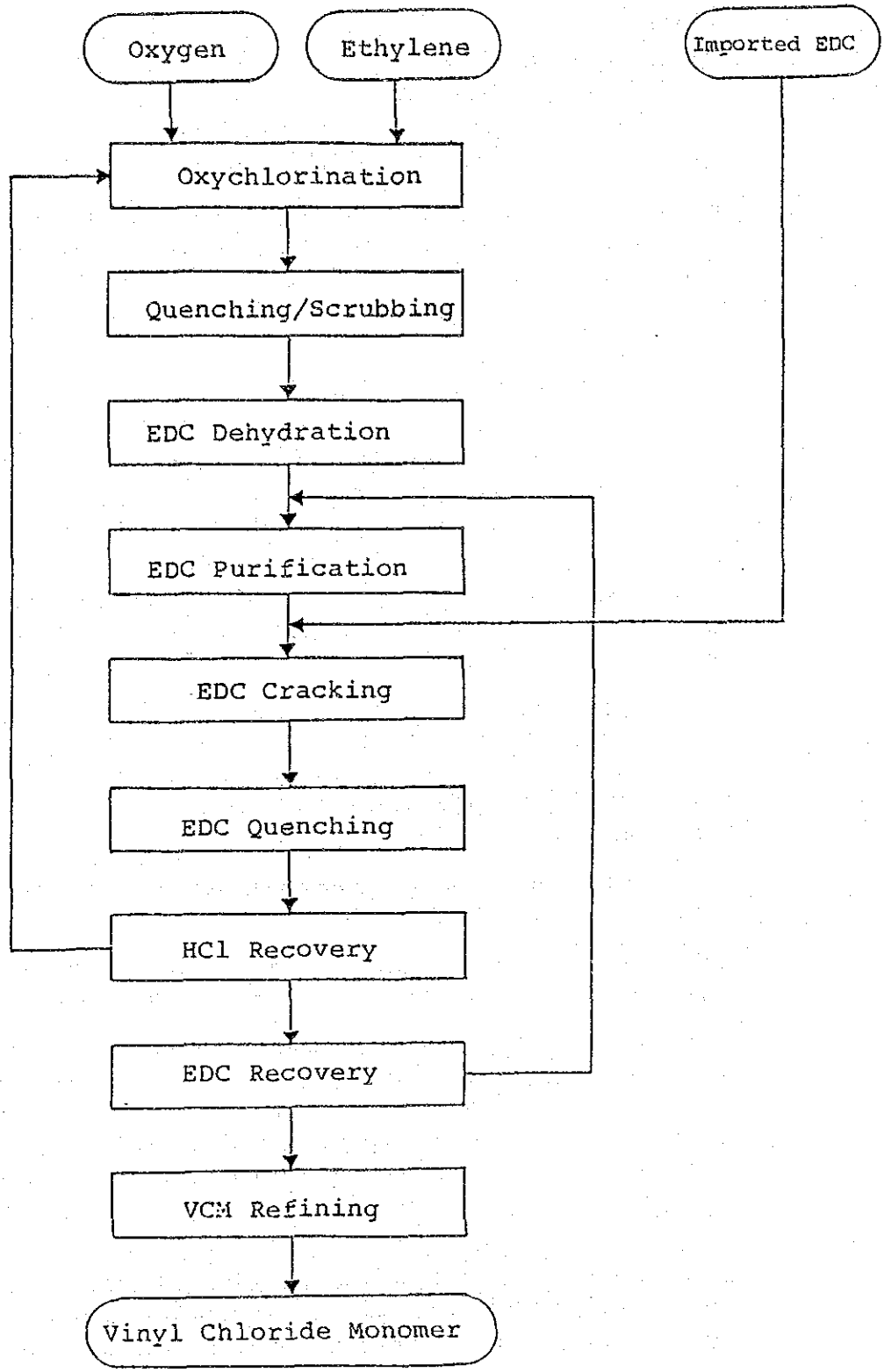

Fig. 4.9 PROCESS BLOCK FLOW DIAGRAM

f) Polypropylene Plant

– General

The capacity of the polypropylene (PP) plant is set as follows.

Case 1 & 4	PP	50,000 T/Y
Case 2 & 5	PP	71,000 T/Y
Case 3 & 6	PP	100,000 T/Y

Similar to the process for making HDPE, the process for making polypropylene now makes use of a uperactive catalyst, which eliminates the need for a process to remove the catalyst from the polymer and conserves energy. This study assumes that the superactive catalyst is used.

– Process Description of the Polypropylene Production

Raw Materials : Propylene
Product : Polypropylene

Propylene, catalysts and a small amount of hydrogen are fed into polymerization reactors containing a hydrocarbon solvent.

Typical polymerization conditions are temperatures in the range of 60 to 80°C and pressures of 5 to 15 atmospheres. Unreacted propylene monomer is flashed and recycled to the reactor without any purification.

The slurry comprising polymer and solvent is transferred to a centrifuge, where it is separated into wet cake of polymer and solvent. The wet cake of polymer is transferred to a drying system to be dried.

The dry powder is mixed with additives and extruded into pellets. Recovery of the solvent separated in the centrifuge and removal of a small amount of atactic polymers are carried out by simple distillation.

– Waste and effluent

Toxic materials such as methanol are not used in this process, so an ordinary environmental protection system for waste effluent treatment is enough.

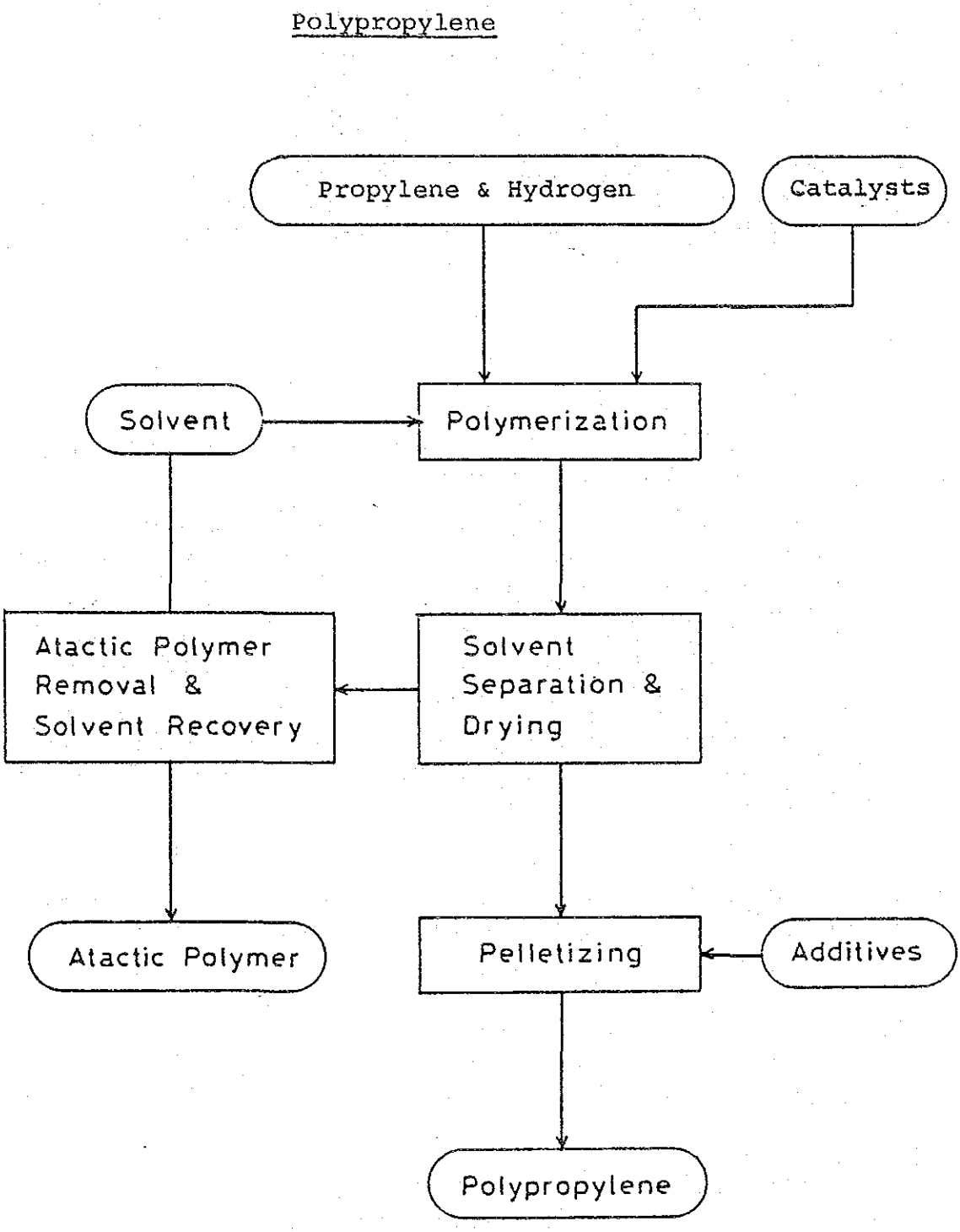

Fig. 4.10 PROCESS BLOCK FLOW DIAGRAM

(4) Overall Material Balance of the Project

a) Raw materials

An over-all material balance is calculated in Table 4.3. The quantities of feedstock, ethane and propane required for this project as defined in the present study have been derived from that table and are as shown below, in natural gas equivalents.

	Case 1 & 4	Case 2 & 5	Case 3 & 6
Ethane (T/Y)	178,000	255,000	356,000
Propane (T/Y)	63,000	89,000	126,000
Natural gas (MMSCFD)	250	360	500

The composition of the natural gas for each case would be as follows.

	Case 1 & 4 (MMSCFD)	Case 2 & 4 (MMSCFD)	Case 3 & 6 (MMSCFD)
Natural gas	250	360	500
Methane	200	290	400
Etane	19	27	38
Propane	8	11	16
Butane	4	6	8
Others	19	26	38

The plan would call for processing of 500 MMSCFD of natural gas in/around 1990.

Therefore, it is possible to implement any one of these six cases. Further, the consumption of the methane would be as follows.

Paka LLN Electric Power Station	300	MMSCFD
DRI (Steel Mill Plant)	20 – 40	MMSCFD
Others	7 – 10	MMSCFD , Total 330–350 MMSCFD

The remainder, 50 – 70 MMSCFD, could be fully utilized to meet requirements of the gas distribution plan which is now being prepared. All of the ethane would be used as feedstock by the petrochemical industry. Some of the propane would be used as feedstock by the production of propylene.

The remainder would be conveyed to the export terminal which is now being constructed, for exportation, or be consumed as fuel elsewhere in the country. All of the butane would be exported via the terminal. Therefore, in any of the three cases the consumption of the gas can be predicted and then would be no special problem regarding the gas balance.

Table 4.4 Material Balance

		Plant Capacity (T/Y)	Unit Consumption per ton	Raw Materials (T/Y)					
				Ethane	Ethylene	Buten-1 (Imports)	EDC (Imports)	Propane	Propylene
CASE I	Ethylene	142,000	1.25	178,000					
	LLDPE	78,000	E 0.93 B 0.1		73,000	8,000			
	HDPE	53,000	1.013		54,000				
	VCM	68,000	E 0.239 EDC 0.776		15,000		54,000		
	Propylene	53,000	1.19					63,000	
	PP	50,000	1.055						53,000
	Total			178,000	142,000	8,000	54,000	63,000	53,000
CASE II	Ethylene	204,000	1.25	255,000					
	LLDPE	111,000	E 0.93 B 0.1		103,000	11,000			
	HDPE	77,000	1.013		78,000				
	VCM	97,000	E 0.239 EDC 0.796		23,000		77,000		
	Propylene	75,000	1.19					89,000	
	PP	71,000	1.055						75,000
	Total			255,000	204,000	11,000	77,000	89,000	75,000
CASE III	Ethylene	285,000	1.25	356,000					
	LLDPE	156,000	E 0.93 B 0.1		145,000	16,000			
	HDPE	106,000	1.013		107,000				
	VCM	136,000	E 0.239 EDC 0.796		33,000		108,000		
	Propylene	106,000	1.19					126,000	
	PP	100,000	1.055						106,000
	Total			356,000	285,000	16,000	108,000	126,000	106,000

Note: E: Ethylene B: Buten-1

b) Utilities

The utility balance is shown in Table 4.4. Steam consumption by the petrochemical complex would be as follows; this is adequate in all cases to justify installation of a steam boiler.

Case 1	60 T/H
Case 2	80 T/H
Case 3	110 T/H

Cooling water requirements would be as follows:

Case 1	50 MM T/Y
Case 2	70 MM T/Y
Case 3	95 MM T/Y

The quantity of cooling water required is quite high, so it would be advisable to install a cooling tower to recycle the water. Processing water would be taken from river and supplied by JKR. Electric power is assumed to be supplied from the project by LLN.

4.3.5 Project Schedule

(1) General

As a primary basis for the projection of the implementation schedule, it is assumed that the ethylene will be made available to the Project by the beginning of 1990. Therefore, each project plant should be ready to receive the ethylene by that time, in due consideration of the construction period of 27 months including a test run of the plants and facilities.

In addition to the project construction schedule, the project implementation schedule should also take into account the time required for the filing of applications and acquisition of permits.

(2) Implementation Schedule

a) Evaluation of feasibility study, and government approval

After selection of the principal company(ies) to participate in the petrochemical complex project, a joint venture is to be established by them with either PETRONAS or Terengganu State. The joint venture will be the entity responsible for subsequent operations. Conducting a feasibility will be the first task of the new company; on the basis of the report taking the necessary steps to obtain the required approvals and permits from the Malaysia government would be the second task. It is believed that these approvals would be completed in 3 months.

Table 4.5 Utilities Balance

		Plant Capacity (T/Y)	Utilities				
			PW (MMT/Y)	CW (MMT/Y)	Steam (T/Y)	Electric Power (MMKW)	Fuel (MMBTU)
CASE I	Ethylene	142,000	0.28	31.0	182,000	5.7	(2,160,000)
	LLDPE	78,000	-	1.6	-	46.8	-
	HDPE	53,000	-	-	36,000	31.8	-
	VCM	68,000	-	15.0	19,000	-	-
	Propylene	53,000	0.10	-	143,000	0.7	(70,000)
	PP	50,000	0.03	-	60,000	29.5	-
	Total		0.41	47.6	440,000	114.5	-
CASE II	Ethylene	204,000	0.41	44.3	260,000	8.1	(309,000)
	LLDPE	111,000	-	2.3	-	66.6	-
	HDPE	77,000	-	-	52,000	46.2	-
	VCM	97,000	-	21.3	27,000	-	-
	Propylene	75,000	0.14	0.1	203,000	1.0	(100,000)
	PP	71,000	0.04	-	86,000	41.9	-
	Total		0.59	68.0	628,000	162.8	-
CASE III	Ethylene	285,000	0.57	62.0	384,000	11.2	(433,000)
	LLDPE	156,000	-	3.2	-	93.6	-
	HDPE	106,000	-	-	71,000	63.6	-
	VCM	136,000	-	29.9	38,000	-	-
	Propylene	106,000	0.20	0.1	286,000	1.4	(140,000)
	PP	100,000	0.06	-	120,000	59.0	-
	Total		0.83	95.2	879,000	228.8	-

Note: Fuel requirements are met by a part of by-produced fuel from ethane cracking and propane dehydrogenation units.

b) Establishing the organization for project implementation

It will be necessary to form a project team, led by a project director. The work of establishing the organization for project implementation would be started simultaneously with the review described in (1) above.

c) Financial arrangements

It will be necessary to prepare and submit requests for long-term project financing to the financial institutions concerned, and to negotiate loan agreements with them and undertake the tasks related to securing commitments.

d) Work from establishment of the design basis to contract award

Use of a turn-key, lump-sum contract is assumed. The milestones from establishment of design basis to the contract award are as follows.

- Detailed examination of the design basis
- Preparation of general terms and conditions for the contract
- Preparation of tender specifications
- Establishment of bid evaluation criteria
- Call for tenders
- Evaluation of tenders and selection of the successful bidder
- Negotiation and award of contract

This period is expected to last 12 months, and because it represents a tight schedule, it is necessary to consider retaining a consultant at the earliest possible time.

e) Work from contract signing to final acceptance

When a turn key contract is used all construction work is performed by, and at the responsibility of, the prime contactor. For a large-scale project such as the ethylene plant, a long time is required before the critical equipment can be erected, and because of the great amount of work to be performed, there is a limit to the progress which can be made in one month.

According to the estimate that the study team believes to be the most likely, from contract award to mechanical completion 30 months will be required after which an additional three months will be required for commissioning of the plant and performance of tests.

During these periods it will be necessary for the owner to supervise the work of the prime contractor to prepare for plant operation, set up the required organization, hire and train personnel, prepare a financial plan and obtain loan commitments, arrange for purchase of raw material and utility supply services, negotiate product sales contracts and complete many other tasks.

After the completion of construction, the project will enter the initial start-up stage.

Until plant acceptance, operation of the plant will be performed by the contractor's operation team.

It would be advantageous for the owner's personnel to obtain experience by participating in the field work from the start of tests and flushing prior to start-up.

Initial operation will also be performed by the contractor but it is desirable to have the owner's personnel join in the work.

A generalized implementation schedule for a petrochemical plant is shown in Figure 4.11.

4.3.6 Project organization

The organization which will be required for operation and maintenance of the ethylene plant, is as shown in Figure 4.12. The remaining plants (propylene plant, LLDPE Plant, HDPE plant, VCM plant and PP plant,) are as shown in CHAPTER 13 in Technical Report II.

This organization is to be composed of administrative, production, maintenance and technical services divisions.

The number of workers at each plant would be as follows.

Ethylene Plant	129 workers
Propylene plant	72
LLDPE plant	121
HDPE plant	121
VCM Plant	108
PP Plant	121
Utility plant	75
Total	746 workers

This figure do not include employees at the head office. The actual requirements need to be confirmed at the time of test operation and hiring should be done on that basis.

4.4 ENVIRONMENTAL PROTECTION

It is aimed in this study that the petrochemical complex being planned at Terengganu district shall utilize the latest technology available and shall form by itself a totally enclosed system to achieve conservation of resources and energy, and environmental protection.

This petrochemical complex will, therefore, basically be pollution free, eliminating the hazardous substances within its process plants and preventing their discharge to the environment.

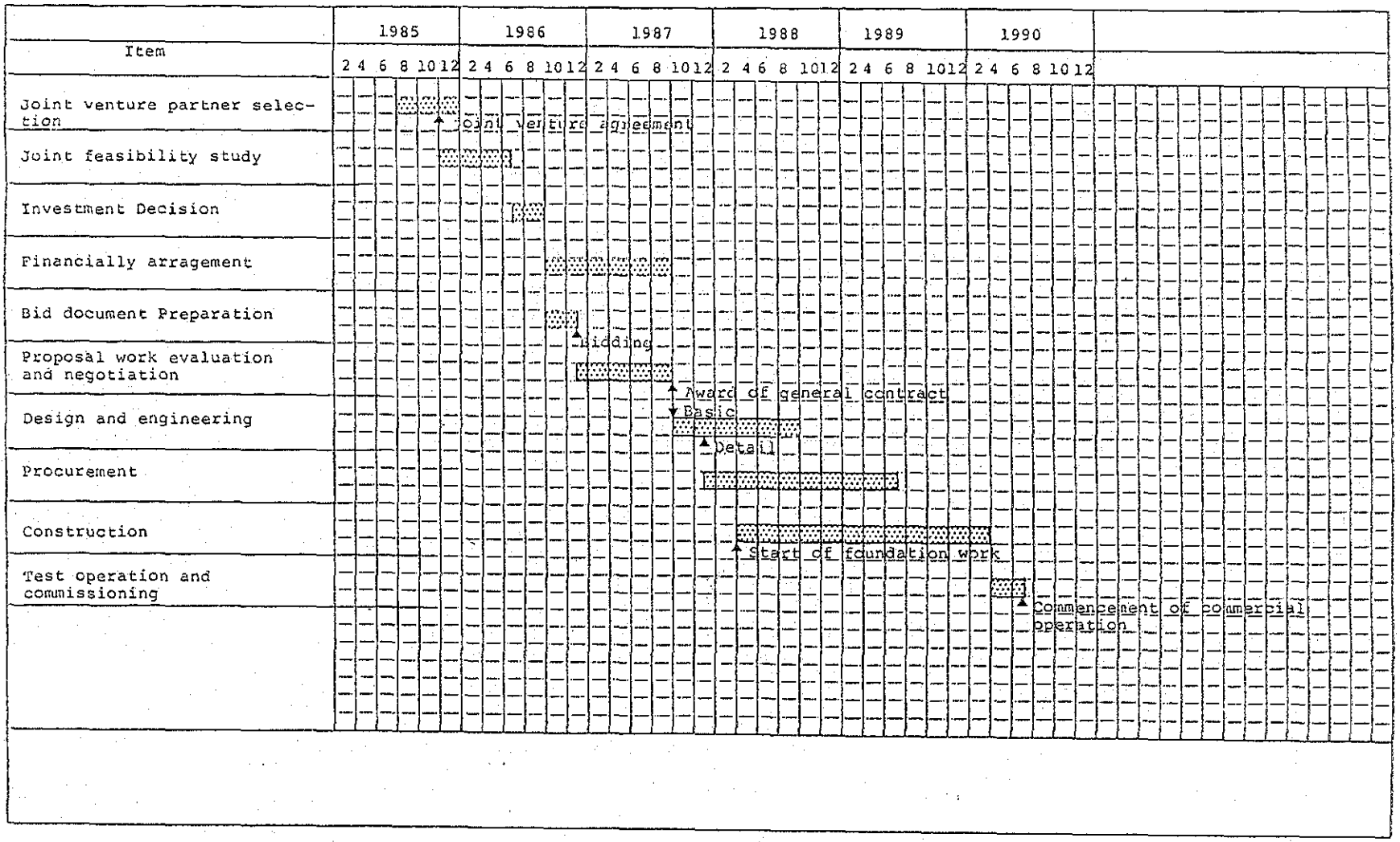

Fig. 4.11 PETROCHEMICAL PLANT IMPLEMENTATION SCHEDULE

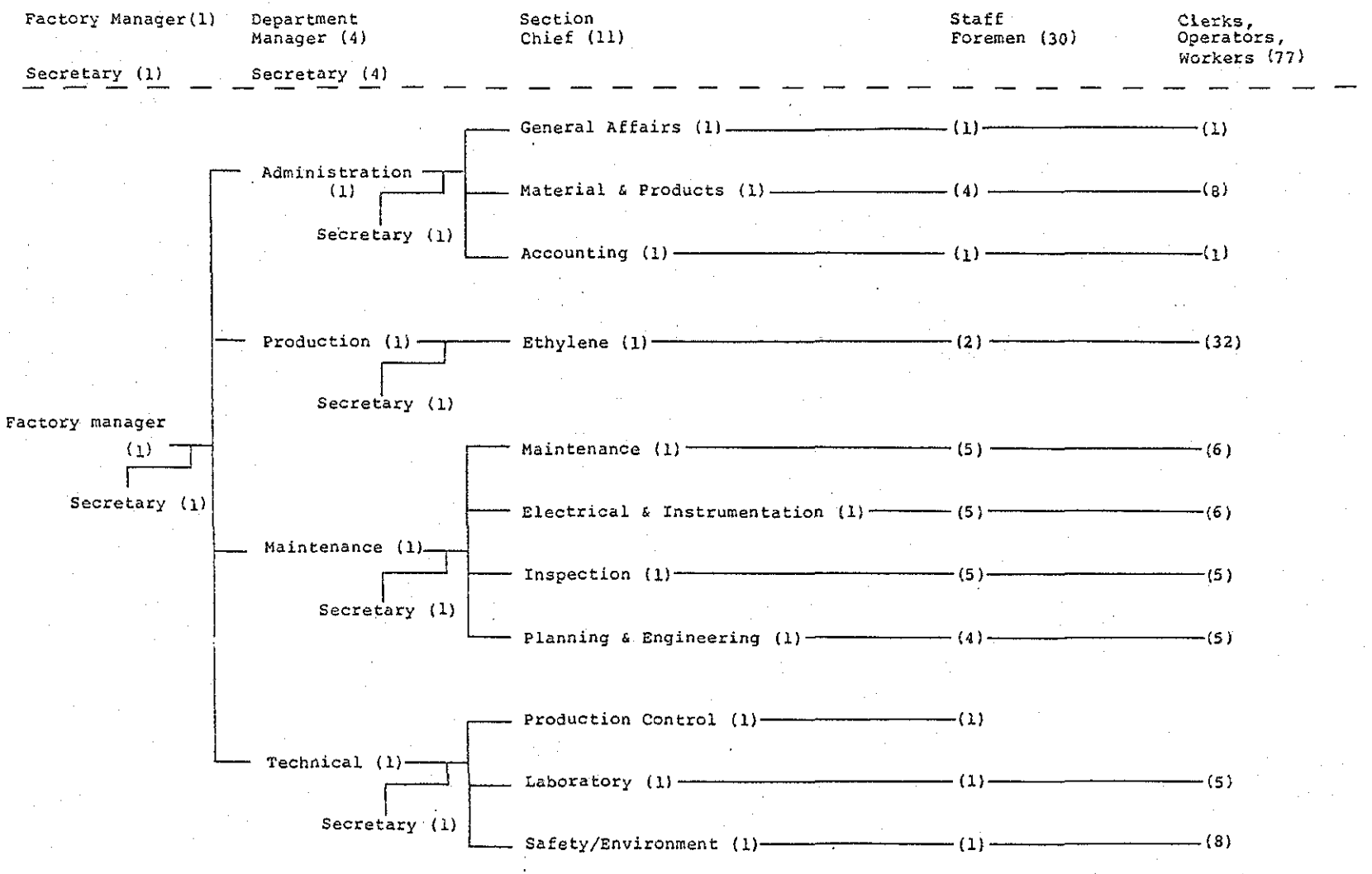

Fig. 4.12 ORGANIZATION CHART FOR THE ETHYLENE PLANT

In this study, the plants are planned and designed based upon the Japanese regulations for environment protection which are regarded as the most severe in the world. Envirnmental standards of Malaysia are also applicable to this study with a few exceptions which are considered inadequate from the technical as well as economical viewpoints.

In the planning of environment protection measures the following steps are adopted.

(1) Confirmation of sources of pollutants

(2) Establishment of standards for pollution prevention and control

To prevent any pollution caused by the operation of the complex, standards are to be established for waste gas and effluent. The standards so established are based on applicable laws and regulations in Japan, standards in Malaysia, and the applicability of pollution prevention and control technology.

(3) Design of pollution prevention facilities

Weaste treatment and disposal methods and facilities necessary to achieve the environment protection targets (for waste gas and effluent emission) are designed in accordance with the standards as established above. For this design, the optimum combination of two methods was considered to be adopted; those two mehods are:

a) Control over generation of waste, by improvement of processes (including change of the design of equipment).

b) Containment, whereby to the greatest extent contained at their sources.

(4) Others

More detail information will be shown in CHAPTER 13 in Technical Report II.

CHAPTER 5 CAPITAL REQUIREMENTS AND FINANCIAL PLAN

5.1 CAPITAL REQUIREMENTS

5.1.1 Introduction

On the basis of the technical requirements, the conceptual design of the facilities and the implementation plan for this Project which are given in CHAPTER 4, the total capital requirement for the Project was estimated, and is shown in Tables 5.2, 5.3.

Because the source of financing for the Project has not yet been determined, some of the basic conditions for estimation of capital requirements are as yet unknown. Nevertheless, the following conditions have been assumed as the bases for the estimation, on the basis of past conditions in Malaysia and other relevant matters:

(1) Type of Contract

A turn-key, lump-sum contract, with a sole responsibility on the contractor.

(2) Basis for Prices

By application of suitable escalation rates to August 1984 base prices, up to the time of expenditure for each item.

(3) Exchange Rates Used for Cost Estimation

The local currency portion is calculated in Malaysia dollars, and converted to U.S. dollars at the rate of US$1 = M$2.28.

The foreign exchange portion is calculated in U.S. Dollars and Japanese yen. The yen portion is converted to dollars at the rate of US$1 = ¥230.

(4) Price Escalations Factors

a) Escalation of general foreign currency costs

The foreign currency costs are assumed to be escalated in accordance with an average escalation consumers goods in the major industrialized countries though the price level of international market is usually kept lower than the consumers goods price level which is dominated by domestic prices. Historical trend and assumed rates of escalation rates in the major countries are as shown in Table 5.1.

Table 5.1 Price Escalation in Major Industrialized Countries

(Unit: %)

	1) USA	2) JAPAN	3) 7 Industrialized Countries	4) Export Price Average
1978	7.7	3.8	6.9	5.7
1979	11.3	3.6	9.2	11.9
1980	13.5	8.0	12.1	11.9
1981	10.4	4.9	9.8	6.3
1982	6.2	2.6	6.9	3.3
1983	3.0	2.0	5.0	3.0

Note: 1) 2) Consumers goods price
3) Average of USA, Germany FR, Japan, Italy, UK, Canada, France Consumer goods price
4) Average of all industrialized countries

Source : IMF

Base Currency : US Dollar

Projected Escalation Rate (Foreign Currency Portion)

Year	Escalation Rate (%)
1984	3.0
1985	4.0
1986	5.0
1987	6.0
1988 and onward	6.0

b) Escalation of general local currency costs

Local inflation, in principle, should follow international inflation trends, if local prices are assessed in terms of U.S. Dollars because such difference between local inflation and international inflation would be adjusted by devaluation or revaluation of foreign exchange rate when such unbalance is caused.

Nevertheless, in the country where local escalation of goods is generally higher than that of international level and where devaluation of local currency is neither enforced frequently nor timely because of fixed rate system, project budget for local currency portion which is estimated in terms of U.S. Dollar and escalated in accordance with the international inflation rate often cause budgetary deficit because of time lags in adjustment for equilibrium of currency value.

In such a case, therefore, an adequate adjustment or supplement in applicable escalation rate or in physical contingency may be required depending upon the foreign exchange control system in such country.

The past price escalation in Malaysia has been kept lower among the Asian countries, and its average escalation rate (consumer price) through past five years was 5.7% per annum in US Dollar term.

Taking into account the above considerations, price escalation rates applicable to general local currency cost items are assumed as follows.

Year	Escalation Rate (%)
1984	3.0
1985	4.0
1986	5.0
1987 and onward	6.0

(5) Import Duty

Assumed to be exempted.

5.1.2 Project Capital Requirements

The breakdown of the projected total requirements is shown in Tables 5.2 and 5.3.

Breakdown data are shown in CHAPTER 13, Technical Papers.

In prices August 1984, the total capital requirement is as follows:

(Unit: US$ Million)

	Foreign Currency Portion	Local Currency Portion	Total
Site-1 Kerteh			
Case-1	335.6	194.9	530.4
Case-2	432.7	239.6	672.3
Case-3	545.4	300.1	845.4
Site-2 Telok Kalong			
Case-4	335.6	195.7	531.2
Case-5	432.7	240.4	673.1
Case-6	545.4	300.8	846.2

5.1.3 Method of Estimation for Each Item

The basic thinking concerning the method of estimation to be used for each cost item is given below.

Table 5.2 Capital Cost Estimate for Petrochemical Complex (Kerteh)

(US$ Million in Constant 1984 price)

	Case-1			Case-2			Case-3		
	F.C.	L.C.	TOTAL	F.C.	L.C.	TOTAL	F.C.	L.C.	TOTAL
FOB Equipment	140.3	-	140.3	179.9	-	179.9	228.6	-	228.6
Civil	8.9	47.1	56.0	11.4	60.4	71.8	13.8	77.3	91.1
Erection	7.6	38.3	45.9	9.8	49.1	58.9	11.8	62.9	74.7
Engineering	45.0	-	45.0	57.6	-	57.6	73.2	-	73.2
Transportation & Insurance	24.8	6.5	31.3	31.7	8.3	40.0	40.1	10.7	50.8
Supervising	16.3	2.1	18.4	21.0	2.7	23.7	26.3	3.7	30.0
Plant Cost (as erected)	242.9	94.0	336.9	311.4	120.5	431.9	393.8	154.6	548.4
Land Cost	-	13.1	13.1	-	13.1	13.1	-	13.1	13.1
Pre-Operation Expense	5.7	16.3	22.0	5.8	18.6	24.4	6.1	21.5	27.6

Note: 1) Including spare parts and catalyst for 2 years
2) Including inland transportation cost
3) F.C.: Foreign Currency Portion
4) L.C.: Local Currency Portion

Table 5.3 Capital Cost Estimate for Petrochemical Complex (Telok Kalong)

(US$ Million in Constant 1984 price)

	Case-4			Case-5			Case-6		
	F.C.	L.C.	TOTAL	F.C.	L.C.	TOTAL	F.C.	L.C.	TOTAL
FOB Equipment	140.1	-	140.1	179.9	-	179.9	228.6	-	228.6
Civil	8.9	47.1	56.0	11.4	60.4	71.8	13.8	77.3	91.1
Erection	7.6	38.3	45.9	9.8	49.1	58.9	11.8	62.9	74.7
Engineering	45.0	-	45.0	57.6	-	57.6	73.2	-	73.2
Transportation & Insurance	24.8	6.3	31.1	31.7	8.1	39.8	40.1	10.5	50.6
Supervising	16.3	2.1	18.4	21.0	2.7	23.7	26.3	3.7	30.0
Plant Cost (as erected)	242.7	93.8	336.5	311.4	120.5	431.9	393.8	154.6	548.4
Land Cost	-	13.9	13.9	-	13.9	13.9	-	13.9	13.9
Pre-Operation Expense	5.7	16.3	22.0	5.8	18.6	24.4	6.1	21.5	27.6

Note: 1) Including spare parts and catalyst for 2 years
2) Including inland transportation cost
3) F.C.: Foreign Currency Portion
4) L.C.: Local Currency Portion

(1) Land Acquisition Cost

Land for the plant site will be part of the Kerteh or Telok Kalong Industrial Estates. The present condition of these Industrial Estates is as follows.

Kerteh	:	Ready for site preparation
Telok Kalong	:	Not ready for site preparation

The present cost of land per square metre in these Industrial Estates is as follows.

(US$ Million)

	Required area (m^2)	Site acquired cost	Site preparation cost	Total land cost
Kerteh	1,725,000	13.1	–	13.1
Telok Kalong	1,725,000	6.6	7.3	13.9

(2) Processing Plant Costs

The direct and indirect cost for construction of the ethylene, propylene, LLDPE, HDPE, VCM and PP Processing plants are as described below.

a) Cost of equipment for industrial facilities and for materials

Industrial facilities includes all required machinery, equipment and materials, and all spare parts and reserve materials which must be on hand at the time of start-up. These are calculated in F.O.B. prices.

b) Civil construction costs

This category includes the cost of geological studies, grading, etc., the materials for and the erection cost of the buildings and structures and any indirect costs.

c) Installation costs

Included in this category is the cost of installing imported equipment, piping, wiring, instrumentation, thermal and cooling insulation, painting and any required materials.

The cost of temporary construction, facilities for the temporary supply of utilities, construction equipment, construction site office costs, etc. are included as indirect costs.

d) Engineering fees and other software costs

This category includes the software costs connected with the facilities, such as engineering fees, preparation of the basic and detailed designs. Also included in the cost of services related to the purchase of equipment and materials, such as inspections, preparation of documents etc.

e) Transportation and insurance costs

Ocean freight, unloading, inland transportation, and customs duty when applicable are included in this category. It is assumed that the materials, equipment, etc. will be landed at Tanjong Berhara and transported overland to the site. Insurance includes coverage during ocean shipping and protection for related construction work.

f) Construction management fees

Included in this category is the cost of dispatching inspectors and other personnel to the contractor and the makers of major equipment, including their travel, per diem expenses and other costs.

(3) Utilities Plant Costs

This item consists of the direct and indirect cost of the constructing required utilities. Details are the same as for the processing plants. (See (2) above.)

(4) Offsite Facilities Costs

Included as offsite facilities costs are: a repair shop, spare parts storehouse, laboratories for analysis of materials and products, administrative office buildings, health and welfare facilities, as well as roads for the plant site, water mains and hydrants for fire fighting, gates, fences, etc.

(5) Pre-operation Costs

This category includes the cost of the employees, including their training, up to the start of the commercial operation of the plants; consulting fees, cost of materials and utilities consumed during test operation, transportation and communication costs. Various fees and charges are also included in this item.

(6) Initial Working Capital

Estimation of this item was based on the following conditions,which are stated below.

Product Storage:

(i) Capacity to store four days of ethylene, propylene production, with the plants operating at full capacity

(ii) Capacity to store fifteen days of LLDPE, HDPE, VCM and PP production, with the plants operating at full capacity

– Materials Storage:

(i) Capacity to store five days of ethane and propane requirement, with the plant operating at full capacity

(ii) Capacity to store fifteen days of EDC and Butene-1 consumption, with the plants operating at full capacity

– Accounts Payable, Accounts Receivable:

45 days of sight bills for each product

In the above, only variable costs of production have been included in the accounts payable.

(7) Interest during Construction

70% of the total capital requirements will be obtained by borrowing. The payment schedule has been formulated according to funds planning and is described in the following section. (5.2 Funds Planning).

Annual interest is taken to be 8%.

5.2 FUNDS PLANNING

As a result of discussions with SEPU, it has been decided to assume that 30% of the total required capital will be obtained as owner's equity. The remaining 70% and the initial working capital will be obtained by long-term borrowing. Interest during construction is included in the total capital requirement but excluded from calculation of the internal rate of return.

The source of the loans has not yet been determined, but for the purposes of this study the general practice of international financial organizations has been taken into consideration. In accordance with that the terms and conditions are to be: repayment in 10 equal annual installments after a three-year period of grace, with interest at an average 8% per annum.

The schedule for receipt of the loans is assumed to be as follows:

1988	30%
1989	45%
1990	25%

In the event that a shortage of capital occurs during operation of the plants, it is assumed that short-term loans from domestic financial institutions will be obtained and that the annual interest rate for such loans will be 13%.

A simplified repayment schedule is included among the financial statements which are given as CHAPTER 13 in Technical Papers.

6.1 PRODUCTION SCHEDULE

6.1.1 Production Capacity of Final Product

It is assumed that the production capacity of the project, in accordance with severe competition in the world petrochemical market, will be as follows.

(Unit: T/Y)

	Case-1 & Case-4	Case-2 & Case-5	Case-3 & Case-6
Ethylene	142,000	204,000	285,000
LLDPE	78,000	111,000	156,000
HDPE	53,000	77,000	106,000
VCM	68,000	97,000	136,000
Propylene	53,000	75,000	106,000
PP	50,000	71,000	100,000

The ethylene produced in the ethylene plant will be supplied to the LLDPE plant, HDPE plant and VCM plant. The propylene produced in propylene plant will be supplied to the PP plant.

The production and sales plan was developed on the basis of the demand for major petrochemical products, which are given in CHAPTER 2. On this basis it has been determined that sales will be as follows.

The stock quantity of ethylene and propylene is assumed to be 4 day's output, at 100% utilization of capacity.

The stock quantity of LLDPE, HDPE, VCM and PP is assumed to be 15 day's output, at 100% utilization of capacity.

These stocks are to be produced during the first year of operation, in addition to the sales volume for that year.

6.1.2 Sales Prices of Final Products (LLDPE, HDPE, VCM, PP)

The anticipated sales prices of products, which was used as a basis for the financial projection and analysis, are as follows.

The petrochemical products will be sold primarily on the Malaysian domestic market. Any surplus will be exported abroad.

Table 6.1 Petrochemical Final Products Sales Plan

(Unit: 1000 T/Y)

	Case-1			Case-2			Case-3			Case-4			Case-5			Case-6		
	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992	1990	1991	1992
(Production)																		
LLDPE	39.0	62.4	70.2	55.5	88.8	99.9	78.0	124.4	140.4	39.0	62.4	70.2	55.5	88.8	99.9	78.0	124.5	140.4
HDPE	26.5	42.4	47.7	38.5	61.6	69.3	53.0	84.8	95.4	26.5	42.4	47.7	38.5	61.6	69.3	53.0	84.8	95.4
VCM	34.0	54.4	61.2	48.5	72.6	87.3	68.0	108.8	122.4	34.0	54.4	61.2	48.5	77.6	87.3	68.0	108.8	122.4
PP	25.0	40.0	45.0	33.5	56.8	63.9	50.0	80.0	90.0	25.0	40.0	45.0	35.5	56.8	63.9	50.0	80.0	90.0
(Sales)																		
LLDPE	37.4	61.4	69.9	53.2	87.4	99.4	74.8	122.9	139.8	37.4	61.4	69.9	53.2	87.4	99.4	74.8	122.9	139.8
HDPE	25.4	41.7	47.5	36.9	60.6	69.0	50.8	83.5	95.0	25.4	41.7	47.5	36.9	60.6	69.0	50.8	83.5	95.0
VCM	32.6	53.6	60.9	46.5	76.4	86.9	65.2	107.1	121.8	32.6	53.6	60.9	46.5	76.4	86.9	65.2	107.1	121.8
PP	24.0	39.4	44.8	34.0	55.9	63.6	47.9	78.8	89.6	24.0	39.4	44.8	34.0	55.9	63.6	47.9	78.8	89.6
(Inventory)																		
LLDPE	1.6	2.6	2.9	2.3	3.7	4.2	3.3	5.2	5.9	1.6	2.6	2.9	2.3	3.7	4.2	3.3	5.2	5.9
HDPE	1.1	1.8	2.0	1.6	2.6	2.9	2.2	3.5	4.0	1.1	1.8	2.0	1.6	2.6	2.9	2.2	3.5	4.0
VCM	1.4	2.3	2.6	2.0	3.2	3.6	2.8	4.5	5.1	1.4	2.3	2.6	2.0	3.2	3.6	2.8	4.5	5.1
PP	1.0	1.7	1.9	1.5	2.4	2.7	2.1	3.3	3.8	1.0	1.7	1.9	1.5	2.4	2.7	2.1	3.3	3.8

Table 6.2 Petrochemical Final Products Sales Plan (Case-1)

(Unit: 1000 T/Y)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
(Production)															
LLDPE	39.0	62.4	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2
HDPE	26.5	42.4	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7
VCM	34.0	54.4	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2
PP	25.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
(Sales)															
LLDPE	37.4	61.4	69.9	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2
HDPE	25.4	41.7	47.5	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7
VCM	32.6	53.6	60.9	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2
PP	24.0	39.4	44.8	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
(Inventory)															
LLDPE	1.6	2.6	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
HDPE	1.1	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
VCM	1.4	2.3	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
PP	1.0	1.7	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9

At present, Malaysia is a market for the surplus petrochemical products of the petrochemical producing countries such as North America, Europe, Japan, Singapore and so on. These surplus products are sold very cheaply on the Malaysian market.

Moreover, these petrochemical products are almost duty-free. Therefore the sales price of the final products set for the project should be close to the prevailing world price of the products.

The assumptions used in forecasting petrochemical products prices are as follows.

(1) Crude oil price forecast

At present, crude oil in the world market is priced between US$28.0/barrel and US$28.5/barrel. Most specialists concerned with crude oil forecast that the crude oil price in the future will be between US$25.0/barrel and US$26.0/barrel, as the relation between supply and demand will become unbalanced.

These conditions will remain until about 1987, after which crude oil prices will begin to rise.

(2) Wholesale price indexes are rising at a rate of about 3% or 4% per annum.

This trend will continue until the end of 1986, after which wholesale price indexes will show an upward tendency.

This was considered, as mentioned above, the consultant forecasts that petrochemical products will maintain their existing prices until 1986, and will rise in price from 1987 at a growth rate of about 6% per annum.

The projected world prices, as well as ex-factory prices, of the final products are shown in Table 6.3.

6.2 PRODUCTION COSTS

6.2.1 Raw Material Costs

(1) The price of the ethane

The price of ethane that will be supplied from the Petronas gas processing plant has not yet been determined. For the financial analysis the ethane price of US$3.00/MMBTU was used. Therefore, the ethane supply price for this project is set at US$147.6/T.

Study team were adjusted of this price by the Petronas planning section.

For the economic analysis the ethane price is as follows.

It is conceivable that the price may be set as a fuel equivalent price, at which ethane could not be effectively used as feedstock for ethylene production.

Table 6.3 Selling Price of Products

(Unit: US$/ton)

	Case-1				Case-2				Case-3			
	LLDPE	HDPE	VCM	PP	LLDPE	HDPE	VCM	PP	LLDPE	HDPE	VCM	PP
1985	531	637	477	743	511	618	457	723	498	604	443	710
1990	632	758	569	885	609	736	544	862	594	720	528	846
1995	846	1015	761	1184	815	984	728	1153	794	963	706	1132
2000	1132	1358	1019	1584	1090	1317	975	1543	1063	1289	945	1515
2004	1429	1714	1286	2000	1376	1663	1230	1948	1342	1627	1194	1913

	Case-4				Case-5				Case-6			
	LLDPE	HDPE	VCM	PP	LLDPE	HDPE	VCM	PP	LLDPE	HDPE	VCM	PP
1985	531	637	477	743	517	624	463	729	508	614	453	720
1990	632	758	569	885	616	743	551	869	605	732	540	858
1995	846	1015	761	1184	824	994	738	1162	810	979	722	1148
2000	1132	1358	1019	1584	1103	1330	988	1556	1084	1310	967	1537
2004	1429	1714	1286	2000	1393	1679	1247	1964	1369	1654	1220	1940

Note: Domestic Sales Price : CIF in Malaysia 1985 Feb.
Export Sales Price : Kerteh
(CIF) - (Shipping Charge + Freight + inland transfer cost)
: Telok Kalong
(CIF) - (Shipping Charge + Freight)

The lowest fuel equivalent price which can be used for ethane is US$4.21/MMBTU, as the price equivalent in terms of calories to the US$25.92/bbl price of heavy oil. For ethane, it is estimated that this would mean a price of US$270/t.

Based on estimated future crude oil price, ethane's price will be constant until 1986. Then ethane will rise in price at a growth rate of 6% per annual from 1987.

(2) The price of the propane

The price at which the propane will be supplied from the Petronas gas processing plant has not yet been determined.

The propane is in the form of LPG. Therefore, for the financial analysis study team considered the world market price of LPG . For this reason, the propane price of US$5.00/MMBTU is used. Therefore, the propane supply price for this project is set as US$239/T.

Based on estimated future crude oil prices, propane will maintain its price until 1986 then will rise in price at a growth rate of 6% per annual from 1987.

Calculation is based on the LLN standard.

6.2.2 Utilities Supply Prices

(1) Electric Power

The Project plans to use electric power supplied by LLN. LLN will be responsible for the supply of electric power up to the plant's fence.

The cost of electric power consumed in the complex is calculated to be US$0.078/kwh at the complex gate as of 1985.

The calculation is based on the LLN standard.

i)	for every kw maximum requirement per month $12.00	– $12.00
ii)	for first 2 million units per month	– 17 cts
iii)	for each additional unit per month	– 16 cts

(2) Water

The financial projections are based on an assumption that the processing water requirement for the project will be met by potable water supplied by the JKR.

The cost of the processing water consumed at the complex is calculated as US$0.88 per ton at the plant gate as of 1985.

However, the cooling water for the project will be used in the plant, and then treated by cooling facilities and returned for reuse in the plant.

The cost of the cooling water consumed at the complex is calculated as US$0.02 per ton.

(3) Fuel Gas Price

The project plans to use fuel gas supplied by Petronas. The financial projections used a fuel gas price of US$3.0/MMBTU.

(4) Steam Price

The project plans to use steam supplied by a boiler plant.

Therefore the cost of steam is included in the cost of the fuel gas.

6.2.3 Taxation

The project will be given the maximum tax incentives which may be allowed under Malaysian tax laws and regulations.

Furthermore, it will benefit under the tax incentives provided to a pioneer-status project under Malaysian investment law.

The following tax was assumed for the financial projections, taking any tax incentives into account.

(1) Corporate Tax

Corporate tax will be imposed at a rate of 50% of taxable income.

The project, however, will be provided with tax holidays for an aggregate period of 10 years from the year when commercial operation starts.

(2) Sales Tax

The project will be exempted from Malaysian sales tax.

(3) Surtax

All products from the complex will be exempted from surtax.

(4) Import Duties

By request to the ministries concerned any spare parts imported subsequently to those initially imported as a package along with the machinery and equipment will be exempted from import duties.

For the financial projections it was assumed that such subsequently imported spare parts will be exempted from import duties.

The catalysts and chemicals imported for the operation of the Project will be exempted from import duties.

(5) Initial and Annual Capital Allowance

The Malaysian tax law allows for no depreciation nor amortization but it does allow initial and annual capital allowances to be deducted from gross earnings for the computation of taxable income. These allowances are as follows.

– Initial Capital Allowance

20% of the total capital value (except working capital) is deductible in the years immediately subsequent to the expiration of the tax holiday period.

– Annual Capital Allowance

7.5% of the total capital value (except working capital) is deductible in the years immediately subsequent to the expiration of the tax holiday period. In subsequent years the same rate is applied, but against the balance of the capital value after the deduction of allowance applied in the preceeding year.

6.2.4 Labour and Overhead Costs

(1) Personnel Requirement and their Cost

The number of personnel required for the operation, quality control, product handling, maintenance, technical coordination, administration and the safety coordination of each plant was studied and estimated by the Consultant using the data given herein.

The number of directly employed personnel shown in the table of production cost corresponds to the sum of the first four categories, while the number of indirectly employed personnel is the total of the remaining three groups.

Personnel cost, using payroll data from PETRONAS, was calculated as the average per workers, as follows.

Operational personnel average	:	US$16,000/Year
Management personnel average	:	US$20,000/Year

(2) Plant Overhead Costs

Plant overhead costs was taken to be the equivalent of 80% of direct personnel cost.

6.2.5 Cost of Maintenance Materials

The annual cost of maintenance materials was calculated as 1.5% of the total fixed capital cost. This includes the cost of repairing materials and spare parts required for operation of the processing plant and off-site facilities but does not include the cost of maintenance personnel, since it is already included as part of the direct personnel cost.

6.2.6 Insurance and Miscellaneous Cost

The cost of insurance and fixed asset tax was taken to be 1.0% of total fixed capital cost.

6.2.7 Sales and General Administrative Costs

Costs incurred in selling the products as well as general administrative costs, such as head office administrative costs, are taken to be the equivalent of 0.5% of ex-factory production costs.

7.1 MAJOR ASSUMPTIONS OF THE FINANCIAL ANALYSIS

7.1.1 The Economic Life Span of the Project

The economic life span of the project is assumed to be 15 years provided that no substantial modification, renovation or additional investment is made on the initial facilities.

7.1.2 Base Cost of the Financial Projections

All financial projection are made in a U.S. Dollar current term basis. Such projections are made according to the relevant escalation rate from the base cost date of February 1, 1985.

7.1.3 Methodology of Financial Analysis

Financial analysis was done mainly by calculating the financial internal rates of return (FIRR) by the discount cash flow method.

Two kinds of financial internal rates of return are calculated, namely: current term FIRR, and real term (or constant) FIRR which is obtained from the current term cash flow by adjusting it with a deflator.

7.2 RESULTS OF THE FINANCIAL ANALYSIS

7.2.1 Financial Analysis

Based on the above assumptions, the financial analysis of the project was completed, and the financial papers prepared.

7.2.2 Project Evaluations

According to the results of the financial analysis, the profitability of the project, and its financial position, are as follows.

The rate of return on investment in this project is evaluated in terms of the internal rate of return. Case 1 will be examined first.

The internal rate of return, as determined by the financial analysis, is 5.3% after tax (current base).

This is too low a rate of return for the project to be judged feasible.

Moreover, regarding profitability, according to the income statement, there would be a loss in each of the first six years of operation. Profits would be recorded only from seventh year and after. It would not be until 2000, the eleventh year of operation, that the cumulative loss would be eliminated.

(1) Financial position and debt repayment ability from the funds flow statement, and other financial statement in CHAPTER 13 in Technical Papers.

There would be shortages of funds, except in the first year of operation, which would require short-term borrowing.

The project does possess the capability to repay the initial loan, but these calculations do not indicate any dividend payments.

From the result noted above, it may be said that the anticipated return on investment in this project is very low, and from a financial viewpoint there is some difficulty in justifying such an investment.

This result cannot be changed by selecting the Telok Kalong site.

(2) Analysis of the sensitivity to changed by key factors

The influence, on the internal rate of return by a change from the assumed values of key factors such as the raw materials supply price, the selling price of the final products (LLDPE, HDPE, VCM, PP), capital requirements cost and capacity utilization is shown in Tables 7.1 and 7.2.

The following table shows the effect on the internal rate of return of favourable changes in the key factors. These changes allow the project to approach feasibility.

	IRR (after tax)	
	Current	Constant
– When the Raw Material Supply Price is reduced by 20%	9.6	3.6
– When the Final Products Sales Price is increased by 20%	13.6	7.5
– When Capital Requirement Cost is reduced by 20%	1.1	-4.4
– When Capacity Utilization Rate is increased by 20%	6.9	1.2
– Project Life Span 20 years	7.4	1.6

Thus, if the final products sales prices are increased by 20%, the internal rate of return for the project increases to at least 7.5% after tax in constant terms.

Of course, if these factors change adversely, the profitability of the project would suffer and its financial viability would fall.

The entire financial analysis of the project, as presented in this CHAPTER, is based on the assumption that there will be a surplus on the world petrochemical market for the future.

Therefore, to make the project attractive to commercial investors, it would be necessary to employ the following policy.

(a) The price of petrochemical products on the domestic market must be kept high by raising a tariff barrier.

(b) The Malaysian government guarantees to supply the natural gas at as concessional price.

Table 7.1 Sensitivity Analysis (Kerteh)

	Case-1				Case-2				Case-3			
	Current (%)		Constant (%)		Current (%)		Constant (%)		Current (%)		Constant (%)	
	Before Tax	After Tax	Before Tax	After Tax	Before Tax	After Tax	Before Tax	After Tax	Before Tax	After Tax	Before Tax	After Tax
Base	5.84	5.29	0.13	-0.37	8.12	7.20	2.27	1.43	9.98	9.05	4.02	3.16
Raw Material Cost												
+20	-0.17	-0.17	-5.45	-5.45	2.04	2.04	-3.39	-3.39	3.73	3.73	-1.80	-1.80
+10	3.07	3.07	-2.44	-2.44	5.31	4.94	-0.35	-0.69	7.08	6.23	1.31	0.54
-10	8.28	7.36	2.41	1.56	10.62	9.70	4.61	3.76	12.58	11.66	6.45	5.61
-20	10.48	9.55	4.47	3.62	12.90	11.99	6.74	5.91	14.95	14.07	8.67	7.86
Capital Requirement Cost												
+20	3.46	3.46	-2.12	-2.12	5.60	5.12	-0.11	-0.55	7.34	6.45	1.52	0.70
+10	4.58	4.41	-1.06	-1.22	6.79	5.99	1.01	0.28	8.58	7.65	2.69	1.84
-10	7.26	6.39	1.48	0.68	9.64	8.71	3.71	2.86	11.57	10.65	5.53	4.68
-20	8.91	7.99	3.04	2.20	11.39	10.47	5.37	4.53	13.43	12.52	7.29	6.46
Sales Price												
+20	14.51	13.62	8.27	7.45	16.85	15.97	10.47	9.66	18.88	18.0	12.39	11.57
+10	10.56	9.63	4.55	3.70	12.83	11.92	6.69	5.86	14.76	13.88	8.51	7.70
-10	-0.36	-0.36	-5.64	-5.64	2.11	2.11	-3.35	-3.35	3.99	3.95	-1.59	-1.62
-20	-10.90	-10.90	-15.28	-15.28	-7.34	-7.34	-12.06	-12.06	-5.03	-5.03	-9.94	-9.94
Capacity Utilization Rate												
+10	7.84	6.92	2.01	1.18	10.0	9.08	4.05	3.20	11.80	10.88	5.74	4.89
-10	3.19	3.19	-2.36	-2.36	5.84	5.30	0.12	-0.38	7.81	6.89	1.97	1.12
-20	1.06	1.06	-4.35	-4.35	3.74	3.73	-1.86	-1.86	5.81	5.26	0.09	-0.42
Project Life Span (year)												
15	5.84	5.29	0.13	-0.37	8.12	7.20	2.27	1.43	9.98	9.05	4.02	3.16
20	8.71	7.35	2.80	1.56	10.73	9.12	4.70	3.23	12.39	10.78	6.26	4.78

Table 7.2 Sensitivity Analysis (Telok Kalong)

	Case-4				Case-5				Case-6			
	Current (%)		Constant (%)		Current (%)		Constant (%)		Current (%)		Constant (%)	
	Before Tax	After Tax	Before Tax	After Tax	Before Tax	After Tax	Before Tax	After Tax	Before Tax	After Tax	Before Tax	After Tax
Base	5.83	5.28	0.12	-0.38	8.65	7.73	2.77	1.93	10.90	9.98	4.89	4.04
Raw Material Cost												
+20	-0.17	-0.17	-5.44	-5.44	2.77	2.77	-2.70	-2.70	4.97	4.70	-0.65	-0.89
+10	3.07	3.07	-2.44	-2.44	5.92	5.37	0.22	-0.28	8.13	7.20	2.29	1.45
-10	8.26	7.34	2.39	1.55	11.10	10.38	5.06	4.21	13.41	12.51	7.23	6.40
-20	10.46	9.54	4.45	3.60	13.34	12.44	7.15	6.32	15.72	14.84	9.40	8.59
Capital Requirement Cost												
+20	3.46	3.46	-2.12	-2.12	6.45	5.74	0.69	0.04	8.22	7.29	2.34	1.49
+10	4.58	4.41	-1.07	-1.22	7.31	6.43	1.50	0.69	9.48	8.55	3.53	2.68
-10	7.25	6.38	1.47	0.68	10.19	9.26	4.23	3.38	12.54	11.62	6.43	5.59
-20	8.90	7.97	3.03	2.19	11.97	11.05	5.92	5.08	14.44	13.54	8.23	7.42
Sales Price												
+20	14.49	13.60	8.25	7.43	17.31	16.42	10.90	10.09	19.70	18.82	13.16	12.35
+10	10.54	9.61	4.54	3.69	13.31	12.41	7.15	6.32	15.61	14.73	9.31	8.50
-10	-0.35	-0.35	-5.64	-5.64	2.77	2.77	-2.73	-2.73	5.09	4.77	-0.56	-0.85
-20	-10.83	-10.83	-15.22	-15.22	-6.53	-6.53	-11.32	-11.32	-3.33	-3.33	-8.37	-8.37
Capacity Utilization Rate												
+10	7.82	6.91	2.00	1.16	10.54	9.62	4.55	3.71	12.75	11.84	6.63	5.79
-10	-	-	-2.37	-2.37	6.35	5.66	0.59	-0.04	8.66	7.74	2.76	1.91
-20	1.07	1.07	-4.35	-4.35	4.28	4.19	-1.35	-1.43	6.71	5.92	0.93	0.20
Project Life Span (year)												
15	5.83	5.28	0.12	-0.38	8.65	7.73	2.77	1.93	10.90	9.98	4.89	4.04
20	8.69	7.36	2.79	1.58	11.20	9.59	5.14	3.67	13.20	11.61	7.02	5.56

8.1 INTRODUCTION

This part of the report evaluates the project in terms of its contribution to the Malaysian economy.

The major contributions would be:

(1) The production of olefines (ethylene, propylene) from paraffines (ethane, propane), and the realization of downstream projects utilizing that olefine would increase the value added to the paraffine fraction of natural gas resources present in Malaysia.

(2) By producing ethylene derivatives (LLDPE, HDPE, VCM) and a propylene derivative (PP) in Malaysia, a contribution would be made to the foreign exchange balance of the country. (Attachment 1). There would also be a favourable impact on related industries, for example mechanical, electrical, civil, engineering, transport and so on.

In the following chapters, the economic costs and benefits of this project are analysed. The economic internal rate of return is then calculated. On that basis, the project is evaluated by quantitative means from the viewpoint of the national economy.

8.2 ECONOMIC EVALUATION OF THE PETROCHEMICAL COMPLEX

8.2.1 Economic Benefits of the Petrochemical Complex

Both direct and indirect economic benefits would result from the realization of the petrochemical complex.

(1) Direct Benefits

The direct benefits can be calculated as the economic value of the ethylene derivatives (LLDPE, HDPE, VCM) and the propylene derivative (PP) produced by investment in this project.

As is discussed in CHAPTER 5, it is thought necessary that the project's production prices be the same as import prices in order that the petrochemical products can be supplied primarily to the Malaysian market and any surplus exported.

Because there are import substitution effects if products are not produced as part of this project, they will have to be imported to satisfy domestic demand.

Therefore, the economic price of the products produced by this complex would be the import price, namely, CIF in Malaysia. The value is the same in the financial analysis.

On the other hand, for the exported products, the price would be FOB in Malaysia. Again the value is the same in the financial analysis.

The FOB price is used because the products which are produced in excess of the domestic market will be exported.

(2) Indirect Benefit

The following are the indirect benefits to be gained from implementation of this project.

a) Creation of Employment Opportunities

Employment opportunities would be created during the construction of the plants and facilities, and during their operation.

b) Impact on Related Industries

The olefine plastics produced in this complex will be supplied to the plastics fabricaing industry in Malaysia.

This will promote the plastics fabricating industry more activity than the past practice of importing plastic resins.

Moreover, the project would have extensive effects on related industries, such as; an increase in demand for construction materials such as steel materials and cement; and stimulation of the development of the engineering and construction industries; and an increased demand for the various materials which will be used in the operation of the plant, and the packing and shipment of the product.

c) Contribution to the development of the regional economy

This project will contribute both directly and indirectly to the development of the economy of Terengganu region, and to the diversification of Malaysian industry.

Although the project would provide various indirect benefits to Malaysia, they are difficult to quantity.

Therefore, in the calculation of the economic internal rate of return, these indirect benefits are not included.

8.2.2 Economic Costs

The economic costs of the project are as follows.

(i) Initial costs (capital costs) essential for the realization of the project.

(ii) The ethane, propane and fuel gas fraction of the natural gas consumed by the production of the ethylene and propylene derivatives.

(iii) Cost of labour resources consumed

(iv) Other costs required for production

There are explained in more detail below.

(1) Initial Project Cost

Initial costs incurred in the implementation of this project include the construction cost for the complex, pre-operation expenses and initial working capital. The value of these initial costs is equal to the capital cost used for the computation of the financial internal rate of return.

Initial costs were calculated on the assumption that they are exempted from taxation. Therefore, we adopt the position that the financial cost is equal to the economic cost.

(2) The Cost of the Ethane, Propane and Fuel Gas Fraction in the Natural Gas

The ethane, propane and fuel gas in indigenous Malaysian natural gas will be used as the feedstock to produce the ethylene and propylene derivatives.

In economic terms, this is consumption of natural gas resources.

In order to compute the cost of the consumed natural gas resources, the economic value of the gas resources has to be assessed.

The only alternative use for the gas (ethane, propane, fuel gas) is as fuel for electric power generation. Therefore if the gas is not used by the project its value would be the same, on a calorific basis, as heavy fuel oil.

The gas cost of electric power generation is estimated at US$4.21/MMBTU.

This analysis, therefore, was based on this figure (US$4.21/MMBTU).

(3) Cost of Labour Resources

The project will require the employment of highly skilled labour, which is scarce in Malaysia. Therefore, the assessment of the economic costs was made on the basis of prevailing wage rates.

(4) Other Costs required for the Production

Other costs required for production include the cost of the catalysts and chemicals consumed by production, and the maintenance cost of equipment and machinery, etc. The assessment of economic cost was made on the basis of prevailing rates for these materials.

The taxes to be imposed under Malaysian tax laws were excluded from the cost items, since these, for the Malaysian nation, can be regarded as transferable costs.

8.2.3 *Economic Internal Rate of Return*

On the basis of the economic benefits and cost of this Project which are given above, the economic internal rate of return was computed for an economic life of 15 years. (CHAPTER 13 in Technical Report).

For case 1 the computed rate is -1.32% in constant terms. (The details are shown in Tables 8.1 and 8.2.)

If the sales price increased, the internal rate of return for case 1 would increase to 7.2% in constant terms.

On the other hand, however, it is likely that the project would bring various economic benefits to the nation.

Table 8.1 Sensitivity Analysis (Kerteh) — Economic Case —

	Case-4		Case-5		Case-6	
	Current (%)	Constant (%)	Current (%)	Constant (%)	Current (%)	Constant (%)
Base	4.22	-1.39	7.93	2.09	9.88	3.93
Raw Material Cost						
+20	-3.50	-8.52	-1.11	-6.31	0.70	-4.61
+10	0.79	4.56	3.12	-2.39	4.96	-0.66
-10	7.12	1.32	9.52	3.57	11.52	5.45
-20	9.69	3.72	11.55	5.47	14.25	8.02
Capital Requirement Cost						
+20	1.92	-3.56	5.76	0.03	7.26	1.44
+10	3.01	-2.54	6.60	0.83	8.50	2.61
-10	5.59	-0.09	9.44	3.52	11.48	5.44
-20	7.17	1.41	11.19	5.18	13.33	7.20
Sales Price						
+20	13.39	7.22	16.79	10.41	18.96	12.46
+10	9.26	3.33	12.72	6.58	14.76	8.51
-10	-2.73	-7.84	1.78	-3.66	3.75	-1.82
+20	-17.01	-20.71	-8.51	-13.13	-5.69	0.55
Capacity Utilization Rate						
+10	6.08	0.36	9.71	3.77	11.64	5.58
-10	2.21	-3.29	6.18	0.42	8.23	2.35
-20	-0.23	-5.56	3.81	-1.79	5.91	0.18
Project Life Span (year)						
15	4.22	-1.39	7.93	2.09	9.88	3.93
20	7.28	1.46	10.56	4.54	12.30	6.18

Table 8.2 Sensitivity Analysis (Telok Kalong) — Economic Case —

	Case-1		Case-2		Case-3	
	Current (%)	Constant (%)	Current (%)	Constant (%)	Current (%)	Constant (%)
Base	4.28	-1.32	5.96	-0.27	7.99	2.17
Raw Material Cost						
+20	-5.32	-10.19	-2.06	-7.18	5.44	-0.22
+10	0.87	-4.50	2.40	-3.06	3.73	1.81
-10	7.19	1.38	9.00	3.09	10.61	4.61
-20	9.80	3.83	11.70	5.61	13.44	7.25
Capital Requirement Cost						
+20	1.98	-3.51	3.56	-2.03	6.35	0.58
+10	3.07	-2.48	4.59	-0.95	7.56	1.73
-10	5.66	-0.02	7.50	1.62	10.48	4.50
-20	7.25	1.48	9.07	3.19	12.28	6.21
Sales Price						
+20	13.46	7.28	15.34	9.05	8.12	11.67
+10	9.32	3.39	11.08	5.05	13.89	7.69
-10	-2.65	-7.77	-0.95	-6.19	2.55	-2.93
-20	-16.90	-20.59	-14.83	-18.36	-7.77	-12.44
Capacity Utilization Rate						
+10	6.15	0.43		1.91	10.65	4.66
-10	2.26	-3.23	4.28	-1.35	7.36	1.54
-20	-0.17	-5.50	1.85	-3.62	4.97	-0.70
Project Life Span (year)						
15	4.28	-1.32	5.96	-0.27	7.99	2.17
20	7.34	1.52	8.83	2.92	11.45	5.38

CHAPTER 9 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

The conclusions reached by this survey are as follows.

(1) The project is of great importance to the Malaysian federal and the Terengganu state government, which want to encourage the development of industry in this area by the construction of a petrochemical complex.

On the other hand, the internal rates of return (after tax) on the basis of estimated current prices will be low. For the export-oriented case which showed the best results in the financial analysis is 10 percent.

Further, the results of an economic analysis indicate that the economic internal rate of return would be approximately 4 percent for the best case. These rates are low, and do not make the complex an attractive investment on a purely economical basis.

The financial profitability would be improved if the Government took such measures as raising domestic selling prices by setting up tariff barriers and at subsidising the raw materials.

However this would not mean that the economic evaluation of the project will be improved. Two major considerations are given below.

a) The world's markets for petrochemicals are in a state of oversupply, and there is continuing fierce competition, leading to price cutting. This tendency of lower prices is expected to continue for the next 2 to 3 years.

After that period the prices of petrochemicals are predicted to rise at a moderate rate of 5 to 6 percent per year. This means that it is unlikely that the selling prices of petrochemicals will go up substantially for some time to come.

b) An important factor in the economics of this type of industry are the economies of scale. However, the size of the domestic market is not large enough at present to enable a petrochemical complex project to fully enjoy these economies of scale. In order to expand domestic markets, it is thought that resin importing firm be found by the Malaysian organizations and corporates such as the government of Terengganu, PETRONAS and HICOM who are expected to be investing on the petrochemical complex and Japanese trading companies who are well experienced in the sales of plastics and such a joint venture company be devoted to the pre-marketing and that an application research laboratory be established and devoted to the development of applications through material substitution and entirely new applications.

(2) In view of the circumstances described in a) and b) above, the feasibility of a petrochemical complex was studied for three cases;

A Domestic-market oriented
B Export-market oriented
C An intermediate situation between cases A and B

Results of the financial and economic analyses show that in the present circumstances, the export-market oriented case B will be the most advantageous, followed by case C (the intermediate case). Case A (domestic market oriented case) would be the least advantageous.

The major reasons for this are as follows.

a) An increase in production to meet export requirements would result in an expansion in the scale of the project, reducing costs by increasing the economies of scale.

b) The tariff barriers against petrochemical imports into Malaysia are low at present. Therefore the difference between domestic selling prices and export prices would not be great.

(3) For the site of the petrochemical complex, Kerteh would be slightly more advantageous for case A.

For cases B and C, Telok Kalong, would be more advantageous.

9.2 Recommendations

From the results of this survey, it is difficult to recommend that preparations should be started immediately for the construction of the complex. Nevertheless, the following suggestions are made as themes for future study on the basis of this study:

A very important point for such a project would be that the economics of scale will not be realized unless a considerable portion of production is directed at overseas markets. Otherwise, production costs would be high.

On the other hand under the present, domestic and overseas conditions it would be difficult to boost selling prices.

The followoing are among the measures which could be taken to improve the feasibility of the project.

1) Long-range measures to expand domestic consumption or to promote the plastics processing industry

2) Establishment of tariff barriers

3) Government subsidies for raw materials

(1) An expansion in domestic consumption is a prerequisite for the advance of the petrochemical industry in the country.

This can be achieved by the promotion and fostering of the plastics processing industry and other industries that consume petrochemical derivatives such as synthetic fibers.

(2) If tariff barriers are established they should be set up with reference to existing barriers in neighbouring countries, particularly the ASEAN countries.

(3) The present raw materials prices are fixed at levels lower than their value when used as fuel. This could be considered as a promotional measure. Yet, it is desirable to pursue a pricing policy that is in keeping with international trends. (Attachment 2).

It is hoped that the Government will implement appropriate fostering measures, including the establishment of educational and training institutions.

ATTACHMENT

Attachment–1 Foreign Exchange Balance (Case–1)

	Foreign Exchange Flow			Foreign Exchange Outlow						
	(1) Long Term Loan	(2) Saving (Products Sales)	(3) Total Inflow	(4) Payments to Foreign parties	(5) L.T. Loan Repayment	(6) L.T. Loan Interest	(7) Chemicals & Catalyst	(8) Maintenance Supplies	(9) Total Outflow	(10) Foreign Exchange Balance
1988	111,392		111,392	100,900		3,262			104,162	7,230
1989	167,089		167,089	144,673		13,966			158,639	8,450
1990	92,827	82,599	175,426	62,657	21,660	32,370	3,478	2,919	123,084	52,342
1991		143,894	143,894		37,131	27,972	5,898	5,004	76,005	67,889
1992		173,510	173,510		37,131	25,001	7,034	5,304	74,470	99,040
1993		184,776	184,776		37,131	22,031	7,456	5,622	72,240	112,536
1994		195,863	195,863		37,131	29,060	7,903	5,959	70,053	125,810
1995		207,613	207,613		37,131	16,090	8,377	6,317	67,915	139,698
1996		220,071	220,071		37,131	13,120	8,880	6,696	65,827	154,244
1997		233,276	233,276		37,131	10,149	9,413	7,098	63,791	169,485
1998		247,272	247,272		37,131	7,179	9,977	7,524	61,811	185,461
1999		262,108	262,108		37,131	4,208	10,576	7,975	59,890	202,218
2000		277,835	277,835		15,471	1,238	11,211	8,454	36,374	241,461
2001		294,505	294,505				11,883	8,961	20,844	273,661
2002		312,175	312,175				12,596	9,489	22,094	290,081
2003		330,905	330,905				13,352	10,068	23,420	307,485
2004		350,760	350,760				14,153	10,673	24,826	325,934
Total	371,308	3,517,162	3,888,470	308,230	371,310	195,646	142,187	108,072	1,125,445	2,763,025

– Study Team Estimate

Attachment–2 Olefine Feedstocks Price in the Worls (Memorandum)

(1984 Price)

Propylene	Natural Gas						Petroleum		Olefine Products	
	Ethane		Propane		Butane		Naphtha		Ethylene	Propylene
	US$/ MMBTU	US$/ TON	US$/ MMBTU	US$/ TON	US$/ MMBTU	US$/ TON	US$/ MMBTU	US$/ TON	US$/ TON	US$ TON
U.S.A.	3.5	(167)	4.6	(219)	6.0	(286)	6.1	(290)	455	512
JAPAN	–	–	4.7	(224)	6.1	(290)	6.4	(305)	596	525
WEST EUROPE	4.5	(214)	–	–	6.4	(305)	6.3	(300)	572	525
CANADA	1.9	(90)	–	–	–	–	5.6	(267)	442	508
SINGAPORE	–	–	–	–	–	–	5.5	(262)	–	
SAUDI ARABIA	0.5	(24)	–	–	–	–	–	–	–	
THAILAND	3.1	(148)	–	–	–	–				
INDONESIA	3.1	(148)	–	–	–	–	–	–		
MEXICO	0.6	(29)	–	–	–	–	–	–	–	

Source: Study Team Estimate

Note : The price of non-separating natural gas is equivalent to Ethane Price.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * * PAGE 1

PRODUCTION AND SALES PLAN

CASE 1 ***** KERTEH *****

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
RATED CAPACITY (LLDPE)	0.	0.	78000.	78000.	78000.	78000.	78000.	78000.	78000.	78000.
CAPACITY UTILIZATION	0.0	0.0	0.500	0.800	0.900	0.900	0.900	0.900	0.900	0.900
PRODUCTION (TON)	0.	0.	39000.	62400.	70200.	70200.	70200.	70200.	70200.	70200.
INCREASE IN INVENTORY	0.	0.	1625.	975.	325.	0.	0.	0.	0.	0.
SALES VOLUME	0.	0.	37375.	61425.	69875.	70200.	70200.	70200.	70200.	70200.
UNIT SALES PRICE	0.0	0.0	0.6319	0.6698	0.7100	0.7526	0.7978	0.8456	0.8964	0.9501
SALES REVENUE	0.	0.	23617.	41143.	49611.	52833.	56003.	59363.	62925.	66700.
RATED CAPACITY (HDPE)	0.	0.	53000.	53000.	53000.	53000.	53000.	53000.	53000.	53000.
CAPACITY UTILIZATION	0.0	0.0	0.500	0.800	0.900	0.900	0.900	0.900	0.900	0.900
PRODUCTION (TON)	0.	0.	26500.	42400.	47700.	47700.	47700.	47700.	47700.	47700.
INCREASE IN INVENTORY	0.	0.	1104.	662.	221.	0.	0.	0.	0.	0.
SALES VOLUME	0.	0.	25396.	41738.	47479.	47700.	47700.	47700.	47700.	47700.
UNIT SALES PRICE	0.0	0.0	0.7583	0.8038	0.8520	0.9031	0.9573	1.0148	1.0757	1.1402
SALES REVENUE	0.	0.	19258.	33549.	40453.	43080.	45665.	48405.	51309.	54388.
RATED CAPACITY (VCM)	0.	0.	68000.	68000.	68000.	68000.	68000.	68000.	68000.	68000.
CAPACITY UTILIZATION	0.0	0.0	0.500	0.800	0.900	0.900	0.900	0.900	0.900	0.900
PRODUCTION (TON)	0.	0.	34000.	54400.	61200.	61200.	61200.	61200.	61200.	61200.
INCREASE IN INVENTORY	0.	0.	1417.	850.	283.	0.	0.	0.	0.	0.
SALES VOLUME	0.	0.	32583.	53550.	60917.	61200.	61200.	61200.	61200.	61200.
UNIT SALES PRICE	0.0	0.0	0.5687	0.6028	0.6390	0.6773	0.7180	0.7610	0.8067	0.8551
SALES REVENUE	0.	0.	18530.	32281.	38925.	41453.	43940.	46576.	49371.	52333.
RATED CAPACITY (PP)	0.	0.	50000.	50000.	50000.	50000.	50000.	50000.	50000.	50000.
CAPACITY UTILIZATION	0.0	0.0	0.500	0.800	0.900	0.900	0.900	0.900	0.900	0.900
PRODUCTION (TON)	0.	0.	25000.	40000.	45000.	45000.	45000.	45000.	45000.	45000.
INCREASE IN INVENTORY	0.	0.	1042.	625.	208.	0.	0.	0.	0.	0.
SALES VOLUME	0.	0.	23958.	39375.	44792.	45000.	45000.	45000.	45000.	45000.
UNIT SALES PRICE	0.0	0.0	0.8846	0.9377	0.9939	1.0536	1.1168	1.1838	1.2548	1.3301
SALES REVENUE	0.	0.	21194.	36921.	44520.	47411.	50255.	53271.	56467.	59855.
TOTAL SALES REVENUE	0.	0.	82599.	143894.	173510.	184776.	195863.	207615.	220071.	233276.

PRODUCTION AND SALES PLAN

CASE 1 ***** KERTEH *****

YEAR	1998	1999	2000	2001	2002	2003	2004
RATED CAPACITY (LLDPE)	78000.	78000.	78000.	78000.	78000.	78000.	78000.
CAPACITY UTILIZATION	0.900	0.900	0.900	0.900	0.900	0.900	0.900
PRODUCTION (TON)	70200.	70200.	70200.	70200.	70200.	70200.	70200.
INCREASE IN INVENTORY	0.	0.	0.	0.	0.	0.	0.
SALES VOLUME	70200.	70200.	70200.	70200.	70200.	70200.	70200.
UNIT SALES PRICE	1.0072	1.0676	1.1316	1.1995	1.2715	1.3478	1.4287
SALES REVENUE	70702.	74944.	79441.	84207.	89260.	94615.	100292.
RATED CAPACITY (HDPE)	53000.	53000.	53000.	53000.	53000.	53000.	53000.
CAPACITY UTILIZATION	0.900	0.900	0.900	0.900	0.900	0.900	0.900
PRODUCTION (TON)	47700.	47700.	47700.	47700.	47700.	47700.	47700.
INCREASE IN INVENTORY	0.	0.	0.	0.	0.	0.	0.
SALES VOLUME	47700.	47700.	47700.	47700.	47700.	47700.	47700.
UNIT SALES PRICE	1.2086	1.2811	1.3580	1.4395	1.5258	1.6174	1.7144
SALES REVENUE	57651.	61110.	64776.	68663.	72783.	77150.	81779.
RATED CAPACITY (VCM)	68000.	68000.	68000.	68000.	68000.	68000.	68000.
CAPACITY UTILIZATION	0.900	0.900	0.900	0.900	0.900	0.900	0.900
PRODUCTION (TON)	61200.	61200.	61200.	61200.	61200.	61200.	61200.
INCREASE IN INVENTORY	0.	0.	0.	0.	0.	0.	0.
SALES VOLUME	61200.	61200.	61200.	61200.	61200.	61200.	61200.
UNIT SALES PRICE	0.9064	0.9608	1.0185	1.0796	1.1443	1.2130	1.2858
SALES REVENUE	55473.	58801.	62329.	66069.	70033.	74235.	78689.
RATED CAPACITY (PP)	50000.	50000.	50000.	50000.	50000.	50000.	50000.
CAPACITY UTILIZATION	0.900	0.900	0.900	0.900	0.900	0.900	0.900
PRODUCTION (TON)	45000.	45000.	45000.	45000.	45000.	45000.	45000.
INCREASE IN INVENTORY	0.	0.	0.	0.	0.	0.	0.
SALES VOLUME	45000.	45000.	45000.	45000.	45000.	45000.	45000.
UNIT SALES PRICE	1.4099	1.4945	1.5842	1.6792	1.7800	1.8868	2.0000
SALES REVENUE	63446.	67253.	71288.	75565.	80099.	84905.	90000.
TOTAL SALES REVENUE	247272.	262108.	277835.	294505.	312175.	330905.	350760.

PRODUCTION COST STATEMENTS

CASE 1 ***** KERTEH *****

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
RAW MATERIAL COST	0.	0.	41951.	71149.	84845.	89936.	95332.	101052.	107115.	113541.
ETHANE	0.	0.	15652.	26545.	31655.	33554.	35567.	37701.	39964.	42361.
EDC	0.	0.	9799.	16619.	19818.	21007.	22267.	23603.	25020.	26521.
BUTENE-1	0.	0.	4103.	6958.	8298.	8796.	9323.	9883.	10476.	11104.
PROPANE	0.	0.	8920.	15128.	18041.	19123.	20270.	21487.	22776.	24142.
OTHER CHEMICALS	0.	0.	3478.	5898.	7034.	7456.	7903.	8377.	8880.	9413.
UTILITIES	0.	0.	9575.	16240.	19366.	20528.	21759.	23065.	24449.	25916.
COOLING WATER	0.	0.	572.	969.	1156.	1225.	1299.	1377.	1459.	1547.
PROCESS WATER	0.	0.	218.	369.	440.	466.	494.	524.	555.	589.
F.G.	0.	0.	2773.	4704.	5609.	5946.	6303.	6681.	7082.	7507.
ELECTRIC POWER	0.	0.	6013.	10197.	12160.	12890.	13663.	14483.	15352.	16273.
VARIABLE COST	0.	0.	51526.	87388.	104211.	110463.	117091.	124116.	131563.	139457.
EMPLOYMENT COST	0.	0.	13662.	23421.	24827.	26316.	27895.	29569.	31343.	33224.
DIRECT PERSONNEL	0.	0.	5969.	10233.	10847.	11498.	12188.	12919.	13694.	14516.
INDIRECT PERSONNEL	0.	0.	2918.	5002.	5302.	5620.	5957.	6315.	6694.	7095.
OVERHEAD	0.	0.	4775.	8186.	8678.	9198.	9750.	10335.	10955.	11613.
MAINTENANCE	0.	0.	2919.	5004.	5304.	5622.	5959.	6317.	6696.	7098.
INSURANCE	0.	0.	195.	334.	354.	375.	397.	421.	446.	473.
DIRECT FIXED COST	0.	0.	16776.	28759.	30484.	32313.	34252.	36307.	38486.	40795.
CASH FACTORY COST	0.	0.	68302.	116147.	134695.	142776.	151343.	160423.	170049.	180252.
ERECTED PLANT COST	0.	0.	17811.	30534.	30534.	30534.	30534.	30534.	30534.	30534.
ENGINEERING	0.	0.	3254.	5579.	5579.	5579.	5579.	5579.	5579.	5579.
FRIEGHT, INSURANCE & OVERHEAD	0.	0.	2286.	3919.	3919.	3919.	3919.	3919.	3919.	3919.
SUPERVISING	0.	0.	1338.	2294.	2294.	2294.	2294.	2294.	2294.	2294.
PRE-OPERATIONAL EXPENSES	0.	0.	1647.	2824.	2824.	2824.	2824.	2824.	2824.	2824.
INTEREST DURING CONSTRUCTION	0.	0.	1594.	2732.	2732.	2732.	2732.	2732.	2732.	2732.
DEPRECIATION AND AMORTIZATION	0.	0.	27931.	47882.	47882.	47882.	47882.	47882.	47882.	47882.
TOTAL FACTORY COST	0.	0.	96233.	164029.	182577.	190658.	199225.	208305.	217931.	228134.
UNIT FACTORY COST	0.0	0.0	2.4675	2.6287	2.6008	2.7159	2.8380	2.9673	3.1044	3.2498
SALES EXPENSES	0.	0.	413.	719.	868.	924.	979.	1038.	1100.	1166.
OPERATING EXPENSES	0.	0.	96646.	164748.	183444.	191582.	200204.	209343.	219031.	229300.
INTEREST ON LONG TERM DEBT	0.	0.	22278.	27972.	25001.	22031.	19060.	16090.	13120.	10149.
INTEREST ON SHORT TERM DEBT	0.	0.	0.	62.	5537.	9657.	13363.	16836.	20041.	22922.
TOTAL PRODUCTION COST	0.	0.	118924.	192783.	213983.	223270.	232628.	242270.	252192.	262371.

PRODUCTION COST STATEMENTS

CASE 1 ***** KERTEH *****

YEAR	1998	1999	2000	2001	2002	2003	2004
RAW MATERIAL COST	120354.	127575.	135230.	143343.	151944.	161061.	170724.
ETHANE	44903.	47597.	50453.	53480.	56689.	60090.	63696.
EDC	28112.	29799.	31587.	33482.	35491.	37620.	39877.
BUTENE-1	11771.	12477.	13225.	14019.	14860.	15752.	16697.
PROPANE	25591.	27126.	28754.	30479.	32308.	34246.	36301.
OTHER CHEMICALS	9977.	10576.	11211.	11883.	12596.	13352.	14153.
UTILITIES	27470.	29119.	30866.	32718.	34681.	36762.	38967.
COOLING WATER	1640.	1738.	1843.	1953.	2070.	2194.	2326.
PROCESS WATER	624.	661.	701.	743.	788.	835.	885.
F.G.	7957.	8434.	8940.	9477.	10045.	10648.	11287.
ELECTRIC POWER	17250.	18285.	19382.	20545.	21777.	23084.	24469.
VARIABLE COST	147824.	156694.	166095.	176061.	186625.	197822.	209692.
EMPLOYMENT COST	35217.	37330.	39570.	41944.	44461.	47128.	49956.
DIRECT PERSONNEL	15387.	16310.	17288.	18326.	19425.	20591.	21826.
INDIRECT PERSONNEL	7521.	7972.	8451.	8958.	9495.	10065.	10669.
OVERHEAD	12309.	13048.	13831.	14661.	15540.	16473.	17461.
MAINTENANCE	7524.	7975.	8454.	8961.	9498.	10068.	10673.
INSURANCE	502.	532.	564.	597.	633.	671.	712.
DIRECT FIXED COST	43242.	45837.	48587.	51502.	54592.	57868.	61340.
CASH FACTORY COST	191067.	202531.	214683.	227563.	241217.	255690.	271032.
ERECTED PLANT COST	30534.	30534.	12723.	0.	0.	0.	0.
ENGINEERING	5579.	5579.	2325.	0.	0.	0.	0.
FRIEGHT, INSURANCE & OVERHEAD	3919.	3919.	1633.	0.	0.	0.	0.
SUPERVISING	2294.	2294.	956.	0.	0.	0.	0.
PRE-OPERATIONAL EXPENSES	2824.	2824.	1177.	0.	0.	0.	0.
INTEREST DURING CONSTRUCTION	2732.	2732.	1138.	0.	0.	0.	0.
DEPRECIATION AND AMORTIZATION	47882.	47882.	19951.	0.	0.	0.	0.
TOTAL FACTORY COST	238949.	250413.	234634.	227563.	241217.	255690.	271032.
UNIT FACTORY COST	3.4038	3.5671	3.3424	3.2416	3.4361	3.6423	3.8608
SALES EXPENSES	1236.	1311.	1389.	1473.	1561.	1655.	1754.
OPERATING EXPENSES	240185.	251723.	236023.	229036.	242778.	257345.	272785.
INTEREST ON LONG TERM DEBT	7179.	4208.	1238.	0.	0.	0.	0.
INTEREST ON SHORT TERM DEBT	25416.	27449.	28940.	26975.	22108.	17433.	12329.
TOTAL PRODUCTION COST	272779.	283381.	266200.	256011.	264886.	274778.	285114.

WORKING CAPITAL STATEMENTS

CASE 1 ***** KERTEH *****

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
CURRENT ASSETS	0.	0.	15989.	27632.	32578.	34505.	36440.	38491.	40666.	42971.
ACCOUNT RECEIVABLE	0.	0.	10325.	17987.	21689.	23097.	24483.	25952.	27509.	29159.
INVENTORIES	0.	0.	5664.	9645.	10889.	11408.	11957.	12539.	13157.	13811.
PRODUCT INVENTORY	0.	0.	4522.	7708.	8580.	8960.	9362.	9789.	10241.	10721.
LLDPE	0.	0.	1363.	2324.	2586.	2701.	2822.	2951.	3087.	3232.
HDPE	0.	0.	962.	1640.	1826.	1907.	1992.	2083.	2179.	2281.
VCM	0.	0.	802.	1367.	1521.	1589.	1660.	1736.	1816.	1901.
PP	0.	0.	882.	1504.	1674.	1748.	1826.	1909.	1998.	2091.
ETHYLENE	0.	0.	363.	619.	689.	720.	752.	786.	822.	861.
PROPYLENE	0.	0.	150.	255.	284.	296.	310.	324.	339.	355.
MATERIAL INVENTORY	0.	0.	1142.	1936.	2309.	2448.	2595.	2750.	2915.	3090.
ETHANE	0.	0.	174.	295.	351.	372.	395.	418.	444.	470.
EDC	0.	0.	408.	692.	826.	875.	928.	983.	1042.	1105.
BUTENE-1	0.	0.	171.	290.	346.	366.	388.	412.	436.	463.
PROPANE	0.	0.	99.	168.	200.	212.	225.	239.	253.	268.
OTHER CHEMICALS	0.	0.	290.	492.	586.	621.	659.	698.	740.	784.
OPERATING CASH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CURRENT LIABILITIES W/O DEBT	0.	0.	6441.	10924.	13026.	13808.	14636.	15515.	16445.	17432.
ACCOUNT PAYABLE	0.	0.	6441.	10924.	13026.	13808.	14636.	15515.	16445.	17432.
OTHER LIABILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PERMANENT WORKING CAPITAL	0.	0.	9548.	16708.	19552.	20697.	21804.	22977.	24220.	25539.
CHANGE IN WORKING CAPITAL	0.	0.	9548.	7160.	2844.	1145.	1107.	1173.	1244.	1318.

YEAR	1998	1999	2000	2001	2002	2003	2004
CURRENT ASSETS	45414.	48004.	49436.	51409.	54493.	57763.	61228.
ACCOUNT RECEIVABLE	30909.	32764.	34729.	36813.	39022.	41363.	43845.
INVENTORIES	14505.	15240.	14707.	14596.	15471.	16400.	17384.
PRODUCT INVENTORY	11229.	11768.	11026.	10694.	11336.	12016.	12737.
LLDPE	3385.	3547.	3324.	3224.	3417.	3622.	3840.
HDPE	2389.	2504.	2346.	2276.	2412.	2557.	2710.
VCM	1991.	2087.	1955.	1896.	2010.	2131.	2259.
PP	2190.	2295.	2151.	2086.	2211.	2344.	2484.
ETHYLENE	902.	945.	886.	859.	910.	965.	1023.
PROPYLENE	371.	389.	365.	354.	375.	397.	421.
MATERIAL INVENTORY	3276.	3472.	3681.	3901.	4136.	4384.	4647.
ETHANE	498.	528.	560.	594.	629.	667.	707.
EDC	1171.	1242.	1316.	1395.	1479.	1568.	1662.
BUTENE-1	490.	520.	551.	584.	619.	656.	696.
PROPANE	284.	301.	319.	338.	359.	380.	403.
OTHER CHEMICALS	831.	881.	934.	990.	1050.	1113.	1179.
OPERATING CASH	0.	0.	0.	0.	0.	0.	0.
CURRENT LIABILITIES W/O DEBT	18478.	19587.	20762.	22008.	23328.	24728.	26211.
ACCOUNT PAYABLE	18478.	19587.	20762.	22008.	23328.	24728.	26211.
OTHER LIABILITIES	0.	0.	0.	0.	0.	0.	0.
PERMANENT WORKING CAPITAL	26936.	28417.	28674.	29401.	31165.	33035.	35017.
CHANGE IN WORKING CAPITAL	1397.	1481.	257.	727.	1764.	1870.	1982.

INCOME STATEMENTS (FOR ENDING DECEMBER 31)

CASE 1 ***** KERTEH *****

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
OPERATING INCOME	0.	0.	82599.	143894.	173510.	184776.	195863.	207615.	220071.	233276.
TOTAL SALES REVENUE	0.	0.	82599.	143894.	173510.	184776.	195863.	207615.	220071.	233276.
COST OF SALES	0.	0.	91711.	160843.	181705.	190279.	198822.	207879.	217478.	227654.
VARIABLE COST	0.	0.	51526.	87388.	104211.	110463.	117091.	124116.	131563.	139457.
DIRECT FIXED COST	0.	0.	16776.	28759.	30484.	32313.	34252.	36307.	38486.	40795.
DEPRECIATION AND AMORTIZATION	0.	0.	27931.	47882.	47882.	47882.	47882.	47882.	47882.	47882.
INC. IN PRODUCT INVENTORY	0.	0.	4522.	3186.	872.	380.	403.	427.	452.	479.
GROSS PROFIT ON SALES	0.	0.	-9112.	-16949.	-8195.	-5502.	-2959.	-264.	2593.	5621.
SALES EXPENSES	0.	0.	413.	719.	868.	924.	979.	1038.	1100.	1166.
OPERATING PROFIT	0.	0.	-9525.	-17668.	-9062.	-6426.	-3939.	-1302.	1493.	4455.
NON-OPERATING EXPENSES	0.	0.	22278.	28034.	30538.	31688.	32423.	32926.	33160.	33071.
INTEREST ON LONG TERM DEBT	0.	0.	22278.	27972.	25001.	22031.	19060.	16090.	13120.	10149.
INTEREST ON SHORT TERM DEBT	0.	0.	0.	62.	5537.	9657.	13363.	16836.	20041.	22922.
NET PROFIT OR (LOSS) BEFORE TAX	0.	0.	-31803.	-45703.	-39601.	-38114.	-36362.	-34229.	-31668.	-28616.
INCOME TAX	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NON-TAXABLE INCOME	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NET PROFIT OR (LOSS) AFTER TAX	0.	0.	-31803.	-45703.	-39601.	-38114.	-36362.	-34229.	-31668.	-28616.
DIVIDENDS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RETAINED EARNINGS	0.	0.	-31803.	-45703.	-39601.	-38114.	-36362.	-34229.	-31668.	-28616.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *

INCOME STATEMENTS (FOR ENDING DECEMBER 31)

CASE 1 ***** KERTEH *****

YEAR	1998	1999	2000	2001	2002	2003	2004
OPERATING INCOME	247272.	262108.	277835.	294505.	312175.	330905.	350760.
TOTAL SALES REVENUE	247272.	262108.	277835.	294505.	312175.	330905.	350760.
COST OF SALES	238440.	249874.	235375.	227896.	240576.	255010.	270311.
VARIABLE COST	147824.	156694.	166095.	176061.	186625.	197822.	209692.
DIRECT FIXED COST	43242.	45837.	48587.	51502.	54592.	57868.	61340.
DEPRECIATION AND AMORTIZATION	47882.	47882.	19951.	0.	0.	0.	0.
INC. IN PRODUCT INVENTORY	508.	539.	-742.	-332.	642.	680.	721.
GROSS PROFIT ON SALES	8832.	12234.	42460.	66609.	71599.	75895.	80449.
SALES EXPENSES	1236.	1311.	1389.	1473.	1561.	1655.	1754.
OPERATING PROFIT	7595.	10924.	41071.	65137.	70039.	74241.	78695.
NON-OPERATING EXPENSES	32594.	31658.	30177.	26975.	22108.	17433.	12329.
INTEREST ON LONG TERM DEBT	7179.	4208.	1238.	0.	0.	0.	0.
INTEREST ON SHORT TERM DEBT	25416.	27449.	28940.	26975.	22108.	17433.	12329.
NET PROFIT OR (LOSS) BEFORE TAX	-24999.	-20734.	10893.	38162.	47931.	56808.	66366.
INCOME TAX	0.	0.	0.	0.	10206.	15676.	21410.
NON-TAXABLE INCOME	0.	0.	0.	0.	0.	0.	0.
NET PROFIT OR (LOSS) AFTER TAX	-24999.	-20734.	10893.	38162.	37725.	41131.	44956.
DIVIDENDS	0.	0.	0.	0.	0.	0.	0.
RETAINED EARNINGS	-24999.	-20734.	10893.	38162.	37725.	41131.	44956.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *
FUNDS FLOW STATEMENTS (FOR ENDING DECEMBER 31)
CASE 1 ***** KERTEH *****

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
SOURCE OF FUNDS	159132.	238698.	151496.	72805.	113104.	144248.	173454.	200741.	225696.	247841.
CASH GENERATED	0.	0.	18406.	30214.	38820.	41456.	43943.	46580.	49375.	52337.
PROFIT AFT. TAX, BFR INT.	0.	0.	-9525.	-17668.	-9062.	-6426.	-3939.	-1302.	1493.	4455.
DEPRECIATION AND AMORTIZATION	0.	0.	27931.	47882.	47882.	47882.	47882.	47882.	47882.	47882.
FINANCIAL RESOURCES	159132.	238698.	133090.	42591.	74285.	102793.	129510.	154161.	176321.	195504.
SHARE CAPITAL	47740.	71609.	39783.	0.	0.	0.	0.	0.	0.	0.
LONG TERM DEBT	111392.	167089.	92827.	0.	0.	0.	0.	0.	0.	0.
SHORT TERM DEBT	0.	0.	480.	42591.	74285.	102793.	129510.	154161.	176321.	195504.
OTHER CASH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NON-CASH FUNDS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
USES OF FUNDS	155732.	217141.	176453.	72805.	113104.	144248.	173454.	200741.	225696.	247841.
FIXED CAPITAL EXPENDITURE	155732.	217141.	122967.	0.	0.	0.	0.	0.	0.	0.
NON DEPRECIABLE FIXED ASSETS	17020.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEPRECIABLE FIXED ASSETS	135450.	203175.	112875.	0.	0.	0.	0.	0.	0.	0.
INTEREST DURING CONSTRUCTION	3262.	13966.	10092.	0.	0.	0.	0.	0.	0.	0.
CHANGE IN WORKING CAPITAL	0.	0.	9548.	7160.	2844.	1145.	1107.	1173.	1244.	1318.
DEBT SERVICES	0.	0.	43938.	65645.	110261.	143103.	172347.	199568.	224452.	246523.
REPAYMENT OF LONG TERM DEBT	0.	0.	21660.	37131.	37131.	37131.	37131.	37131.	37131.	37131.
REPAYMENT OF SHORT TERM DEBT	0.	0.	0.	480.	42591.	74285.	102793.	129510.	154161.	176321.
INTEREST ON LONG TERM DEBT	0.	0.	22278.	27972.	25001.	22031.	19060.	16090.	13120.	10149.
INTEREST ON SHORT TERM DEBT	0.	0.	0.	62.	5537.	9657.	13363.	16836.	20041.	22922.
DIVIDENDS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CASH INCREASE OR (DECREASE)	3400.	21557.	-24957.	0.	0.	0.	0.	0.	-0.	0.
BEGINNING CASH BALANCE	0.	3400.	24957.	0.	0.	0.	0.	0.	0.	-0.
ENDING CASH BALANCE	3400.	24957.	0.	0.	0.	0.	0.	0.	-0.	-0.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *
FUNDS FLOW STATEMENTS (FOR ENDING DECEMBER 31)
CASE 1 ***** KERTEH *****

YEAR	1998	1999	2000	2001	2002	2003	2004
SOURCE OF FUNDS	266626.	281418.	268519.	235198.	193934.	153404.	109151.
CASH GENERATED	55477.	58806.	61022.	65137.	59833.	58565.	57285.
PROFIT AFT. TAX, BFR INT.	7595.	10924.	41071.	65137.	59833.	58565.	57285.
DEPRECIATION AND AMORTIZATION	47882.	47882.	19951.	0.	0.	0.	0.
FINANCIAL RESOURCES	211149.	222612.	207497.	170062.	134101.	94839.	51865.
SHARE CAPITAL	0.	0.	0.	0.	0.	0.	0.
LONG TERM DEBT	0.	0.	0.	0.	0.	0.	0.
SHORT TERM DEBT	211149.	222612.	207497.	170062.	134101.	94839.	51865.
OTHER CASH	0.	0.	0.	0.	0.	0.	0.
NON-CASH FUNDS	0.	0.	0.	0.	0.	0.	0.
USES OF FUNDS	266626.	281418.	268519.	235198.	193934.	153404.	109151.
FIXED CAPITAL EXPENDITURE	0.	0.	0.	0.	0.	0.	0.
NON DEPRECIABLE FIXED ASSETS	0.	0.	0.	0.	0.	0.	0.
DEPRECIABLE FIXED ASSETS	0.	0.	0.	0.	0.	0.	0.
INTEREST DURING CONSTRUCTION	0.	0.	0.	0.	0.	0.	0.
CHANGE IN WORKING CAPITAL	1397.	1481.	257.	727.	1764.	1870.	1982.
DEBT SERVICES	265229.	279937.	268261.	234472.	192170.	151534.	107168.
REPAYMENT OF LONG TERM DEBT	37131.	37131.	15471.	0.	0.	0.	0.
REPAYMENT OF SHORT TERM DEBT	195504.	211149.	222612.	207497.	170062.	134101.	94839.
INTEREST ON LONG TERM DEBT	7179.	4208.	1238.	0.	0.	0.	0.
INTEREST ON SHORT TERM DEBT	25416.	27449.	28940.	26975.	22108.	17433.	12329.
DIVIDENDS	0.	0.	0.	0.	0.	0.	0.
CASH INCREASE OR (DECREASE)	0.	0.	0.	0.	0.	0.	0.
BEGINNING CASH BALANCE	-0.	-0.	-0.	-0.	-0.	-0.	-0.
ENDING CASH BALANCE	-0.	-0.	-0.	-0.	-0.	-0.	0.

BALANCE SHEET (FOR ENDING DECEMBER 31)

CASE 1 ***** KERTEH *****

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
ASSETS	159132.	397830.	483898.	447659.	404723.	358768.	312821.	266990.	221283.	175706.
CURRENT ASSETS	0.	0.	15989.	27632.	32578.	34505.	36440.	38491.	40666.	42971.
OPERATING CASH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ACCOUNT RECEIVABLE	0.	0.	10325.	17987.	21689.	23097.	24483.	25952.	27509.	29159.
INVENTORIES	0.	0.	5664.	9645.	10889.	11408.	11957.	12539.	13157.	13811.
ACC. EXESS CASH	3400.	24957.	0.	0.	0.	0.	0.	0.	-0.	-0.
NET FIXED ASSETS	155732.	372873.	467909.	420027.	372145.	324263.	276381.	228499.	180617.	132735.
INVESTMENT	155732.	372873.	495840.	495840.	495840.	495840.	495840.	495840.	495840.	495840.
NON-DEPR. ASSETS	17020.	17020.	17020.	17020.	17020.	17020.	17020.	17020.	17020.	17020.
DEPRECIABLE ASSETS	135450.	338625.	451500.	451500.	451500.	451500.	451500.	451500.	451500.	451500.
INTEREST DRG CONSTR.	3262.	17228.	27320.	27320.	27320.	27320.	27320.	27320.	27320.	27320.
LESS: ACC. DEPRECIATION	0.	0.	27931.	75813.	123695.	171577.	219459.	267341.	315223.	363105.
LIABILITIES	111392.	278481.	356569.	366033.	362698.	354857.	345272.	333670.	319630.	302669.
CURRENT LIABILITIES	0.	21660.	44052.	90646.	124442.	153731.	181278.	206806.	229897.	250067.
ACCOUNT PAYABLE	0.	0.	6441.	10924.	13026.	13808.	14636.	15515.	16445.	17432.
CURRENT PORTION OF L/T DEBT	0.	21660.	37131.	37131.	37131.	37131.	37131.	37131.	37131.	37131.
SHORT TERM DEBT	0.	0.	480.	42591.	74285.	102793.	129510.	154161.	176321.	195504.
OTHER LIABILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FIXED LIABILITIES	111392.	256821.	312518.	275387.	238256.	201125.	163995.	126864.	89733.	52602.
LONG TERM DEBT BALANCE	111392.	256821.	312518.	275387.	238256.	201125.	163995.	126864.	89733.	52602.
OTHER FIXED LIABILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
STOCK HOLDERS EQUITY	47740.	119349.	127329.	81626.	42025.	3911.	-32451.	-66680.	-98348.	-126963.
SHARE CAPITAL	47740.	119349.	159132.	159132.	159132.	159132.	159132.	159132.	159132.	159132.
ACC. RETAINED EARNINGS	0.	0.	-31803.	-77506.	-117107.	-155221.	-191583.	-225812.	-257480.	-286095.
LIABILITIES & S/H EQUITY	159132.	397830.	483898.	447659.	404723.	358768.	312821.	266990.	221283.	175706.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *

BALANCE SHEET (FOR ENDING DECEMBER 31)

CASE 1 ***** KERTEH *****

YEAR	1998	1999	2000	2001	2002	2003	2004
ASSETS	130267.	84975.	66456.	68429.	71513.	74783.	78248.
CURRENT ASSETS	45414.	48004.	49436.	51409.	54493.	57763.	61228.
OPERATING CASH	0.	0.	0.	0.	0.	0.	0.
ACCOUNT RECEIVABLE	30909.	32764.	34729.	36813.	39022.	41363.	43845.
INVENTORIES	14505.	15240.	14707.	14596.	15471.	16400.	17384.
ACC. EXESS CASH	-0.	-0.	-0.	-0.	-0.	-0.	0.
NET FIXED ASSETS	84853.	36971.	17020.	17020.	17020.	17020.	17020.
INVESTMENT	495840.	495840.	495840.	495840.	495840.	495840.	495840.
NON-DEPR. ASSETS	17020.	17020.	17020.	17020.	17020.	17020.	17020.
DEPRECIABLE ASSETS	451500.	451500.	451500.	451500.	451500.	451500.	451500.
INTEREST DRG CONSTR.	27320.	27320.	27320.	27320.	27320.	27320.	27320.
LESS: ACC. DEPRECIATION	410987.	458869.	478820.	478820.	478820.	478820.	478820.
LIABILITIES	282229.	257671.	228259.	192069.	157429.	119567.	78077.
CURRENT LIABILITIES	266758.	257671.	228259.	192069.	157429.	119567.	78077.
ACCOUNT PAYABLE	18478.	19587.	20762.	22008.	23328.	24728.	26211.
CURRENT PORTION OF L/T DEBT	37131.	15471.	0.	0.	0.	0.	0.
SHORT TERM DEBT	211149.	222612.	207497.	170062.	134101.	94839.	51865.
OTHER LIABILITIES	0.	0.	0.	0.	0.	0.	0.
FIXED LIABILITIES	15471.	0.	0.	0.	0.	0.	0.
LONG TERM DEBT BALANCE	15471.	0.	0.	0.	0.	0.	0.
OTHER FIXED LIABILITIES	0.	0.	0.	0.	0.	0.	0.
STOCK HOLDERS EQUITY	-151962.	-172696.	-161803.	-123641.	-85916.	-44785.	172.
SHARE CAPITAL	159132.	159132.	159132.	159132.	159132.	159132.	159132.
ACC. RETAINED EARNINGS	-311094.	-331828.	-320935.	-282773.	-245048.	-203917.	-158960.
LIABILITIES & S/H EQUITY	130267.	84975.	66456.	68429.	71513.	74783.	78248.

LONG TERM DEBT

CASE 1 ***** KERTEH *****

AMOUNT OF DEBT 371308.

INTEREST RATE 8.000 PER CENT/YEAR

REPAYMENT 10 YEAR-EQUAL-INSTALLMENT-REPAYMENT (ANNUAL REPAYMENT)

YEAR	SER.NO	PRINCIPAL	INTEREST	DEBT SERVICE	BALANCE AFT. PAYMENT
1988	1	0.	0.	0.	111392.
1989	2	0.	0.	0.	278481.
1990	3	21660.	22278.	43938.	349648.
1991	4	37131.	27972.	65103.	312518.
1992	5	37131.	25001.	62132.	275387.
1993	6	37131.	22031.	59162.	238256.
1994	7	37131.	19060.	56191.	201125.
1995	8	37131.	16090.	53221.	163994.
1996	9	37131.	13120.	50250.	126864.
1997	10	37131.	10149.	47280.	89733.
1998	11	37131.	7179.	44309.	52602.
1999	12	37131.	4208.	41339.	15471.
2000	13	15471.	1238.	16709.	0.
2001	14	0.	0.	0.	0.
2002	15	0.	0.	0.	0.
2003	16	0.	0.	0.	0.
2004	17	0.	0.	0.	0.
TOTAL		371308.	168326.	539634.	0.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *
PROFITABILITY AND FINANCIAL INDICATORS
CASE 1 ***** KERTEH *****

YEAR	(1) AFT TAX PROFIT -TO- SALES REV (PCT)	(2) AFT TAX PROFIT -TO- S/H EQUITY (PCT)	(3) BFR TAX PROFIT -TO- INVESTMENT (PCT)	(4) AFT TAX PROFIT -TO- S/CAPITAL (PCT)	(5) CURRENT RATIO	(6) QUICK RAITO	(7) DEBT SERVICE RATIO	(8) L/T DEBT -TO- S/H EQUITY	(9)* PROFIT B.E.P. CAPACITY UTILIZE (PCT)	(10)* CASH B.E.P. SALES PRICE (PRICE)	(11)* CASH B.E.P. CAPACITY UTILIZE (PCT)
1990	-38.5	-25.0	-6.4	-20.0	0.36	0.23	0.42	71 / 29	108.5	3014.1	98.4
1991	-31.8	-56.0	-9.2	-28.7	0.30	0.20	0.46	77 / 23	149.2	2963.5	134.0
1992	-22.8	-94.2	-8.0	-24.9	0.26	0.17	0.54	85 / 15	142.6	2908.5	128.6
1993	-20.6	-974.5	-7.7	-24.0	0.22	0.15	0.54	98 / 2	136.6	3027.3	123.6
1994	-18.6	112.1	-7.3	-22.9	0.20	0.14	0.54	125 / -25	132.0	3160.6	119.7
1995	-16.5	51.3	-6.9	-21.5	0.19	0.13	0.56	211 / ***	127.4	3298.0	115.8
1996	-14.4	32.2	-6.4	-19.9	0.18	0.12	0.58	*** / ***	122.7	3439.3	111.7
1997	-12.3	22.5	-5.8	-18.0	0.17	0.12	0.62	-71 / 171	117.9	3584.3	107.6
1998	-10.1	16.5	-5.0	-15.7	0.17	0.12	0.68	-11 / 111	113.1	3732.6	103.4
1999	-7.9	12.0	-4.2	-13.0	0.19	0.13	0.76	-0 / 100	108.2	3883.6	99.0
2000	3.9	-6.7	2.2	6.8	0.22	0.15	1.92	-0 / 100	80.6	3728.2	77.0
2001	13.0	-30.9	7.7	24.0	0.27	0.19	********	-0 / 100	60.7	3646.9	60.7
2002	12.1	-43.9	9.7	23.7	0.35	0.25	********	-0 / 100	56.1	3773.3	56.1
2003	12.4	-91.8	11.5	25.8	0.48	0.35	********	-0 / 100	52.0	3914.2	52.0
2004	12.8	26202.2	13.4	28.3	0.78	0.56	********	0 / 100	48.1	4061.5	48.1
AVERAGE1	-9.3	1675.1	-1.5	-6.7	0.29	0.20	********	-30 / 130	103.7	3475.7	95.7
AVERAGE2	-4.5	24.7	-1.4	-6.2	0.24	0.17	0.90	154 / -54			

(AVERAGE1) : SUM OF ANNUAL FIGURES OF PERCENTAGE AND RATIO IS DIVIDED BY NO. OF YEARS(SIMPLE AVERAGE)
(AVERAGE2) : AVERAGE FIGURES ARE CALCULATED BY ACTUAL VALUES ACCUMULATED OVER THE PROJECT LIFE(WEIGHTED AVERAGE)
* NOTE FOR (9)(10)(11)
WHEN THERE ARE TWO OR MORE PRODUCTS, AND DURING THE YEARS WHEN ALL OF PRODUCTS ARE NOT PRODUCED AT THE SAME RATE OF CAPACITY UTILIZATION, ABOVE BREAK-EVEN-POINTS CANNOT GIVE CORRECT FIGURES.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *

FINANCIAL RATE OF RETURN (IN CURRENT PRICE)

CASE 1 ***** KERTEH *****

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	(1) GROSS CAPITAL EXPENDTR	OPERATING PROFIT	DEPRECIATN	(2) GROSS CASH IN-FLOW	(3) INCOME TAX	(4) BFR-TAX NET IN-FLOW (2)-(1)	(5) AFT-TAX NET IN-FLOW (4)-(3)
1988	152470.	0.	152470.	0.	0.	0.	0.	-152470.	-152470.
1989	203175.	0.	203175.	0.	0.	0.	0.	-203175.	-203175.
1990	112875.	9548.	122423.	-9525.	27931.	18406.	0.	-104017.	-104017.
1991	0.	7160.	7160.	-17668.	47882.	30214.	0.	23054.	23054.
1992	0.	2844.	2844.	-9062.	47882.	38820.	0.	35976.	35976.
1993	0.	1145.	1145.	-6426.	47882.	41456.	0.	40311.	40311.
1994	0.	1107.	1107.	-3939.	47882.	43943.	0.	42836.	42836.
1995	0.	1173.	1173.	-1302.	47882.	46580.	0.	45407.	45407.
1996	0.	1244.	1244.	1493.	47882.	49375.	0.	48131.	48131.
1997	0.	1318.	1318.	4455.	47882.	52337.	0.	51019.	51019.
1998	0.	1397.	1397.	7595.	47882.	55477.	0.	54080.	54080.
1999	0.	1481.	1481.	10924.	47882.	58806.	0.	57325.	57325.
2000	0.	257.	257.	41071.	19951.	61022.	0.	60764.	60764.
2001	0.	727.	727.	65137.	0.	65137.	0.	64410.	64410.
2002	0.	1764.	1764.	70039.	0.	70039.	10206.	68274.	58069.
2003	0.	1870.	1870.	74241.	0.	74241.	15676.	72371.	56695.
2004	-17020.	-33035.	-50055.	78695.	0.	78695.	21410.	128750.	107340.
	451500.	-0.	451499.	305725.	478820.	784545.	47292.	333045.	285754.

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 5.84 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) 5.29 PER CENT

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *

FINANCIAL RATE OF RETURN (IN CONSTANT PRICE)

CASE 1 ***** KERTEH *****

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	(1) GROSS CAPITAL EXPENDTR	OPERATING PROFIT	DEPRECIATN	(2) GROSS CASH IN-FLOW	(3) INCOME TAX	(4) BFR-TAX NET IN-FLOW (2)-(1)	(5) AFT-TAX NET IN-FLOW (4)-(3)	DEFLATOR
1988	152470.	0.	152470.	0.	0.	0.	0.	-152470.	-152470.	1.000
1989	191675.	0.	191675.	0.	0.	0.	0.	-191675.	-191675.	1.060
1990	100458.	8498.	108956.	-8477.	24859.	16381.	0.	-92575.	-92575.	1.124
1991	0.	5531.	5531.	-14835.	40203.	25368.	0.	19837.	19837.	1.191
1992	0.	1458.	1458.	-7178.	37927.	30749.	0.	29290.	29290.	1.262
1993	0.	-21.	-21.	-4802.	35780.	30978.	0.	30999.	30999.	1.338
1994	0.	-95.	-95.	-2777.	33755.	30978.	0.	31073.	31073.	1.419
1995	0.	-90.	-90.	-866.	31844.	30978.	0.	31068.	31068.	1.504
1996	0.	-85.	-85.	936.	30042.	30978.	0.	31063.	31063.	1.594
1997	0.	-80.	-80.	2637.	28341.	30978.	0.	31058.	31058.	1.689
1998	0.	-75.	-75.	4241.	26737.	30978.	0.	31054.	31054.	1.791
1999	0.	-71.	-71.	5755.	25224.	30978.	0.	31049.	31049.	1.898
2000	0.	-719.	-719.	20411.	9915.	30326.	0.	31045.	31045.	2.012
2001	0.	-466.	-466.	30539.	0.	30539.	0.	31005.	31005.	2.133
2002	0.	0.	0.	30978.	0.	30978.	4514.	30978.	26464.	2.261
2003	0.	-0.	-0.	30978.	0.	30978.	6541.	30978.	24437.	2.397
2004	-6700.	-13784.	-20484.	30978.	0.	30978.	8428.	51462.	43034.	2.540
	437903.	-0.	437903.	118518.	324627.	443145.	19483.	5242.	-14241.	

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 0.13 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) -0.37 PER CENT

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *

NET PRESENT VALUE (IN CONSTANT PRICE)

CASE 1 ***** KERTEH *****

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	(1) GROSS CAPITAL EXPENDTR	OPERATING PROFIT	DEPRECIATN	(2) GROSS CASH IN-FLOW	(3) INCOME TAX	(4) BFR-TAX NET IN-FLOW (2)-(1)	(5) AFT-TAX NET IN-FLOW (4)-(3)	DISCOUNT RATE
1988	152470.	0.	152470.	0.	0.	0.	0.	-152470.	-152470.	1.000
1989	171138.	0.	171138.	0.	0.	0.	0.	-171138.	-171138.	1.120
1990	80085.	6774.	86859.	-6758.	19817.	13059.	0.	-73800.	-73800.	1.254
1991	0.	3937.	3937.	-10559.	28616.	18056.	0.	14120.	14120.	1.405
1992	0.	927.	927.	-4562.	24103.	19541.	0.	18615.	18615.	1.574
1993	0.	-12.	-12.	-2725.	20303.	17578.	0.	17590.	17590.	1.762
1994	0.	-48.	-48.	-1407.	17101.	15695.	0.	15743.	15743.	1.974
1995	0.	-41.	-41.	-392.	14405.	14013.	0.	14054.	14054.	2.211
1996	0.	-34.	-34.	378.	12133.	12512.	0.	12546.	12546.	2.476
1997	0.	-29.	-29.	951.	10220.	11171.	0.	11200.	11200.	2.773
1998	0.	-24.	-24.	1366.	8609.	9974.	0.	9998.	9998.	3.106
1999	0.	-20.	-20.	1654.	7251.	8906.	0.	8926.	8926.	3.479
2000	0.	-185.	-185.	5239.	2545.	7784.	0.	7969.	7969.	3.896
2001	0.	-107.	-107.	6999.	0.	6999.	0.	7105.	7105.	4.363
2002	0.	0.	0.	6339.	0.	6339.	924.	6339.	5415.	4.887
2003	0.	-0.	-0.	5660.	0.	5660.	1195.	5660.	4465.	5.474
2004	-1093.	-2249.	-3341.	5053.	0.	5053.	1375.	8395.	7020.	6.130
	402600.	8889.	411489.	7236.	165103.	172339.	3493.	-239150.	-242643.	

INCOME STATEMENTS (FOR ENDING DECEMBER 31)

CASE 1 (ECONOMIC) ***** KERTEH ***** (USD 1000

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
OPERATING INCOME	0.	0.	82599.	143894.	173510.	184776.	195863.	207615.	220071.	233276.
TOTAL SALES REVENUE	0.	0.	82599.	143894.	173510.	184776.	195863.	207615.	220071.	233276.
COST OF SALES	0.	0.	93812.	164466.	186638.	195558.	204419.	213811.	223767.	234320.
VARIABLE COST	0.	0.	56333.	95542.	113933.	120769.	128015.	135696.	143838.	152468.
DIRECT FIXED COST	0.	0.	14174.	24298.	25756.	27301.	28939.	30675.	32516.	34467.
DEPRECIATION AND AMORTIZATION	0.	0.	27931.	47882.	47882.	47882.	47882.	47882.	47882.	47882.
INC. IN PRODUCT INVENTORY	0.	0.	4626.	3256.	933.	394.	418.	443.	469.	497.
GROSS PROFIT ON SALES	0.	0.	-11214.	-20572.	-13128.	-10782.	-8556.	-6197.	-3695.	-1044.
SALES EXPENSES	0.	0.	413.	719.	868.	924.	979.	1038.	1100.	1166.
OPERATING PROFIT	0.	0.	-11626.	-21291.	-13996.	-11706.	-9535.	-7235.	-4796.	-2211.
NON-OPERATING EXPENSES	0.	0.	22278.	28250.	31213.	33076.	34671.	36187.	37608.	38906.
INTEREST ON LONG TERM DEBT	0.	0.	22278.	27972.	25001.	22031.	19060.	16090.	13120.	10149.
INTEREST ON SHORT TERM DEBT	0.	0.	0.	278.	6211.	11045.	15611.	20097.	24489.	28757.
NET PROFIT OR (LOSS) BEFORE TAX	0.	0.	-33905.	-49541.	-45208.	-44782.	-44207.	-43422.	-42404.	-41117.
INCOME TAX	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NON-TAXABLE INCOME	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NET PROFIT OR (LOSS) AFTER TAX	0.	0.	-33905.	-49541.	-45208.	-44782.	-44207.	-43422.	-42404.	-41117.
DIVIDENDS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RETAINED EARNINGS	0.	0.	-33905.	-49541.	-45208.	-44782.	-44207.	-43422.	-42404.	-41117.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *

INCOME STATEMENTS (FOR ENDING DECEMBER 31)

CASE 1 (ECONOMIC) ***** KERTEH ***** (USD 1000

YEAR	1998	1999	2000	2001	2002	2003	2004
OPERATING INCOME	247272.	262108.	277835.	294505.	312175.	330905.	350760.
TOTAL SALES REVENUE	247272.	262108.	277835.	294505.	312175.	330905.	350760.
COST OF SALES	245506.	257364.	243314.	236311.	249496.	264465.	280333.
VARIABLE COST	161616.	171313.	181592.	192487.	204037.	216279.	229256.
DIRECT FIXED COST	36535.	38727.	41051.	43514.	46125.	48892.	51825.
DEPRECIATION AND AMORTIZATION	47882.	47882.	19951.	0.	0.	0.	0.
INC. IN PRODUCT INVENTORY	527.	559.	-720.	-310.	665.	705.	748.
GROSS PROFIT ON SALES	1766.	4745.	34521.	58194.	62679.	66440.	70426.
SALES EXPENSES	1236.	1311.	1389.	1473.	1561.	1655.	1754.
OPERATING PROFIT	530.	3434.	33132.	56721.	61118.	64785.	68672.
NON-OPERATING EXPENSES	40046.	40988.	41685.	41000.	39040.	36387.	33118.
INTEREST ON LONG TERM DEBT	7179.	4208.	1238.	0.	0.	0.	0.
INTEREST ON SHORT TERM DEBT	32868.	36780.	40447.	41000.	39040.	36387.	33118.
NET PROFIT OR (LOSS) BEFORE TAX	-39517.	-37554.	-8553.	15721.	22079.	28398.	35555.
INCOME TAX	0.	0.	0.	0.	0.	1471.	6004.
NON-TAXABLE INCOME	0.	0.	0.	0.	0.	0.	0.
NET PROFIT OR (LOSS) AFTER TAX	-39517.	-37554.	-8553.	15721.	22079.	26927.	29550.
DIVIDENDS	0.	0.	0.	0.	0.	0.	0.
RETAINED EARNINGS	-39517.	-37554.	-8553.	15721.	22079.	26927.	29550.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *
FUNDS FLOW STATEMENTS (FOR ENDING DECEMBER 31)
CASE 1 (ECONOMIC) ***** KERTEH ***** (USD 1000

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
SOURCE OF FUNDS	159132.	238698.	151053.	74369.	118848.	156261.	192938.	229024.	264297.	298500.
CASH GENERATED	0.	0.	16305.	26591.	33886.	36176.	38347.	40647.	43086.	45671.
PROFIT AFT. TAX, BFR INT.	0.	0.	-11626.	-21291.	-13996.	-11706.	-9535.	-7235.	-4796.	-2211.
DEPRECIATION AND AMORTIZATION	0.	0.	27931.	47882.	47882.	47882.	47882.	47882.	47882.	47882.
FINANCIAL RESOURCES	159132.	238698.	134749.	47778.	84961.	120085.	154592.	188376.	221211.	252829.
SHARE CAPITAL	47740.	71609.	39783.	0.	0.	0.	0.	0.	0.	0.
LONG TERM DEBT	111392.	167089.	92827.	0.	0.	0.	0.	0.	0.	0.
SHORT TERM DEBT	0.	0.	2139.	47778.	84961.	120085.	154592.	188376.	221211.	252829.
OTHER CASH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NON-CASH FUNDS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
USES OF FUNDS	155732.	217141.	176010.	74369.	118848.	156261.	192938.	229024.	264297.	298500.
FIXED CAPITAL EXPENDITURE	155732.	217141.	122967.	0.	0.	0.	0.	0.	0.	0.
NON DEPRECIABLE FIXED ASSETS	17020.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEPRECIABLE FIXED ASSETS	135450.	203175.	112875.	0.	0.	0.	0.	0.	0.	0.
INTEREST DURING CONSTRUCTION	3262.	13966.	10092.	0.	0.	0.	0.	0.	0.	0.
CHANGE IN WORKING CAPITAL	0.	0.	9105.	6849.	2726.	1093.	1051.	1115.	1181.	1252.
DEBT SERVICES	0.	0.	43938.	67519.	116121.	155168.	191887.	227909.	263116.	297248.
REPAYMENT OF LONG TERM DEBT	0.	0.	21660.	37131.	37131.	37131.	37131.	37131.	37131.	37131.
REPAYMENT OF SHORT TERM DEBT	0.	0.	0.	2139.	47778.	84961.	120085.	154592.	188376.	221211.
INTEREST ON LONG TERM DEBT	0.	0.	22278.	27972.	25001.	22031.	19060.	16090.	13120.	10149.
INTEREST ON SHORT TERM DEBT	0.	0.	0.	278.	6211.	11045.	15611.	20097.	24489.	28757.
DIVIDENDS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CASH INCREASE OR (DECREASE)	3400.	21557.	-24957.	0.	0.	-0.	-0.	0.	-0.	0.
BEGINNING CASH BALANCE	0.	3400.	24957.	0.	0.	0.	0.	-0.	-0.	-0.
ENDING CASH BALANCE	3400.	24957.	0.	0.	0.	0.	-0.	-0.	-0.	-0.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *

FUNDS FLOW STATEMENTS (FOR ENDING DECEMBER 31)

CASE 1 (ECONOMIC) ***** KERTEH ***** (USD 1000)

YEAR	1998	1999	2000	2001	2002	2003	2004
SOURCE OF FUNDS	331334.	362448.	368466.	357027.	341021.	318067.	289754.
CASH GENERATED	48412.	51316.	53083.	56721.	61118.	63314.	62668.
PROFIT AFT. TAX, BFR INT.	530.	3434.	33132.	56721.	61118.	63314.	62668.
DEPRECIATION AND AMORTIZATION	47882.	47882.	19951.	0.	0.	0.	0.
FINANCIAL RESOURCES	282922.	311132.	315384.	300306.	279903.	254753.	227085.
SHARE CAPITAL	0.	0.	0.	0.	0.	0.	0.
LONG TERM DEBT	0.	0.	0.	0.	0.	0.	0.
SHORT TERM DEBT	282922.	311132.	315384.	300306.	279903.	254753.	227085.
OTHER CASH	0.	0.	0.	0.	0.	0.	0.
NON-CASH FUNDS	0.	0.	0.	0.	0.	0.	0.
USES OF FUNDS	331334.	362448.	368466.	357027.	341021.	318067.	289754.
FIXED CAPITAL EXPENDITURE	0.	0.	0.	0.	0.	0.	0.
NON DEPRECIABLE FIXED ASSETS	0.	0.	0.	0.	0.	0.	0.
DEPRECIABLE FIXED ASSETS	0.	0.	0.	0.	0.	0.	0.
INTEREST DURING CONSTRUCTION	0.	0.	0.	0.	0.	0.	0.
CHANGE IN WORKING CAPITAL	1327.	1407.	179.	643.	1676.	1776.	1883.
DEBT SERVICES	330006.	361041.	368288.	356384.	339346.	316290.	287871.
REPAYMENT OF LONG TERM DEBT	37131.	37131.	15471.	0.	0.	0.	0.
REPAYMENT OF SHORT TERM DEBT	252829.	282922.	311132.	315384.	300306.	279903.	254753.
INTEREST ON LONG TERM DEBT	7179.	4208.	1238.	0.	0.	0.	0.
INTEREST ON SHORT TERM DEBT	32868.	36780.	40447.	41000.	39040.	36387.	33118.
DIVIDENDS	0.	0.	0.	0.	0.	0.	0.
CASH INCREASE OR (DECREASE)	-0.	-0.	-0.	-0.	0.	-0.	0.
BEGINNING CASH BALANCE	-0.	-0.	-0.	-0.	-0.	-0.	-0.
ENDING CASH BALANCE	-0.	-0.	-0.	-0.	-0.	-0.	-0.

BALANCE SHEET (FOR ENDING DECEMBER 31)

CASE 1 (ECONOMIC) ***** KERTEH ***** (USD 1000

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
ASSETS	159132.	397830.	484056.	447924.	405068.	359133.	313208.	267401.	221718.	176167.
CURRENT ASSETS	0.	0.	16147.	27897.	32923.	34870.	36827.	38902.	41101.	43432.
OPERATING CASH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ACCOUNT RECEIVABLE	0.	0.	10325.	17987.	21689.	23097.	24483.	25952.	27509.	29159.
INVENTORIES	0.	0.	5822.	9911.	11234.	11773.	12344.	12950.	13592.	14272.
ACC. EXESS CASH	3400.	24957.	0.	0.	0.	0.	-0.	-0.	-0.	-0.
NET FIXED ASSETS	155732.	372873.	467909.	420027.	372145.	324263.	276381.	228499.	180617.	132735.
INVESTMENT	155732.	372873.	495840.	495840.	495840.	495840.	495840.	495840.	495840.	495840.
NON-DEPR. ASSETS	17020.	17020.	17020.	17020.	17020.	17020.	17020.	17020.	17020.	17020.
DEPRECIABLE ASSETS	135450.	338625.	451500.	451500.	451500.	451500.	451500.	451500.	451500.	451500.
INTEREST DRG CONSTR.	3262.	17228.	27320.	27320.	27320.	27320.	27320.	27320.	27320.	27320.
LESS: ACC. DEPRECIATION	0.	0.	27931.	75813.	123695.	171577.	219459.	267341.	315223.	363105.
LIABILITIES	111392.	278481.	358829.	372238.	374590.	373437.	371719.	369333.	366054.	361620.
CURRENT LIABILITIES	0.	21660.	46311.	96851.	136334.	172311.	207724.	242469.	276321.	309018.
ACCOUNT PAYABLE	0.	0.	7042.	11943.	14242.	15096.	16002.	16962.	17980.	19059.
CURRENT PORTION OF L/T DEBT	0.	21660.	37131.	37131.	37131.	37131.	37131.	37131.	37131.	37131.
SHORT TERM DEBT	0.	0.	2139.	47778.	84961.	120085.	154592.	188376.	221211.	252829.
OTHER LIABILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FIXED LIABILITIES	111392.	256821.	312518.	275387.	238256.	201125.	163995.	126864.	89733.	52602.
LONG TERM DEBT BALANCE	111392.	256821.	312518.	275387.	238256.	201125.	163995.	126864.	89733.	52602.
OTHER FIXED LIABILITIES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
STOCK HOLDERS EQUITY	47740.	119349.	125227.	75686.	30478.	-14304.	-58511.	-101932.	-144336.	-185454.
SHARE CAPITAL	47740.	119349.	159132.	159132.	159132.	159132.	159132.	159132.	159132.	159132.
ACC. RETAINED EARNINGS	0.	0.	-33905.	-83446.	-128654.	-173436.	-217643.	-261064.	-303468.	-344586.
LIABILITIES & S/H EQUITY	159132.	397830.	484056.	447924.	405068.	359133.	313208.	267401.	221718.	176167.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *

BALANCE SHEET (FOR ENDING DECEMBER 31)

CASE 1 (ECONOMIC) ***** KERTEH ***** (USD 1000)

YEAR	1998	1999	2000	2001	2002	2003	2004
ASSETS	130756.	85493.	67006.	69011.	72130.	75437.	78942.
CURRENT ASSETS	45903.	48522.	49986.	51991.	55110.	58417.	61922.
OPERATING CASH	0.	0.	0.	0.	0.	0.	0.
ACCOUNT RECEIVABLE	30909.	32764.	34729.	36813.	39022.	41363.	43845.
INVENTORIES	14994.	15758.	15256.	15178.	16089.	17054.	18077.
ACC. EXESS CASH	-0.	-0.	-0.	-0.	-0.	-0.	-0.
NET FIXED ASSETS	84853.	36971.	17020.	17020.	17020.	17020.	17020.
INVESTMENT	495840.	495840.	495840.	495840.	495840.	495840.	495840.
NON-DEPR. ASSETS	17020.	17020.	17020.	17020.	17020.	17020.	17020.
DEPRECIABLE ASSETS	451500.	451500.	451500.	451500.	451500.	451500.	451500.
INTEREST DRG CONSTR.	27320.	27320.	27320.	27320.	27320.	27320.	27320.
LESS: ACC. DEPRECIATION	410987.	458869.	478820.	478820.	478820.	478820.	478820.
LIABILITIES	355726.	348017.	338083.	324367.	305408.	281788.	255742.
CURRENT LIABILITIES	340255.	348017.	338083.	324367.	305408.	281788.	255742.
ACCOUNT PAYABLE	20202.	21414.	22699.	24061.	25505.	27035.	28657.
CURRENT PORTION OF L/T DEBT	37131.	15471.	0.	0.	0.	0.	0.
SHORT TERM DEBT	282922.	311132.	315384.	300306.	279903.	254753.	227085.
OTHER LIABILITIES	0.	0.	0.	0.	0.	0.	0.
FIXED LIABILITIES	15471.	0.	0.	0.	0.	0.	0.
LONG TERM DEBT BALANCE	15471.	0.	0.	0.	0.	0.	0.
OTHER FIXED LIABILITIES	0.	0.	0.	0.	0.	0.	0.
STOCK HOLDERS EQUITY	-224970.	-262524.	-271077.	-255356.	-233277.	-206351.	-176800.
SHARE CAPITAL	159132.	159132.	159132.	159132.	159132.	159132.	159132.
ACC. RETAINED EARNINGS	-384102.	-421656.	-430209.	-414488.	-392409.	-365483.	-335932.
LIABILITIES & S/H EQUITY	130756.	85493.	67006.	69011.	72130.	75437.	78942.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *
PROFITABILITY AND FINANCIAL INDICATORS
CASE 1 (ECONOMIC) ***** KERTEH ***** (USD 1000

YEAR	(1) AFT TAX PROFIT -TO- SALES REV (PCT)	(2) AFT TAX PROFIT -TO- S/H EQUITY (PCT)	(3) BFR TAX PROFIT -TO- INVESTMENT (PCT)	(4) AFT TAX PROFIT -TO- S/CAPITAL (PCT)	(5) CURRENT RATIO	(6) QUICK RATIO	(7) DEBT SERVICE RATIO	(8) L/T DEBT -TO- S/H EQUITY	(9)* PROFIT B.E.P. CAPACITY UTILIZE (PCT)	(10)* CASH B.E.P. SALES PRICE (PRICE)	(11)* CASH B.E.P. CAPACITY UTILIZE (PCT)
1990	-41.0	-27.1	-6.8	-21.3	0.35	0.22	0.37	71 / 29	123.3	3073.1	111.4
1991	-34.4	-65.5	-10.0	-31.1	0.29	0.19	0.40	78 / 22	167.4	3027.1	149.6
1992	-26.1	-148.3	-9.1	-28.4	0.24	0.16	0.45	89 / 11	159.7	2989.6	143.5
1993	-24.2	313.1	-9.0	-28.1	0.20	0.13	0.42	108 / -8	153.5	3122.5	138.4
1994	-22.6	75.6	-8.9	-27.8	0.18	0.12	0.40	155 / -55	149.2	3272.6	134.9
1995	-20.9	42.6	-8.8	-27.3	0.16	0.11	0.39	509 / ***	144.9	3429.2	131.4
1996	-19.3	29.4	-8.6	-26.6	0.15	0.10	0.37	*** / 264	140.6	3592.5	127.9
1997	-17.6	22.2	-8.3	-25.8	0.14	0.09	0.36	-40 / 140	136.3	3762.7	124.4
1998	-16.0	17.6	-8.0	-24.8	0.13	0.09	0.35	-7 / 107	132.1	3939.7	120.8
1999	-14.3	14.3	-7.6	-23.6	0.14	0.09	0.35	-0 / 100	127.8	4123.5	117.1
2000	-3.1	3.2	-1.7	-5.4	0.15	0.10	0.76	-0 / 100	97.3	4005.5	93.1
2001	5.3	-6.2	3.2	9.9	0.16	0.11	********	-0 / 100	75.9	3966.9	75.9
2002	7.1	-9.5	4.5	13.9	0.18	0.13	********	-0 / 100	72.2	4141.9	72.2
2003	8.1	-13.0	5.7	16.9	0.21	0.15	********	-0 / 100	68.3	4319.3	68.3
2004	8.4	-16.7	7.2	18.6	0.24	0.17	********	-0 / 100	64.2	4500.7	64.2
AVERAGE1	-14.0	15.4	-4.4	-14.1	0.19	0.13	********	53 / 47	120.8	3684.4	111.5
AVERAGE2	-9.6	19.3	-4.1	-13.2	0.17	0.12	0.58	*** / ***			

(AVERAGE1) : SUM OF ANNUAL FIGURES OF PERCENTAGE AND RATIO IS DIVIDED BY NO. OF YEARS(SIMPLE AVERAGE)
(AVERAGE2) : AVERAGE FIGURES ARE CALCULATED BY ACTUAL VALUES ACCUMULATED OVER THE PROJECT LIFE(WEIGHTED AVERAGE)
* NOTE FOR (9)(10)(11)
WHEN THERE ARE TWO OR MORE PRODUCTS, AND DURING THE YEARS WHEN ALL OF PRODUCTS ARE NOT PRODUCED AT THE SAME RATE OF CAPACITY UTILIZATION, ABOVE BREAK-EVEN-POINTS CANNOT GIVE CORRECT FIGURES.

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *

FINANCIAL RATE OF RETURN (IN CURRENT PRICE)

CASE 1 (ECONOMIC) ***** KERTEH ***** (USD 1000

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	(1) GROSS CAPITAL EXPENDTR	OPERATING PROFIT	DEPRECIATN	(2) GROSS CASH IN-FLOW	(3) INCOME TAX	(4) BFR-TAX NET IN-FLOW (2)-(1)	(5) AFT-TAX NET IN-FLOW (4)-(3)
1988	152470.	0.	152470.	0.	0.	0.	0.	-152470.	-152470.
1989	203175.	0.	203175.	0.	0.	0.	0.	-203175.	-203175.
1990	112875.	9105.	121980.	-11626.	27931.	16305.	0.	-105676.	-105676.
1991	0.	6849.	6849.	-21291.	47882.	26591.	0.	19742.	19742.
1992	0.	2726.	2726.	-13996.	47882.	33886.	0.	31160.	31160.
1993	0.	1093.	1093.	-11706.	47882.	36176.	0.	35083.	35083.
1994	0.	1051.	1051.	-9535.	47882.	38347.	0.	37295.	37295.
1995	0.	1115.	1115.	-7235.	47882.	40647.	0.	39533.	39533.
1996	0.	1181.	1181.	-4796.	47882.	43086.	0.	41905.	41905.
1997	0.	1252.	1252.	-2211.	47882.	45671.	0.	44419.	44419.
1998	0.	1327.	1327.	530.	47882.	48412.	0.	47084.	47084.
1999	0.	1407.	1407.	3434.	47882.	51316.	0.	49909.	49909.
2000	0.	179.	179.	33132.	19951.	53083.	0.	52904.	52904.
2001	0.	643.	643.	56721.	0.	56721.	0.	56078.	56078.
2002	0.	1676.	1676.	61118.	0.	61118.	0.	59443.	59443.
2003	0.	1776.	1776.	64785.	0.	64785.	1471.	63009.	61538.
2004	-17020.	-31382.	-48402.	68672.	0.	68672.	6004.	117075.	111070.
	451500.	-0.	451500.	205997.	478820.	684817.	7476.	233318.	225842.

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) 4.28 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) 4.19 PER CENT

* * * PETROCHEMICAL COMPLEX STUDY OF SOUTH TERENGGANU * * *

FINANCIAL RATE OF RETURN (IN CONSTANT PRICE)

CASE 1 (ECONOMIC) ***** KERTEH ***** (USD 1000)

YEAR	FIXED CAPITAL EXPEND.	CHANGE IN WORKING CAPITAL	(1) GROSS CAPITAL EXPENDTR	OPERATING PROFIT	DEPRECIATN	(2) GROSS CASH IN-FLOW	(3) INCOME TAX	(4) BFR-TAX NET IN-FLOW (2)-(1)	(5) AFT-TAX NET IN-FLOW (4)-(3)	DEFLATOR
1988	152470.	0.	152470.	0.	0.	0.	0.	-152470.	-152470.	1.000
1989	191675.	0.	191675.	0.	0.	0.	0.	-191675.	-191675.	1.060
1990	100458.	8104.	108562.	-10348.	24859.	14511.	0.	-94051.	-94051.	1.124
1991	0.	5292.	5292.	-17876.	40203.	22326.	0.	17034.	17034.	1.191
1992	0.	1401.	1401.	-11086.	37927.	26841.	0.	25440.	25440.	1.262
1993	0.	-21.	-21.	-8747.	35780.	27033.	0.	27054.	27054.	1.338
1994	0.	-95.	-95.	-6722.	33755.	27033.	0.	27128.	27128.	1.419
1995	0.	-90.	-90.	-4811.	31844.	27033.	0.	27123.	27123.	1.504
1996	0.	-85.	-85.	-3009.	30042.	27033.	0.	27118.	27118.	1.594
1997	0.	-80.	-80.	-1308.	28341.	27033.	0.	27113.	27113.	1.689
1998	0.	-75.	-75.	296.	26737.	27033.	0.	27108.	27108.	1.791
1999	0.	-71.	-71.	1809.	25224.	27033.	0.	27104.	27104.	1.898
2000	0.	-719.	-719.	16465.	9915.	26380.	0.	27100.	27100.	2.012
2001	0.	-466.	-466.	26593.	0.	26593.	0.	27059.	27059.	2.133
2002	0.	0.	0.	27033.	0.	27033.	0.	27033.	27033.	2.261
2003	0.	-0.	-0.	27033.	0.	27033.	614.	27033.	26419.	2.397
2004	-6700.	-13095.	-19795.	27033.	0.	27033.	2364.	46827.	44464.	2.540
	437903.	-0.	437903.	62354.	324627.	386980.	2978.	-50922.	-53900.	

INTERNAL RATE OF RETURN

ON (4) BFR-TAX NET IN-FLOW (2)-(1) -1.32 PER CENT

ON (5) AFT-TAX NET IN-FLOW (4)-(3) -1.41 PER CENT