8-4-2 Fuel Ethanol

(1) Market and Steps for Introduction

Market and steps for introduction will be discussed separately for penetration and ultimate stages.

1) Penetration Stage

For Jakarta and vicinity, anhydrous ethanol will be mixed in regular gasoline at the rate of 10%. The octane value improvement effect of anhydrous ethanol enables to substitute lead tetraethyl used heretofore which not only reduces the amount of gasoline consumption but expected to improve environmental effect.

Amount of ethanol consumption is estimated at 160 x 10^3 kl.

2) Ultimate Stage

For the entire Republic of Indonesia, anhydrous ethanol will be mixed in regular gasoline at the rate of 20%.

This not only enables reduction of gasoline consumption but is expected to improve the environment the same as that for penetration stage. Ethanol consumption is estimated at 950 x 10^3kl.

(2) Production Program

Production program fo fuel ethanol will be separately discussed for penetration and ultimate stages.

1) Penetration Stage

As stated earlier, required amount of fuel ethanol is about 160 x 10^3 kl/year in the penetration stage.

i) Raw materials

Main raw materials for producing about 160 x 10^3 kl/year of ethanol include cassava, sugar cane, molasses, sweet potato and sago palm.

o Cassava

BPPT is running a test plant of 8 kl/day capacity at Sulusuban, Sumatra Island, under grant aid from Japan and technical problems related to ethanol plant have been solved. However, for a commercial plant operation, farms growing cassava around ethanol production plant must be secured. Additionally, since it takes quite a while for the farmers to fully learn how to grow cassava, cassava should be considered as raw material for ultimate stage rather than for penetration stage.

o Sugar Cane

Sugar cane is generally used as raw material for sugar. In Brazil, sugar cane is used as the main raw material for fuel alcohol. In the Republic of Indonesia, as shown in Table 8-4-1, sugar is still imported. The Republic of Indonesia has a plan for increased sugar production to realize domestic supply of sugar in the future. Nevertheless, because comparatively fertile soil is required for sugar cane plantation and the Republic of Indonesia lacks in lands suitable for sugar cane, it is considered difficult to place sugar cane as raw material for fuel alcohol. In the Republic of Indonesia, as shown in Table 8-4-1, sugar is still imported The Republic of Indonesia have a plan for increased sugar production to realize domestic supply of sugar in the future. Nevertheless, because comparatively fertile soil is required for sugar cane plantation and the Republic of Indonesia lacks in lands suitable for sugar cane, it is considered difficult to place sugar cane as raw material for fuel ethanol production.

Table 8-4-1 Sugar in the Republic of Indonesia

(Unit: 1000)

Fiscal year	Production	Consumption	Import
1976.5 to 1977.4	1,148	1,460	298
1977.5 to 1978.4	1,201	1,616	440
1978.5 to 1979.4	1,224	1,700	470
1979.5 to 1980.4	1,385	1,850	526
1980.5 to 1981.4	1,313	1,870	550
1981.5 to 1982.4	1,354	1,895	780
1982.5 to 1983.4	1,770	1,900	675
1983.5 to 1984.4	1,790	2,037	190
1984.5 to 1985.4	1,855	2,001	6
1985.5 to 1986.4	1,874	2,084	6

[Source: F.O Light]

o Molasses

The Republic of Indonesia has constructed seven sugar plants in 1981 through 1982 for achieving domestic supply of sugar as shown in Table 8-4-2.

Table 8-4-2 Newly Constructed Sugar Plants

Plants	Sugar Cane Milling Capacity	Location
Sei Semayang II	4,000 T/Day	Sumatra
Subang	3,000 "	Jawa
Cinta Manis	4,000 "	Sumatra
Caming	3,000 "	Sulawesi
Takalar	3,000 "	Sulawesi
Ketapang	4,000 "	Sumatra
Cula Putih Mataram	10,000 "	Sumatra

[Source: Ministry of Agriculture]

With the increased number of sugar plants now in operation, the output of sugar manufacturing plants, molasses as by-product have also increased, reaching 500 x 10^3 t/year in 1985. Molasses used as raw material for industrial ethanol is 120 x 10^3 t/year and the remaining 380 x 10^3 t/year are exported.

Furthermore, the Republic of Indonesia has an expansion program for eleven additional sugar plants of 3 x 10^3 to 4 x 10^3 t/day capacity, and when they are completed, the output of by-product molasses will increase to about 230 x 10^3 t/year. Adding the same to the present exports results in a total of 610 x 10^3 t/year of molasses available as raw material for fuel ethanol production.

Since 1 kl of ethanol can be produced from about 3.5 t of molasses in typical case, about 170 x 10^3 kl/year of fuel ethanol can be produced from the 610 x 10^3 t/year of molasses.

Since required amount of fuel ethanol is about 160 x 10^3 kl/year in the penetration stage, raw material molasses produced in the Republic of Indonesia will be enough to meet the said requirement, if additional new sugar plants are constructed.

o Sweet Potato

Although it is confirmed that BPPT's affiliated farms in Sulusban have biannual crop of sweet potatoes, it is premature to say that a large scale plantation technology regarding sweet potatoes have been established in the Republic of Indonesia because of unsolved problem of damage from insects. Presently it is difficult to consider sweet potato as raw material for fuel ethanol.

o Sago Palm

In the Republic of Indonesia, natural sago palm in marshland is considered as raw material for ethanol but it requires more than ten years from planting through harvesting and since large scale cultivation technology as industrial raw material has not been established, sago palm is considered difficult to use as raw material for fuel ethanol.

From the above mentioned reasons, molasses is studied as a subject for raw material for fuel ethanol in the penetration stage.

ii) Production Capacity for each Ethanol Plant

When molasses, the by-product of sugar plant is used as raw material for fuel ethanol, it will be advantageous to select a plant location adjacent to sugar plant to reduce the raw material transportation cost.

Table 8-4-2 shows that newly constructed sugar plants in the Republic of Indonesia 1981 onward have more than 3×10^3 t/day of sugar cane processing capacity.

In the case of 3×10^3 t/day sugar cane processing capacity, molasses will be produced at the rate of 4% as by-product. Assuming that 150 is the number of working days per year (average number of sugar plant working days in the Republic of Indonesia), 18×10^3 t will be the annual molasses production.

Since 1 kl of ethanol will be produced from 3.5 t of molasses, one sugar plant is able to supply raw material for about 5×10^3 kl/year of ethanol plant.

With fuel ethanol production plant, in term of production cost it is more advantageous to have larger production capacity for each plant. However, based on the actual experience in Brazil and from the standpoint of raw material availability, this study has assumed 10 x 10^3 kl/year as plant capacity of each ethanol plant. In general, it is assumed that fuel ethanol plant will be constructed adjacent to newly built sugar plants and one half of raw material molasses will be supplied from the by-product molasses produced in the newly constructed sugar plants with the remaining one half shortage required to be collected from nearby sugar plants.

iii) Production Schedule

Required amount of fuel ethanol in the penetration stage is 160 x 10^3 kl/year. Production schedule for this will be as given below.

o First Step

Table 8-4-3 shows the status for existing ethanol plants in the Republic of Indonesia. All plants are producing industrial ethanol (94-95% purity) using molasses.

According to BPPT, major application of industrial ethanol is in the field of solvent. But, because industrial methanol, used as substitute for industrial ethanol, is recovered from textile and other industries at low cost, the ethanol market is taken over by methanol drastically lowering the rate of operation for the existing ethanol plant to as low as 50% average.

According to Table 8-4-3, the gross production capacity of existing industrial ethanol plants in the Repbulic of Indonesia is about 60 x 10^3 kl/year, thus increasing the production by about 30 x 10^3 kl/year can be easily achieved by improving the present operation rate of 50% to 100%.

Because the increased industrial ethanol production (94-95% purity) of 30 x 10^3 kl/year enables to produce fuel ethanol (99.3% purity min.) by additional investment for dehydraton facility, and it is clearly more economical than constructing new fuel ethanol plant, in the first step, production of industrial ethanol will be increased and fuel ethanol will be produced by dehydrating the increased industrial ethanol produced.

Table 8-4-3 Ethanol Production Plants

(unit: Kl/year)

NO.	COMPANY	LOCATION	PRODUCTION CAPACITY
1	Jatiroto I & II	Jawa Timur	7 500
2	PD. Aneka Kimia	Jawa Timur	18 000
3	PT. Madu Sari S.I.	Jawa Timur	5 250
4	PT. Malindo Raya	Jawa Timur	3 000
5	P.S.A. Comal	Jawa Tengah	5 700
6	PT. Padaharja	Jawa Barat	2 000
7	P.S.A.Madukismo	D.I. Yogyakarta	7 500
8	PT. Palimanan	Jawa Barat	3 000
9	PT. Nabiti Sarana	Jawa Barat	1 800
10	PT. Permata Sakti	Sumatera Utara	5 250
11	PT. Basis Indah	Sulawesi Selatan	3 600
12	P.S.A. Sari Kencana	Jawa Timur	-
13	P.S.A. Sari Murni	Sulawesi Selatan	-
		TOTAL	62 600

[Source : BPPT]

Dehydration facility required for fuel ethanol production can be installed at the industrial ethanol production plants shown in Table 8-4-3. However, since the majority of industrial ethanol production plants shown in Table 8-4-3 are of small scale, individual installation in the industrial methanol plants is not economical. When the distribution of fuel ethanol is considered, it is more economical to construct a dehydration facility of 30×10^3 kl/year capacity at the Cilacap Refinery or depot-site nearly Jakarta, which is a gasoline supply base for Jakarta and its surrounding area.

In other words, about one half of the plants shown in Table 8-4-3 (equivalent to 30×10^3 kl/year industrial ethanol production plant capacity) are to continue industrial ethanol production and industrial ethanol produced by the remaining one half of the plants (equivalent to 30×10^3 kl/year industrial ethanol production plant capacity) will be dehydrated by dehydration facility constructed at the Cilicap refinery site or depot-site nearby Jakarta to turn to fuel ethanol of 99.3% purity min. The fuel ethanol so produced then will be mixed at the rate of 10% in regular gasoline tanks within the Refinery or depot-site and distributed to Jakarta and adjacent areas.

Raw material molasses required for the fuel ethanol production in the first stage is about 110×10^3 t/year.

- Second Step

  In the second step which is the penetration stage, 13 hydrous fuel ethanol production plants of 10×10^3 kl/year capacity will be constructed adjacent to sugar plants as stated earlier.

  In this case, fuel anhydrous ethanol will be produced by dehydrating at some of large scale dehydration facilities, in the same manner.

  Raw material molasses required for fuel ethanol production in the second step is about 460×10^3 t/year.

2) Ultimate Stage

Fuel ethanol required for ultimate stage is about 950 x 10^3 kl/year.

i) Raw Material

Cassava will be the raw material for fuel ethanol in the ultimate stage. Background for selecting cassava as the most suitable material are given below.

o Molasses was considered as the raw material for penetration stage because of its estimated availability of 610 x 10^3 t/year in the Republic of Indonesia which represents about 170 x 10^3 kl/year of ethanol, and there will be a shortage.

o For ethanol production process using cassava as raw material, a plant of 8 kl/day is successfully in operation at Sulusuban, Sumatra Island, and technological know-how is obtaiend.

o In the Repubic of Indonesia, the basic national policy includes transmigration from Java Island to othe islands. Transmigrants can cultivate and sell it to ethanol plants in their neighborhood. That means development of cash earning source, which help smooth execution of transmigration policy. In addition, cassava does not require so much fertile soil for its cultiavtion, it is considered to provide enough crops in transmigration areas.

ii) Production Capacity per One Ethanol Plant

According to the FAO statistics, average crop of cassava per hectar(ha) in the Republic of Idonesia is about 9 tons/ha. When cassava is used as raw material, since 1 kl of ethanol is from about 6 tons of raw material, 1.5 kl of ethanol is produced per ha.

According to the Department of Transmigration of the Repbulic of Indonesia, transmigrants are given 2 ha. of land from the government, of which one ha. is already developed and the remaining 1 ha. is expected to be developed by transmigrants themselves.
Assuming cassava is planted in 1 ha. to be developed by transmigrants themselves, and also assuming that 10 x 10^3 kl/year is the production

capacity of one fuel ethanol plant, as in the case of penetration stage, required area will be about 6,700 ha. and raw material for fuel ethanol plants will be supplied by 6,700 transmigrant families planting cassava which covers the requirement.

iii) Production Schedule

Since fuel ethanol required in the ultimate stage is 950×10^3 kl/year, the following production schedule will be employed, coping with the transmigration policy.

- o Since 160×10^3 kl/year is already secured in the penetration stage, the same amount is assumed available for use in the ultimate stage.

- o For the shortage of 790×10^3 kl/year in the ultimate stage, 79 hydrous ethanol plants using cassava as raw material will be newly constructed.

- o Those sites of 79 hydrous ethanol plants will be nearby new transmigration area.
  However, concrete sites will be decided in accordance with the transmigration policy in the course.

(3) Distribution System and Relevant Facilities

1) Distribution System

i) Penetration Stage

Fuel ethanol required for the penetration stage is 160 x 10^3 kl/year. In the first step, the present industrial ethanol production will be increased, and by dehydrating the industrial ethanol so produced, anhydrous fuel ethanol of 30 x 10^3 kl/year will be produced. In the second step, 130 x 10^3 kl/year of anhydrous fuel ethanol will be produced. This study assumes the adoption of centralized dehydration system, which will be discussed in the distribution system.

- o Hydrous ethanol produced will be transported by barge or tank truck, for example, to the Cilacap refinery site or to one or two dehydration plants nearby Jakarta.

- o Collected hydrous ethanol (94-95% purity) will be dehydrated by dehydration plant and turned into anhydrous ethanol.
- o This anhydrous fuel ethanol will be mixed at the rate of 10% in regular gasoline tanks at the refinery or depot-site nearby Jakarta.

- o This gasohol with 10% anhydrous fuel ethanol mixed in regular gasoline will be transported to gasoline stands around Jakarta and will be sold to general consumers through the existing distribution system.

- o At gasoline stands, it will be necessary to install tanks, gauges and filling system to automobiles for Gasohol (10% anhydrous fuel ethanol mixed) in addition to the existing facilities for regular gasoline and premium gasoline.

- o To prevent the use of anhydrous fuel ethanol (99.3% purity min.) to be mixed in gasoline for drinking purposes, it will be necessary to denature it with small amount of methanol, etc.

ii) Ultimate Stage

In the ultimate stage, total fuel ethanol requirement will be 950 x 10^3 kl/year which will be covered by the 160 kl/year of fuel ethanol produced in the penetration stage plus the 790 x 10^3 kl/year of fuel ethanol to be produced using cassava as raw material in settlements outside Java Island.

As in the penetration stage, for anhydrous fuel ethanol production, producing hydrous ethanol at each ethanol production plant will be collected to some of dehydration plants to produce anhydrous fuel ethanol.

- o Hydrous ethanol produced will be transported by barge or tank truck to 3 to 4 dehydration facilities constructed in the Republic of Indonesia.

- o Collected hydrous ethanol (94 to 95% purity) will be dehydrated to anhydrous fuel ethanol at 3 to 4 dehydration facilities.

- o Anhydrous fuel ethanol produced will be transported to gasoline depot in the neighbourhood of dehydration facilities, and will be mixed in regular gasoline at the rate of 20%.

- o Gasoline will be transported by tank trucks from gasoline depot to gasoline stands through the existing gasoline distribution system, then will be sold to general consumers.

- o At gasoline stands, it will be necessary to install tanks, gauges and filling system for automobiles for gasohol (20% ethanol mixed) in addition to the existing facilities for regular gasoline and premium gasoline. In Jakarta and surrounding areas, facilities (10% ethanol mixed) set up in the penetration stage can be utilized as is.

- o To prevent the use of fuel ethanol of 99.3% purity min. to be mixed in gasoline for drinking purposes, it will be necessary to denature it with small amount of methanol, etc.

2) Distribution Facilities

As explained earlier, distribution systems for penetration stage and ultimate stage are similar, thus explanation common for both stages will be given later.

i) Distribution Facilities

- o Transportation from ethanol plant to receiving tank at dehydration plant

  Barges will be used for newly constructed ethanol plant outside Java Island, and tank trucks will be used for inland transportation within Java Island. For barges and tank trucks, the existing ones used in the Republic of Indonesia can be utilized.

- o Hydrous ethanol storage tank

  Storage tanks for hydrous ethanol transported by barges and tank trucks have to be newly constructed.

- o Dehydration plant

  New dehydration plants to produce anhydrous ethanol are required. Benzene or cyclohexane will be used as the dehydration agent. For this dehydration plant process flow, main equipment required and rough estimation of construction cost will be discussed later.

- o Gasohol storage tank

  Anhydrous ethanol produced at dehydration plant and regular gasoline will be mixed by line blender then stored in gasohol storage tank, and storage tank should be newly constructed.

- o Transportation facilities from gasohol tanks to gasoline stands

  Gasohol with anhydrous ethanol mixed at the rate of 10% in regular gasoline will be transported by tank trucks to gasoline stands. The existing tank trucks used for gasoline can be utilized.

Fig. 8-4-3 shows the flow of fuel ethanol in relation with the above related facilities.

ii) Dehydration plant

Dehydraton plant is to produce anhydrous ethanol using hydrous ethanol as its raw material with benzene or cyclohexane as the dehydration agent.

a) Process outline

Process outline using the most commonly used benzene as its dehydration agent is as follows:

- o Anhydration ethanol stored in tank will be sent to dehydration tower by pump.

- o The dehydration tower with reboiler using steam as its heat source will distill ethanol, benzene and water. Benzene and water will be distillated from the tower top and hydrous ethanol will be distillated to hydrous tank from the tower bottom via product cooler.

- o Benzene and water from the tower top will be distilled at benzene recovery column, where benzene and water will be separated, benzene from the top and water from the bottom.

- o Hydrous ethanol so produced and stored once will be mixed with regular gasoline by line blender and then will be stored in gasohol tank.

The above process outline is shown in Fig. 8-4-4, "Outline of Dehydration Plant".

b) Main equipment

Main equipment required for dehydration plant are shown in Table 8-4-4, "Main Equipment List".

Table 8-4-4 Main Equipment List of Dehydration Plant

No.	Equipment	Q'ty	Specification
1	Hydrous Ethanol Storage Tank	2	5000 m^3, Carbon Steel
2	Hydrous Ethanol Feed Pump	1	
3	Dehydration Column	1	Stainless Steel
4	Dehydration Column Reboiler	1	Shell / Tube Type
5	Dehydration Column Condenser	2	Shell / Tube Type
6	Benzene Recovery Column Condenser	1	Stainless Steel
7	Benzene Recovery Column Condenser	1	Shell / Tube Type
8	Dehydration Column Bottom Pump	1	
9	Product Cooler	1	Shell / Tube Type
10	Benzene Tank	1	Carbon Steel
11	Anhydrous Ethanol Storage Tank	2	5000 m^3, Carbon Steel
12	Line Blender	1	Static Mixer Type
13	Benzene Feed Pump	1	
14	Anhydrous Ethanol Tank Pump	1	
15	Regular Gasoline Feed Pump	1	

c) Rough estimate of construction cost

Since requirement of hydrous ethanol in penetration stage is 30×10^3 kl/year in the first step and 130×10^3 kl/year in the second step, dehydration plant of 160×10^3 kl/year production capacity have to be newly constructed.

Estimated construction cost is 2.9×10^6\$ for 30×10^3 kl/year and 8.1×10^6\$ for 130×10^6 kl/year.

Additionally, 5 to 6 dehydration plants of 160×10^3 kl/year production capacity are required for the ultimate stage.

Fig. 8-4-3 Flow of Fuel Ethanol

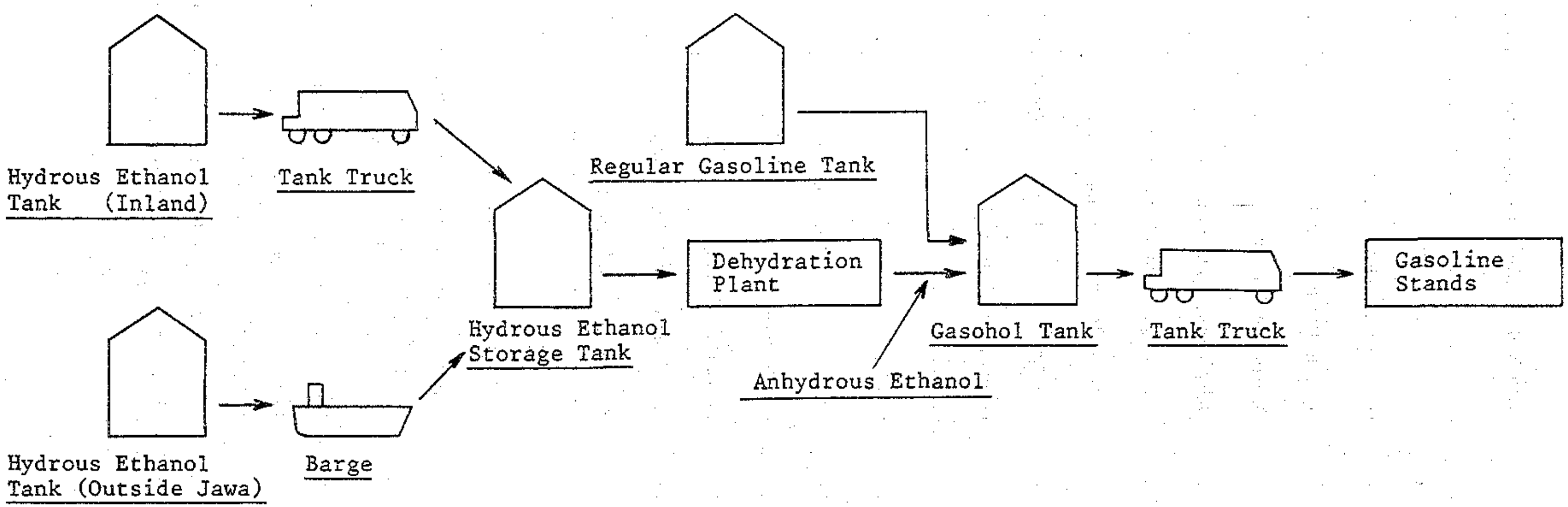
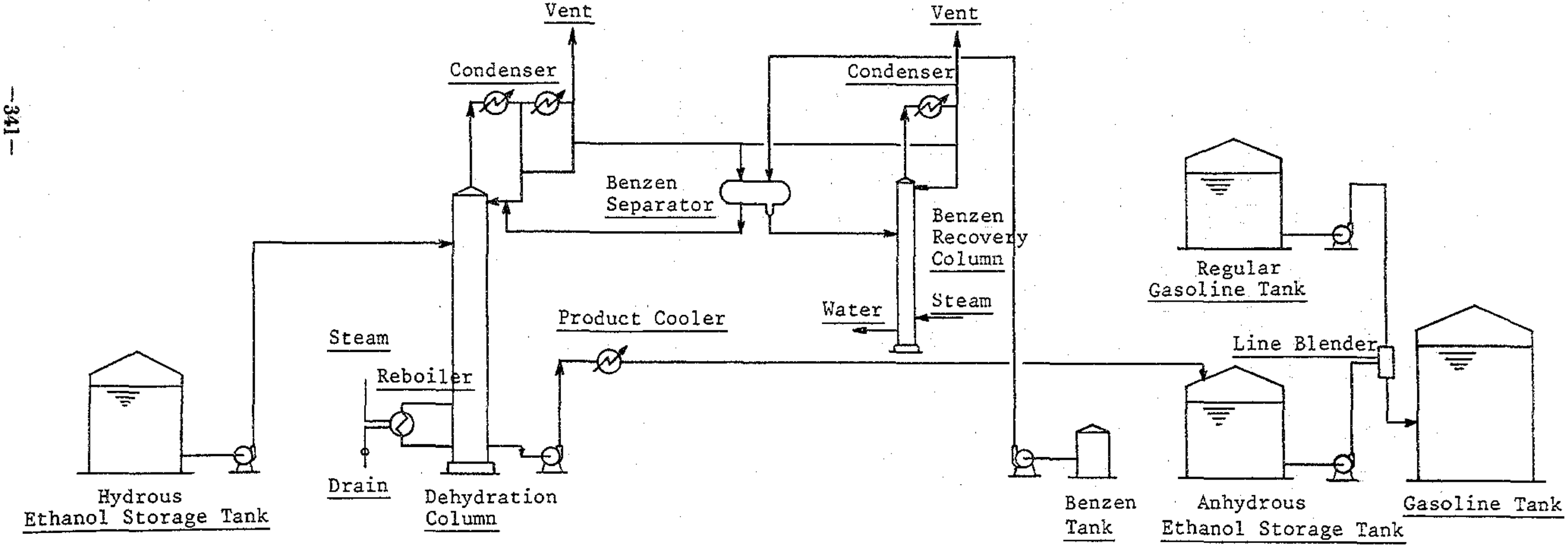


Fig. 8-4-4 Outline of Dehydration Plant



8-5 Issues and Measures for Introducing Fuel Alcohol

8-5-1 Fuel Methanol Production and Distribution Costs

(1) Fuel methanol production cost

The production cost of fuel methanol is detailed in the Interim Report II (1985), which is summarized b elow.

1) Preconditions of financial analysis

i) Methanol production: 1,600 x 10^3 t/y (project life: 30 years)

ii) Finance: Equity 25%
Debts 75% (interest rate 8%)

iii) Exchange rates: $1 = ¥200, Rp1 = ¥0.18

iv) Fixed-capital investment: 989,500 x 10^6 Rp (¥178,600 x 10^6)

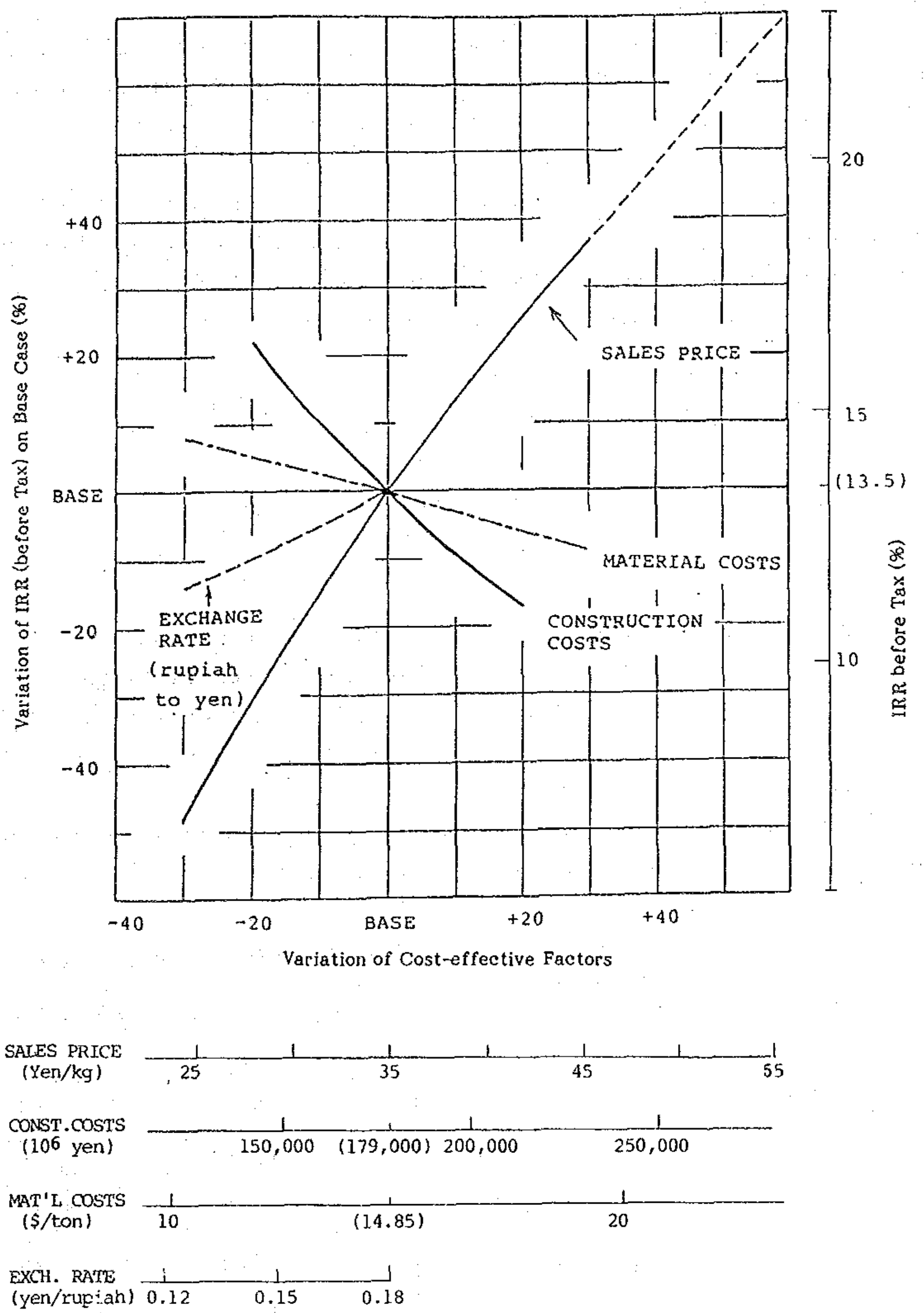
v) Raw material (coal): 16,454 Rp/t (14.85 $/t)

vi) Plant gate price of methanol (assumed): 194 Rp/kg (35 ¥/kg)

2) Financial analysis results

Based on these preconditions, IRR (Internal Rate of Return) become 13.5% and the minimum shipping price of fuel methanol (IRR 8% = interest rate) 143 Rp/kg (112 Rp/l). The relation between IRR and cost factors is shown in Fig. 8-5-1. It is noted that the factors having great influence on IRR are the plant gate price of me thanol and fixed capital investment.

Fig. 8-5-1 Sensitivity of Cost-effective Factors



(2) Fuel methanol distribution cost

In a project to produce fuel methanol from Banko coal, distribution is assumed as follows.

Fuel methanol is stored in Palembang, which serves as a terminal, from which it is forwarded to refineries or depots near individual consuming areas, where it is blended with gasoline and given other preparation treatments. Resultant products are supplied to fuel consumers directly or via service stations.

Based on local survey results, the marine transportation cost of fuel oil is assumed to average 6.95 $/kl in general in Indonesia. Also considering the domestic oil flow, marine transporation costs from the Plaju refinery to major consumig area were estimated, results of which are shown below.

Plaju - Demand Region	I (Medan)	15.40 $/kl
"	II (Palembang)	0
"	III (Jakarta)	7.70
"	IV (Semarang)	11.62
"	V (Surabaya)	15.40
"	VI (U. Pandang)	32.90

Because Palembang adjoins Plaju and because marine transportation of fuel methanol is thought to be identical to that of fuel oil, the figures shown in the preceding table can be identical to marine transportation costs of fuel methanol from Balikpapan. Also, local survey results suggest that the land transportation cost is an estimated 0.15 $/kl.km.

Based on these results, transportation costs of fuel methanol from Palembang to individual consuming areas located inland within 100km from the starting point were estimated, and are presented in Table 8-5-1.

Table 8-5-1 Transportation Costs from Palembang to Each Demand Region

From Palembang	Marine cost ①	Inland cost (100km) ②	Total ①+②
to Demand Region I	15.40	15.0	30.40
II	0	15.0	15.00
III	7.70	15.0	22.70
IV	11.62	15.0	26.62
V	15.40	15.0	30.40
VI	32.90	15.0	47.90

8-5-2 Production and Distribution Cost of Fuel Ethanol

8-5-2 Production and Distribution Cost of Fuel Ethanol

(1) Production Cost of Fuel Ethanol

1) Penetration Stage

In the penetration stage, molasses is used as the raw material, and ethanol production plant production capacity is assumed to be 100 x 10^3 Kl/year. Production cost is computed on the following assumption.

i) Raw Material Cost

According to the study report on the effective use of sugar by-products in the Republic of Indonesia in 1983, the price of molasses in the Republic of Indonesia for 1977 to 1982 is as given in Table 8-5-2.

Table 8-5-2

(unit: Rp/T)

F.Y.	1977	1978	1979	1980	1981	1982
Price	15,200	20,600	33,500	65,000	55,000	20,000

It is evaluated that the unusual price up of molasses in 1980 and 1981 depends on the effect of 2nd oil crisis and, on the other hand, the decrease of the price in 1982 depends on the oversupply of molasses because of additional constructions of sugar plants in 1981 and 1982 as well as the trend of the price down of oil price in 1982.

Because the constructions of several sugar plants is planned at present time to keep self-balance in Indonesia, the supply of molasses, as by-product of sugar, is estimated to be oversupply and the price is even or may be dropped in short and long terms.

Taking into consideration above market and price situation, the price of molasses will be assumed to be 20,000 Rp/Kl in short and long terms.

If one applies the ratio of 1110 Rp/$, as exchange rate, the price of molasses as feedstock of fuel ethanol is equivalent to 18 $/kl. The unit consumption of molasses per unit fuel ethanol is about 3.5 therefore the feedstock cost of fuel ethanol from molasses is estimated to be 63 $/Kl ethanol.

ii) Utility Cost

With consideration for fuel, water, power and chemicals, and based on the report obtained from Aneka-Kimia plant in the Republic of Indonesia, utility cost of 33.20 $/Kl is applied.

iii) Labor Cost

For unit labor cost, 1,000 $/Y as reported by PD Aneka-Kimia is applied, requiring 120 workers.

iv) Plant Construction Cost

Construction cost in 1985 assumed as 8.6 x $10^6$$.

v) Interest

Assumed construction cost x 10%.

vi) Maintenance Cost

Assumed construction cost x 3%.

vii) Taxes and Insurances

Assumed construction cost x 0.5%.

viii) Depreciation

Salvage value after full depreciation is assumed 10% to be depreciated over 10 years period. Therefore, annual depreciation cost will be, Construction cost x 0.9 x 1/10.

ix) Profit

Assumed 10% of construction cost.

x) Administration Cost

Assumed labor cost x 80%.

Table 8-5-3 gives the cost of fuel ethanol in penetration stage as computed from the foregoing.

Table 8-5-3 Cost of Fuel Ethanol from Molasses (Penetration Stage)

Item	Costs	$/Kl
Raw Material	18 $/T x 3.5 T/Kl	63
Utility & Chemicals	33.20 $/Kl	33
Labor	1000 $/man x 120 man x 1/10,000 Kl	12
Interest	8.6×10^6 $ x 0.10 x 1/10,000 Kl	86
Maintenance	8.6×10^6 $ x 0.03 x 1/10,000 Kl	26
Taxes & Insurances	8.6×10^6 $ x 0.005 x 1/10,000 Kl	4
Depreciation	8.6×10^6 $ x 0.9 x 1/10 x 1/10,000 Kl	77
Profit	8.6×10^6 $ x 0.1 x 1/10,000 Kl	86
Administration	1000 $/man x 120 man x 1/10,000 Kl x 0.8	10
	Total	397

The financial analysis results shown on Table 8-5-3 could be ealuated in view of economic evaluation as 134 $/Kl as economic evaluation cost, because labour cost, tax, deprication and profit could be considered to be benefit for Indonesia.

If one assumes that the preferable impacts on environmental modification by decrease of leaded gasoline and the save of domestic oil consumption, 134 $/Kl could be evaluated in lower evaluation cost.

2) Ultimate Stage

As stated earlier, in the ultimate stage, further 890 x 10^3Kl/year ethanol is required in addition to the 160 x 10^3 Kl/year in the penetration stage, making 950 x 10^3 Kl/year as the total requrement. For this additional 890 x 10^3 Kl/year, cassava will be used as raw material and the ethanol plant production capacity will be 10 x 10^3 Kl/year/plant. Production cost is calculated based on the following.

i) Raw Material Cost

According to the Bureau of Statistics of the Republic of Indonesia, the price of cassava used as raw material in the ultimate stage in 1979 to 1984 will be as follows:

Table 8-5-4 Price of Cassava

(unit: Rp/T)

F.Y.	1979	1980	1981	1982	1983	1984
Price	54,000	75,000	88,000	13,000	134,000	124,000

The Rp currency of the Republic of Indonesia is converted to \$ based on the International Financial Statistics and further adjusted to \$ on 1985 base using the deflator and given in Table 8-5-5.

Table 8-5-5 Price of Cassava

(unit: \$/T)

F.Y.	1979	1980	1981	1982	1983	1984
Price	145.92	155.55	165.37	173.71	158.50	115.40

As shown in Table 8-5-5, although the price of cassava varies greatly, this report employs 152.40 \$/T, average price for 1979 to 1984. Therefore, raw material cost is obtained by multiplying 152.40 \$/T with 6 T/Kl required to produce 1 Kl of ethanol.

ii) Utility Cost

With consideration for fuel, power and chemicals, 61.59 \$/Kl is assumed.

iii) Labor Cost

As in the penetration stage, 1,000 \$/man is assumed using 120 men.

iv) Plant Construction Cost

Assumed construction cost as 10.12×10^6 for 1985.

v) Interest

Assumed construction cost x 10%.

vi) Maintenance

Assumed construction cost x 3%.

vii) Taxes and Insurances

Assumed construction cost x 0.5%.

viii) Depreciation

Salvage value after full depreciation is assumed as 10% to be depreciated over the 10 year period. Therefore, annual depreciation cost will be construction cost x 0.9 x 1/10.

ix) Profit

Assumed 10% of construction cost.

x) Administration cost

Assumed labor cost x 80%.

Table 8-5-6 Cost of Fuel Ethanol from Cassava (Ultimate Stage)

Item	Costs	\$/Kl
Material	152.40 \$/T x 6 T/Kl	914
Utility & Chemicals	61.59 \$/Kl	62
Labor	1,000 \$/man x 120 man x 1/10,000 Kl	12
Interest	10.12×10^6 \$ x 0.10 x 1/10,000 Kl	101
Maintenance	10.12×10^6 \$ x 0.03 x 1/10,000 Kl	30
Taxes & Insurances	10.12×10^6 \$ x 0.005 x 1/10,000 Kl	5
Depreciation	10.12×10^6 \$ x 0.9 x 1/10 x 1/10,000 Kl	91
Profit	10.12×10^6 \$ x 0.1 x 1/10,000 Kl	101
Administration	1,000 \$/man x 120 man x 1/10,000 Kl x 0.8	10
	Total	1,326

The financial analysis results shown on Table 8-5-6 could be evaluated in view of ecnomic evaluation as 220 \$/Kl as economic evaluation cost, because labor cost, tax, depreciation and profit could be considered to be of benefit to Indonesia.

Economic evaluation cost may be more lower if one considers the preferable impacts on environmental modifications and transmission policy of Indonesia as well as the decrease of domestic oil consumption.

(2) Distribution Cost of Fuel Ethanol

1) Penetration Stage

As stated earlier, in the penetration stage, hydrous ethanol produced from molasses as raw material at the existing industrial ethanol plants and newly constructed hydrous ethanol plants will be collected at the 1 or 2 dehydration facilities, dehydrated into anhydrous fuel ethanol and mixed with regular gasoline at refining depot.

Existing industrial ethanol plants ─┐
　　　　　　　　　　　　　　　　　├→ Dehydration facilities → Refinery(Depot)
Newly constructed hydrous ethanol plants ─┘

Existing industrial ethanol plants are, as shown in Table 8-4-3, mostly located in Java Island, and newly constructed hydrous ethanol plants are most likely to be located in Kalimantan area, Sumatra Island as shown in Tabl 8-4-2, because they will be in the site affiliated to newly constructed sugar plants.

Hydrous ethanol will be transported from these areas to the dehydration facilities located in Java Island, thus exact calculation will be difficult, so the preset study is estimated based on the following.

i) Prerequisites

- o In the penetration stage, hydrous ethanol is assumed to be transported for an average of 300 Km offshore and 200 Km inland.
- o Marine Distribution Unit Cost
  Hydrous ethanol will be assumably transported by barges of 500 to 1000 Kl and unit cost is estimated to be 0.02 \$/Kl·Km based on the same in Japan in 1985.
- o Inland Distribution Unit Cost
  Hydrous ethanol will be assumably transported by tank trucks of 6 to 10 Kl and unit cost is estimted at 0.15 \$/Kl·Km as reorted by Aneka-Kimia, the largest ethanol plant in the Republic of Indonesia as of 1985.

ii) Result of Computation

$0.02 \times 300 + 0.15 \times 200 = 36$ \$/Kl

2) Ultimate Stage

In this stage, 790×10^3 Kl/Y of fuel ethanol newly produced in the settlements using cassava as raw material will be used in addition to the 160×10^3 Kl/Y of fuel ethanol produced in the penetration stage.

This fuel ethanol will be first produced as hydrous ethanol, transported to the 4 to 5 dehydration plants located in Java Island, then dehydrated there and mixed at the rate of 20% in regular gasoline at refinery depot near the dehydration plants.

In this stage, exact calculation of distribution cost is difficult but since most of the hydrous ethanol will be produced outside Java Island and then transported to Java Island, roughly the same as in the case of penetration stage, the present study assumes 36 \$/Kl, same distribution cost as in the penetration stage applies.

8-5-3 Safety

(1) General Properties of Alcohols

Table 8-5-7 shows the properties of methanol and ethanol. Both methanol and ethanol are saturated monohydric alcohol with hydroxyl groups, and easily blended into water, alcohols, ether, and other organic solvents. Methanol have a lower calorific value than does gasoline, and are inflammable at ambient temperature. In combustion, they have air fuel ratio rich in fuel, and the flame is invisible.

Methanol is toxic, although the degree is lower than oil. The drinking of 30 - 100 ml of methanol may cause death, and 7 - 8 ml blindness. Therefore, it must be handled with great care. It smells similarly to ethanol. Do not drink it by mistake.

(2) Dangerousness of Explosion

Methanol is liquid inflammable at 11°C. Its vapor forms explosive mixed gas in the range from 6.72 to 36.5%, when it is mixed with air.

Ethanol is liquid inflammable at 12.8°C. Its vapor forms explosive mixed gas in the range from 3.3 to 19%, when it is mixed with air.

When stored in a closed container such as a tank, can and bottle, both methanol and ethanol produce explosive mixed gas in the container in the temperature range from about 11 to 42°C. (See Fig. 8-5-2)

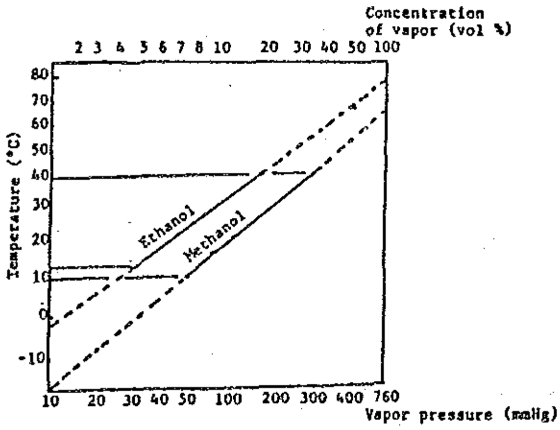


Fig. 8-5-2 Vapor Pressure and Explosion Limit of Methanol and Ethanol (Source: The Chemical Society of Japan: Guidance for Chemical Accident Prevention)

Table 8-5-7 Physical Properties of Alcohols

	Methanol	Ethanol	Gasoline
Appearance	Colorless, transparent liquid	Colorless, transparent liquid	Colored to orange
Odor	Characteristic aroma	Characteristic aroma	Characteristic odor
Taste	(Toxic)	Burning taste	
Boiling point 760mmHg	64.65°C	78.325°C	30~200°C
Melting point	-96°C	-114.5°C	
Density of steam (air = 1)	1.11	1.58	3~4
Flash point	11°C	12.8°C	-40°C
Ignition point	470°C	392°c	
Explosion limit (in the air)	6.72~36.5vol%	3.3~19vol%	1.4~7.6vol%
Vapor pressure	60mmHg (12.1°C)	40mmHg (19°C)	
Heat of combustion	(HV) 173.6 Kcal/mol	(HV) 326.6 Kcal/mol	
	(LV) 153.6 Kcal/mol	(LV) 288.0 Kcal/mol	About 11,000Kcal/kg

[Source: The Chemical Society of Japan : Guidance for Chemical Accident Prevention]

Gasoline exceeds upper explosion limit in a closed container, since it is mixed liquid with different boiling points, and usually contains a low boiling point fraction (pentane).
Therefore, it is important to premix methanol and ethanol with the low boiling point fraction such as gasoline that contains 3-25% butane or to install a flame arrester to the opening before using methanol and ethanol to prevent inflammation.
Methanol and ethanol is similar to oils in general inflammability. They are characterized by flame during combustion that is hard to distinguish. For this, favorable results have been obtained by mixing 15% of gasoline that contains 40% aromatic into methanol, gasoline that contains 85% or more of methanol ignites when it is dropped onto a high temperature manifold of a car. Gasoline or gasoline containing methanol at a low level does not seem to ignite, when it is dropped onto the manifold, because it rolls down with keeping it dry (R. Piquette and others: 7th International Symposium on Alcohol Fuels. Paris Oct/20 - 23, 1986)

(3) Toxicity

Table 8-5-8 shows the toxicity of alcohols. As clear from the Table, methanol is toxic. Ethanol usually acts as a sedative without toxicity. This section deals with methanol that is toxic.

An oral dose of 8 - 20g of methanol may cause blindness and 30 - 50g death. The LD_{50} to methanol in rats is 12-14 mg/kg. The figure for both methanol-gasoline mixture and gasoline is 10mg/kg in this species. The LD_{50} is comparable among the three.

Transcutaneous exposure to 200 ppm or more of methanol may produce chronic poisoning such as optic nerve disorders and multiple neuritis.

The toxic inhalation dose of methanol irritates the eyes, nose, and pharyngeal and laryngeal mucosa, which may cause poisoning symptoms. The allowable concentration is 250 ppm for exposure within 15 minutes and 200ppm or less for exposure for 8 hours a day.*
*ACGIH (American Conference of Governmental Industrial Hygienists)
Methanol toxicity may give rise to acidemia, and severe toxicity may cause ranal and liver disorders. The allowable concentration of gasoline is 500 ppm.

A comparative acute toxicity test in rats shows no marked difference in oral, transcutaneous, or inhalation toxicity between 15% methanol-gasoline mixture and gasoline.

As for action on the central nervous system, methanol-gasoline mixture has a stronger sedative action.
A subacute toxicity test shows that methanol-gasoline mixture affects the respiratory system more strongly. This returns to normal after stopping exposure.

A mutagenicity test using Salmonella Lignieres and Ames method shows no differences between methanol-gasoline mixture and gasoline; neither compound is mutagenic. The chronic toxicity, including carcinogenicity, of a low level of methanol vapor should be tested through out the life of laboratory animals as done with agricultural chemicals. For this reason, laboratory animals with a short life expectancy such as rats and mice are generally used for this test. On the other hand, monkeys, which is a primate, is suited to evaluate the effects of ethanol on human, since the toxicity of ethanol in primates is clearly different from that in other species.
In view of these, mokeys and rats and mice were selected as laboratory animals to start about 3-yearchronic toxicity test in monkeys. In addition, a lifetime toxicity test, including carcinogenicity test was done in rats and mice of a number that is required for statistical analysis.

Four levels of spray methanol, 0 (control), 10, 100 and 1000 ppm, were selected for these tests based on the results of a test of a high level of methanol that was done to determine in a short period which part of the monkey's body is affected by methanol and the industrial hygiene standard (260 ppm).
The chronic toxicity test has been done for more than one year as of the end of March, 1984. Monkeys and mice remain unchanged with 100 ppm of methanol or less.
Only monkeys have symptoms suggesting arrhythmia and irregular menstruation with 1000 ppm.
A test of a high level of methanol, which was done to understand symptoms that appeared in monkeys as described above, was done at levels of 3,000, 5,000, 7000 and 10,000 ppm for two weeks.

(Source: Nomura Research Institute: Feasibility Study on the Use of Alcohol-Gasoline Mixture in Fiscal 1980 and 1981)

Table 8-5-8 Harmfulness of Alcohols

Items	Ethanol	Methanol
(1) General properties	Sedative The drinking of an appropriate amount of ethanol improves appetite, and stimulates the secretion of gastric juice, which helps the absorption of food. The repeat drinking of large amount irritates the gastric mucosa. Excessive drinking is harmful to the nervous system.	Poison Not drinkable. Usually, 8～20g causes blindness 30～50g causes death.
Blood level	Toxic symptoms	
0.05 %	Inhibitory nerve paralyzed and judgement lost	
0.1 %	Motor and sensory nerves paralyzed	
0.2 %	All motor nerves disturbed	
0.37 %	The center of the brain paralyzed and sensory paralysis	
0.4～0.5 %	The entire sensory region of the brain affected; coma	
0.6～0.7 %	The respiration center and cardiac center paralyzed; death	
(2) At handling	Relatively harmless Alcohol vapor acts as an anesthetic. The repeated exposure of ethanol irritates the eyes and bronchus, and causes headache, shivering, sleepiness, vomitting, and anorexia.	Harmful Methanol irritates the eyes and nose and pharyngolaryngeal mucosa Repeated contact with methanol causes dry, squamous, and crack dermatitis.
Allowable level (ACGIH)	15 minutes or less 1000 ppm 8 hrs/day 1000 ppm	250 ppm 250 ppm

Level	Effects	Effects
1000 ppm	————	Acute toxicity: Drunkenness, pain, headache, and dim sight
1380 ppm	28 min:No effects 38 min:Headache 39 min:Slight numbness	
2300 ppm	Feels hot in the head, drunk, and cold in the arms and legs. 50 min:Sleepiness	
5000 ppm	20 ppm:Increased headache	Acute toxicity: Coma to death
6000 ppm	Discomfort and slight sleepiness	
7000 ppm	Discomfort, 30 min:Feels hot 90 min:Fatigue	
8000 ppm	Odor, burning sensation in the eyes 30 min:Fatigue and sleepiness	
(3) Acute toxicity	————	LD_{50}(rats) 12～14 mg/kg
(4) Cutaneous absorption	Absorbed cutaneously, which may cause poisoning.	200 ppm or more causes subacute and chronic poisoning, optic nerve disorders, and multiple neuritis.

〔Source: The Chemical Society of Japan :
Guidance for Chemical Accident Prevention 〕

8-5-4 Environment

(1) Effects of Production Processes on Environment

The methanol manufacturing plant does not have the leakage of a high level of methanol, causing no problems of environmental contamination in the surrounding area, as long as it satisfies standards for facilities for manufacturing dangerous articles.

Generally, care must be taken not to drain a high level of methanol such as fluid at the bottom of the rectifier into the general water system.

In the aspect of working atmosphere, when the manhole, which is on the facility for storing methanol, is opened, methanol vapor is present near the manhole. The worker should stand to the windward or go away from the manhole. This decreases the level of alcohol rapidly, and there is no problem.

Ethanol causes no problems, since it has no toxicity, which is found in methabnol.

However, ethanol is manufactured by biomass. Waste fluid is produced in the manufacturing process. It requires to process when it is returned to the nature. It can be processed by the methane fermentation, activated mud, the cultivation of yeast, and concentration. Residue after processing is used as a fertilizer or feed. (See Figs. 8-5-3 - 8-5-4).

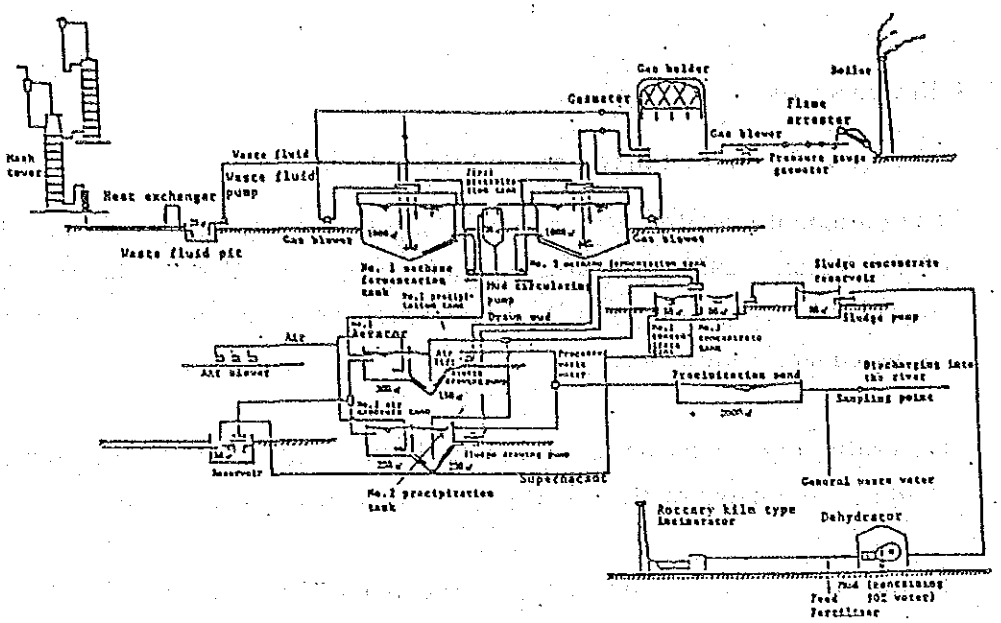


Fig. 8-5-3 Flow Chart of the Process of Waste Fluid by a Combination of the Fermentation of Methane and Activated Mud

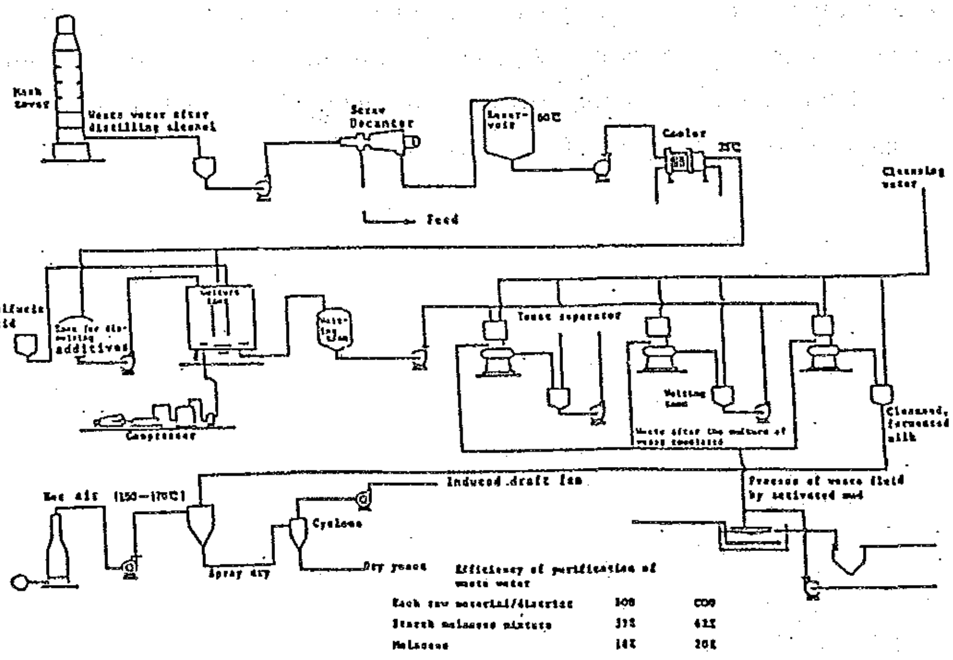


Fig. 8-5-4 Process of Waste by the Cultivation of Yeast

(2) Effect of Distribution Processes on Environment

1) Effects on an Ecosystem

A blend of gasoline and methanol or ethanol is usually made by refineries. It is distributed as a alcohol-gasoline mixture. The effects of the alcohol-gasoline mixture on the natural ecosystem during its release to the water system and the effects of methanol on aquatic life are presented here.

i) Biodegradation

The measurement of biochemical oxygen demand in the closed system that contains standard activated mud and the direct analysis of dissolved substances in the water show no differences in decomposability between 15% methanol-gasoline mixture and gasoline. The low-boiling point fraction gasoline has higher decomposability than the high-boiling point one. Methanol-gasoline mixture starts to be broken down more early.

ii) Accumulation of a Aocohols in Fish

The ratio of the amount of the representative components, which are contained in 15% methanol-gasoline mixture and gasoline, dissolved in the water and their amount accumulated in carp is some ten to some hundred times; there were no significant differences between the two.

iii) Effects of Methanol on the Life of Water

There are no knowledge available on the chronic efects of relatively long-term exposure to methanol on aquatic life, its evasion from methanol, or the effects of methanol on micro-organisms in the water. Fatal level test in Himedaka (a kind of killfish), evasion test in ear shells etc. chronic effect test in Himedaka, and growth test in plankton have been done to make an overall evaluation of these effects, particularly taking the effects of methanol on culture fishery into account etc. Red sea breams, prawns, ear shells, seaweed etc. have been selected for these tests. At present, these tests are well under way without any problems. The following tests also have been done:

a) Fertility and teratogenicity test

b) Mutagenicity test

c) Metabolism test

d) Test of diffusion in the water
(Source: Shizuo Takatori: Electricity and Gas 1984 Vol. 34, No.7)

2) Level of Alcohol Concentration in the Working Atmosphere

The assay of the levl of vent gas from the vent tube at the unloading of fuel in the underground tank, which is a oil supply facility, satisfies the regulation imposed by local self-governing bodies, including Tokyo. In Japan, we are obliged to return the vapor of this vent gas that generates during unloading to the oil supply facility to a tank lorry from the standpoint of prevention of air pollution caused by the vaporization of hydrocarbons.

The maximum level of ethanol has been measured near the nose of the operator as 5.6 vol ppm, when cars are filled up with 10% ethanol-gasoline mixture. The maximum level of methanol has been measured in the same place as 48 vol ppm, when cars are filled up with 10% methanol-gasoline mixture. There results suggest no problem of working atmosphere, because these values are much lower than the allowable level, and time of exposure to these alcohol is short.

Table 8-5-9 shows the levels of alcohol-gasoline mixtures in the air assayed near the facilities and equipment of the small-sized distribution system.

Table 8-5-9 Work in the Process of Storage and Distribution of Alcohols and the Maximum Levels of Alcohols

Name of work	Gasoline used	Maximum level
(1) Filling up using a gasoline meter	Summer: 15% methanol-gasoline mixture	Methanol 154 ppm
(2) Drain from the joint after loading a tank lorry	Winter: 15% methanol-gasoline mixture	Methanol 137 ppm
(3) Drain from a tank lorry joint after pouring	Summer: 15% methanol-gasoline mixture	Methanol 112 ppm
into the under-ground tank from a tank lorry	Summer: 10% ethanol-gasoline mixture	Ethanol 415 ppm
(4) Opening the tank manhole	Summer: 10% ethanol-gasoline mixture	Ethanol 415 ppm

(Source: Nomura Research Institute: Feasibility Study on the Use of Alcohol and Oil Products Mixture in 1984)

(3) Effect of Exhaust from Cars

1) Present Status of Regulations

The volume of passenger traffic and carloadings increased by leaps and bounds with marked pouplarity of cars. At the same time, cityward drifting of population and extended urban districts caused a problem of traffic pollution in urban areas in many countries.

Traffic pollution is classified into two major types: air pollution and noise pollution. Air pollution includes nitrogen dioxide, nitrogen monoxide, hydrocarbon, smoke, and lead. The present status of regulations on exhaust from cars in various countries is described below.

Japan: Regulations became effective in 1973, and were intensified every year. (See Figs. 8-5-5 and 6.) (See Table 8-5-10.)

USA: Regulations became effective in 1970. They remain in force in California, where severer regulations are applied, and other states, seprately.

Germany:Regulations were enforced by the exhaut control in 1968.
Decreases in lead in gasoline was legislated in 1971.

France: The government ordinance 1974 regulates exhaut from cars.

England: Exhaust from cars was specified in the Road Traffic Art 1972, and became effective in 1973.
Regulations that was adopted by the United Nations European Economy Committee (ECE) in 1972 were introduced.

Indonesia:Basic provisions were enacted to control living environment in 1982.
Tables 8-5-11 - 12 show the current criteria in Indonesia.

Fig. 8-5-5 Regulated Limit of NOx Exhaust from Cars and Environmental NOx Concentration v.s. the Number of Cars in Japan

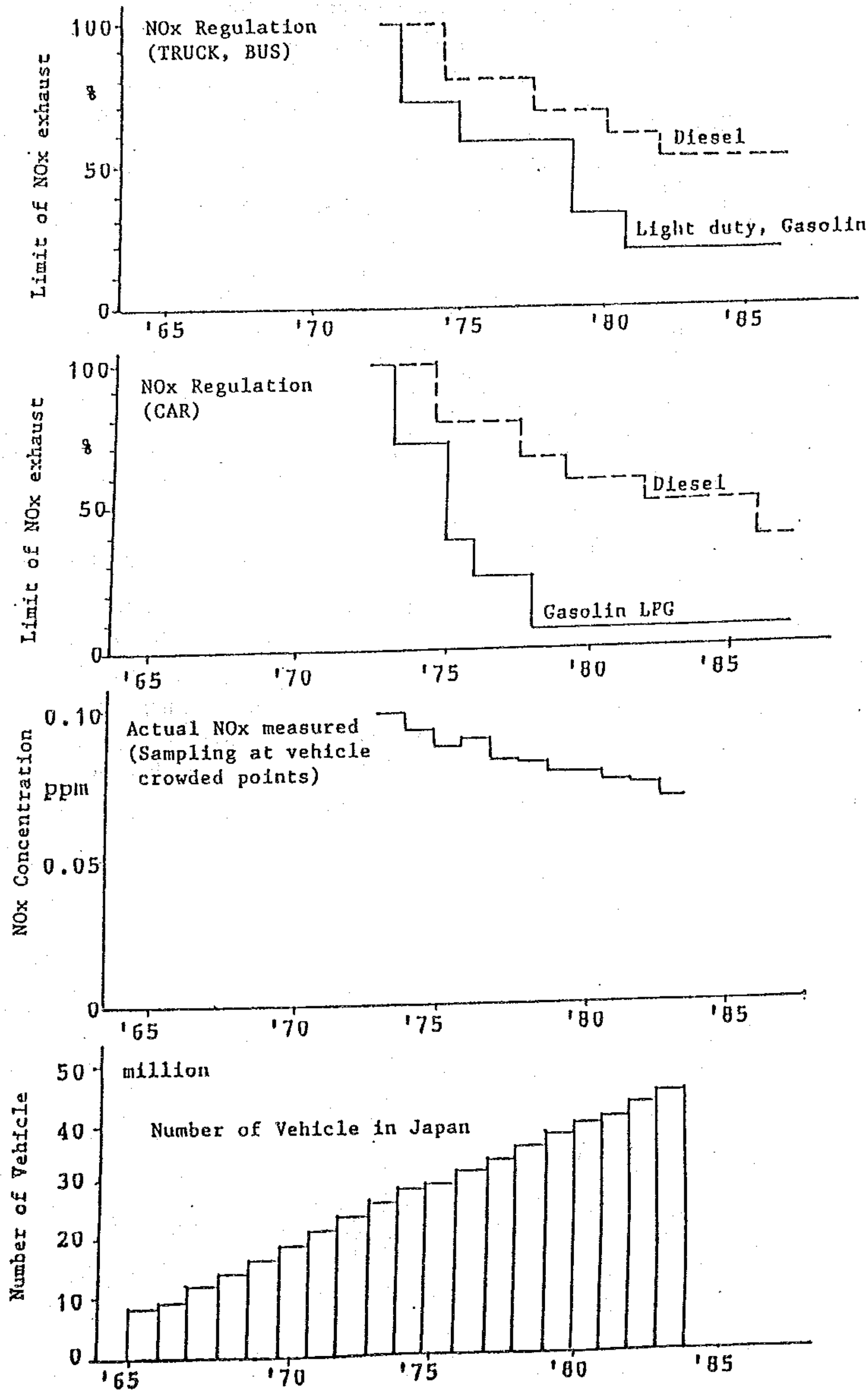


Fig. 8-5-6 Comparison of Regulations of Major Countries
(Regulated Limit of Exhaust from Cars)

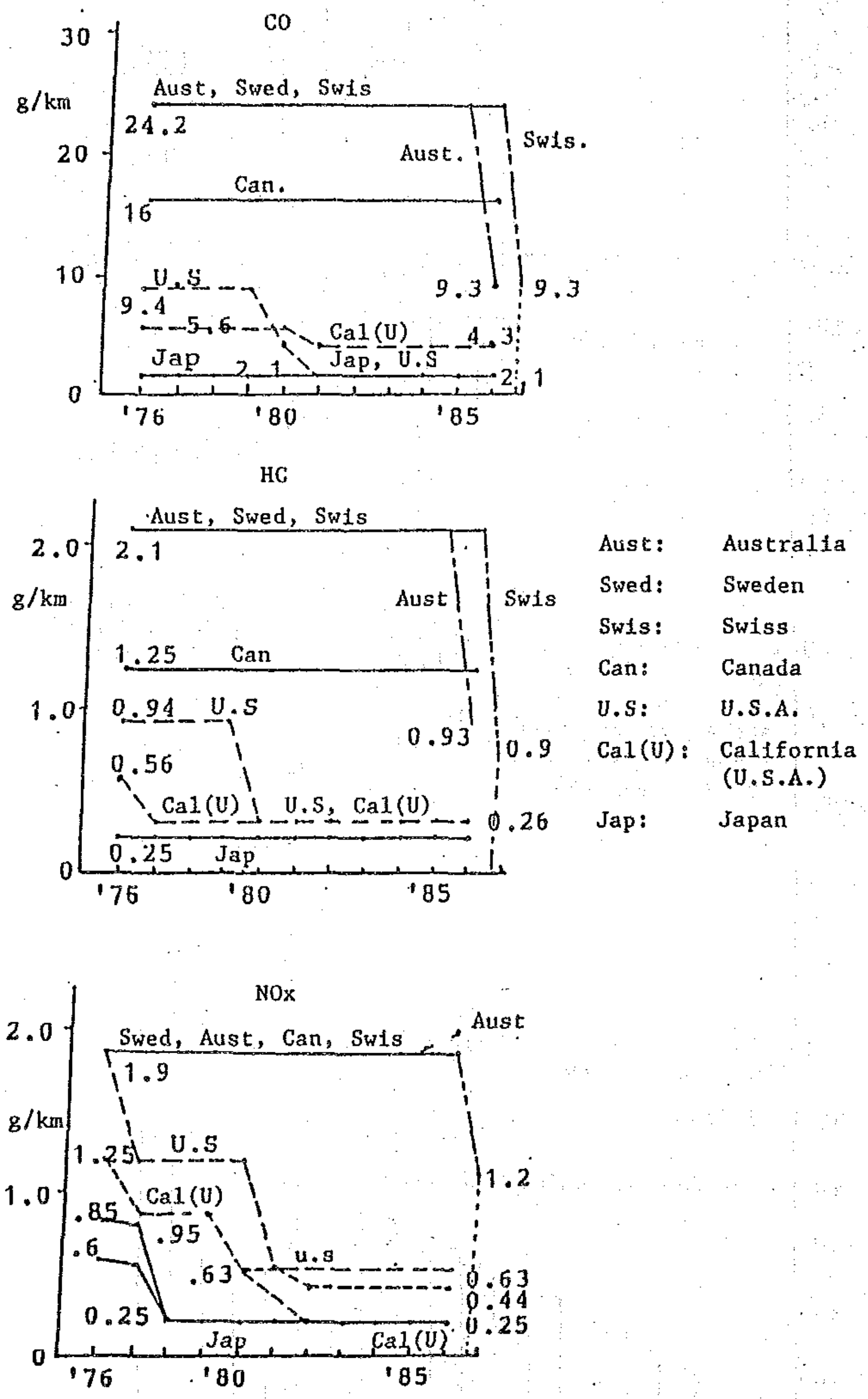


Table 8-5-10 History of Regulations on Cars, Including Those on NOx, in Japan

YEAR	ITEM	REMARKS
1973	Regulations 1973 were enforced. (Regulations on CO were intensified, and regulations on HC and NOx became effective.)	
1974	Regulations 1974 were enforced. (Regulations on CO, HC, and NOx from diesels became effective.)	
1975	Measuress to reduce a total number of cars in the three major cities were promoted (MITI). Regulations 1975 were enforced. (Regulations on CO, HC, and NOx were intensified.)	Lead-free regular gasoline was put into practice.
1976	Regulations 1976 were enforced. (Regulations on NOx were intensified.)	
1977	Regulations 1977 were enforced. (Regulations on NOx from diesels and other cars were intensified.)	
1978	Regulations 1978 were enforced. (Regulations on NOx were intensified.)	
1979	January Regulations 1979 were enforced. (Regulations on noise and NOx from gasoline cars were intensified.) April Regulations 1979 were enforced. (Regulations on noise and NOx from diesels were intensified.)	

1981	Regulations 1981 were enforced. (Regulations on NOx from light duty gasoline cars were intensified.) Regulations 1981 were enforced. (Regulations on NOx from intermediate duty gasoline cars were intensified.)	
1982	Regulations 1982 were enforced. (Regulations on NOx from trucks, heavy duty gasoline cars, and indirect injection diesels were intensified.) Regulations 1982 were enforced. (Regulations on NOx from indirect injection diesel trucks and buses were intensified.)	
1983	Regulations 1983 were enforced. (Regulations on NOx from direct injection diesels were intensified.)	

〔Source : Environment Agency : Environmental white paper '85〕

Table 8-5-11 Criteria for Air Environment in Indonesia

	ITEMS	REGULATED LIMIT
1	SO_2	0.10 ppm (260 mg/m³)
2	CO	20.00 ppm (2260 mg/m³)
3	NOx	0.05 ppm (92.5 mg/m³)
4	O_3	0.10 ppm (200 mg/m³)
5	Dust	0.26 mg/m³
6	Pb	0.06 mg/m³
7	H_2S	0.03 ppm (42 mg/m³)
8	NH_3	2.00 ppm (1360 mg/m³)
9	Hydrocarbon	0.24 ppm (160 mg/m³)

(Source: Environment Agency:
Envirnonmental White Paper '85)

Table 8-5-12 Regulated Limit of Exhaust from Mobile Sources of Generation in Indonesia

	Type of vehicles	Fuel	Mode	Regulated limit of exhaust					
				CO g/Km		HC gr/Km		NO_x g/Km	
				Max	Mean	Max	Mean	Max	Mean
1	Nine-passenger gasoline car	Gasoline	Ten mode	28.2	24.6	4.2	3.6	3.4	3.1
2	Gasoline car with a weight of 2.5 tons or less	Gasoline	Ten mode	31.4	26.8	4.8	4.3	3.7	3.3
3	Diesel								
	Direct injection	Light oil	Six mode	1050 ppm	920 ppm	—	—	1010 ppm	920 ppm
	Indirect injection	Light oil	Six mode	1050 ppm	920 ppm	680 ppm	590 ppm	1010 ppm	920 ppm
4	Two-wheeled vehicle								
	Four cycle	Gasoline	Idling	4.5%	—	3300	—	—	—
	Two cycle	Gasoline	Idling		—	7800	—	—	—

(Source: Environment Agency: Environmental White Paper '85)

2) Effect of Fuel Alcohol in Environment

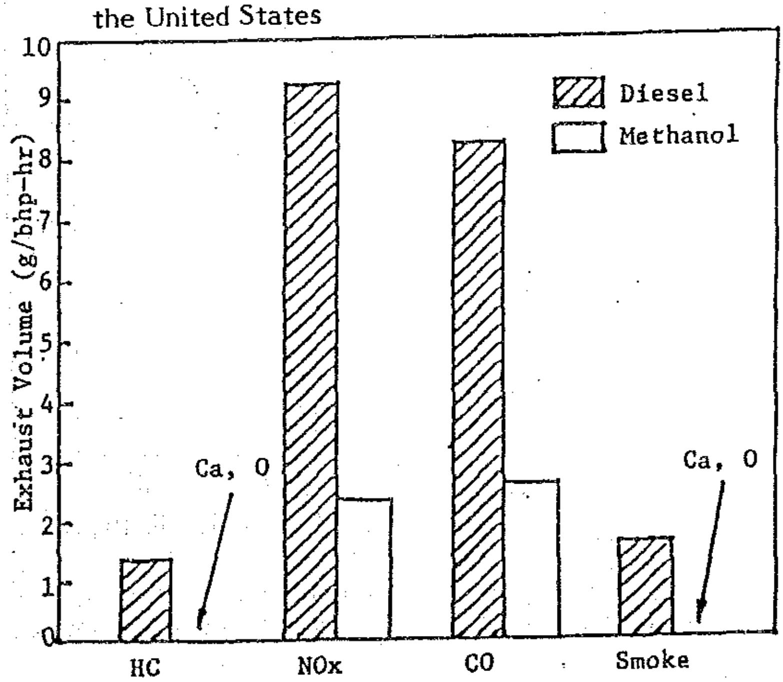
A mixture of gasoline and alcohol, clean fuel, has desirable effects on exhaust.

Air pollution in 2000 was estimated in California, USA. It is expressed by the level of ozon in the air.

	Peak O_3
100% gasoline cars	0.333 ppm
Exclusion of the effects of cars	0.250 ppm
100% methanol cars	0.285 ppm

Effectiveness of methanol to reduce ozone is shown on the above figures. Factors affecting air pollution include Nox, CO, HC, aldehyde, and smoke. A comparison of the volume of exhaust between diesel and methanol engines shows marked improvement in those factors, as shown in Fig. 8-5-7.

Fig. 8-5-7 Comparison of the Volume of Exhaust between Methanol Engine for Large-sized Vehicles and Diesel Engines in the United States



(Source: Documents for the Sixth International AFT Conference)

NOx and smoke emission of diesel engines in densely populated areas is one of the biggest environmental problems. In case of diesel engine using diesel fuel, technical methods to reduce NOx, smoke and particulates cannot be found, unlike gasoline engines. On the other hand, spark assist diesel engine using fuel methanol (M100) can dramatically decrease the NOx and smoke emissions. Fig. 8-5-8 shows the estimated relation between atmospheric NOx-content and conversion ratio to methanol from diesel, which was studied on the basis of actual atmospheric NOx content of before-conversion in typical big cities in Japan and expected exhaust emission of methanol cars. According to Japanese environmental regulation in 1985, it is estimated that about 50% of diesel cars in densely populated areas must be converted to metanol from diesel oil to achieve 0.06 ppm (average of a day) of atmospheric NOx content allowed by the environmental regulation.

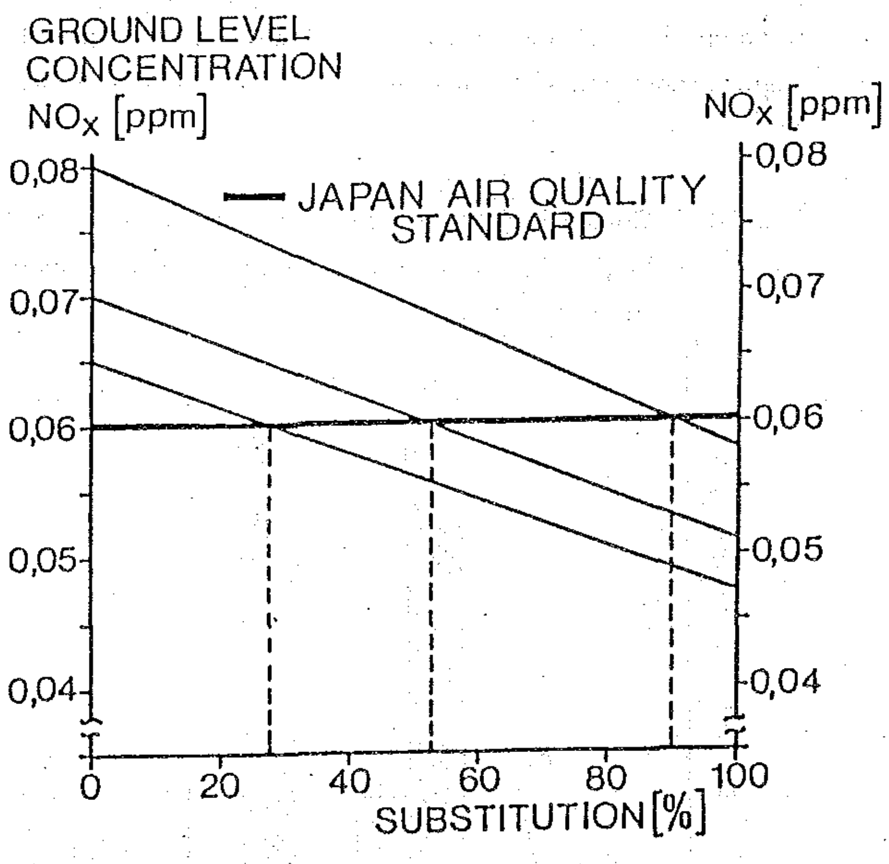


Fig. 8-5-8 Expeccted Improvement in Ground Level Concentration of Nox by Substitution of Diesel Fuel by Methanol in Japan (122)

Some reports on the formation of aldehde state that the level of aldehde in the exhaust is in proportion to the content of alsohol mixed. Fig. 8-5-9 show the effect of the level of motor alcohol on aldehyde exhaust (R.J. Nates: 7th International Symposium on Alcohol Fuels, Paris Oct/20 - 23 1986)

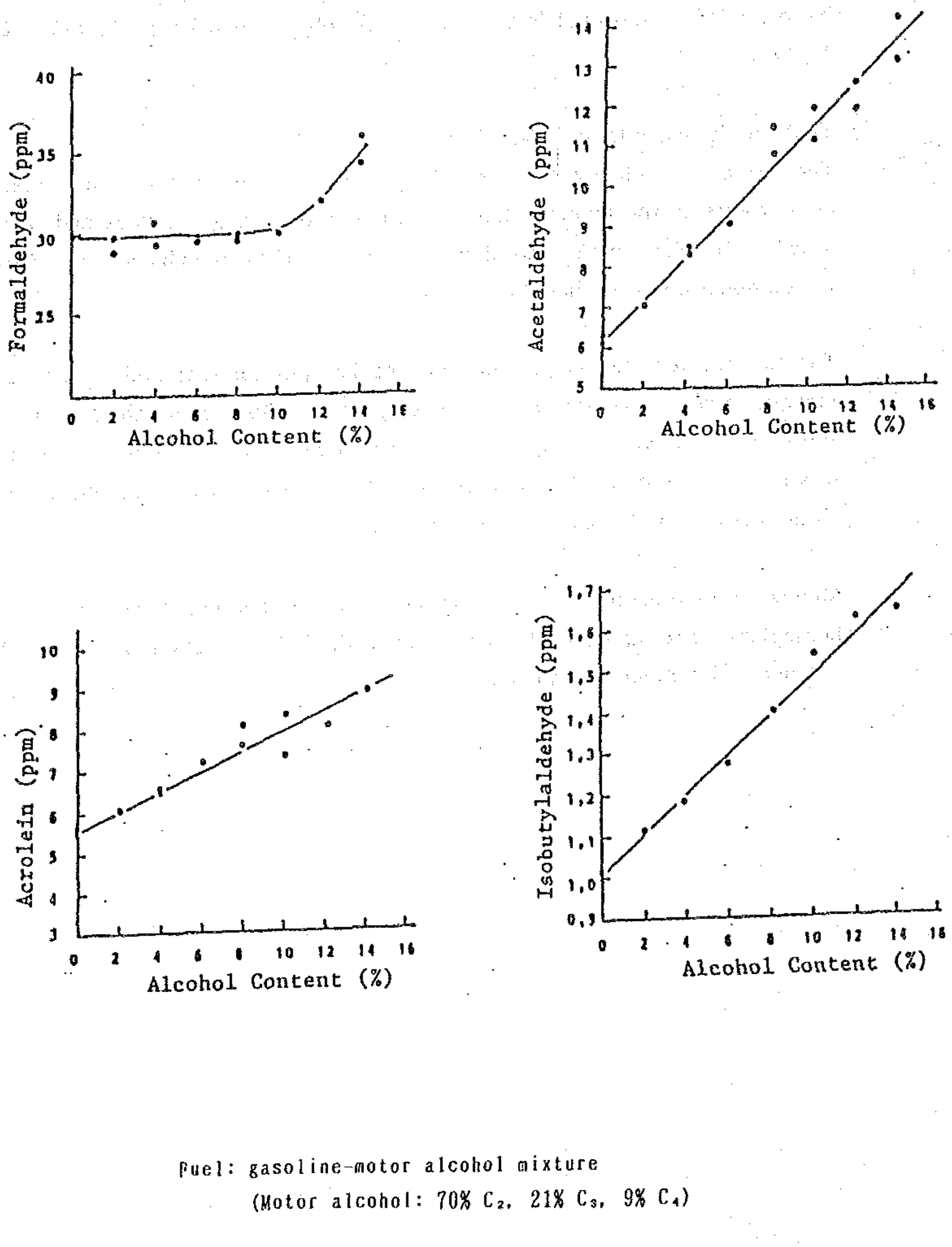
3) Test for the Effects of Aldehyde

The effects of aldehyde, to which the closest attention is paid among components in the exhaust, have been evaluated using monkeys and rats, as with the chronic test, to understand the effects of exhaust caused by the combustion of methanol on human.

The highest test levels of aldehyde are 10 ppm for rats and 5 ppm for monkey, and the lowest level is one ppm, taking into account the fact that the level of aldehyde is 0.5 ppm or less at the outlet of a chimney and the precision of the control of test levels. Rats are exposed to aldehyde for three months and monkeys for one month.

Moneys remain unchanged with one ppm of aldehyde, and showed reduced hemoglobin and ephemeral pneumonia with 5 ppm. Even one ppm of aldehyde slightly affected rats.

Fig. 8-5-9 Aldehyde vs Alcohol Content



Fuel: gasoline-motor alcohol mixture

(Motor alcohol: 70% C_2, 21% C_3, 9% C_4)

Car: VW GOLF 1.6 ℓ

8-6 Policy and Measures for Introducing Fuel Alcohol

8-6-1 Basic Policy for Introducing Fuel Alcohol

Over the last 15 years, because of economic growth, population growth, industrial expansion, and wider electricity distribution, domestic energy consumption has risen very rapidly.

The biggest problem is that the mix of energy sources in the domestic consumption pattern has grown too dependent upon oil and oil products during the same period. Unless Indonesia takes some action, she will consume all of its oil domestically, thereby depriving herself of one of the main sources of foreign currency needed for national development.

The Indonesian government has formulated a comprehensive energy policy aimed at minimizing the domestic consumption of oil and refined products and maximizing the use of non exportable energy sources.

The policy has four main pillars:

i) Intensification

To accelerate and intensify the survey and exploration of all energy resources, in an effort for a better identification of their potentials for an economic development program.

ii) Diversification

To reduce the dependence on oil in the overall domestic energy consumption and replace it with other available energy resources.

Priorities were set to develop non-exportable and renewable sources of energy: first hydropower and geothermal, followed by coal.

iii) Conservation

To economize energy use as well as to ensure its more efficient and wise use. This conservation program is being implemented through the following steps:

a) Sectoral identification of wasteful energy use

b) Providing information and educational programs

c) Implementation through legislation and directives

iv) Indexation

To apply the best and most efficient energy source for each particular energy demand.

The policy is then elaborated as follows:

a) Domestic energy supply

To guarantee the domestic energy supply in amount and quality according to the demand and with a price affordable to the public, with the objective of improving the welfare of the Indonesian people and providing the necessary support for rapid socio-economic growth

b) Export of energy

To secure the supply of energy, not only for domestic use but also for export, to provide foreign exchange which can be used also for the development of new energy sources

c) Development of alternate energy sources

To develop alternate energy sources which are renewable but not exportable so as to lessen the consumption growth rate of exportable energy and ultimately repalce the non-renewable energy sources

d) Conservation of oil

Oil should be used as economically as possible, and possibly only for those application where the use of other forms of energy is not possible.

e) Protection of environment

In the development of energy resources, the protection of the environment should be maintained, to accomplish an improvement in the quality of life of the Indonesian people.

f) National resilience

The overall effort of providing energy and the management of the energy resources should bring an increase of national resilience which will enable the Indonesian people to face the future with more skill and confidence.

Fortunately, fuel methanol can be produced from natural gas and coal, including low grade coal, which are abundant in Indonesia. However, it will be the basic energy policy of Indonesia that crude oil, natural gas from large scale deposits and high quality coal shall be utilized for export to get foreign currency.

Therefore, major resources to produce fuel alcohol would be natural gas from small scale deposits, associated gas and low grade coal which would be produced by open cut mining. The above-mentioned resources are difficult to export in view of economics and therefore will be effectively utilized to produce fuel methanol, resulting in reducing the domestic consumption of oil products.

Fuel ethanol will be produced from molasses, which is produced by the sugar industry as a by-product, and agricultural products such as sugar cane and cassava which will be produced in transmigration area.

Effective utilization of molasses will help decrease the production cost of sugar and development of the cassava market will support the transmigration policy as well as transmigrants' lives.

Production of fuel alcohol will create new industry and working chances in Indonesia.

If one considers the above-mentioned energy policy and impact on economics in Indonesia, the production and utilization of fuel alcohol is strongly intended to be made part of government policy regarding energy, industrialization and transmigration.

As part of the basic policy for introducing fuel alcohol, the following steps will be recommended to have high priority in the introduction of fuel alcohol:

1st step: Fuel ethanol will be blended in gasoline up to the rate of 20%.

Raw materials will be molasses and cassava.

Dehydration facilities to produce anhydrous ethanol will be constructed. Delivery facilities such as tank lorries and service stations will also be built considering their reasonable combination with existing relevant facilities

2nd step: Neat methanol will be produced from natural gas, associated gas and/or low grade coal and consumed in gas turbine generators. Supply using the capacity of the Bunyu methanol plant will be given first priority in the 2nd stage. Necessary facilities including tanks and fuel supply system will be installed.

A fuel methanol reforming unit will also be installed if economical.

3rd step: Neat methanol will be consumed by diesel type power generators and special vehicles such as city buses, trucks and trains.

8-6-2 Production and Distribution

In Indonesia some key industries are run by the Government. Petroleum products that fall under this study are produced and distributed by PERTAMINA, together with methanol made from natural gas. The production and distribution of about 30% of the ethanol produced in Indonesia is attributable to ANEKA KIMIA. Both enterprises are wholly capitalized by the Government; the employees are treated as public service officials. Under such cirmumstances, fuel alcohol should be produced and distributed by state-run enterprises.

In establishing enterprises to produce and distribute fuel alcohol, the following basic items should be given consideration:

1) The production and distribution of fuel alcohol should be based on the nation's energy, transportation, environment and transmigration policies. Such enterprises should secure a steady supply of energy.

ii) Effective production and distribution of fuel alcohol as well as the existing fuels and products should be achieved.

With the above-mentioned items and the existing petroleum-related enterprises taken into account, the following is proposed:

a) Fuel Methanol Production

Natural gas as raw material:	PERTAMINA
Coal as raw material	
{ Coal production :	Perum BATUBARA or PTBA
{ Methanol production :	New state-run enterprise (A) (under the Ministry of Mines and Energy)

b) Fuel Ethanol Production

Molasses as raw material:	Existing sugar companies
Agricultural products as raw material :	New state-run enterprises (B)

Transmigrant should make products such as sugar cane and cassava in their settlements according to transmigaration policy, and in turn the new state-run enterprise (B) should purchase them. Hydrated ethanol should be produced by state-run enterprise (B) in the transmigration area. Then state-run enterprise (B) should make unhydrous ethanol from it to be distributed by PERTAMINA.

c) Upstream distribution

As production and distribution are inseparably connected with transportation, state-run enterprises A and B should take charge of transportation using their own facilities (storage tank, tankers, tank trucks, etc.)

d) Processing for Fuel

Judging from economic as well as technical aspects, a company (or enterprise) distributing final products should process them to make neat alcohol fuel or blend them with gasoline. For this reason, PERTAMINA should process them.

e) Downstream Distribution and Sales to End Users

In view of the convenience for end users, quality control, safety control, efficiency and so on, the role should be played by PERTAMINA.

Fig. 8-6-1 shows the roles of each entity involved in the processes ranging from the production of raw material to the distribution of final products by items.

Fig. 8-6-1 Suggested Production and Distribution Entity

	Production of raw material	Production of alcohol	Upstream distribution	Blending or processing	Downstream distribution	Sales to end users
Methanol from natural gas	PERTAMINA	PERTAMINA	PERTAMINA			
Methanol from coal	Perum BATUBARA or PTBA	New state-run enterprise(A)	(A)			
				PERTAMINA	PERTAMINA	PERTAMINA
Ethanol from molasses	Existing sugar companies	Existing sugar companies or New enterprise(B)	Existing sugar companies or New enterprise(B)			
Ethanol from agricultural products	Transmigrants	New state-run enterprise(B)	New state-run enterprise(B)			

8-6-3 Incentives for Producers and Consumers

The above deliberations on the use of methanol in different economic regions and in the various consumption sectors have shown that the criteria for fuel alcohol use are divers. It has been shown that fuel alcohol production is in most cases economically unattractive if the price of oil is lower than $30/bbl. However, there are other reasons to encourage or enforce the production of ethanol from molasses and cassava and methanol from natural gas and coal such as conservation of oil products, effective utilization of alternative energy sources, protection of the environment and others. The achievement of such goals requires governmental incentives and support. Although quite different strategic deliberations apply to each sector and region which might favour the use of fuel alcohol, it is nevertheless possible to define certain common policies which might be implemented by governmnts:

- the development of a generally acknowledged specification of fuel grade methanol
- more active research in the sector of methanol and ethanol production, with a view to reducing the production cost, with particular respect to fuel-grade alcohol
- comprehensive investigation into the use of fuel alcohol in new consumption areas, particularly the transport, heat and power, sectors;
- market analyses on the availability of raw materials, plant capacities, and general infrastructure, for the more active use of fuel alcohol;
- studies on the economic aspects of fuel alcohol production, on the basis of different raw materials;
- studies on the economic viability of fuel alcohol, as energy source for electricity and heat generation and as a transport fuel;
- studies on the repercussions from using fuel alcohol on other material currently used, e.g. in the transport sector, on the present structure of refineries or on the car industry.

Such investigations could be carried out by the governments, or possibly sponsored by governments as technology assessments.

Environmental protection is no longer a regional, but a global issue. This means that e.g. ethanol should be used as a substitute for lead in gasoline in Indonesia. Methanol combustion instead of fuel oil would substantially reduce pollutant emissions. Political measures to reinforce such targets would be e.g.:

- statutory regulations for reducing the lead content in gasoline

- government definition of emission standards could accelerate the desirable introduction of fuel alcohol

- government incentives to encourage fuel alcohol use in the transport sector

As mentioned in section 8-6-2, it is estimated that almost all producers are government enterprises and therefore a number of political decisions could be taken in the activities of each enterprise.
Incentives will be especially required for

- o Suppliers of molasses
- o Suppliers of cassava
- o Users of fuel alcohol
- o Car manufacturers

The following incentives will be recommended:

1) Incentives to suppliers of molasses
   a) Competitive price setting to export molasses
   b) Purchase commitment by ethanol producers
   c) Tax discount for storage and transportation facilities
   d) Financial aid for facilities

2) Incentives to suppliers of cassava
   a) Reasonable price setting to support producer's life
   b) Purchase commitment
   c) Supply or rental of cassava production and transportation facilities

The above-mentioned incentives will be coordinated with the incentives of the transmigration policy.

3) End users of fuel alcohol
   a) Tax discount for alcohol fuel cars
   b) Price discount of fuel alcohol in view of calorific value, or price increase of oil products

4) Incentives to car manufacturers
   a) Tax discounts for manufacturing facilities
   b) Financial aid with low interest finance

As incentive to government enterprises, the required budget will be allowed in accordance with the priority of each introduction step. The following will be given higher priority:

a) Dehydration facilities to produce anhydrous ethanol
b) Blending, storage and distribution facilities of hydrous ethanol and blended gasoline
c) Modification of existing gas turbine generators for fuel methanol use, including storage tanks and fuel supply system

8-7 Overall Evaluation

8-7-1 Impact on Demand for Petroleum Products

As discussed in section 8-3-2-(1) "Prospects of Long-term Demand for Fuel Alcohol", the necessary conditions for introducing all ($1600x10^3$t, $2010x10^3$KL) of the fuel methanol from Banko coal is less than 111$/kl of the methanol price under 30 $/BBL of fixed crude oil price and should be more than 38 $/BBL of crude oil under 139 $/kl of fixed methanol price (the price corresponding to IRR 13.5%).

In comparison with the case of Ascope, which is the base for the LP model study, methanol volume on introduction is equivalent to 14% ($810x10^3$kl of gas, equivalent) of demand for gasoline and 3% ($222x10^3$kl of Kerosene equivalent) of demand for kerosene.

For ethanol introduction, $950x10^3$kl of ethanol ($665x10^3$kl of gasoline equivalent), which is evaluated to the max. potential volume for the ultimate stage, is equal to 12% of gasoline demand in case of Ascope.
However, as both ethanol and methanol are to be introduced to Pertamina Supply Region III (JKT) and/or V (Surabaya), there should be some arrangement for actual introduction to the gasoline market in these regions. And also, introducing fuel alcohol into the conventional oil market should have the following impacts on the refining pattern and distribution of oil products:
As the impact of ethanol is very small, the impacts of methanol is described here.

(1) AM30 - AM37

In these cases, gasoline transportation to Supply Region III is to decrease and also gasoline transportation to Supply Region IV from Cilacap refinery is to increase because of the introduction of methanol into the gasoline market and/or kerosene market. Cilacap refinery will maintain max. production of gasoline, which has an important role to supply gasoline to Supply Region III, IV and V.

Gasoline transportation to Supply Region IV from Dumai refinery will decrease because of gasoline increase from Cilacap refinery. Although crude-runs in Dumai will decrese, reformate exports will increase.

(2) AM38

Gasoline transportation from Cilacap will further decrease compared with other cases mentioned above but will increase to Supply Regions IV and V.
To make up for this gasoline, gasoline transportation to supply Region V from Balikpapan will decrease and lead to the increase of reformate exports. However, in this case, crude-runs in Balikpapan will keep the same level because of max. production of kerosen.

(3) AM-37

In this case, methanol is to be firstly introduced to the kerosene market in Supply Region II. The decrease of kerosene delivery to this region from Plaju will lead to an increase of deliveries to Supply Region III and kerosene production in Plaju will not change. And, as a result, kerosene from Cilacap to Supply Region III will decrease and increase to IV without changing its kerosene production.
Although kerosene delivery for Supply Region IV from Balikpapan will decrease with no change of crude-runs, kerosene fraction in the surplus is to be used as a blending stock for ADO and be exported.

Table 8-7-1(a) Impacts of Methanol Introduction on Gas. Flow
Case A-M-30 - A-M-37 (v.s. Case A)

To / From	Demand Area 3	Demand Area 4	Demand Area 5	Crude Oil Volume Processed	Gasoline Production	Processed Volume by Reformer	Exports
Dumai		↓ ③		↓	↓ ④	→	Reformate ↑
Plaju				→	→	→	→
Cilacap	↓ ①	↑ ②		→	→	→	→
Balikpapan				→	→	→	→
Demand Area for Methanol	○						

Table 8-7-1(b) Impacts of Methanol Introduction on Gas. Flow
Case A-M-38 (v.s. Case A)

From \ To	Demand Area 3	Demand Area 4	Demand Area 5	Crude Oil Volume Processed	Gasoline Production	Processed Volume by Reformer	Exports
Dumai		↓ ③		↓	↓ ④	→	Reformate ↑ Kerosene ↑ ADO ↓ FO ↓
Plaju	→			→	→	→	→
Cilacap	↓ ①	↑ ②	↑ ②	→	→	→	→
Balikpapan			↓ ③	→	↓ ④	→	Reformate ↑ ADO ↑ FO ↓
Demand Area for Methanol	○						

Table 8-7-1(c) Impacts of Methanol Introduction on Kero. Flow
Case A-M-37 (v.s. Case A)

To / From	Demand Area 2	Demand Area 3	Demand Area 4	Demand Area 5	Crude Oil Volume Processed	Kerosene Production	Exports
Dumai					↓	↑	Reformate ↑ Kerosene ↑ ADO ↓ IDO ↓
Plaju	↓ ①	↑ ②			→	→	→
Cilacap		↓ ③	↑ ④		→	→	→
Balikpapan			↓ ⑤	→	→	↓ ⑥	ADO ↑ IDO ↓
Demand Area for Methanol	○						

8-7-2 Impact on Utilization of Natural Resources

If fuel methanol from Banko coal is to be introduced to the domestic oil products market in the future, 114 million tons of coal will need to be obtained from the Banko area during the thirty years of the project's life.

This utilization of non-commercial, low-grade coal will make 810×10^3kl of gasoline equivalent and 450×10^3kl of kerosene equivalent for surplus. The impacts of that introduction have already been discussed in 8-7-1.

As well as utilization of low-grade coal like Banko coal, small scale natural gas in remote areas from demand areas should be used for the conservation of existing exportable commercial energy on the one hand and export income assured on the other hand, which will aid the national interest of Indonesia.

8-7-3 Impact on Transmigration Policy

Indonesia has a big population of more than 150 million people, of which 62% lived on Java island, which occupies less than 7% of total land as of 1980. Java island has 690 men/km^2 of population density compared with 77 men/km^2 in Indonesia as a whole. The population growth rate during 1980/1971 on Java island was almost 2.0%/annum compared during 1971/1961 with 1.9%/annum and this growth rate was rather small compared with 3.3%/annum in Sumatra, 3.2%/annum in Kalimantan and 2.8%/annum in Nusa Tenggara.

The transmigration program is construed as a multiobjective program. It is intended to provide land for the landless on Java, Bali and Lombok, to improve the distribution of population and at the same time provide manpower for the labor-scarce areas outside Java, Bali and Lombok so that the latter areas can develop as new centers of production, particularly agricultural production. The program is also seen as a vehicle to promote national stability and integration.

According to the results of general transmigration in 1981, 28% of a total 90,000 families flowed to the southern part of Sumatra, 14% to Riau (central Sumatra), 8% to the southern part of Kalimantan and 7% to south-east of Sulawesi. Transmigration from the eastern and central parts of Java is prevailing, which occupies about 40 to 60% in each region of destination. An overall trend is that from Java to Sumatra, Kalimantan and Sulawesi.

During the period of REPELITA-IV, the Government expects 750 thousand families to transmigrate. As for this transmigration plan, a voluntary transmigration program called Swakarsa is to be encouraged due to budgetary limits, and 250 thousand families will have during REPELITA-IV.

During the period of REPELITA-III, there were 527 thousand transmigration families, which surpassed the target of 500 thousand families. However, the newly established settlements are abandaned by many families.

In view of the present transmigration situation it is required to give a way for transmigration to assure an income source through cassave for ethanol production. More concretely speaking, besides a cassava price supporting policy, which will assure a certain level of income, a more detailed policy and measures to promote settlement of transmigrants will be required.

8-7-4 Impact on Environmental Policy

Indonesia is said to have a program to enforce environmental regulations on factories from 1987. Emission regulations for automobile have been enforced already, but periodical inspetion has been done only for commercial vehicles, and also, control is not severe.

In Jakarta, sometimes there are severe traffic jams and the city becomes smoggy which might be the result of poor adjustment of automobile engines and specifications of oil products.

As to the international situation on regulation of exhaust gas emissions, such materials as NO_2, NO, hydrocarbon, smoke and lead are the main targets for reducing air pollution. And also the tendency toward unleaded gasoline seems to be prevailing rapidly mainly in the U.S.A. and European countries. This issue will come to the fore in developing countries including Indonesia.

With this background, blending ethanol or methanol into gasoline as an octane booster and neat use of methanol in diesel engines in the longer term will be an effective countermeasure, which will reduce T.E.L. without deterioration of the octane number and smoke from buses and trucks, which contributes to reducing air pollution and improving the environment for people living in urban areas.

8-8 Conclusions and Recommendations

(1) Fuel Ethanol

1) The most preferable utilization of fuel ethanol is as automobile fuel as low blend gasoline.
2) The production of fuel ethanol from molasses is desirable. However, it is estimated to be difficult to commercialize by the private sector because of less profitability in view of financial analysis.
3) In the case of production from cassava, financial analysis shows rather worse economics than that of molasses.
4) On the otherhand, the production and utilization of fuel ethanol can contribute to the policies of the Indonesian Government such as transmigration policy, energy policy and environmental policy.
5) Taking into consideration the above-mentioned contributions, it is recommended that the concrete study for introduction of fuel ethanol be carried out in view of the following points:
   i) Production plan including conceptual design of the related facilities and construction cost estimation
   ii) Utilization plan including octane control system of unleaded gasoline
   iii) Introduction policy and program of fuel ethanol in view of transmigration policy, energy policy and environmental policy

(2) Fuel Methanol

1) It is recommended to utilize fuel methanol as an automobile fuel (M3 gasoline) and fuel for existing gas turbine generators, at the penetration stage.
2) Application of fuel methanol will be extended to gasoline engine (M85-M90) and diesel engines (neat). Such applications will be beneficial to city buses and trucks, diesel engine generators and reformed type gas turbine genertors in the long-term.
3) The raw materials of fuel methanol will be isolated small scale deposits of natural gas and low grade coal such as Banko coal.
4) The enterprise for the production and up-stream distribution of fuel methanol will be a national organization of Indonesia, because the economic feasibility of methanol production is greatly influenced by the availability of low cost finance and overall energy policy of Indonesian Government.

5) The same kinds of study shown in 8-8-(1)-5) will be carried out for introduction of fuel methanol.

9. CONCLUSIONS AND RECOMMENDATIONS

(1) Conclusions

All of the studies scheduled in FY 1986 have successfully been completed.

1) The construction work of the pilot plant building in PUSPIPTEK was completed in September, 1986.
2) Fabrication and transportation of equipment for the coal gasification test facilities as well as utilities facilities were carried out and completed in September, 1986.
3) Field work of the coal gasification test facilities and utilities facilities was completed in January 1987, including acceptance inspection of equipment.
4) Mechanical and operation tests of the facilities, including a performance test, were successfully completed in March 1987.
   The operation test result shows that the coal gasification test can be carried in FY1987 as scheduled.
5) A coal sampling study was carried out including shallow boring and deep boring.
   i) 2.7 tons of coal sample for mechanical and operation tests were taken by pitting in N.W. Banko.
   ii) A total 2.2 tons of 10 coal samples for coal gasification in FY1987 were taken by a 101mm core drilling machine in N.W. Banko.
   iii) The outcrop lines and coal seam structure in Central Banko and North Suban Jeriji were grasped, and coal sampling spots in FY1987 were decided.
6) The preliminary evaluation of mining cost of N.W. Banko coal were investigated. The mining cost of N.W. Banko coal is estimated to be 14.5 $/ton-coal by shovel and truck system.
7) The preliminary evaluation of urea production cost has been carried out.
   The economics of urea production is inferior to that of methanol, and therefore it can be concluded that case II of the master plan (coproduction of methanol and urea) will be eliminated from further study in the 3rd stage.
8) The preliminary evaluation of electricity generation cost has been studied, applying the coal gasification-combined cycle power generation system.

IRR for sales in the Jakarta area is estimated to be 6.9 - 10.3%, on the basis of 98 RP/KWH of sales price in Jakarata as of 1985. The economics may be even or inferior to that of methanol production. It is concluded that lower cost finance than 6.9% year will be required and the study shall be investigated in more details in the 3rd stage.

9) Study of Market and Fuel Ethanol Distribution System

i) The most preferable utilization of fuel ethanol is automobile fuel as low blend gasoline.

ii) The production of fuel ethanol from molasses is desirable. However, it is estimated difficult to be commercialized by private sector because of less profitability in view of financial analysis.

iii) In the case of production from cassava, the financial analysis shows rather worse economics than that from molasses.

iv) On the other hand, the production and utilization of fuel ethanol can contribute to the policies of the Indonesian Government such as transmigration policy, energy policy and environmental policy.

v) Taking into consideration the above-mentioned contributions, it is recommended that a more concrete study for introduction of fuel ethanol be carried out in view of the following points:

a) Production plan including conceptual design of the related facilities and construction cost estimation

b) Utilization plan including octane control system of unleaded gasoline

c) Introduction policy and program of fuel ethanol in view of transmigration policy, energy policy and environmental policy

10) Study of Market and Fuel Methanol Distribution System

i) It is recommended to utilize fuel methanol as automobile fuel (M3 gasoline) and fuel for existing gas turbine generators at the penetration stage.

ii) Application of fuel methanol will be extended to gasoline-based engines (M85-M90) and diesel-based engines (neat). Such applications will be beneficial to city buses and trucks, reformed type diesel engine generators and reformed type gas turbine generators in the long-term.

iii) The raw materials of fuel methanol will be isolated small scale deposits of natural gas and low grade coal such as Banko coal.

iv) The enterprise for the production and up-stream distribution of fuel methanol will be a national organization of Indonesia, because the economic feasibility of methanol production is greaty influenced by the availability of low cost finance and overall energy policy of Indonesian Government.

v) The same kinds of more concrete studies in case of fuel ethanol will be carried out for introduction of fuel methanol.

(2) Recommendations

1) The study in FY 1987 should be carried out in accordance with the Scope of Work

2) Strategic evaluation for the study as of the 2nd state should be carried out at the end of the 2nd stage.

3) Necessity of further study on the fuel alcohol market and its distribution system (See proposed points in Section 9-(1)-9) and 10)) will be seriously discussed by both sides.

APPENDIX I

Minutes of Meeting

MINUTES OF MEETING

THE FEASIBILITY STUDY
ON
EFFECTIVE UTILIZATION OF BANKO COAL

1. In accordance with the Scope of Work for the Feasibility Study on Effective Utilization of Banko Coal in the Republic of Indonesia, JICA sent the study team headed by Mr. Takehiko Sato to the Republic of Indonesia from June 16 to 27, 1986.

   According to the prepared program, BPPT (the counterpart team) and the study team have discussed the following subjects:

   1) The Inception Report (FY 1986)

   2) The Interim Report II (FY 1985)

   3) The study on market for fuel alcohol and its supply system

   4) Construction of the coal gasification test facilities

   5) Coal sampling schedule in FY 1986

2. The study team provided to BPPT 15 copies of the Inception Report illustrating the implementation plan of the Study to be carried out in FY 1986.

   After discussion, BPPT and the study team agreed on the Interim Report on June 26, 1986.

Both sides confirmed mutually that the necessary budget for the Study in FY 1986 has been approved.

The major items of undertakings by each side in FY 1986 which were confirmed are as follows :

(i) Handling of equipments provided by JICA (by BPPT).

(ii) Installation of utility facilities such as cooling tower and air compressor (by BPPT).

(iii) Coal sampling in N.W. Banko and West Banko, - applying machine boring (by BPPT and MTDC).

(iv) Provision of utilities and consumerable materials required for construction and test run of the coal gasification test facilities (by BPPT).

(v) Provision of equipment and materials of the coal gasification test facilities (by JICA).

(vi) Construction and test run of the coal gasification test facilities (by JICA).

3. 15 Copies of the Interim Report II (FY 1985) summarizing the result of the study carried out in FY 1985 have been provided to BPPT by air mail.
BPPT confirmed the acceptance and agreed on the Interim Report II (FY 1985).

4. The market of fuel alcohol and its supply system was discussed.
The first Joint Meeting including the following relevant organizations was carried out on June 20, 1986 at BPPT office.

BPPT
DG of MIGAS
DG of E & NE
Ministry of Industry
Ministry of State for Population and Environment
Ministry of Communication
PERTAMINA
PLN
LEMIGAS
Central Bureau of Statistics

5. The study team prepared the Progress Report (draft), recording the results of discussion and site survey.

   After discussions, BPPT and the study team agreed on the Progress Report on June 26, 1986, as shown in APPENDIX I. 15 copies of the Progress Report were provided to BPPT.

6. JICA study team explained the JICA's procedure of "bidding and order" of the construction work of the coal gasification test facilities to be installed at PUSPIPTEK in Serpong.

   1) Bidding and order will be issued by JICA INDONESIA.

   2) The following contractors will be invited to tender:
      i) P.T. P.P.-TAISEI INDONESIA CONSTRUCTION
      ii) P.T. JAYA OHBAYASHI
      iii) P.T. WASKITA KAJIMA CORPORATION INDONESIA
      iv) P.T. HUTAMA TAKENAKA CORPORATION INDONESIA

   3) The expected schedule of bidding and order is as follows:
      . Explanation Meeting to tender : 20 June
      . Closing date of quotation : 15 July

. Order of the work : End of August
. Arrival of JICA equipment : Middle of September
. Start of the work : Beginning of October
. Completion of construction : End of January 1987

4) The following bid documents were provided and explained in details:
   . Request for Quotation
   . Requisition No. MP6-002
   . Project Specification No. MP6-002

   Project Specification includes the detailed drawings for the construction work.

APPENDIX

I : Progress Report (June, 1986)

For JAPAN INTERNATIONAL COOPERATION AGENCY

T. Sato June 26, '86

TAKEHIKO SATO
Leader of the Study Team
Japan International Cooperation Agency

For THE AGENCY FOR THE ASSESSMENT AND APPLICATION OF TECHNOLOGY

Wardiman 26.6.86

WARDIMAN DJOJONEGORO
Deputy Chairman for Administration
Agency for the Assessment & Application of Technology

MINUTES OF MEETING

THE FEASIBILITY STUDY
ON
EFFECTIVE UTILIZATION OF BANKO COAL

1. In accordance with the Scope of Work for the Feasibility Study on Effective Utilization of Banko Coal in the Republic of Indonesia, JICA sent the study team headed by Mr. Takehiko Sato to the Republic of Indonesia from Aug. 13 to Sept. 11, 1986.

   According to the prepared program, BPPT (the counterpart team) and the study team have studied on market for fuel alcohol and its supply system.

2. The Second and 3rd Joint Meeting including the following relevant organizations were carried out on Aug. 15 and Sept. 9, 1986 at BPPT office respectively.

   BPPT
   DG of MIGAS
   DG of EP & NE
   Ministry of Industry
   Ministry of State for Population and Environment
   Ministry of Communication
   PERTAMINA
   PLN
   LEMIGAS
   Central Bureau of Statistics

3. The study team prepared the Progress Report (draft), recording the results of discussion and site survey.

After discussions, BPPT and the study team agreed on the Progress Report on September 10, 1986, as shown in APPENDIX I. 10 copies of the Progress Report were provided to BPPT.

4. JICA study team explained the JICA's schedule of the construction work of the coal gasification test facilities to be undertaken by JICA.

   1) Order will be issued by JICA INDONESIA

   2) The contractor will be nominated by JICA INDONESIA within this week.

   3) The expected schedule of construction work is as follows:

      - Order of the work : Middle of September
      - Arrival of JICA equipment : 21st of September
      - Start of the work : Beginning of October
      - Completion of construction : End of January 1987

5. BPPT explained the BPPT's procedure of "bidding and order" of the construction work to be undertaken by BPPT

   1) Bidding and order will be issued by BPPT

   2) The contractor contracted by JICA will be invited to tender

   3) The schedule of construction work will be the same with JICA's work.

   4) BPPT request to the study team to prepare "Project Specification" to be undertaken by BPPT. The study team promissed to prepare the Project Specification as soon as possible.

6. Training for counterpart personnel in FY 1986

JICA study team explained that JICA will accept three trainees in FY 1986. The schedule of training will be around November and decided by JICA in due course. BPPT explained that the necessary official procedures by BPPT have completed on September 9.

APPENDIX

I : Progress Report (September 1986)

For JAPAN INTERNATIONAL COOPERATION AGENCY

10. Sept '86

TAKEHIKO SATO
Leader of the Study Team
Japan International
Cooperation Agency

For THE AGENCY FOR THE ASSESSMENT AND APPLICATION OF TECHNOLOGY

10.9.86.

WARDIMAN DJOJONEGORO
Deputy Chairman for
Administration
Agency for the Assessment &
Application of Technology

APPENDIX II

Schedule, Organization and Program,

Visited by the Study Team in FY 1986

SCHEDULE, ORGANIZATION AND PERSONNEL VISITED BY THE MINING TEAM(No. 1)

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
25/May (Man)	8:30- 9:30	JICA Indonesia	Mr. Aoki
	9:30-16:00	BPPT	Dr. Wardiman Djojonegoro Ir. Subagio Imam Bakri Ir. Bambang Suwondo Rahardjo Ir. Achmad Setiadi Ir. Untung Sumotarto Ir. Unggul Rriyanto Ir. Djoko Sulaksono Ir. Prapto Heljono
26/May (Tue)	10:00-14:00	PPTM	Ir. Komar Priatna Anwar Ir. Yuyun Basyuni Mr. Koen Mabsora Ir. Subagio Imam Bakri(BPPT) Ir. Bambang Suwondo Rahardjo (BPPT)
27/May (Wed)	9:00-10:30	DOC (Bandung)	Ir. Subandoro Ir. Subagio Imam Bakri(BPPT) Ir. Bambang Suwondo Rahardjo (BPPT)
	11:00-12:30	PPTM	The Same as 26/May
28/May (Thur)	9:30-11:00	PTBA (Palembang)	Mr. Zulyadin Ir. Subagio Imam Bakri(BPPT) Ir. Bambang Suwondo Rahardjo (BPPT)
	14:30-16:00	PTBA (Tanjung Enim)	Ir. Soetjipto wijadi Ir. Andi Massalangka Be. Rachman Sukardi
29/May (Fri)	10:00-12:00	CV RENE	Mr. Thalib Nasution Ir. Subagio Imam Bakri(BPPT)
	12:30-13:00	DOC (Tanjung Enim)	Mr. Parigan Ir. Subagio Imam Bakri(BPPT)
30/May (Sat)	9:30-15:00	PTBA (Palembang)	Mr. Zulyadin Ir. Subagio Imam Bakri(BPPT)
2/June (Mon)	10:00- 15:00	BPPT	Ir. Subagio Imam Bakri Ir. Bambang Suwondo rohardjo Ir. Yuyun Basyuni(PPTM) Be. Endang Yuyu Wiraatmadja, (PPTM) Mr. Mochammad Rochim(PPTM)
	17:00-18:00	JICA Indonesia	Mr. Aoki

Schedule, Organization and Personnel visited by the Study Team (A)

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
June 17	14:00 - 17:00	BPPT	Dr. Wardiman Djojonegoro
			Mr. Subagio Imam Bakri
(Tue)			Mr. Unggul Priyanto
			Mr. Suharjono
			Mr. Untung Sumotarto
			Mr. Amiral A.
June 18	09:00 - 11:30	BPPT	Mr. Subagio Imam Bakri
(Wed)			Mr. Bambang Suwondo
June 19	09:00 - 15:45	BPPT	Mr. Subagio Imam Bakri
(Thurs.)			Mr. Bambang Suwondo
			Mr. Unggul Priyanto
			Mr. Helmy Said
			Mr. Joko Prihiartoto
			Mr. Untung Sumotarto
June 20	09:30 - 11:30	BPPT	Dr. Wardiman Djojonegoro
(Fri.)			Mr. Helmy Said
			Mr. Joko Prihiastoto
			Mr. Subagio I.B.
			Mr. Suharjono
		Pertamina	Mr. Torie Setiawan
		DG of E & NE	Ms. Maritje Hutapea
		C.B. of Statistics	Mr. Soewondo, Hp.

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
June 20	09:30 - 11:30	DG of MIGAS	Mr. T. Sitanggang
(Fri)		P L N	Mr. Sudjanadi
		DG of Industry	Mr. J. Purba
		"	Mr. Ir. Waluyo
		LEMIGAS	Mr. Hendro Prawoto
		Dept. of Communication	Mr. Maskur Effendi
June 21	10:30 - 12:15	Dept Of Communication	Mr. Maskur Effendi
(Sat)			Mr. Mahdi Siahaan
			Mr. Soemanto
			Ms. Amala Nurhaida
		BPPT	Mr. Helmy Said
June 23	09:00 - 12:30	BPPT	Mr. Bambang Suwondo
			Mr. Achmad Setiadi
(Mon)			Mr. Untung Sumotarto
		PUSPIPTEK	Mr. Sulaiman Kurdi
	13:30 - 16:30	BPPT	Mr. Subagio Imam Bakri
			Mr. Untung Sumotarto
			Mr. Joko Prihiastoto
	09:30 - 11:30	BPPT	Mr. Subagio Imam Bakri
			Mr. Helmy Said
	13:00 - 14:20	DG of MIGAS	Mr. T. Sitanggang
		BPPT	Mr. Helmy Said
	14:20 - 15:00	DG of MIGAS	Mr. Widartomo

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
June 24	09:30 - 11:20	Central Bureau of Statistics	Mr. Soewondo Ms. Supati Mr. T.H. Suprono
(Tue)		BPPT	Mr. Helmy Said
	13:30 - 15:30	Pertamina	Mr. Torie Setiawan
		BPPT	Mr. Helmy Said
	13:30 - 15:30	PUSPIPTEK (Jakarta)	Mr. Sulaiman Kurdi
		BPPT	Mr. Subagio Imam Bakri
June 25 (wed)	10:00 - 11:30	DG of E & NE	Mr. IGN GDE Pemayun Mr. M. Panjaitan
	15:00 - 17:00	Mitsubishi Co.	Mr. S. Okuhara
June 26 (Thurs)	12:00 - 13:00	BPPT	Dr. Wardiman Djojonegoro Mr. Subagio Imam Bakri and all staff members.

Schedule, Organization and Personnel visited by the Study Team (C)

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
Aug. 15 (Fri.)	09:00 - 11:30	BPPT	Dr. Wardiman Djojonegoro Mr. Bambang Suwondo Mr. Unggul Prijanto Mr. Achmad Setiadi Mr. Helmy Said Ms. Saraswati Mr. Indra Budi Susetyo
		C.B. of Statistics	Mr. L. Ginting
		MIGAS	Mr. T. Sitanggang
		PERTAMINA	Mr. L.M.L. Tobing
		D.G. of Basic Chemical Industries	Mr. J. Purba
		State Ministry for Population & Environment	Mr. Hendra Setiawan
		D.G. of Electric Power & New Energy	Ms. Maritje Hutapea
Aug. 18 (Mon.)	08:30 - 10:40	Cilacap Refinery	Mr. R. Noerdanto Mr. B. Poediasmara Mr. Maskurun Mr. Mustofa Mr. Mohammad Yunus Mr. Tb. A. Alin
		(BPPT)	Mr. Suharjono Mr. Indra Budi Susetyo

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
Aug. 20 (Wed.)	13:30 - 16:00	PERTAMINA	Mr. Djoko Hernowo Mr. Ibrahim L. Chaniago Mr. L.M.L. Tobing Mr. Hardono
		BPPT	Mr. Achmad Setiadi
Aug. 20 (Wed.)	16:00 - 17:00	BPPT	Ms. Saraswati Mr. Bambang Suwondo R. Mr. Helmy Said Mr. Indra Budi S.
Aug. 21 (Thurs.)	09:00 - 11:30	MIGAS	Mr. E.E. Hantoro Ariadji Mr. T. Sitanggang Mr. Gono Soedimo Mr. Hasyim
		BPPT	Mr. Indra Budi Susetyo
Aug. 21 (Thurs.)	12:50 - 13:30	Department of Trans-migration	Dr. Soedjino Mr. Helmy Said
Aug. 21 (Thurs.)	12:00 - 15:00	PLN	Mr. Hartoyo Mr. P. Oka Mr. Sudja Mr. Sudjanadi Mr. Suharjono (BPPT)
Aug. 23 (Sat.)	08:30 - 10:30	PLN XI District Office	Mr. A. Soetjipto Mr. Krisno Pandito Mr. Sofyan Taca
		BPPT	Mr. Suharjono

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
Aug. 23 (Sat.)	09:00 - 11:30	Balikpapan Refinery	Mr. R. Pradipto Mr. Muzanulsyah Mr. Wagianto Sudargo
		BPPT	Mr. Achmad Setiadi Mr. Unggul Prijanto
Aug. 25 (Mon.)	09:00 - 12:00	PD Acen Factory, Mojokerto	Mr. Dwipurwo Pangarso Mr. M. Sukartono Mr. A. Rachman Mr. Oedojono Mr. H.M. Kholid
		BPPT	Ms. Saraswati Mr. Bambang Suwondo Mr. Indra Budi S.
Aug. 25 (Mon.)	10:00 - 12:00	Handil Oil Field, TOTAL	Mr. Rako B.J. Mr. Madeo H. Mr. Dodi Budiristio Mr. A. Alkatili
		BPPT	Mr. Achmad Setiadi Mr. Unggul Prijanto
Aug. 25 (Mon.)	14:00 - 15.30	Senipah Terminal, TOTAL	Mr. Rayadi Mr. Dodi Budiristio
		BPPT	Mr. Achmad Setiadi Mr. Unggul Prijanto

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
Aug. 25 (Mon.)	08:00 - 11:30	Power Plant, Kupang	Mr. Halomon Tobing Mr. Made Artha Mr. Slamet Riyanto
		BPPT	Mr. Suharjono
Aug. 26 (Tues.)	11:30 - 14:00	Power Plant, Bali	Mr. A. Soetjipto Mr. Nurbudi Rahardjo Mr. D. Derangin-Angin
		BPPT	Mr. Suharjono
Aug. 27 (Wed.)	11:00 - 12:30	Ministry of Communication	Mr. Maskur Effendi
		BPPT	Mr. Helmy Said
Aug. 28 (Thurs.)	09:00 - 10:30	LEMIGAS	Dr. Rachman Subroto Mr. Hendro Prawoto Mr. Hirwan Effendi
		BPPT	Mr. Bambang Suwondo Mr. Unggul Prijanto
Aug. 28 (Thurs.)	09:20 - 10:50	D.G. of Electric Power & New Energy	Mr. Maraudin Panjaitan Ms. Maritje Hutapea
		BPPT	Mr. Helmy Said

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
Aug. 29 (Fri.)	09;30 - 10:30	D.G. of Basic Chemical Industries	Mr. Soenaryo Danusaputro Mr. Jaweldin Purba Mr. H. Silaen
		BPPT	Mr. Subagio Imam Bakri Mr. Achmad Setiadi
Aug. 29 (Fri.)	09:15 - 11:30	PLN	Mr. Sudjanadi
		BPPT	Mr. Suharjono
Aug. 29 (Fri.)	13:30 - 15:00	C.B. of Statistics	Mr. Soewondo Hp. Mr. L. Ginting
		BPPT	Mr. Helmy Said
Sept. 1 (mon.)	09:00 - 12:00	MIGAS	Mr. T. Sitanggang Mr. Gono Soedimo Mr. Hasyim
Sept. 1 (Mon.)	13:30 - 16:00	PERTAMINA	Mr. L.M.L. Tobing
		BPPT	Mr. Achmad Setiadi
Sept. 1 (Mon.)	16:00 - 17:00	BPPT	Dr. Zuhal Mr. Subagio Imam Bakri
Sept. 2 (Tues.)	09:30 - 11:00	Ministry of Communication	Mr. Maskur Effendi Mr. Panal S. Mr. Soemanto Mr. Toga Hutabarat
		BPPT	Mr. Helmy Said Mr. Unggul Prijanto

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
Sept. 2 (Tues.)	12:30 - 13:30	PLN	Mr. Sudjanadi
		BPPT	Mr. Suharjono
Sept. 2 (Tues.)	13:00 - 15:00	C.B. of Statistics	Mr. Soewondo Hp. Mr. L. Ginting
		BPPT	Mr. Helmy Said
Sept. 3 (Wed.)	09:20 - 12:00	PERTAMINA	Mr. Bambang Pitoyo Mr. Javed Sumbung Mr. Santoso Koerdi B.Sc.
		BPPT	Mr. Achmad Setiadi
Sept. 3 (Wed.)	10:00 - 11:30	State Ministry of Population & Environment	Mr. Hendra Setiawan Ms. Sri Hudyastuti
		BPPT	Mr. Suharjono
Sept. 3 (Wed.)	13:00 - 15:00	BPPT	Mr. Ayusak Lubis Mr. Fathor Rahman Mr. Helmy Said Mr. Achmad Setiadi Mr. Unggul Prijanto
Sept. 4 (Thurs.)	10:00 - 11:30	The State Ministry for Population & Environment	Mr. Hendra Setiawan Ms. Sri Hudyastuti
	11:00 - 15:00	Dumai Refinery	Mr. Djunarto Mr. Achmadi Mr. Asyhab

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
Sept. 4 (Thurs.)	16:00 - 17:00	BPPT	Ms. Saraswati
		(PD ANEKA KIMIA)	Mr. Dwipurwo Pangarso

Schedule, Organization and Personnel

visited by the Study Team (D)

Date	Time	Name of Organization	Name of Attendant
March 2	09.30 - 10.30	JICA	MR. AOKI
	13.00 - 16.00	BPPT	DR. WARDIMAN
			MR. SUBAGIO
			MR. BAMBANG
			DR. ZUHAL
March 3	09.00 - 11.00	BPPT	MR. SUBAGIO
			MR. BAMBANG
			MR. SASAGURI
	15.00 - 18.00	BPPT	DR. WARDIMAN
			DR. ZUHAL
			MR. SUBAGIO
			MR. BAMBANG
			MR. SETIADI
March 4	08.00 - 15.00	PUSPIPTEK	JICA OPERATION GROUP
			DR. LOLO
			MR. SUHARJONO
			MR. MAHALLY

Date	Time	Name of Organization	Name of Attendant
March 5	09.30 - 12.00		MR. SETIADI DR. LOLO JICA OPERATION GROUP
March 5	15.30 - 18.30	BPPT	DR. WARDIMAN MR. SUBAGIO MR. SETIADI MR. UNGGUL
March 6	10.00 - 11.00	JICA	MR. ENDO (Part time) MR. AOKI
	17.00 - 18.30	BPPT	MR. WARDIMAN MR. SUBAGIO MR. SETIADI MR. UNGGLE
March 7	08.30 - 16.00	PUSPIPTEK	MR. SETIADI MR. MAHALLY MR. SUBAGIO JICA OPERATION GROUP
MARCH 8	14.00 - 16.00	PUSPIPTEK	MR. SETIADI

Date	Time	Name of Organization	Name of Attendant
			MR. SUHARJONO MR. SUBAGIO MR. BAMBANG JICA OPERATION GROUP
March 9	08.30 - 12.00	PUSPIPTEK	(DEMONSTRATION CEREMONY)
	16.00 - 17.30	BPPT	DR. WARDIMAN (Part time) MR. SUBAGIO MR. BAMBANG
March 12	08.00 - 09.30	BPPT	DR. WARDIMAN MR. SUBAGIO MR. BAMBANG MR. SETIADI MR. SUHARJONO MR. UNGGLE MR. EDDY MR. TEDDY
March 13	14.30 - 15.30	BPPT	DR. ZUHAL MR. BAMBANG MR. SETIADI MR. UNGGLE

March 5	08.30 - 11.30	BPPT	IR. SUBAGIO IMAN BAKRI IR. UNGGLE PUJANTO
March 6	08.30 - 11.30	PPTM	IR. KOMAR PRIATNA ANWAR MOCHAMMAD ROCHIM B.E.
March 7	08.30 - 14.00	PPTM	IR. YUYUN BASYUNI MOCHAMMAD ROCHIM B.E.
March 10	09.30 - 12.00	BPPT	IR. SUBAGIO IMAN BAKRI IR. ACHMAD SETIADI IR.UNGGLE PUJANTO IR. BAMBANG SWONDO
March 11	10.00 - 12.00	PPTM BPPT	IR. KOMAR PRIATNA ANWAR IR. SUBAGIO IMAN BAKRI IR. ACHMAD SETIADI

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
March 10 (Tues.)	10:00 - 12:00	MIGAS	T. Sitanggang Gono Sudimo
		BPPT	Helmy Said Eddy Novi Teddy
March 10 (Tues.)	14:20 - 15:40	C.B. of Statistics	Soewondo Soeprono
		BPPT	Eddy Novi Teddy
March 11 (Wed.)	09:00 - 11:30	PERTAMINA	H. Sudradjat P.K. Tobing
		BPPT	Helmy Said Eddy Novi Teddy
March 12 (Thurs.)	09:00 - 10:30	PLN	Sudjanadi
		BPPT	Helmy Said Dwi Novi
March 12 (Thurs.)	11:00 - 12:00	D.G. of E.P & N.E	M. Hutapea
		BPPT	Dwi Novi
March 13 (Fri.)	09:00 - 11:30	BPPT	Helmy Said A. Setiadi Eddy Novi Teddy Dwi

APPENDIX III

List of Documents, DWGs and Data

Submitted by the Counterpart

1. The Implementation of Energy Policy in Indonesia

2. Brochure of Cilacap Refinery

3. Brochure of Balikpapan Refinery

4. Brochure of Dumai Refinery

5. Energy Consumption by Sector (1975-1984)

6. A Field Survey Report on Social Economic Condition at Transmigration Area

7. Peak Load Production and Installed Capacity (April, 1986) PLN Region JAVA (Table-6)/PLN Region Outside JAVA (Table-3)

8. PERKEMBANGAN PENJUALAN BBM DALAM NEGERI SELAMA III DASAWARSA 1950 - 1984, by Hirwan Effendi (Lemigas) (Production of crude oil and sales of BBM in last 35 years)

9. Electricity supply by PLM in Indonesia 1983/84, 1984/85

10. IKHTISAR TARIP DASAR LISTRIK 1986 (PLM) (Tariff Table)

11. Review of Repelita IV (By PLN) (June 30, 1985)
    - Peak Load, Production and Installed Capacity (Java, outside Java)
    - Energy Production, Fuel Consumption and Fuel Cost (Java, outside Java)

12. DAEPAR KERJA PLN WILAYAH XI DENPSAR (Power Plant Map in PLM WILAYAH XI)

13. Number of VA Connected per Group of Tariff (June 1986)

14. Number of Connected per Group of Tariff (June 1986)

15. Number of KWH Distributed (sales) per Group of Tariff (June 1986)

16. Methanol Industry

17. Ethanol Industry

18. Demand for Methanol to Industrial Sector

19. Demand for Ethanol to Industrial Sector

20. Demand for Ethanol (spiritus) to Industrial Sector

21. Distribution System and Relevant Facilities by Ethanol Plant

22. Distribution System and Relevant Facilities by Ethanol Plant

23. System for Methanol Transportation

24. Projection of Methanol Consumption according to Region

25. Projection of Ethanol Consumption according to Region

26. Alcohol Industry

27. Energy Planning for Development (Phase II) Sep. 1985
Energy/Development Int'l with Int'l Development and Energy
Associates, P. T. Cipkocon

28. Energy Conservation in Indonesia (Final Report) by [Trans Energy
for DG Listrik dan Energi Baru]

29. Agency for R&D in Dept of Communication Data and Energy
Information for Transportation Sector (Indonesian language)

30. INDONESIAN MINING YEAR BOOK 1984

APPENDIX IV

Member List of the JICA Mission

STUDY TEAM A

Explanation and Discussion with Counterpart

NAME	UNDERTAKING	AREA OF EXPERTISE
Takehiko SATO	Team Leader	Registered Consulting Engineer in Mechanical Engineering
Taizo HAYASHI	Energy Demand Forecast	Evaluation of Alternative Energy
Ryo SUZUKI	Methanol Production & Distribution System	Chemical Engineer
Toshitaka YANAGI	Test Plant Building	Authorized Building Engineer

STUDY TEAM B

Coal Sampling for Gasification Test

NAME	UNDERTAKING	AREA OF EXPERTISE
Shozo IDA	Leader of Coal Mining	Mining Engineer
Tomoya KIKUCHI	Coal Mining	Mining Engineer
Hajime NOZAKI	Coal Mining	Mining Engineer
Atsushi NAKAI	Equipment Installation	Chemical Analyst
Tatsuya YONEMITSU	Mining Cost Estimation	Mining Engineer

STUDY TEAM C

Survey on the Supply System of the Fuel Alcohol Market

NAME	UNDERTAKING	AREA OF EXPERTISE
Takehiko SATO	Team Leader	Registered Consulting Engineer in Mechanical Engineering
Taizo HAYASHI	Energy Demand Forecast	Evaluation of Alternative Energy
Ryo SUZUKI	Methanol Production & Distribution System	Chemical Engineer
Masayoshi SOGA	Demand Projection of Fuel Alcohol	Chemical Engineer
Satoru NISHIYAMA	Ethanol Production & Distribution System	Chemical Engineer
Kenjiro TAKASE	Utilization Technology of Fuel Alcohol	Mechanical Engineer
Hamao HAYASHI	Environment and Satety	Applied Chemistry

STUDY TEAM D

Supervision of the Installation Work of
the Coal Gasification Test Facilities

NAME	UNDERTAKING	AREA OF EXPERTISE
Hirotaka SASAGURI	Team Leader of the Test Plant Construction	Mining Planning
Ichiro TANIWAKI	Mechanical Construction	Mechanical Engineer
Toru MURAKAMI	Control of Electrical Work and Instrumentation	Electrical Engineer

STUDY TEAM E

Test Operation of the Coal Gasification Test Facilities

NAME	UNDERTAKING	AREA OF EXPERTISE
Takehiko SATO	Team Leader	Registered Consulting Engineer in Mechanical Engineering
Toshitaka YANAGI	Leader of Test Operation	Authorized Building Engineer
Yoshiharu NAKASITA	Design of Electric System	Electrical Engineer
Yasuaki HATAKEYAMA	Process Analysis	Technology of Coal Utilization
Koichi TANAKA	Test Plant Operation	Mechanical Operation
Shinji SUGIMOTO	Instrumentation	Electrical Engineer
Shigeharu YAMAGUCHI	Furnace Construction	Furnace
Kimikazu OTANI	Melting Furnace Controll	Furnace
Noboru ENDO	Melting Furnace Operation	Operation of Blast Furnace
Masanobu KOBATAKE	Gasification Furnace Operation	Operation of Gas Furnace

STUDY TEAM F

Explanation and Discussion with Counterpart

NAME	UNDERTAKING	AREA OF EXPERTISE
Takehiko SATO	Team Leader	Registered Consulting Engineer in Mechanical engineering
Tomoya KIKUCHI	Coal Mining	Mining Engineer
Taizo HAYASHI	Energy Demand Forecast	Evaluation of Alternative Energy

APPENDIX V

BANKO COAL GASIFICATION

TEST PLANT

FINAL DRAWINGS

(Separate Volume)

APPENDIX VI

Techinical Specifications for the Construction Work
(Separate Volume)

1) Project Specification
2) Requisition
3) Request for Quotation

APPENDIX VII

Operation Procedure & Maintenance Manual
(Separate Volume)

APPENDIX VIII

Computer Printout

- Urea Production Cost -

CASE U - 3 ﾆｮｳｿ PRICE 40000

UNIT= MILLION RUPIAH

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* P / L *											
* ﾒﾀﾉｰﾙ											
VOLUME (M.M.TON)	0.00	0.00	0.00	0.00	0.91	1.10	1.30	1.30	1.30	1.30	1.30
PRICE (RUPIAH/TON)	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906
* ﾆｮｳｿ											
VOLUME (M.M.TON)	0.00	0.00	0.00	0.00	0.39	0.48	0.56	0.56	0.56	0.56	0.56
PRICE (RUPIAH/TON)	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607
REVENUE	0	0	0	0	263,324	319,751	376,177	376,177	376,177	376,177	376,177
VARIABLE COSTS TOTA	0	0	0	0	62,738	70,501	79,230	77,300	75,370	74,404	74,404
RAW MATERIALS	0	0	0	0	47,414	57,574	67,734	67,734	67,734	67,734	67,734
CATALYST/CHEMICALS	0	0	0	0	2,327	2,825	3,324	3,324	3,324	3,324	3,324
PERSONALS	0	0	0	0	12,997	10,102	8,172	6,242	4,311	3,346	3,346
(LOCAL STAFF)	0	0	0	0	3,346	3,346	3,346	3,346	3,346	3,346	3,346
(JAPANESE STAFF)	0	0	0	0	9,651	6,756	4,825	2,895	965	0	0
CONSTANT COSTS TOTA	0	0	0	0	168,943	168,943	168,943	168,943	168,943	168,943	168,943
DEP & AMORT	0	0	0	0	129,095	129,095	129,095	129,095	129,095	129,095	129,095
MAINTENANCE	0	0	0	0	28,463	28,463	28,463	28,463	28,463	28,463	28,463
INSURANCE	0	0	0	0	11,385	11,385	11,385	11,385	11,385	11,385	11,385
OTHER DIRECT COSTS	0	0	0	0	12,997	12,997	12,997	12,997	12,997	12,997	12,997
ADMINISTRATIVE COST	0	0	0	0	6,499	6,499	6,499	6,499	6,499	6,499	6,499
INTEREST PAID	0	0	0	0	84,648	77,904	66,583	52,449	38,873	27,160	16,296
(LONG)	0	0	0	0	81,480	70,616	59,752	48,888	38,024	27,160	16,296
(SHORT)	0	0	0	0	3,168	7,288	6,831	3,561	850	0	0
TOTAL EXPENSES	0	0	0	0	335,825	336,844	334,252	318,187	302,682	290,003	279,139
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	0	0	0	0	-72,501	-17,094	41,925	57,990	73,495	86,174	97,038
TAX	0	0	0	0	0	0	0	4,748	33,808	39,640	44,637
NET PROFIT	0	0	0	0	-72,501	-17,094	41,925	53,242	39,687	46,534	52,401
RETAINED EARNING	0	0	0	0	-72,501	-89,594	-47,669	5,574	45,261	91,795	144,196

** INDONESIA パンコタン PROJECT PAGE 2 (87/01/27)

CASE U - 3 ニヨウソ PRICE 40000 UNIT= MILLION RUPIAH

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* P / L *											
* メタノール											
VOLUME (M.M.TON)	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
PRICE (RUPIAH/TON)	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906
* ニヨウソ											
VOLUME (M.M.TON)	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
PRICE (RUPIAH/TON)	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607
REVENUE	376,177	376,177	376,177	376,177	376,177	376,177	376,177	376,177	376,177	376,177	376,177
VARIABLE COSTS TOTA	74,404	74,404	74,404	74,404	74,404	74,404	74,404	74,404	74,404	74,404	74,404
RAW MATERIALS	67,734	67,734	67,734	67,734	67,734	67,734	67,734	67,734	67,734	67,734	67,734
CATALYST/CHEMICALS	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324
PERSONALS	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346
(LOCAL STAFF)	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	168,943	168,943	168,943	59,977	59,977	59,977	59,977	59,977	39,848	39,848	39,848
DEP & AMORT	129,095	129,095	129,095	20,129	20,129	20,129	20,129	20,129	0	0	0
MAINTENANCE	28,463	28,463	28,463	28,463	28,463	28,463	28,463	28,463	28,463	28,463	28,463
INSURANCE	11,385	11,385	11,385	11,385	11,385	11,385	11,385	11,385	11,385	11,385	11,385
OTHER DIRECT COSTS	12,997	12,997	12,997	12,997	12,997	12,997	12,997	12,997	12,997	12,997	12,997
ADMINISTRATIVE COST	6,499	6,499	6,499	6,499	6,499	6,499	6,499	6,499	6,499	6,499	6,499
INTEREST PAID	5,432	0	0	0	0	0	0	0	0	0	0
(LONG)	5,432	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENSES	268,275	262,843	262,843	153,877	153,877	153,877	153,877	153,877	133,748	133,748	133,748
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	107,902	113,334	113,334	222,300	222,300	222,300	222,300	222,300	242,429	242,429	242,429
TAX	49,635	52,134	52,134	102,258	102,258	102,258	102,258	102,258	111,518	111,518	111,518
NET PROFIT	58,267	61,200	61,200	120,042	120,042	120,042	120,042	120,042	130,912	130,912	130,912
RETAINED EARNING	202,463	263,663	324,863	444,905	564,947	684,989	805,031	925,073	1,055,985	1,186,897	1,317,809

** INDONESIA ｶﾞｿﾘﾝ PROJECT PAGE 3 (87/01/27)

CASE U - 3 ﾆｮｳｿ PRICE 40000 UNIT= MILLION RUPIAH

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* P / L *											
* ﾒﾀﾉｰﾙ											
VOLUME (M.M.TON)	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
PRICE (RUPIAH/TON)	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906	193,906
* ﾆｮｳｿ											
VOLUME (M.M.TON)	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
PRICE (RUPIAH/TON)	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607	221,607
REVENUE	376,177	376,177	376,177	376,177	376,177	376,177	376,177	376,177	376,177	376,177	376,177
VARIABLE COSTS TOTA	74,404	74,404	74,404	74,404	74,404	74,404	74,404	74,404	74,404	74,404	74,404
RAW MATERIALS	67,734	67,734	67,734	67,734	67,734	67,734	67,734	67,734	67,734	67,734	67,734
CATALYST/CHEMICALS	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324	3,324
PERSONALS	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346
(LOCAL STAFF)	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346	3,346
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	39,848	39,848	39,848	39,848	39,848	39,848	39,848	39,848	39,848	39,848	39,848
DEP & AMORT	0	0	0	0	0	0	0	0	0	0	0
MAINTENANCE	28,463	28,463	28,463	28,463	28,463	28,463	28,463	28,463	28,463	28,463	28,463
INSURANCE	11,385	11,385	11,385	11,385	11,385	11,385	11,385	11,385	11,385	11,385	11,385
OTHER DIRECT COSTS	12,997	12,997	12,997	12,997	12,997	12,997	12,997	12,997	12,997	12,997	12,997
ADMINISTRATIVE COST	6,499	6,499	6,499	6,499	6,499	6,499	6,499	6,499	6,499	6,499	6,499
INTEREST PAID	0	0	0	0	0	0	0	0	0	0	0
(LONG)	0	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENSES	133,748	133,748	133,748	133,748	133,748	133,748	133,748	133,748	133,748	133,748	133,748
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429
TAX	111,518	111,518	111,518	111,518	111,518	111,518	111,518	111,518	111,518	111,518	111,518
NET PROFIT	130,912	130,912	130,912	130,912	130,912	130,912	130,912	130,912	130,912	130,912	130,912
RETAINED EARNING	1,448,721	1,579,633	1,710,545	1,841,456	1,972,368	2,103,280	2,234,192	2,365,104	2,496,016	2,626,927	2,757,839

CASE U - 3 ﾆｮｳｿ PRICE 40000

UNIT= MILLION RUPIAH

	2023	TOTAL
* P / L *		
* ﾒﾀﾉｰﾙ		
VOLUME (M.M.TON)	1.30	38.41
PRICE (RUPIAH/TON)	193,906	
* ﾆｮｳｿ		
VOLUME (M.M.TON)	0.56	16.55
PRICE (RUPIAH/TON)	221,607	
REVENUE	376,177	11,116,038
VARIABLE COSTS TOTA	74,404	2,225,249
RAW MATERIALS	67,734	2,001,542
CATALYST/CHEMICALS	3,324	98,227
PERSONALS	3,346	125,480
(LOCAL STAFF)	3,346	100,388
(JAPANESE STAFF)	0	25,093
CONSTANT COSTS TOTA	39,848	2,587,030
DEP & AMORT	0	1,391,601
MAINTENANCE	26,463	853,878
INSURANCE	11,385	341,551
OTHER DIRECT COSTS	12,997	389,917
ADMINISTRATIVE COST	6,499	194,956
INTEREST PAID	0	369,344
(LONG)	0	347,646
(SHORT)	0	21,698
TOTAL EXPENSES	133,748	5,766,499
INTEREST RECEIVED	0	0
PROFIT BEF TAX	242,429	5,349,539
TAX	111,518	2,460,788
NET PROFIT	130,912	2,888,751
RETAINED EARNING	2,888,751	

CASE U - 3 ﾁｯﾌﾟ PRICE 40000

UNIT= MILLION RUPIAH

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* C / F *											
CASH-IN											
PROFIT BEF TAX	0	0	0	0	-72,501	-17,094	41,925	57,990	73,495	86,174	97,038
DEPREC. & AMORT.	0	0	0	0	129,095	129,095	129,095	129,095	129,095	129,095	129,095
EQUITY	93,212	98,978	74,029	95,913	0	0	0	0	0	0	0
DEBT (LONG)	279,636	296,933	222,088	287,738	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	79,204	23,797	0	0	0	0	0
TOTAL	372,847	395,910	296,117	383,651	135,799	135,799	171,021	187,085	202,591	215,269	226,133
CASH-OUT											
INVESTMENT TOTAL	372,847	395,910	296,117	383,651	0	0	0	0	0	0	0
(PROCESS)	250,970	250,970	167,313	167,313	0	0	0	0	0	0	0
(OTHER PLANT)	90,582	90,582	60,386	60,386	0	0	0	0	0	0	0
(WORKING)	0	0	0	56,925	0	0	0	0	0	0	0
(OPENING)	0	0	0	7,003	0	0	0	0	0	0	0
(TRANSPORTATION)	20,111	20,111	13,407	13,407	0	0	0	0	0	0	0
(TRAINING)	0	0	0	3,213	0	0	0	0	0	0	0
(IDCP)	11,185	34,246	55,009	75,402	0	0	0	0	0	0	0
TAX PAID	0	0	0	0	0	0	0	4,748	33,808	39,640	44,637
REPAYMENT TOTAL	0	0	0	0	135,799	135,799	171,021	182,338	157,041	135,799	135,799
(LONG)	0	0	0	0	135,799	135,799	135,799	135,799	135,799	135,799	135,799
(SHORT)	0	0	0	0	0	0	35,222	46,538	21,242	0	0
TOTAL	372,847	395,910	296,117	383,651	135,799	135,799	171,021	187,085	214,332	255,100	271,830
CASH (NET C/F)	0	0	0	0	0	0	0	0	11,742	39,830	45,697

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* B / S *											
CASH	0	0	0	0	0	0	0	0	11,742	51,572	97,268
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	0	0	0	56,925	56,925	56,925	56,925	56,925	56,925	56,925	56,925
FIXED ASSET	341,551	683,102	910,803	1,138,504	1,034,718	930,933	827,147	723,361	619,575	515,789	412,004
DEFERRED ASSET	31,296	85,655	154,071	253,097	227,787	202,477	177,168	151,858	126,548	101,239	75,929
TOTAL ASSET	372,847	768,758	1,064,875	1,448,526	1,319,431	1,190,335	1,061,240	932,144	814,790	725,525	642,126
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	279,636	576,568	798,656	1,086,394	950,595	814,796	678,997	543,197	407,398	271,599	135,799
DEBT (SHORT)	0	0	0	0	79,204	103,002	67,780	21,242	0	0	0
EQUITY	93,212	192,189	266,219	362,131	362,131	362,131	362,131	362,131	362,131	362,131	362,131
RETAINED EARNINGS	0	0	0	0	-72,501	-89,594	-47,669	5,574	45,261	91,795	144,196
TOTAL LIABIL & CAP	372,847	768,758	1,064,875	1,448,526	1,319,431	1,190,335	1,061,240	932,144	814,790	725,525	642,126

CASE U - 3 ﾆｮｳｿ PRICE 40000 UNIT= MILLION RUPIAH

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* C / F *											
CASH-IN											
PROFIT BEF TAX	107,902	113,334	113,334	222,300	222,300	222,300	222,300	222,300	242,429	242,429	242,429
DEPREC. & AMORT.	129,095	129,095	129,095	20,129	20,129	20,129	20,129	20,129	0	0	0
EQUITY	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	236,997	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429
CASH-OUT											
INVESTMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(PROCESS)	0	0	0	0	0	0	0	0	0	0	0
(OTHER PLANT)	0	0	0	0	0	0	0	0	0	0	0
(WORKING)	0	0	0	0	0	0	0	0	0	0	0
(OPENING)	0	0	0	0	0	0	0	0	0	0	0
(TRANSPORTATION)	0	0	0	0	0	0	0	0	0	0	0
(TRAINING)	0	0	0	0	0	0	0	0	0	0	0
(IDCP)	0	0	0	0	0	0	0	0	0	0	0
TAX PAID	49,635	52,134	52,134	102,258	102,258	102,258	102,258	102,258	111,518	111,518	111,518
REPAYMENT TOTAL	135,799	0	0	0	0	0	0	0	0	0	0
(LONG)	135,799	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	286,561	432,725	432,725	382,601	382,601	382,601	382,601	382,601	373,341	373,341	373,341
CASH (NET C/F)	51,563	190,296	190,296	140,171	140,171	140,171	140,171	140,171	130,912	130,912	130,912
* B / S *											
CASH	148,832	339,127	529,423	669,594	809,766	949,937	1,090,108	1,230,280	1,361,192	1,492,103	1,623,015
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	56,925	56,925	56,925	56,925	56,925	56,925	56,925	56,925	56,925	56,925	56,925
FIXED ASSET	308,218	204,432	100,646	80,517	60,388	40,259	20,129	0	0	0	0
DEFERRED ASSET	50,619	25,310	0	0	0	0	0	0	0	0	0
TOTAL ASSET	564,594	625,794	686,995	807,037	927,079	1,047,121	1,167,163	1,287,205	1,418,117	1,549,029	1,679,940
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
DEBT (SHORT)	0	0	0	0	0	0	0	0	0	0	0
EQUITY	362,131	362,131	362,131	362,131	362,131	362,131	362,131	362,131	362,131	362,131	362,131
RETAINED EARNINGS	202,463	263,663	324,863	444,905	564,947	684,989	805,031	925,073	1,055,985	1,186,897	1,317,809
TOTAL LIABIL & CAP	564,594	625,794	686,995	807,037	927,079	1,047,121	1,167,163	1,287,205	1,418,117	1,549,029	1,679,940

CASE U - 3 ﾆﾖｳ PRICE 40000

UNIT= MILLION RUPIAH

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* C / F *											
CASH-IN											
PROFIT BEF TAX	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429
DEPREC. & AMORT.	0	0	0	0	0	0	0	0	0	0	0
EQUITY	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429	242,429
CASH-OUT											
INVESTMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(PROCESS)	0	0	0	0	0	0	0	0	0	0	0
(OTHER PLANT)	0	0	0	0	0	0	0	0	0	0	0
(WORKING)	0	0	0	0	0	0	0	0	0	0	0
(OPENING)	0	0	0	0	0	0	0	0	0	0	0
(TRANSPORTATION)	0	0	0	0	0	0	0	0	0	0	0
(TRAINING)	0	0	0	0	0	0	0	0	0	0	0
(IDCP)	0	0	0	0	0	0	0	0	0	0	0
TAX PAID	111,518	111,518	111,518	111,518	111,518	111,518	111,518	111,518	111,518	111,518	111,518
REPAYMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(LONG)	0	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	373,341	373,341	373,341	373,341	373,341	373,341	373,341	373,341	373,341	373,341	373,341
CASH (NET C/F)	130,912	130,912	130,912	130,912	130,912	130,912	130,912	130,912	130,912	130,912	130,912

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* B / S *											
CASH	1,753,927	1,884,839	2,015,751	2,146,663	2,277,575	2,408,486	2,539,398	2,670,310	2,801,222	2,932,134	3,063,046
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	56,925	56,925	56,925	56,925	56,925	56,925	56,925	56,925	56,925	56,925	56,925
FIXED ASSET	0	0	0	0	0	0	0	0	0	0	0
DEFERRED ASSET	0	0	0	0	0	0	0	0	0	0	0
TOTAL ASSET	1,810,852	1,941,764	2,072,676	2,203,588	2,334,500	2,465,412	2,596,323	2,727,235	2,858,147	2,989,059	3,119,971
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
DEBT (SHORT)	0	0	0	0	0	0	0	0	0	0	0
EQUITY	362,131	362,131	362,131	362,131	362,131	362,131	362,131	362,131	362,131	362,131	362,131
RETAINED EARNINGS	1,448,721	1,579,633	1,710,545	1,841,456	1,972,368	2,103,280	2,234,192	2,365,104	2,496,016	2,626,927	2,757,839
TOTAL LIABIL & CAP	1,810,852	1,941,764	2,072,676	2,203,588	2,334,500	2,465,412	2,596,323	2,727,235	2,858,147	2,989,059	3,119,971

CASE U - 3 ﾆｮｳｿ PRICE 40000 UNIT= MILLION RUPIAH

	2023	TOTAL
* C / F *		
CASH-IN		
PROFIT BEF TAX	242,429	5,349,539
DEPREC. & AMORT.	0	1,391,601
EQUITY	0	362,131
DEBT (LONG)	0	1,086,394
-//- (SHORT)	0	103,002
TOTAL	242,429	8,292,668
CASH-OUT		
INVESTMENT TOTAL	0	1,448,526
(PROCESS)	0	836,565
(OTHER PLANT)	0	301,939
(WORKING)	0	56,925
(OPENING)	0	7,003
(TRANSPORTATION)	0	67,036
(TRAINING)	0	3,213
(IDCP)	0	175,845
TAX PAID	111,518	2,460,788
REPAYMENT TOTAL	0	1,189,396
(LONG)	0	1,086,394
(SHORT)	0	103,002
TOTAL	373,341	1,485,625
CASH (NET C/F)	130,912	3,193,957

* B / S *	
CASH	3,193,957
RECEIVABLE ASSET	0
INVENTORIES	56,925
FIXED ASSET	0
DEFERRED ASSET	0
TOTAL ASSET	3,250,883
PAYABLES	0
DEBT (LONG)	0
DEBT (SHORT)	0
EQUITY	362,131
RETAINED EARNINGS	2,888,751
TOTAL LIABIL & CAP	3,250,883

87/01/27
CASE U - 3 ﾆｮｳｿ PRICE 40000

I.R.R. (109) = 13.819 %

	CASH-FLOW	DIS CASH-FLOW
0	0.000	0.000
1	0.000	0.000
2	0.000	0.000
3	0.000	0.000
4	0.000	0.000
5	-361662.036	-189336.698
6	-361662.036	-166349.376
7	-241108.024	-97435.292
8	-308249.295	-109444.287
9	141242.654	44059.874
10	189905.810	52047.755
11	237603.869	57214.175
12	239534.063	50676.170
13	241464.257	44882.365
14	242429.354	39590.816
15	242429.354	34784.105
16	242429.354	30560.975
17	242429.354	26850.575
18	242429.354	23590.653
19	242429.354	20726.517
20	242429.354	18210.116
21	242429.354	15999.230
22	242429.354	14056.767
23	242429.354	12350.139
24	242429.354	10850.711
25	242429.354	9533.329
26	242429.354	8375.890
27	242429.354	7358.975
28	242429.354	6465.524
29	242429.354	5680.546
30	242429.354	4990.872
31	242429.354	4384.932
32	242429.354	3852.558
33	242429.354	3384.820
34	242429.354	2973.870
35	242429.354	2612.813
36	242429.354	2295.592
37	242429.354	2016.885
38	299354.560	2188.105
TOTAL	5894728.314	0.001

87/01/27
CASE J - 3 ニヨウソ PRICE 40000

I.R.R. (208) = 14.231 %

	CASH-FLOW	DIS CASH-FLOW
0	0.000	0.000
1	0.000	0.000
2	0.000	0.000
3	0.000	0.000
4	0.000	0.000
5	-361662.036	-185941.341
6	-361662.036	-162776.073
7	-241108.024	-94997.880
8	-251324.090	-86686.402
9	141242.654	42647.869
10	189905.810	50197.758
11	237603.869	54981.197
12	239534.063	48522.433
13	241464.257	42819.614
14	242429.354	37634.808
15	242429.354	32946.123
16	242429.354	28841.571
17	242429.354	25248.381
18	242429.354	22102.843
19	242429.354	19349.188
20	242429.354	16938.594
21	242429.354	14828.320
22	242429.354	12980.953
23	242429.354	11363.737
24	242429.354	9948.000
25	242429.354	8708.641
26	242429.354	7623.686
27	242429.354	6673.899
28	242429.354	5842.439
29	242429.354	5114.566
30	242429.354	4477.374
31	242429.354	3919.566
32	242429.354	3431.252
33	242429.354	3003.774
34	242429.354	2629.553
35	242429.354	2301.953
36	242429.354	2015.167
37	242429.354	1764.110
38	242429.354	1544.331
TOTAL	5894728.314	0.002

** INDONESIA ﾊﾞﾝｺﾗﾝ PROJECT PAGE 1 (87/01/27)

CASE U - 3 ﾆｮｳｿ PRICE 40000 UNIT= MILLION YEN

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* P / L *											
* ﾒﾀﾉｰﾙ											
VOLUME (M.M.TON)	0.00	0.00	0.00	0.00	0.91	1.10	1.30	1.30	1.30	1.30	1.30
PRICE (YEN / TON)	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000
* ﾆｮｳｿ											
VOLUME (M.M.TON)	0.00	0.00	0.00	0.00	0.39	0.48	0.56	0.56	0.56	0.56	0.56
PRICE (YEN / TON)	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
REVENUE	0	0	0	0	47,530	57,715	67,900	67,900	67,900	67,900	67,900
VARIABLE COSTS TOTA	0	0	0	0	11,324	12,725	14,301	13,953	13,604	13,430	13,430
RAW MATERIALS	0	0	0	0	8,558	10,392	12,226	12,226	12,226	12,226	12,226
CATALYST/CHEMICALS	0	0	0	0	420	510	600	600	600	600	600
PERSONALS	0	0	0	0	2,346	1,823	1,475	1,127	778	604	604
(LOCAL STAFF)	0	0	0	0	604	604	604	604	604	604	604
(JAPANESE STAFF)	0	0	0	0	1,742	1,219	871	523	174	0	0
CONSTANT COSTS TOTA	0	0	0	0	30,494	30,494	30,494	30,494	30,494	30,494	30,494
DEP & AMORT	0	0	0	0	23,302	23,302	23,302	23,302	23,302	23,302	23,302
MAINTENANCE	0	0	0	0	5,137	5,137	5,137	5,137	5,137	5,137	5,137
INSURANCE	0	0	0	0	2,055	2,055	2,055	2,055	2,055	2,055	2,055
OTHER DIRECT COSTS	0	0	0	0	2,346	2,346	2,346	2,346	2,346	2,346	2,346
ADMINISTRATIVE COST	0	0	0	0	1,173	1,173	1,173	1,173	1,173	1,173	1,173
INTEREST PAID	0	0	0	0	15,279	14,062	12,016	9,467	7,017	4,902	2,941
(LONG)	0	0	0	0	14,707	12,746	10,785	8,824	6,863	4,902	2,941
(SHORT)	0	0	0	0	572	1,316	1,233	643	153	0	0
TOTAL EXPENSES	0	0	0	0	60,616	60,800	60,332	57,433	54,634	52,346	50,385
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	0	0	0	0	-13,086	-3,085	7,568	10,467	13,266	15,554	17,515
TAX	0	0	0	0	0	0	0	857	6,102	7,155	8,057
NET PROFIT	0	0	0	0	-13,086	-3,085	7,568	9,610	7,164	8,399	9,458
RETAINED EARNING	0	0	0	0	-13,086	-16,172	-8,604	1,006	8,170	16,569	26,027

** INDONESIA ﾊﾞｿｺﾀﾞﾝ PROJECT PAGE 2 (87/01/27)

CASE U - 3 ﾆｮｳｿ PRICE 40000 UNIT= MILLION YEN

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* P / L *											
* ﾒﾀﾉｰﾙ											
VOLUME (M.M.TON)	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
PRICE (YEN / TON)	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000
* ﾆｮｳｿ											
VOLUME (M.M.TON)	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
PRICE (YEN / TON)	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
REVENUE	67,900	67,900	67,900	67,900	67,900	67,900	67,900	67,900	67,900	67,900	67,900
VARIABLE COSTS TOTA	13,430	13,430	13,430	13,430	13,430	13,430	13,430	13,430	13,430	13,430	13,430
RAW MATERIALS	12,226	12,226	12,226	12,226	12,226	12,226	12,226	12,226	12,226	12,226	12,226
CATALYST/CHEMICALS	600	600	600	600	600	600	600	600	600	600	600
PERSONALS	604	604	604	604	604	604	604	604	604	604	604
(LOCAL STAFF)	604	604	604	604	604	604	604	604	604	604	604
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	30,494	30,494	30,494	10,826	10,826	10,826	10,826	10,826	7,192	7,192	7,192
DEP & AMORT	23,302	23,302	23,302	3,633	3,633	3,633	3,633	3,633	0	0	0
MAINTENANCE	5,137	5,137	5,137	5,137	5,137	5,137	5,137	5,137	5,137	5,137	5,137
INSURANCE	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055
OTHER DIRECT COSTS	2,346	2,346	2,346	2,346	2,346	2,346	2,346	2,346	2,346	2,346	2,346
ADMINISTRATIVE COST	1,173	1,173	1,173	1,173	1,173	1,173	1,173	1,173	1,173	1,173	1,173
INTEREST PAID	980	0	0	0	0	0	0	0	0	0	0
(LONG)	980	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENSES	48,424	47,443	47,443	27,775	27,775	27,775	27,775	27,775	24,141	24,141	24,141
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	19,476	20,457	20,457	40,125	40,125	40,125	40,125	40,125	43,758	43,758	43,758
TAX	8,959	9,410	9,410	18,458	18,458	18,453	18,458	18,458	20,129	20,129	20,129
NET PROFIT	10,517	11,047	11,047	21,668	21,668	21,668	21,668	21,668	23,630	23,630	23,630
RETAINED EARNING	36,544	47,591	58,638	80,305	101,973	123,641	145,308	166,976	190,605	214,235	237,865

** INDONESIA ﾊﾞｿｺﾀﾞｿ PROJECT　　PAGE 3 (87/01/27)

CASE U - 3 ﾆﾖｳｿ PRICE 40000　　UNIT= MILLION YEN

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* P / L *											
* ﾒﾀﾉｰﾙ											
VOLUME (M.M.TON)	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
PRICE (YEN / TON)	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000
* ﾆﾖｳｿ											
VOLUME (M.M.TON)	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
PRICE (YEN / TON)	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
REVENUE	67,900	67,900	67,900	67,900	67,900	67,900	67,900	67,900	67,900	67,900	67,900
VARIABLE COSTS TOTA	13,430	13,430	13,430	13,430	13,430	13,430	13,430	13,430	13,430	13,430	13,430
RAW MATERIALS	12,226	12,226	12,226	12,226	12,226	12,226	12,226	12,226	12,226	12,226	12,226
CATALYST/CHEMICALS	600	600	600	600	600	600	600	600	600	600	600
PERSONALS	604	604	604	604	604	604	604	604	604	604	604
(LOCAL STAFF)	604	604	604	604	604	604	604	604	604	604	604
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	7,192	7,192	7,192	7,192	7,192	7,192	7,192	7,192	7,192	7,192	7,192
DEP & AMORT	0	0	0	0	0	0	0	0	0	0	0
MAINTENANCE	5,137	5,137	5,137	5,137	5,137	5,137	5,137	5,137	5,137	5,137	5,137
INSURANCE	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055
OTHER DIRECT COSTS	2,346	2,346	2,346	2,346	2,346	2,346	2,346	2,346	2,346	2,346	2,346
ADMINISTRATIVE COST	1,173	1,173	1,173	1,173	1,173	1,173	1,173	1,173	1,173	1,173	1,173
INTEREST PAID	0	0	0	0	0	0	0	0	0	0	0
(LONG)	0	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENSES	24,141	24,141	24,141	24,141	24,141	24,141	24,141	24,141	24,141	24,141	24,141
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758
TAX	20,129	20,129	20,129	20,129	20,129	20,129	20,129	20,129	20,129	20,129	20,129
NET PROFIT	23,630	23,630	23,630	23,630	23,630	23,630	23,630	23,630	23,630	23,630	23,630
RETAINED EARNING	261,494	285,124	308,753	332,383	356,012	379,642	403,272	426,901	450,531	474,160	497,790

CASE U - 3 ニョウソ PRICE 40000

UNIT= MILLION YEN

	2023	TOTAL
* P / L *		
* メタノール		
VOLUME (M.M.TON)	1.30	38.41
PRICE (YEN / TON)	35,000	
* ニョウソ		
VOLUME (M.M.TON)	0.56	16.55
PRICE (YEN / TON)	40,000	
REVENUE	67,900	2,006,445
VARIABLE COSTS TOTA	13,430	401,657
RAW MATERIALS	12,226	361,278
CATALYST/CHEMICALS	600	17,730
PERSONALS	604	22,649
(LOCAL STAFF)	604	18,120
(JAPANESE STAFF)	0	4,529
CONSTANT COSTS TOTA	7,192	466,959
DEP & AMORT	0	251,184
MAINTENANCE	5,137	154,125
INSURANCE	2,055	61,650
OTHER DIRECT COSTS	2,346	70,380
ADMINISTRATIVE COST	1,173	35,190
INTEREST PAID	0	66,667
(LONG)	0	62,750
(SHORT)	0	3,917
TOTAL EXPENSES	24,141	1,040,653
INTEREST RECEIVED	0	0
PROFIT BEF TAX	43,758	965,592
TAX	20,129	444,172
NET PROFIT	23,630	521,420
RETAINED EARNING	521,420	

CASE U - 3 ﾁｯﾌﾟ PRICE 40000 UNIT= MILLION YEN

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* C / F *											
CASH-IN											
PROFIT BEF TAX	0	0	0	0	-13,086	-3,085	7,566	10,467	13,266	15,554	17,515
DEPREC. & AMORT.	0	0	0	0	23,302	23,302	23,302	23,302	23,302	23,302	23,302
EQUITY	16,825	17,865	13,362	17,312	0	0	0	0	0	0	0
DEBT (LONG)	50,474	53,596	40,087	51,937	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	14,296	4,295	0	0	0	0	0
TOTAL	67,299	71,462	53,449	69,249	24,512	24,512	30,869	33,769	36,568	38,856	40,817
CASH-OUT											
INVESTMENT TOTAL	67,299	71,462	53,449	69,249	0	0	0	0	0	0	0
(PROCESS)	45,300	45,300	30,200	30,200	0	0	0	0	0	0	0
(OTHER PLANT)	16,350	16,350	10,900	10,900	0	0	0	0	0	0	0
(WORKING)	0	0	0	10,275	0	0	0	0	0	0	0
(OPENING)	0	0	0	1,264	0	0	0	0	0	0	0
(TRANSPORTATION)	3,630	3,630	2,420	2,420	0	0	0	0	0	0	0
(TRAINING)	0	0	0	580	0	0	0	0	0	0	0
(IDCP)	2,019	6,182	9,929	13,610	0	0	0	0	0	0	0
TAX PAID	0	0	0	0	0	0	0	857	6,102	7,155	8,057
REPAYMENT TOTAL	0	0	0	0	24,512	24,512	30,869	32,912	23,346	24,512	24,512
(LONG)	0	0	0	0	24,512	24,512	24,512	24,512	24,512	24,512	24,512
(SHORT)	0	0	0	0	0	0	6,357	8,400	3,834	0	0
TOTAL	67,299	71,462	53,449	69,249	24,512	24,512	30,869	33,769	36,687	46,045	49,065
CASH (NET C/F)	0	0	0	0	0	0	0	0	2,119	7,189	8,248

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* B / S *											
CASH	0	0	0	0	0	0	0	0	2,119	9,309	17,557
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	0	0	0	10,275	10,275	10,275	10,275	10,275	10,275	10,275	10,275
FIXED ASSET	61,650	123,300	164,400	205,500	186,767	168,033	149,300	130,567	111,833	93,100	74,367
DEFERRED ASSET	5,649	15,461	27,810	45,684	41,116	36,547	31,979	27,410	22,842	18,274	13,705
TOTAL ASSET	67,299	138,761	192,210	261,459	238,157	214,355	191,554	168,252	147,070	130,957	115,904
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	50,474	104,071	144,157	196,094	171,582	147,071	122,559	98,047	73,535	49,024	24,512
DEBT (SHORT)	0	0	0	0	14,296	18,592	12,234	3,834	0	0	0
EQUITY	16,825	34,690	48,052	65,365	65,365	65,365	65,365	65,365	65,365	65,365	65,365
RETAINED EARNINGS	0	0	0	0	-13,086	-16,172	-8,604	1,006	8,170	16,569	26,027
TOTAL LIABIL & CAP	67,299	138,761	192,210	261,459	238,157	214,855	191,554	168,252	147,070	130,957	115,904

CASE U - 3 コンク PRICE 40000 UNIT= MILLION YEN

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* C / F *											
CASH-IN											
PROFIT BEF TAX	19,476	20,457	20,457	40,125	40,125	40,125	40,125	40,125	43,758	43,758	43,758
DEPREC. & AMORT.	23,302	23,302	23,302	3,633	3,633	3,633	3,633	3,633	0	0	0
EQUITY	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	42,778	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758
CASH-OUT											
INVESTMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(PROCESS)	0	0	0	0	0	0	0	0	0	0	0
(OTHER PLANT)	0	0	0	0	0	0	0	0	0	0	0
(WORKING)	0	0	0	0	0	0	0	0	0	0	0
(OPENING)	0	0	0	0	0	0	0	0	0	0	0
(TRANSPORTATION)	0	0	0	0	0	0	0	0	0	0	0
(TRAINING)	0	0	0	0	0	0	0	0	0	0	0
(IDCP)	0	0	0	0	0	0	0	0	0	0	0
TAX PAID	6,959	9,410	9,410	18,458	18,458	18,458	18,458	18,458	20,129	20,129	20,129
REPAYMENT TOTAL	24,512	0	0	0	0	0	0	0	0	0	0
(LONG)	24,512	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	52,085	78,107	78,107	69,059	69,059	69,059	69,059	69,059	67,388	67,388	67,388
CASH (NET C/F)	9,307	34,348	34,348	25,301	25,301	25,301	25,301	25,301	23,630	23,630	23,630

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* B / S *											
CASH	26,354	61,212	95,561	120,862	146,163	171,464	196,765	222,065	245,695	269,325	292,954
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	10,275	10,275	10,275	10,275	10,275	10,275	10,275	10,275	10,275	10,275	10,275
FIXED ASSET	55,633	36,900	18,167	14,533	10,900	7,267	3,633	0	0	0	0
DEFERRED ASSET	9,137	4,568	0	0	0	0	0	0	0	0	0
TOTAL ASSET	101,909	112,956	124,003	145,670	167,338	189,005	210,673	232,340	255,970	279,600	303,229
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
DEBT (SHORT)	0	0	0	0	0	0	0	0	0	0	0
EQUITY	65,365	65,365	65,365	65,365	65,365	65,365	65,365	65,365	65,365	65,365	65,365
RETAINED EARNINGS	36,544	47,591	58,638	80,305	101,973	123,641	145,308	166,976	190,605	214,235	237,865
TOTAL LIABIL & CAP	101,909	112,956	124,003	145,670	167,338	189,005	210,673	232,340	255,970	279,600	303,229

CASE U - 3 ﾆｮｳｿ PRICE 40000

UNIT= MILLION YEN

	2023	TOTAL
* C / F *		
CASH-IN		
PROFIT BEF TAX	43,758	965,592
DEPREC. & AMORT.	0	251,184
EQUITY	0	65,365
DEBT (LONG)	0	196,094
-//- (SHORT)	0	18,592
TOTAL	43,758	1,496,827
CASH-OUT		
INVESTMENT TOTAL	0	261,459
(PROCESS)	0	151,000
(OTHER PLANT)	0	54,500
(WORKING)	0	10,275
(OPENING)	0	1,264
(TRANSPORTATION)	0	12,100
(TRAINING)	0	580
(IDCP)	0	31,740
TAX PAID	20,129	444,172
REPAYMENT TOTAL	0	214,686
(LONG)	0	196,094
(SHORT)	0	18,592
TOTAL	67,388	2,073,336
CASH (NET C/F)	23,630	576,509

* B / S *	
CASH	576,509
RECEIVABLE ASSET	0
INVENTORIES	10,275
FIXED ASSET	0
DEFERRED ASSET	0
TOTAL ASSET	586,784
PAYABLES	0
DEBT (LONG)	0
DEBT (SHORT)	0
EQUITY	65,365
RETAINED EARNINGS	521,420
TOTAL LIABIL & CAP	586,784

CASE U - 3 ﾆｮｳｿ PRICE 40000 UNIT= MILLION YEN

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* C / F *											
CASH-IN											
PROFIT BEF TAX	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758
DEPREC. & AMORT.	0	0	0	0	0	0	0	0	0	0	0
EQUITY	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758	43,758
CASH-OUT											
INVESTMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(PROCESS)	0	0	0	0	0	0	0	0	0	0	0
(OTHER PLANT)	0	0	0	0	0	0	0	0	0	0	0
(WORKING)	0	0	0	0	0	0	0	0	0	0	0
(OPENING)	0	0	0	0	0	0	0	0	0	0	0
(TRANSPORTATION)	0	0	0	0	0	0	0	0	0	0	0
(TRAINING)	0	0	0	0	0	0	0	0	0	0	0
(IDCP)	0	0	0	0	0	0	0	0	0	0	0
TAX PAID	20,129	20,129	20,129	20,129	20,129	20,129	20,129	20,129	20,129	20,129	20,129
REPAYMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(LONG)	0	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	67,388	67,388	67,388	67,388	67,388	67,388	67,388	67,388	67,388	67,388	67,388
CASH (NET C/F)	23,630	23,630	23,630	23,630	23,630	23,630	23,630	23,630	23,630	23,630	23,630

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* B / S *											
CASH	316,584	340,213	363,843	387,473	411,102	434,732	458,361	481,991	505,621	529,250	552,880
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	10,275	10,275	10,275	10,275	10,275	10,275	10,275	10,275	10,275	10,275	10,275
FIXED ASSET	0	0	0	0	0	0	0	0	0	0	0
DEFERRED ASSET	0	0	0	0	0	0	0	0	0	0	0
TOTAL ASSET	326,859	350,488	374,118	397,748	421,377	445,007	468,636	492,266	515,896	539,525	563,155
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
DEBT (SHORT)	0	0	0	0	0	0	0	0	0	0	0
EQUITY	65,365	65,365	65,365	65,365	65,365	65,365	65,365	65,365	65,365	65,365	65,365
RETAINED EARNINGS	261,494	285,124	308,753	332,383	356,012	379,642	403,272	426,901	450,531	474,160	497,790
TOTAL LIABIL & CAP	326,859	350,488	374,118	397,748	421,377	445,007	468,636	492,266	515,896	539,525	563,155

APPENDIX IX

Computer Printout

- Electricity Generation Cost -

** INDONESIA ﾊﾞｿｺﾀﾞﾝ PROJECT PAGE 1 (87/02/02)

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION RUPIAH

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* P / L *											
* ﾊﾂﾃﾞﾝ											
VOLUME (BIL.KWT)	0.00	0.00	0.00	0.00	2963.10	3598.05	4233.00	4233.00	4233.00	4233.00	4233.00
PRICE (RUPIAH/KWH	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00
REVENUE	0	0	0	0	189,638	230,275	270,912	270,912	270,912	270,912	270,912
VARIABLE COSTS TOTA	0	0	0	0	39,116	43,133	47,895	46,403	44,912	44,166	44,166
RAW MATERIALS	0	0	0	0	28,900	35,093	41,285	41,285	41,285	41,285	41,285
CATALYST/CHEMICALS	0	0	0	0	283	344	404	404	404	404	404
PERSONALS	0	0	0	0	9,934	7,696	6,205	4,714	3,222	2,476	2,476
(LOCAL STAFF)	0	0	0	0	2,476	2,476	2,476	2,476	2,476	2,476	2,476
(JAPANESE STAFF)	0	0	0	0	7,457	5,220	3,729	2,237	746	0	0
CONSTANT COSTS TOTA	0	0	0	0	128,515	128,515	128,515	128,515	128,515	128,515	128,515
DEP & AMORT	0	0	0	0	98,886	98,886	98,886	98,886	98,886	98,886	98,886
MAINTENANCE	0	0	0	0	21,163	21,163	21,163	21,163	21,163	21,163	21,163
INSURANCE	0	0	0	0	8,465	8,465	8,465	8,465	8,465	8,465	8,465
OTHER DIRECT COSTS	0	0	0	0	9,934	9,934	9,934	9,934	9,934	9,934	9,934
ADMINISTRATIVE COST	0	0	0	0	4,970	4,970	4,970	4,970	4,970	4,970	4,970
INTEREST PAID	0	0	0	0	65,764	60,886	52,581	42,027	31,266	21,433	12,632
(LONG)	0	0	0	0	63,162	54,741	46,319	37,897	29,476	21,054	12,632
(SHORT)	0	0	0	0	2,602	6,145	6,262	4,129	1,790	379	0
TOTAL EXPENSES	0	0	0	0	248,299	247,437	243,894	231,849	219,596	209,018	200,217
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	0	0	0	0	-58,661	-17,162	27,018	39,063	51,316	61,894	70,695
TAX	0	0	0	0	0	0	0	0	19,124	28,471	32,520
NET PROFIT	0	0	0	0	-58,661	-17,162	27,018	39,063	32,192	33,423	38,175
RETAINED EARNING	0	0	0	0	-58,661	-75,823	-48,805	-9,741	22,450	55,873	94,049

** INDONESIA パンコダン PROJECT PAGE 2 (87/02/02)

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION RUPIAH

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* P / L *											
* ハツデン											
VOLUME (BIL.KWT)	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00
PRICE (RUPIAH/KWH)	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00
REVENUE	270,912	270,912	270,912	270,912	270,912	270,912	270,912	270,912	270,912	270,912	270,912
VARIABLE COSTS TOTA	44,166	44,166	44,166	44,166	44,166	44,166	44,166	44,166	44,166	44,166	44,166
RAW MATERIALS	41,285	41,285	41,285	41,285	41,285	41,285	41,285	41,285	41,285	41,285	41,285
CATALYST/CHEMICALS	404	404	404	404	404	404	404	404	404	404	404
PERSONALS	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476
(LOCAL STAFF)	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	128,515	128,515	128,515	48,613	48,613	48,613	48,613	48,613	29,629	29,629	29,629
DEP & AMORT	98,886	98,886	98,886	18,984	18,984	18,984	18,984	18,984	0	0	0
MAINTENANCE	21,163	21,163	21,163	21,163	21,163	21,163	21,163	21,163	21,163	21,163	21,163
INSURANCE	8,465	8,465	8,465	8,465	8,465	8,465	8,465	8,465	8,465	8,465	8,465
OTHER DIRECT COSTS	9,934	9,934	9,934	9,934	9,934	9,934	9,934	9,934	9,934	9,934	9,934
ADMINISTRATIVE COST	4,970	4,970	4,970	4,970	4,970	4,970	4,970	4,970	4,970	4,970	4,970
INTEREST PAID	4,211	0	0	0	0	0	0	0	0	0	0
(LONG)	4,211	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENSES	191,795	187,585	187,585	107,682	107,682	107,682	107,682	107,682	88,698	88,698	88,698
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	79,117	83,327	83,327	163,230	163,230	163,230	163,230	163,230	182,214	182,214	182,214
TAX	36,394	38,331	38,331	75,086	75,086	75,086	75,086	75,086	83,818	83,818	83,818
NET PROFIT	42,723	44,997	44,997	88,144	88,144	88,144	88,144	88,144	98,396	98,396	98,396
RETAINED EARNING	136,772	181,768	226,765	314,909	403,053	491,197	579,341	667,485	765,881	864,276	962,672

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION RUPIAH

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* P / L *											
* ﾊﾂﾃﾞﾝ											
VOLUME (BIL.KWT)	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00
PRICE (RUPIAH/KWH)	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00
REVENUE	270,912	270,912	270,912	270,912	270,912	270,912	270,912	270,912	270,912	270,912	270,912
VARIABLE COSTS TOTA	44,166	44,166	44,166	44,166	44,166	44,166	44,166	44,166	44,166	44,166	44,166
RAW MATERIALS	41,285	41,285	41,285	41,285	41,285	41,285	41,285	41,285	41,285	41,285	41,285
CATALYST/CHEMICALS	404	404	404	404	404	404	404	404	404	404	404
PERSONALS	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476
(LOCAL STAFF)	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476	2,476
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	29,629	29,629	29,629	29,629	29,629	29,629	29,629	29,629	29,629	29,629	29,629
DEP & AMORT	0	0	0	0	0	0	0	0	0	0	0
MAINTENANCE	21,163	21,163	21,163	21,163	21,163	21,163	21,163	21,163	21,163	21,163	21,163
INSURANCE	8,465	8,465	8,465	8,465	8,465	8,465	8,465	8,465	8,465	8,465	8,465
OTHER DIRECT COSTS	9,934	9,934	9,934	9,934	9,934	9,934	9,934	9,934	9,934	9,934	9,934
ADMINISTRATIVE COST	4,970	4,970	4,970	4,970	4,970	4,970	4,970	4,970	4,970	4,970	4,970
INTEREST PAID	0	0	0	0	0	0	0	0	0	0	0
(LONG)	0	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENSES	88,698	88,698	88,698	88,698	88,698	88,698	88,698	88,698	88,698	88,698	88,698
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214
TAX	83,818	83,818	83,818	83,818	83,818	83,818	83,818	83,818	83,818	83,818	83,818
NET PROFIT	98,396	98,396	98,396	98,396	98,396	98,396	98,396	98,396	98,396	98,396	98,396
RETAINED EARNING	1,061,067	1,159,463	1,257,858	1,356,254	1,454,649	1,553,045	1,651,440	1,749,836	1,848,232	1,946,627	2,045,023

CASE E - 4 (PRICE= 11.552¥/KWH)

UNIT= MILLION RUPIAH

	2023	TOTAL
* P / L *		
* ﾊﾂﾃﾞﾝ		
VOLUME (BIL.KWT)	4233.00	125085.15
PRICE (RUPIAH/KWH)	64.00	
REVENUE	270,912	8,005,449
VARIABLE COSTS TOTA	44,166	1,325,614
RAW MATERIALS	41,285	1,219,981
CATALYST/CHEMICALS	404	11,951
PERSONALS	2,476	93,682
(LOCAL STAFF)	2,476	74,294
(JAPANESE STAFF)	0	19,388
CONSTANT COSTS TOTA	29,629	1,972,650
DEP & AMORT	0	1,083,786
MAINTENANCE	21,163	634,903
INSURANCE	8,465	253,961
OTHER DIRECT COSTS	9,934	298,006
ADMINISTRATIVE COST	4,970	149,086
INTEREST PAID	0	290,801
(LONG)	0	269,493
(SHORT)	0	21,308
TOTAL EXPENSES	88,698	4,036,157
INTEREST RECEIVED	0	0
PROFIT BEF TAX	182,214	3,969,293
TAX	83,818	1,825,875
NET PROFIT	98,396	2,143,418
RETAINED EARNING	2,143,418	

** INDONESIA ﾊﾞｶﾞｽ PROJECT PAGE 5 (87/02/02)

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION RUPIAH

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* C / F *											
CASH-IN											
PROFIT BEF TAX	0	0	0	0	-58,661	-17,162	27,018	39,063	51,316	61,894	70,695
DEPREC. & AMORT.	0	0	0	0	98,886	98,886	98,886	98,886	98,886	98,886	98,886
EQUITY	72,693	77,190	57,733	73,106	0	0	0	0	0	0	0
DEBT (LONG)	218,080	231,569	173,200	219,317	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	65,045	23,546	0	0	0	0	0
TOTAL	290,773	308,759	230,933	292,423	105,271	105,271	125,904	137,950	150,202	160,781	169,581
CASH-OUT											
INVESTMENT TOTAL	290,773	308,759	230,933	292,423	0	0	0	0	0	0	0
(PROCESS)	168,532	168,532	112,355	112,355	0	0	0	0	0	0	0
(OTHER PLANT)	85,429	85,429	56,953	56,953	0	0	0	0	0	0	0
(WORKING)	0	0	0	39,102	0	0	0	0	0	0	0
(OPENING)	0	0	0	4,305	0	0	0	0	0	0	0
(TRANSPORTATION)	28,089	28,089	18,726	18,726	0	0	0	0	0	0	0
(TRAINING)	0	0	0	2,382	0	0	0	0	0	0	0
(IDCP)	8,723	26,709	42,900	58,601	0	0	0	0	0	0	0
TAX PAID	0	0	0	0	0	0	0	0	19,124	28,471	32,520
REPAYMENT TOTAL	0	0	0	0	105,271	105,271	125,904	137,950	131,078	114,742	105,271
(LONG)	0	0	0	0	105,271	105,271	105,271	105,271	105,271	105,271	105,271
(SHORT)	0	0	0	0	0	0	20,633	32,679	25,807	9,471	0
TOTAL	290,773	308,759	230,933	292,423	105,271	105,271	125,904	137,950	150,202	178,348	201,372
CASH (NET C/F)	0	0	0	0	0	0	0	0	0	17,567	31,791

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* B / S *											
CASH	0	0	0	0	0	0	0	0	0	17,567	49,358
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	0	0	0	39,102	39,102	39,102	39,102	39,102	39,102	39,102	39,102
FIXED ASSET	253,961	507,922	677,230	846,537	771,376	696,214	621,053	545,891	470,729	395,568	320,406
DEFERRED ASSET	36,812	91,610	153,235	237,249	213,524	189,799	166,074	142,349	118,624	94,899	71,175
TOTAL ASSET	290,773	599,532	830,465	1,122,889	1,024,002	925,116	826,229	727,343	628,456	547,137	480,042
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	218,080	449,649	622,849	842,166	736,896	631,625	526,354	421,083	315,812	210,542	105,271
DEBT (SHORT)	0	0	0	0	65,045	88,591	67,958	35,279	9,471	0	0
EQUITY	72,693	149,883	207,616	280,722	280,722	280,722	280,722	280,722	280,722	280,722	280,722
RETAINED EARNINGS	0	0	0	0	-58,661	-75,823	-48,805	-9,741	22,450	55,873	94,049
TOTAL LIABIL & CAP	290,773	599,532	830,465	1,122,889	1,024,002	925,116	826,229	727,343	628,456	547,137	480,042

CASE E - 4 (PRICE= 11.552¢/KWH) UNIT= MILLION RUPIAH

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* C / F *											
CASH-IN											
PROFIT BEF TAX	79,117	83,327	83,327	163,230	163,230	163,230	163,230	163,230	182,214	182,214	182,214
DEPREC. & AMORT.	98,886	98,886	98,886	18,984	18,984	18,984	18,984	18,984	0	0	0
EQUITY	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	178,003	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214
CASH-OUT											
INVESTMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(PROCESS)	0	0	0	0	0	0	0	0	0	0	0
(OTHER PLANT)	0	0	0	0	0	0	0	0	0	0	0
(WORKING)	0	0	0	0	0	0	0	0	0	0	0
(OPENING)	0	0	0	0	0	0	0	0	0	0	0
(TRANSPORTATION)	0	0	0	0	0	0	0	0	0	0	0
(TRAINING)	0	0	0	0	0	0	0	0	0	0	0
(IDCP)	0	0	0	0	0	0	0	0	0	0	0
TAX PAID	36,394	38,331	38,331	75,086	75,086	75,086	75,086	75,086	83,818	83,818	83,818
REPAYMENT TOTAL	105,271	0	0	0	0	0	0	0	0	0	0
(LONG)	105,271	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	214,342	326,097	326,097	289,342	289,342	289,342	289,342	289,342	280,609	280,609	280,609
CASH (NET C/F)	36,339	143,883	143,883	107,128	107,128	107,128	107,128	107,128	98,396	98,396	98,396

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* B / S *											
CASH	85,697	229,580	373,463	480,592	587,720	694,848	801,977	909,105	1,007,500	1,105,896	1,204,291
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	39,102	39,102	39,102	39,102	39,102	39,102	39,102	39,102	39,102	39,102	39,102
FIXED ASSET	245,245	170,083	94,922	75,937	56,953	37,969	18,984	0	0	0	0
DEFERRED ASSET	47,450	23,725	0	0	0	0	0	0	0	0	0
TOTAL ASSET	417,494	462,491	507,487	595,631	683,775	771,919	860,063	948,207	1,046,603	1,144,998	1,243,394
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
DEBT (SHORT)	0	0	0	0	0	0	0	0	0	0	0
EQUITY	280,722	280,722	280,722	280,722	280,722	280,722	280,722	280,722	280,722	280,722	280,722
RETAINED EARNINGS	136,772	181,768	226,765	314,909	403,053	491,197	579,341	667,485	765,881	864,276	962,672
TOTAL LIABIL & CAP	417,494	462,491	507,487	595,631	683,775	771,919	860,063	948,207	1,046,603	1,144,998	1,243,394

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION RUPIAH

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* C / F *											
CASH-IN											
PROFIT BEF TAX	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214
DEPREC. & AMORT.	0	0	0	0	0	0	0	0	0	0	0
EQUITY	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214	182,214
CASH-OUT											
INVESTMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(PROCESS)	0	0	0	0	0	0	0	0	0	0	0
(OTHER PLANT)	0	0	0	0	0	0	0	0	0	0	0
(WORKING)	0	0	0	0	0	0	0	0	0	0	0
(OPENING)	0	0	0	0	0	0	0	0	0	0	0
(TRANSPORTATION)	0	0	0	0	0	0	0	0	0	0	0
(TRAINING)	0	0	0	0	0	0	0	0	0	0	0
(IDCP)	0	0	0	0	0	0	0	0	0	0	0
TAX PAID	83,818	83,818	83,818	83,818	83,818	83,818	83,818	83,818	83,818	83,818	83,818
REPAYMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(LONG)	0	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	280,609	280,609	280,609	280,609	280,609	280,609	280,609	280,609	280,609	280,609	280,609
CASH (NET C/F)	98,396	98,396	98,396	98,396	98,396	98,396	98,396	98,396	98,396	98,396	98,396
* B / S *											
CASH	1,302,687	1,401,083	1,499,478	1,597,874	1,696,269	1,794,665	1,893,060	1,991,456	2,089,851	2,188,247	2,286,642
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	39,102	39,102	39,102	39,102	39,102	39,102	39,102	39,102	39,102	39,102	39,102
FIXED ASSET	0	0	0	0	0	0	0	0	0	0	0
DEFERRED ASSET	0	0	0	0	0	0	0	0	0	0	0
TOTAL ASSET	1,341,789	1,440,185	1,538,581	1,636,976	1,735,372	1,833,767	1,932,163	2,030,558	2,128,954	2,227,349	2,325,745
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
DEBT (SHORT)	0	0	0	0	0	0	0	0	0	0	0
EQUITY	280,722	280,722	280,722	280,722	280,722	280,722	280,722	280,722	280,722	280,722	280,722
RETAINED EARNINGS	1,061,067	1,159,463	1,257,858	1,356,254	1,454,649	1,553,045	1,651,440	1,749,836	1,848,232	1,946,627	2,045,023
TOTAL LIABIL & CAP	1,341,789	1,440,185	1,538,581	1,636,976	1,735,372	1,833,767	1,932,163	2,030,558	2,128,954	2,227,349	2,325,745

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION RUPIAH

* C / F *	2023	TOTAL
CASH-IN		
PROFIT BEF TAX	182,214	3,969,293
DEPREC. & AMORT.	0	1,083,786
EQUITY	0	280,722
DEBT (LONG)	0	842,166
-//- (SHORT)	0	86,591
TOTAL	182,214	6,264,559
CASH-OUT		
INVESTMENT TOTAL	0	1,122,889
(PROCESS)	0	561,773
(OTHER PLANT)	0	284,765
(WORKING)	0	39,102
(OPENING)	0	4,305
(TRANSPORTATION)	0	93,629
(TRAINING)	0	2,382
(IDCP)	0	136,933
TAX PAID	83,818	1,825,875
REPAYMENT TOTAL	0	930,758
(LONG)	0	842,166
(SHORT)	0	88,591
TOTAL	280,609	8,649,596
CASH (NET C/F)	98,396	2,385,038

* B / S *	
CASH	2,385,038
RECEIVABLE ASSET	0
INVENTORIES	39,102
FIXED ASSET	0
DEFERRED ASSET	0
TOTAL ASSET	2,424,140
PAYABLES	0
DEBT (LONG)	0
DEBT (SHORT)	0
EQUITY	280,722
RETAINED EARNINGS	2,143,418
TOTAL LIABIL & CAP	2,424,140

87/02/02
CASE E - 4 (PRICE= 11.552¥/KWH)

I.R.R. (109) = 13.456 %

	CASH-FLOW	DIS CASH-FLOW
0	0.000	0.000
1	0.000	0.000
2	0.000	0.000
3	0.000	0.000
4	0.000	0.000
5	-282049.851	-150035.545
6	-282049.851	-132241.516
7	-188033.234	-77705.224
8	-233822.706	-85167.900
9	105990.197	34027.388
10	142610.652	40354.181
11	178485.401	44515.671
12	179976.813	39564.023
13	181468.226	35160.751
14	182213.932	31118.079
15	182213.932	27427.514
16	182213.932	24174.644
17	182213.932	21307.562
18	182213.932	18780.511
19	182213.932	16553.166
20	182213.932	14589.981
21	182213.932	12859.627
22	182213.932	11334.491
23	182213.932	9990.235
24	182213.932	8805.405
25	182213.932	7761.095
26	182213.932	6840.639
27	182213.932	6029.348
28	182213.932	5314.274
29	182213.932	4684.008
30	182213.932	4128.491
31	182213.932	3638.857
32	182213.932	3207.293
33	182213.932	2826.912
34	182213.932	2491.644
35	182213.932	2196.138
36	182213.932	1935.679
37	182213.932	1706.109
38	221316.424	1826.470
TOTAL	4397026.446	0.000

87/02/02
CASE E - 4 (PRICE= 11.552¥/KWH)

I.R.R. (208) = 13.815 %

	CASH-FLOW	DIS CASH-FLOW
0	0.000	0.000
1	0.000	0.000
2	0.000	0.000
3	0.000	0.000
4	0.000	0.000
5	-282049.851	-147679.229
6	-282049.851	-129753.214
7	-188033.234	-76002.097
8	-194720.214	-69151.357
9	105990.197	33071.514
10	142610.652	39096.605
11	178485.401	42992.083
12	179976.813	38089.130
13	181468.226	33743.009
14	182213.932	29768.949
15	182213.932	26155.451
16	182213.932	22980.576
17	182213.932	20191.083
18	182213.932	17740.193
19	182213.932	15586.803
20	182213.932	13694.802
21	182213.932	12032.461
22	182213.932	10571.903
23	182213.932	9288.634
24	182213.932	8161.135
25	182213.932	7170.498
26	182213.932	6300.108
27	182213.932	5535.371
28	182213.932	4863.461
29	182213.932	4273.110
30	182213.932	3754.420
31	182213.932	3298.690
32	182213.932	2898.279
33	182213.932	2546.472
34	182213.932	2237.369
35	182213.932	1965.787
36	182213.932	1727.170
37	182213.932	1517.518
38	182213.932	1333.314
TOTAL	4397026.446	0.001

** INDONESIA ﾊﾞｿｺﾀﾝ PROJECT PAGE 1 (87/02/02)

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION YEN

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* P / L *											
* ﾊﾂﾃﾞﾝ											
VOLUME (BIL.KWT)	0.00	0.00	0.00	0.00	2963.10	3598.05	4233.00	4233.00	4233.00	4233.00	4233.00
PRICE (YEN / KWH)	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55
REVENUE	0	0	0	0	34,230	41,565	48,900	48,900	48,900	48,900	48,900
VARIABLE COSTS TOTA	0	0	0	0	7,060	7,785	8,645	8,376	8,107	7,972	7,972
RAW MATERIALS	0	0	0	0	5,216	6,334	7,452	7,452	7,452	7,452	7,452
CATALYST/CHEMICALS	0	0	0	0	51	62	73	73	73	73	73
PERSONALS	0	0	0	0	1,793	1,389	1,120	851	582	447	447
(LOCAL STAFF)	0	0	0	0	447	447	447	447	447	447	447
(JAPANESE STAFF)	0	0	0	0	1,346	942	673	404	135	0	0
CONSTANT COSTS TOTA	0	0	0	0	23,197	23,197	23,197	23,197	23,197	23,197	23,197
DEP & AMORT	0	0	0	0	17,849	17,849	17,849	17,849	17,849	17,849	17,849
MAINTENANCE	0	0	0	0	3,820	3,820	3,820	3,820	3,820	3,820	3,820
INSURANCE	0	0	0	0	1,528	1,528	1,528	1,528	1,528	1,528	1,528
OTHER DIRECT COSTS	0	0	0	0	1,793	1,793	1,793	1,793	1,793	1,793	1,793
ADMINISTRATIVE COST	0	0	0	0	897	897	897	897	897	897	897
INTEREST PAID	0	0	0	0	11,870	10,990	9,491	7,586	5,643	3,869	2,280
(LONG)	0	0	0	0	11,401	9,881	8,361	6,840	5,320	3,800	2,280
(SHORT)	0	0	0	0	470	1,109	1,130	745	323	68	0
TOTAL EXPENSES	0	0	0	0	44,818	44,662	44,023	41,849	39,637	37,728	36,139
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	0	0	0	0	-10,588	-3,098	4,877	7,051	9,263	11,172	12,760
TAX	0	0	0	0	0	0	0	0	3,452	5,139	5,870
NET PROFIT	0	0	0	0	-10,588	-3,098	4,877	7,051	5,811	6,033	6,891
RETAINED EARNING	0	0	0	0	-10,588	-13,686	-8,809	-1,758	4,052	10,085	16,976

** INDONESIA バンコタン PROJECT PAGE 2 (87/02/02)

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION YEN

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* P / L *											
* ハツデン											
VOLUME (BIL.KWT)	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00
PRICE (YEN / KWH)	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55
REVENUE	48,900	48,900	48,900	48,900	48,900	48,900	48,900	48,900	48,900	48,900	48,900
VARIABLE COSTS TOTA	7,972	7,972	7,972	7,972	7,972	7,972	7,972	7,972	7,972	7,972	7,972
RAW MATERIALS	7,452	7,452	7,452	7,452	7,452	7,452	7,452	7,452	7,452	7,452	7,452
CATALYST/CHEMICALS	73	73	73	73	73	73	73	73	73	73	73
PERSONALS	447	447	447	447	447	447	447	447	447	447	447
(LOCAL STAFF)	447	447	447	447	447	447	447	447	447	447	447
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	23,197	23,197	23,197	8,775	8,775	8,775	8,775	8,775	5,348	5,348	5,348
DEP & AMORT	17,849	17,849	17,849	3,427	3,427	3,427	3,427	3,427	0	0	0
MAINTENANCE	3,820	3,820	3,820	3,820	3,820	3,820	3,820	3,820	3,820	3,820	3,820
INSURANCE	1,528	1,528	1,528	1,528	1,528	1,528	1,528	1,528	1,528	1,528	1,528
OTHER DIRECT COSTS	1,793	1,793	1,793	1,793	1,793	1,793	1,793	1,793	1,793	1,793	1,793
ADMINISTRATIVE COST	897	897	897	897	897	897	897	897	897	897	897
INTEREST PAID	760	0	0	0	0	0	0	0	0	0	0
(LONG)	760	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENSES	34,619	33,859	33,859	19,437	19,437	19,437	19,437	19,437	16,010	16,010	16,010
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	14,281	15,041	15,041	29,463	29,463	29,463	29,463	29,463	32,890	32,890	32,890
TAX	6,569	6,919	6,919	13,553	13,553	13,553	13,553	13,553	15,129	15,129	15,129
NET PROFIT	7,711	8,122	8,122	15,910	15,910	15,910	15,910	15,910	17,760	17,760	17,760
RETAINED EARNING	24,687	32,809	40,931	56,841	72,751	88,661	104,571	120,481	138,241	156,002	173,762

** INDONESIA ﾊﾞﾂｺﾀﾞﾝ PROJECT PAGE 3 (87/02/02)

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION YEN

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* P / L *											
* ﾊﾂﾃﾞﾝ											
VOLUME (BIL.KWT)	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00	4233.00
PRICE (YEN / KWH)	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55
REVENUE	48,900	48,900	48,900	48,900	48,900	48,900	48,900	48,900	48,900	48,900	48,900
VARIABLE COSTS TOTA	7,972	7,972	7,972	7,972	7,972	7,972	7,972	7,972	7,972	7,972	7,972
RAW MATERIALS	7,452	7,452	7,452	7,452	7,452	7,452	7,452	7,452	7,452	7,452	7,452
CATALYST/CHEMICALS	73	73	73	73	73	73	73	73	73	73	73
PERSONALS	447	447	447	447	447	447	447	447	447	447	447
(LOCAL STAFF)	447	447	447	447	447	447	447	447	447	447	447
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	5,348	5,348	5,348	5,348	5,348	5,348	5,348	5,348	5,348	5,348	5,348
DEP & AMORT	0	0	0	0	0	0	0	0	0	0	0
MAINTENANCE	3,820	3,820	3,820	3,820	3,820	3,820	3,820	3,820	3,820	3,820	3,820
INSURANCE	1,528	1,528	1,528	1,528	1,528	1,528	1,528	1,528	1,528	1,528	1,528
OTHER DIRECT COSTS	1,793	1,793	1,793	1,793	1,793	1,793	1,793	1,793	1,793	1,793	1,793
ADMINISTRATIVE COST	897	897	897	897	897	897	897	897	897	897	897
INTEREST PAID	0	0	0	0	0	0	0	0	0	0	0
(LONG)	0	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENSES	16,010	16,010	16,010	16,010	16,010	16,010	16,010	16,010	16,010	16,010	16,010
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890
TAX	15,129	15,129	15,129	15,129	15,129	15,129	15,129	15,129	15,129	15,129	15,129
NET PROFIT	17,760	17,760	17,760	17,760	17,760	17,760	17,760	17,760	17,760	17,760	17,760
RETAINED EARNING	191,523	209,283	227,043	244,804	262,564	280,325	298,085	315,845	333,606	351,366	369,127

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION YEN

	2023	TOTAL
* P / L *		
* ﾊｯﾃﾞﾝ		
VOLUME (BIL.KWT)	4233.00	125085.15
PRICE (YEN / KWH)	11.55	
REVENUE	48,900	1,444,984
VARIABLE COSTS TOTA	7,972	239,273
RAW MATERIALS	7,452	220,207
CATALYST/CHEMICALS	73	2,157
PERSONALS	447	16,910
(LOCAL STAFF)	447	13,410
(JAPANESE STAFF)	0	3,500
CONSTANT COSTS TOTA	5,348	356,063
DEP & AMORT	0	195,623
MAINTENANCE	3,820	114,600
INSURANCE	1,528	45,840
OTHER DIRECT COSTS	1,793	53,790
ADMINISTRATIVE COST	897	26,910
INTEREST PAID	0	52,490
(LONG)	0	48,644
(SHORT)	0	3,846
TOTAL EXPENSES	16,010	728,526
INTEREST RECEIVED	0	0
PROFIT BEF TAX	32,890	716,457
TAX	15,129	329,570
NET PROFIT	17,760	386,887
RETAINED EARNING	386,887	

CASE E - 4 (PRICE= 11.552¥/KWH)

UNIT= MILLION YEN

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* C / F *											
CASH-IN											
PROFIT BEF TAX	0	0	0	0	-10,588	-3,098	4,877	7,051	9,263	11,172	12,760
DEPREC. & AMORT.	0	0	0	0	17,849	17,849	17,849	17,849	17,849	17,849	17,849
EQUITY	13,121	13,933	10,421	13,196	0	0	0	0	0	0	0
DEBT (LONG)	39,363	41,798	31,263	39,587	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	11,741	4,250	0	0	0	0	0
TOTAL	52,485	55,731	41,683	52,782	19,001	19,001	22,726	24,900	27,112	29,021	30,609
CASH-OUT											
INVESTMENT TOTAL	52,485	55,731	41,683	52,782	0	0	0	0	0	0	0
(PROCESS)	30,420	30,420	20,280	20,280	0	0	0	0	0	0	0
(OTHER PLANT)	15,420	15,420	10,280	10,280	0	0	0	0	0	0	0
(WORKING)	0	0	0	7,058	0	0	0	0	0	0	0
(OPENING)	0	0	0	777	0	0	0	0	0	0	0
(TRANSPORTATION)	5,070	5,070	3,380	3,380	0	0	0	0	0	0	0
(TRAINING)	0	0	0	430	0	0	0	0	0	0	0
(IDCP)	1,575	4,821	7,743	10,577	0	0	0	0	0	0	0
TAX PAID	0	0	0	0	0	0	0	0	3,452	5,139	5,870
REPAYMENT TOTAL	0	0	0	0	19,001	19,001	22,726	24,900	23,660	20,711	19,001
(LONG)	0	0	0	0	19,001	19,001	19,001	19,001	19,001	19,001	19,001
(SHORT)	0	0	0	0	0	0	3,724	5,899	4,658	1,710	0
TOTAL	52,485	55,731	41,683	52,782	19,001	19,001	22,726	24,900	27,112	32,192	36,348
CASH (NET C/F)	0	0	0	0	0	0	0	0	0	3,171	5,738

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* B / S *											
CASH	0	0	0	0	0	0	0	0	0	3,171	8,909
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	0	0	0	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058
FIXED ASSET	45,840	91,680	122,240	152,800	139,233	125,667	112,100	98,533	84,967	71,400	57,833
DEFERRED ASSET	6,645	16,536	27,659	42,823	38,541	34,259	29,976	25,694	21,412	17,129	12,847
TOTAL ASSET	52,485	108,216	149,899	202,681	184,832	166,983	149,134	131,285	113,436	98,758	86,647
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	39,363	81,162	112,424	152,011	133,010	114,008	95,007	76,006	57,004	38,003	19,001
DEBT (SHORT)	0	0	0	0	11,741	15,991	12,266	6,368	1,710	0	0
EQUITY	13,121	27,054	37,475	50,670	50,670	50,670	50,670	50,670	50,670	50,670	50,670
RETAINED EARNINGS	0	0	0	0	-10,588	-13,686	-8,809	-1,758	4,052	10,085	16,976
TOTAL LIABIL & CAP	52,485	108,216	149,899	202,681	184,832	166,983	149,134	131,285	113,436	98,758	86,647

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION YEN

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* C / F *											
CASH-IN											
PROFIT BEF TAX	14,281	15,041	15,041	29,463	29,463	29,463	29,463	29,463	32,890	32,890	32,890
DEPREC. & AMORT.	17,849	17,849	17,849	3,427	3,427	3,427	3,427	3,427	0	.0	0
EQUITY	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	32,130	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890
CASH-OUT											
INVESTMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(PROCESS)	0	0	0	0	0	0	0	0	0	0	0
(OTHER PLANT)	0	0	0	0	0	0	0	0	0	0	0
(WORKING)	0	0	0	0	0	0	0	0	0	0	0
(OPENING)	0	0	0	0	0	0	0	0	0	0	0
(TRANSPORTATION)	0	0	0	0	0	0	0	0	0	0	0
(TRAINING)	0	0	0	0	0	0	0	0	0	0	0
(IDCP)	0	0	0	0	0	0	0	0	0	0	0
TAX PAID	6,569	6,919	6,919	13,553	13,553	13,553	13,553	13,553	15,129	15,129	15,129
REPAYMENT TOTAL	19,001	0	0	0	0	0	0	0	0	0	0
(LONG)	19,001	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	38,689	58,861	58,861	52,226	52,226	52,226	52,226	52,226	50,650	50,650	50,650
CASH (NET C/F)	6,559	25,971	25,971	19,337	19,337	19,337	19,337	19,337	17,760	17,760	17,760
* B / S *											
CASH	15,468	41,439	67,410	86,747	106,083	125,420	144,757	164,093	181,854	199,614	217,375
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058
FIXED ASSET	44,267	30,700	17,133	13,707	10,280	6,853	3,427	0	0	0	0
DEFERRED ASSET	8,565	4,282	0	0	0	0	0	0	0	0	0
TOTAL ASSET	75,358	83,480	91,601	107,511	123,421	139,331	155,241	171,151	188,912	206,672	224,433
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
DEBT (SHORT)	0	0	0	0	0	0	0	0	0	0	0
EQUITY	50,670	50,670	50,670	50,670	50,670	50,670	50,670	50,670	50,670	50,670	50,670
RETAINED EARNINGS	24,687	32,809	40,931	56,841	72,751	88,661	104,571	120,481	138,241	156,002	173,762
TOTAL LIABIL & CAP	75,358	83,480	91,601	107,511	123,421	139,331	155,241	171,151	188,912	206,672	224,433

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION YEN

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* C / F *											
CASH-IN											
PROFIT BEF TAX	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890
DEPREC. & AMORT.	0	0	0	0	0	0	0	0	0	0	0
EQUITY	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890	32,890
CASH-OUT											
INVESTMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(PROCESS)	0	0	0	0	0	0	0	0	0	0	0
(OTHER PLANT)	0	0	0	0	0	0	0	0	0	0	0
(WORKING)	0	0	0	0	0	0	0	0	0	0	0
(OPENING)	0	0	0	0	0	0	0	0	0	0	0
(TRANSPORTATION)	0	0	0	0	0	0	0	0	0	0	0
(TRAINING)	0	0	0	0	0	0	0	0	0	0	0
(IDCP)	0	0	0	0	0	0	0	0	0	0	0
TAX PAID	15,129	15,129	15,129	15,129	15,129	15,129	15,129	15,129	15,129	15,129	15,129
REPAYMENT TOTAL	0	0	0	0	0	0	0	0	0	0	0
(LONG)	0	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	50,650	50,650	50,650	50,650	50,650	50,650	50,650	50,650	50,650	50,650	50,650
CASH (NET C/F)	17,760	17,760	17,760	17,760	17,760	17,760	17,760	17,760	17,760	17,760	17,760

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* B / S *											
CASH	235,135	252,895	270,656	288,416	306,177	323,937	341,697	359,458	377,218	394,979	412,739
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058
FIXED ASSET	0	0	0	0	0	0	0	0	0	0	0
DEFERRED ASSET	0	0	0	0	0	0	0	0	0	0	0
TOTAL ASSET	242,193	259,953	277,714	295,474	313,235	330,995	348,755	366,516	384,276	402,037	419,797
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	0	0	0	0	0	0	0	0	0	0	0
DEBT (SHORT)	0	0	0	0	0	0	0	0	0	0	0
EQUITY	50,670	50,670	50,670	50,670	50,670	50,670	50,670	50,670	50,670	50,670	50,670
RETAINED EARNINGS	191,523	209,283	227,043	244,804	262,564	280,325	298,085	315,845	333,606	351,366	369,127
TOTAL LIABIL & CAP	242,193	259,953	277,714	295,474	313,235	330,995	348,755	366,516	384,276	402,037	419,797

CASE E - 4 (PRICE= 11.552¥/KWH) UNIT= MILLION YEN

	2023	TOTAL
* C / F *		
CASH-IN		
PROFIT BEF TAX	32,890	716,457
DEPREC. & AMORT.	0	195,623
EQUITY	0	50,670
DEBT (LONG)	0	152,011
-//- (SHORT)	0	15,991
TOTAL	32,890	1,130,753
CASH-OUT		
INVESTMENT TOTAL	0	202,681
(PROCESS)	0	101,400
(OTHER PLANT)	0	51,400
(WORKING)	0	7,058
(OPENING)	0	777
(TRANSPORTATION)	0	16,900
(TRAINING)	0	430
(IDCP)	0	24,716
TAX PAID	15,129	329,570
REPAYMENT TOTAL	0	168,002
(LONG)	0	152,011
(SHORT)	0	15,991
TOTAL	50,650	1,561,252
CASH (NET C/F)	17,760	430,499

* B / S *	
CASH	430,499
RECEIVABLE ASSET	0
INVENTORIES	7,058
FIXED ASSET	0
DEFERRED ASSET	0
TOTAL ASSET	437,557
PAYABLES	0
DEBT (LONG)	0
DEBT (SHORT)	0
EQUITY	50,670
RETAINED EARNINGS	386,887
TOTAL LIABIL & CAP	437,557

APPENDIX X

Computer Printout

- Impact of Fuel Alcohol on Oil Refining Sector in Indonesia -

(1)Results of methanol introduction cases

UNIT : 10*3 kl

CASES	A	A−C	A−M	P	P−C	P−M	K	K−C	K−M
[precondition]				Expanded capacity cases			Kerosene import cases		
Domestic demand	ASCOPE	ASCOPE	ASCOPE	PELITA4	PELITA4	PELITA4	PELITA4	PELITA4	PELITA4
Crude oil export price	30.5$/BBL	30.5$/BBL	?	30.5$/BBL	30.5$/BBL	?	30.5$/BBL	30.5$/BBL	?
Methanol price	No introduction	?	139$/kl	No introduction	?	139$/kl	No introduction	?	139$/kl
[RESULT]									
Crude oil export price	↑	↑	38.5$/BBL	↑	↑	34.5$/BBL	↑	↑	38.5$/BBL
Methanol price	———	111$/kl	↑	———	121$/kl	↑	———	111$/kl	↑
Amount of profit (10*3 $)	18,260	18,355	23,883	18,107	18,120	20,860	18,011	18,141	23,917
Crude oil production									
SLC	43,352	43,352	43,352	43,352	43,352	43,352	43,352	43,352	43,352
Arjuna	17,875	17,875	17,875	17,875	17,875	17,875	17,875	17,875	17,875
Attaka	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701
Bekapai	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888
Handil	9,692	9,692	9,692	9,692	9,692	9,692	9,692	9,692	9,692
Arun condensate	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545
TOTAL	87,053	87,053	87,053	87,053	87,053	87,053	87,053	87,053	87,053
Import of AL	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636
Crude oil processed									
DUMAI									
SLC	6,979	6,690	6,690	9,602	9,053	9,006	6,979	6,979	6,979
PLAJU									
SLC	3,122	1,242	2,734	4,169	988	1,022	1,204	2,666	2,788
Arjuna	3,174	5,054	3,562	5,922	7,198	7,366	5,092	3,630	3,508
CILACAP									
Arjuna	6,181	6,181	6,181	11,953	10,677	10,509	6,181	6,181	6,181
Attaka	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701
Import of AL	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636
BALIKPAPAN									
Bekapai	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888
Handil	8,442	8,442	8,442	9,692	9,692	9,692	8,442	8,442	8,442
TOTAL	40,123	39,834	39,834	53,563	49,833	49,820	40,123	40,123	40,123
Crude oil exports									
SLC	33,251	35,420	33,928	29,581	33,311	33,324	35,169	33,707	33,585
Arjuna	8,520	6,640	8,132	0	0	0	6,602	8,064	8,186
Attaka	0	0	0	0	0	0	0	0	0
Bekapai	0	0	0	0	0	0	0	0	0
Handil	1,250	1,250	1,250	0	0	0	1,250	1,250	1,250
Arun Condensate	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545
TOTAL	50,566	50,855	50,855	37,126	40,856	40,869	50,566	50,566	50,566
Natural gas exports	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000
Production volume									
Propane	593	647	620	827	821	821	599	621	619
Butane	969	1,056	1,012	1,378	1,362	1,362	961	1,012	1,010
Naphtha	3,740	4,663	4,315	8,393	8,028	8,026	4,068	4,731	4,721
Gasoline	6,042	5,252	5,232	5,025	5,025	5,025	5,025	4,426	4,373
Reformate	0	437	437	593	568	586	212	873	909
Jet fuel	621	621	621	605	605	605	605	605	605
Kerosene	7,410	8,486	9,115	11,763	10,778	10,778	6,929	6,700	6,753
A.D.O.	9,595	9,802	9,457	11,836	11,836	11,836	11,836	11,836	11,836
I.D.O.	1,540	1,540	1,540	1,967	1,967	1,967	1,967	1,967	1,967
Fuel oil	7,542	5,459	5,658	8,746	6,514	6,507	5,490	5,490	5,490
L.S.W.R.	0	0	0	0	0	0	0	0	0
Asphalt	300	300	300	300	300	300	300	300	300
Sulfur	64	42	41	57	55	55	45	43	42
Cokes	374	248	248	360	341	341	297	260	248
TOTAL	38,790	38,553	38,596	51,850	48,200	48,209	38,334	38,864	38,873
Kerosene imports	0	0	0	0	0	0	4,834	4,834	4,834
Total supply	38,790	38,553	38,596	51,850	48,200	48,209	43,168	43,698	43,707
Domestic demand									
Propane	463	463	463	463	463	463	463	463	463
Butane	0	0	0	0	0	0	0	0	0
Naphtha	0	0	0	0	0	0	0	0	0
Gasoline	6,042	6,042	6,042	5,025	5,025	5,025	5,025	5,025	5,025
Jet fuel	621	621	621	605	605	605	605	605	605
Kerosene	7,047	7,047	7,047	11,763	11,763	11,763	11,763	11,763	11,763
A.D.O.	7,170	7,170	7,170	11,836	11,836	11,836	11,836	11,836	11,836
I.D.O.	1,540	1,540	1,540	1,967	1,967	1,967	1,967	1,967	1,967
Fuel oil	3,250	3,250	3,250	5,490	5,490	5,490	5,490	5,490	5,490
L.S.W.R.	0	0	0	0	0	0	0	0	0
Asphalt	300	300	300	300	300	300	300	300	300
TOTAL	26,433	26,433	26,433	37,449	37,449	37,449	37,449	37,449	37,449
Export volume									
Propane	130	184	157	364	358	358	136	158	156
Butane	969	1,056	1,012	1,378	1,362	1,362	961	1,012	1,010
Naphtha	3,740	4,663	4,315	8,393	8,028	8,026	4,068	4,731	4,721
Reformate	0	437	437	593	568	586	212	873	909
Kerosene	363	1,661	2,220	0	0	0	0	191	194
A.D.O.	2,425	2,632	2,287	0	0	0	0	0	0
Fuel oil	4,292	2,209	2,408	3,256	1,024	1,017	0	0	0
L.S.W.R.	0	0	0	0	0	0	0	0	0
Asphalt	0	0	0	0	0	0	0	0	0
Sulfur	64	42	41	57	55	55	45	43	42
Cokes	374	248	248	360	341	341	297	260	248
TOTAL	12,357	13,132	13,195	14,401	11,736	11,745	5,719	7,268	7,280
Processed volume(each unit)									
Topping									
Dumai	6,979	6,690	6,690	9,602	9,053	9,006	6,979	6,979	6,979
Plaju	6,296	6,296	6,296	10,091	8,186	8,388	6,296	6,296	6,296
Cilacap	14,518	14,518	14,518	20,280	19,014	18,846	14,518	14,518	14,518
Balikpapan	12,330	12,330	12,330	13,590	13,580	13,580	12,330	12,330	12,330
TOTAL	40,123	39,834	39,834	53,563	49,833	49,820	40,123	40,123	40,123
Reformer									
Dumai	792	792	792	792	792	792	792	792	792
Cilacap	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784
Balikpapan	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
TOTAL	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625
F.C.C.									
Plaju	944	944	944	944	944	944	408	944	944
Hydro cracking									
Dumai	1,991	2,886	2,886	3,829	3,802	3,802	2,886	2,886	2,886
Balikpapan	1,921	2,428	2,886	2,886	2,886	2,886	2,886	2,801	2,886
TOTAL	3,912	5,314	5,772	6,715	6,688	6,688	5,772	5,687	5,772
Methanol introduction									
Demand area 2									
Gasoline(*0.52)									
Kerosene(*0.49)		453	453		755	755		755	755
A.D.O. (*0.47)									
I.D.O. (*0.46)									
Demand area 3									
Gasoline(*0.52)		1,557	1,557					1,153	1,255
Kerosene(*0.49)					1,255	1,255		102	
A.D.O. (*0.47)									
I.D.O. (*0.46)									
Total methanol volume	0	2,010	2,010	0	2,010	2,010	0	2,010	2,019
Oil products replaced									
Gasoline	0	810	810	0	0	0	0	600	653
Kerosene	0	222	222	0	985	985	0	420	370

(2)Results of methanol introduction cases UNIT : 10*3 kl

CASES	A	A-M20	A-M25	A-M26	A-M27	A-M28	A-M29	A-M30	A-M31	A-M32	A-M33	A-M34	A-M35	A-M36	A-M37
[precondition]															
Domestic demand Crude oil export price Methanol price	ASCOPE 30.5$/BBL No introduction	ASCOPE 20.5$/BBL 139$/kl	ASCOPE 25.5$/BBL 139$/kl	ASCOPE 26.5$/BBL 139$/kl	ASCOPE 27.5$/BBL 139$/kl	ASCOPE 28.5$/BBL 139$/kl	ASCOPE 29.5$/BBL 139$/kl	ASCOPE 30.5$/BBL 139$/kl	ASCOPE 31.5$/BBL 139$/kl	ASCOPE 32.5$/BBL 139$/kl	ASCOPE 33.5$/BBL 139$/kl	ASCOPE 34.5$/BBL 139$/kl	ASCOPE 35.5$/BBL 139$/kl	ASCOPE 36.5$/BBL 139$/kl	ASCOPE 37.5$/BBL 139$/kl
[RESULT]															
Crude oil export price	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Methanol price	------	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Amount of profit (10*3 $)	18,260	11,443	14,890	15,580	16,271	16,961	17,651	18,341	19,032	19,723	20,414	21,105	21,796	22,492	23,185
Crude oil production															
SLC	43,352	43,352	43,352	43,352	43,352	43,352	43,352	43,352	43,352	43,352	43,352	43,352	43,352	43,352	43,352
Arjuna	17,875	17,875	17,875	17,875	17,875	17,875	17,875	17,875	17,875	17,875	17,875	17,875	17,875	17,875	17,875
Attaka	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701
Bekapai	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888
Handil	9,692	9,692	9,692	9,692	9,692	9,692	9,692	9,692	9,692	9,692	9,692	9,692	9,692	9,692	9,692
Arun condensate	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545
TOTAL	87,053	87,053	87,053	87,053	87,053	87,053	87,053	87,053	87,053	87,053	87,053	87,053	87,053	87,053	87,053
Import of AL	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636
Crude oil processed															
DUMAI															
SLC	6,979	6,979	6,834	6,834	6,834	6,834	6,834	6,691	6,691	6,691	6,691	6,690	6,690	6,690	6,690
PLAJU															
SLC	3,122	1,545	1,242	1,242	1,242	1,242	1,242	1,242	1,242	1,242	1,242	1,242	2,734	2,734	2,734
Arjuna	3,174	2,979	5,054	5,054	5,054	5,054	5,054	5,054	5,054	5,054	5,054	5,054	3,562	3,562	3,562
CILACAP															
Arjuna	6,181	5,648	3,730	5,030	5,030	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181	6,181
Attaka	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701	4,701
Import of AL	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636	3,636
BALIKPAPAN															
Bekapai	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888	3,888
Handil	8,442	8,442	8,442	8,442	8,442	8,442	8,442	8,442	8,442	8,442	8,442	8,442	8,442	8,442	8,442
TOTAL	40,123	37,818	37,527	38,827	38,827	39,978	39,978	39,835	39,835	39,835	39,835	39,834	39,834	39,834	39,834
Crude oil exports															
SLC	33,251	34,828	35,276	35,276	35,276	35,276	35,276	35,419	35,419	35,419	35,419	35,420	33,928	33,928	33,928
Arjuna	8,520	9,248	9,091	7,791	7,791	6,640	6,640	6,640	6,640	6,640	6,640	6,640	8,132	8,132	8,132
Attaka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bekapai	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Handil	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250
Arun Condensate	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545	7,545
TOTAL	50,566	52,871	53,162	51,862	51,862	50,711	50,711	50,854	50,854	50,854	50,854	50,855	50,855	50,855	50,855
Natural gas exports	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000
Production volume															
Propane	593	581	590	620	620	648	648	647	646	646	646	647	620	620	620
Butane	969	929	949	1,006	1,006	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,012	1,012	1,012
Naphtha	3,740	3,308	3,457	3,974	3,974	4,433	4,433	4,435	4,435	4,435	4,435	4,435	4,089	4,089	4,089
Gasoline	6,042	6,003	5,965	5,965	5,965	5,985	5,985	5,980	5,911	5,911	5,911	5,701	5,693	5,693	5,693
Reformate	0	0	0	0	0	0	0	0	0	0	0	197	202	202	202
Jet fuel	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621
Kerosene	7,410	8,628	9,285	9,285	9,285	8,645	8,644	8,625	8,709	8,709	9,337	9,337	9,337	8,240	9,115
A.D.O.	9,595	8,574	8,205	8,619	8,619	9,625	9,626	9,581	9,580	9,579	8,951	8,951	9,235	10,332	9,457
I.D.O.	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540
Fuel oil	7,542	5,625	5,078	5,311	5,311	5,517	5,517	5,457	5,455	5,455	5,455	5,459	5,658	5,658	5,658
L.S.W.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asphalt	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Sulfur	64	49	40	41	41	43	43	42	42	42	42	42	42	42	42
Cokes	374	327	259	259	259	259	259	248	248	248	248	248	248	248	248
TOTAL	38,790	36,485	36,309	37,561	37,561	38,672	38,672	38,532	38,543	38,542	38,542	38,534	38,597	38,597	38,597
Kerosene imports	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total supply	38,790	36,485	36,309	37,561	37,561	38,672	38,672	38,532	38,543	38,542	38,542	38,534	38,597	38,597	38,597
Domestic demand															
Propane	463	463	463	463	463	463	463	463	463	463	463	463	463	463	463
Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naphtha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gasoline	6,042	6,042	6,042	6,042	6,042	6,042	6,042	6,042	6,042	6,042	6,042	6,042	6,042	6,042	6,042
Jet fuel	621	621	621	621	621	621	621	621	621	621	621	621	621	621	621
Kerosene	7,047	7,047	7,047	7,047	7,047	7,047	7,047	7,047	7,047	7,047	7,047	7,047	7,047	7,047	7,047
A.D.O.	7,170	7,170	7,170	7,170	7,170	7,170	7,170	7,170	7,170	7,170	7,170	7,170	7,170	7,170	7,170
I.D.O.	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,540
Fuel oil	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250	3,250
L.S.W.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asphalt	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
TOTAL	26,433	26,433	26,433	26,433	26,433	26,433	26,433	26,433	26,433	26,433	26,433	26,433	26,433	26,433	26,433
Export volume															
Propane	130	118	127	157	157	185	185	184	183	183	183	184	157	157	157
Butane	969	929	949	1,006	1,006	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,012	1,012	1,012
Naphtha	3,740	3,308	3,457	3,974	3,974	4,433	4,433	4,435	4,435	4,435	4,435	4,435	4,089	4,089	4,089
Reformate	0	0	0	0	0	0	0	0	0	0	0	197	202	202	202
Kerosene	363	1,581	2,238	2,238	2,238	1,598	1,597	1,578	1,662	1,662	2,290	2,290	2,290	1,193	2,290
A.D.O.	2,425	1,404	1,035	1,449	1,449	2,455	2,456	2,411	2,410	2,409	1,781	1,781	2,065	3,162	2,287
Fuel oil	4,292	2,375	1,828	2,061	2,061	2,267	2,267	2,207	2,205	2,205	2,205	2,209	2,408	2,408	2,408
L.S.W.R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asphalt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur	64	49	40	41	41	43	43	42	42	42	42	42	42	42	42
Cokes	374	327	259	259	259	259	259	248	248	248	248	248	248	248	248
TOTAL	12,357	10,091	9,933	11,165	11,165	12,296	12,296	12,161	12,241	12,240	12,240	12,442	12,513	12,513	12,735
Processed volume(each unit)															
Topping															
Dumai	6,979	6,979	6,834	6,834	6,834	6,834	6,834	6,691	6,691	6,691	6,691	6,690	6,690	6,690	6,690
Plaju	6,296	4,524	6,296	6,296	6,296	6,296	6,296	6,296	6,296	6,296	6,296	6,296	6,296	6,296	6,296
Cilacap	14,518	13,985	12,067	13,367	13,367	14,518	14,518	14,518	14,518	14,518	14,518	14,518	14,518	14,518	14,518
Balikpapan	12,330	12,330	12,330	12,330	12,330	12,330	12,330	12,330	12,330	12,330	12,330	12,330	12,330	12,330	12,330
TOTAL	40,123	37,818	37,527	38,827	38,827	39,978	39,978	39,835	39,835	39,835	39,835	39,834	39,834	39,834	39,834
Reformer															
Dumai	792	792	792	792	792	792	792	792	729	729	729	792	792	792	792
Cilacap	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784	1,784
Balikpapan	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049	1,049
TOTAL	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,625	3,562	3,562	3,562	3,625	3,625	3,625	3,625
F.C.C.															
Plaju	944	944	944	944	944	944	944	944	944	944	944	944	944	944	944
Hydro cracking															
Dumai	1,991	2,886	2,886	2,886	2,886	2,886	2,886	2,886	2,886	2,886	2,886	2,886	2,886	2,886	2,886
Balikpapan	1,921	1,921	2,428	2,428	2,428	2,428	2,428	2,428	2,428	2,428	2,428	2,428	2,886	2,886	2,886
TOTAL	3,912	4,807	5,314	5,314	5,314	5,314	5,314	5,314	5,314	5,314	5,314	5,314	5,772	5,772	5,772
Methanol introduction Demand area 2 Gasoline(*0.52) Kerosene(*0.49) A.D.O.(*0.47) I.D.O.(*0.46)															453
Demand area 3 Gasoline(*0.52) Kerosene(*0.49) A.D.O.(*0.47) I.D.O.(*0.46)		74	110	110	110	110	110	119	252	252	252	656	671	671	671
Total methanol volume	0	74	110	110	110	110	110	119	252	252	252	656	671	671	1,124
Oil products replaced															
Gasoline	0	38	57	57	57	57	57	62	131	131	131	341	349	349	349
Kerosene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	222

(3) Distribution cost and volume of oil products for methanol introduction cases

UNIT : 10*3 kl/year

			Transportation cost ($/kl)	A	A-M20	A-M25	A-M26	A-M27	A-M28	A-M29	A-M30	A-M31	A-M32	A-M33	A-M34	A-M35	A-M36	A-M37	A-M
Demand area 1	L.P.G.	Dumai	5.60	35.64	35.64	35.64	35.64	35.64	35.64	35.64	35.64	35.64	35.64	35.64	35.64	35.64	35.64	35.64	35.64
	Gasoline	Dumai	5.60	660.10	660.10	660.10	660.10	660.10	660.10	660.10	660.10	660.10	660.10	660.10	660.10	660.10	660.10	660.10	660.10
	Jet fuel	Cilacap	32.20	61.40	61.40	61.40	61.40	61.40	61.40	61.40	61.40	61.40	61.40	61.40	61.40	61.40	61.40	61.40	61.40
	Kerosene	Dumai	5.60	781.50	781.50	781.50	781.50	781.50	781.50	781.50	781.50	781.50	781.50	781.50	781.50	781.50	781.50	781.50	781.50
	A.D.O.	Dumai	5.60	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50	1117.50
	I.D.O.	Dumai	5.60	52.40	52.40	52.40	52.40	52.40	52.40	52.40	52.40	52.40	52.40	52.40	52.40	52.40	52.40	52.40	52.40
	Fuel oil	Dumai	5.60	152.80	152.80	152.80	152.80	152.80	152.80	152.80	152.80	152.80	152.80	152.80	152.80	152.80	152.80	152.80	152.80
Demand area 2	L.P.G.	Plaju		10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80	10.80
	Gasoline	Plaju		419.40	419.40	419.40	419.40	419.40	419.40	419.40	419.40	419.40	419.40	419.40	419.40	419.40	419.40	419.40	419.40
	Jet fuel	Balikpapan	25.90	21.70	21.70	21.70	21.70	21.70	21.70	21.70	21.70	21.70	21.70	21.70	21.70	21.70	21.70	21.70	21.70
	Kerosene	Plaju		443.50	443.50	443.50	443.50	443.50	443.50	443.50	443.50	443.50	443.50	443.50	443.50	443.50	443.50	221.73	221.73
	A.D.O.	Plaju		859.60	859.60	859.60	859.60	859.60	859.60	859.60	859.60	859.60	859.60	859.60	859.60	859.60	859.60	859.60	859.60
	I.D.O.	Dumai	10.50	124.90	124.90	124.90	124.90	124.90	124.90	124.90	124.90	124.90	124.90	124.90	124.90	124.90	124.90	124.90	124.90
	Fuel oil	Plaju		39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00
Demand area 3	L.P.G.	Plaju Cilacap	7.70	101.70 177.55	114.24 165.01	159.31 119.94	128.76 150.49	128.76 150.49	101.70 177.55	101.70 177.55	101.70 177.55	101.70 177.55	101.70 177.55	101.70 177.55	101.70 177.55	101.70 177.55	101.70 177.55	101.70 177.55	101.70 177.55
	Gasoline	Plaju Cilacap	7.70	451.39 1952.61	451.39 1914.10	451.39 1895.25	451.39 1895.25	451.39 1895.25	451.39 1895.25	451.39 1895.25	451.39 1890.78	451.39 1821.55	451.39 1821.55	451.39 1821.55	451.39 1611.28	451.39 1603.49	451.39 1603.49	451.39 1603.49	451.39 1142.77
	Jet fuel	Cilacap		204.80	204.80	204.80	204.80	204.80	204.80	204.80	204.80	204.80	204.80	204.80	204.80	204.80	204.80	204.80	204.80
	Kerosene	Plaju Cilacap	7.70	470.62 2084.98	 2555.60	609.70 1945.90	609.70 1945.90	609.70 1945.90	523.62 2031.98	609.69 1945.91	523.62 2031.98	609.69 1945.91	609.69 1945.91	609.69 1945.91	609.69 1945.91	413.30 2142.30	499.36 2056.24	721.13 1834.47	721.13 1834.47
	A.D.O.	Plaju Cilacap	7.70	 2313.70	 2313.70	 2313.70	 2313.70	 2313.70	86.06 2227.61	 2313.70	86.06 2227.64	 2313.70	 2313.70	 2313.70	 2313.70	86.06 2227.64	 2313.70	 2313.70	 2313.70
	I.D.O.	Dumai Plaju Cilacap	18.90 7.70	826.16 19.31 73.43	377.94 540.96	126.21 5.28 787.41	126.21 5.28 787.41	126.21 5.28 787.41	126.21 5.28 787.41	126.21 5.28 787.41	59.08 5.28 851.54	56.82 5.28 856.80	56.82 5.28 856.80	56.82 5.28 856.80	60.65 5.28 852.97	60.65 16.41 841.84	60.65 16.41 841.84	60.65 16.41 841.84	60.65 16.41 841.84
	Fuel oil	Plaju Cilacap	7.70	204.81 1257.68	352.63 1109.87	239.16 1223.34	239.16 1223.34	239.16 1223.34	239.14 1223.36	239.14 1223.36	239.14 1223.36	239.14 1223.36	239.14 1223.36	239.14 1223.36	239.14 1223.36	211.91 1250.59	211.91 1250.59	211.91 1250.59	211.91 1250.59
Demand area 4	L.P.G.	Cilacap	3.22	42.77	42.77	42.77	42.77	42.77	42.77	42.77	42.77	42.77	42.77	42.77	42.77	42.77	42.77	42.77	42.77
	Gasoline	Dumai Cilacap	21.00 3.22	349.12 354.68	310.60 393.20	291.76 412.04	291.76 412.04	291.76 412.04	291.76 412.04	291.76 412.04	287.29 416.51	218.06 485.74	218.06 485.74	218.06 485.74	7.79 696.01	 703.80	 703.80	 703.80	 703.80
	Jet fuel	Cilacap Balikpapan	3.22 16.10	21.10 	21.10 	 21.10	21.10 	 21.10	21.10 	 21.10	 21.10	21.10 	 21.10	 21.10	 21.10	21.10 	21.10 	 21.10	21.10
	Kerosene	Cilacap Balikpapan	3.22 16.10	223.18 790.62	269.40 744.40	137.36 876.44	116.26 897.51	137.36 876.44	207.90 805.90	315.06 698.74	218.46 795.34	283.07 730.73	304.17 709.63	304.17 709.63	304.77 709.03	89.03 924.77	196.19 817.61	417.97 595.83	396.87 616.93
	A.D.O.	Cilacap Balikpapan	3.22 16.10	713.78 88.52	 802.30	113.46 688.84	527.37 274.93	527.37 274.93	802.30 	716.24 86.06	802.30 	716.24 86.06	716.24 86.06	716.24 86.06	716.24 86.06	802.30 	716.24 86.06	716.24 86.06	716.24 86.06
	I.D.O.	Dumai Balikpapan	21.00 16.10	134.10 	134.10 	 134.10	 134.10	 134.10	 134.10	 134.10	 134.10	 134.10	 134.10	 134.10	 134.10	 134.10	 134.10	 134.10	 134.10
	Fuel oil	Cilacap	3.22	409.50	409.50	409.50	409.50	409.50	409.50	409.50	409.50	409.50	409.50	409.50	409.50	409.50	409.50	409.50	409.50
Demand area 5	L.P.G.	Cilacap		79.71	79.71	79.71	79.71	79.71	79.71	79.71	79.71	79.71	79.71	79.71	79.71	79.71	79.71	79.71	79.71
	Gasoline	Cilacap Balikpapan	12.60	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	288.11 1072.69	748.84 611.96
	Jet fuel	Balikpapan	12.60	206.60	206.60	206.60	206.60	206.60	206.60	206.60	206.60	206.60	206.60	206.60	206.60	206.60	206.60	206.60	206.60
	Kerosene	Balikpapan	12.60	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00	1753.00
	A.D.O.	Balikpapan	12.60	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10	1497.10
	I.D.O.	Cilacap Balikpapan	12.60	294.50 	294.50 	 294.50	 294.50	 294.50	 294.50	 294.50	 294.50	 294.50	 294.50	 294.50	 294.50	 294.50	 294.50	 294.50	 294.50
	Fuel oil	Cilacap Balikpapan	12.60	1020.50 	916.69 103.81	242.26 778.24	475.52 544.98	475.52 544.98	681.44 339.06	681.44 339.06	621.68 398.82	619.67 400.83	619.67 400.83	619.67 400.83	623.08 397.42	605.76 414.74	605.76 414.74	605.76 414.74	605.76 414.74
Demand area 6	L.P.G.	Balikpapan	7.84	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25
	Gasoline	Balikpapan	7.84	265.23	265.23	265.23	265.23	265.23	265.23	265.23	265.23	265.23	265.23	265.23	265.23	265.23	265.23	265.23	265.23
	Jet fuel	Balikpapan	7.84	57.10	57.10	57.10	57.10	57.10	57.10	57.10	57.10	57.10	57.10	57.10	57.10	57.10	57.10	57.10	57.10
	Kerosene	Balikpapan	7.84	260.50	260.50	260.50	260.50	260.50	260.50	260.50	260.50	260.50	260.50	260.50	260.50	260.50	260.50	260.50	260.50
	A.D.O.	Balikpapan	7.84	286.50	286.50	286.50	286.50	286.50	286.50	286.50	286.50	286.50	286.50	286.50	286.50	286.50	286.50	286.50	286.50
	I.D.O.	Balikpapan	7.84	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40
	Fuel oil	Balikpapan	7.84	165.80	165.80	165.80	165.80	165.80	165.80	165.80	165.80	165.80	165.80	165.80	165.80	165.80	165.80	165.80	165.80
Demand area 7	Gasoline	Balikpapan	13.58	169.30	169.30	169.30	169.30	169.30	169.30	169.30	169.30	169.30	169.30	169.30	169.30	169.30	169.30	169.30	169.30
	Jet fuel	Balikpapan	13.58	23.60	23.60	23.60	23.60	23.60	23.60	23.60	23.60	23.60	23.60	23.60	23.60	23.60	23.60	23.60	23.60
	Kerosene	Balikpapan	13.58	204.20	204.20	204.20	204.20	204.20	204.20	204.20	204.20	204.20	204.20	204.20	204.20	204.20	204.20	204.20	204.20
	A.D.O.	Balikpapan	13.58	207.70	207.70	207.70	207.70	207.70	207.70	207.70	207.70	207.70	207.70	207.70	207.70	207.70	207.70	207.70	207.70
Demand area 8	Gasoline	Balikpapan	35.00	59.30	59.30	59.30	59.30	59.30	59.30	59.30	59.30	59.30	59.30	59.30	59.30	59.30	59.30	59.30	59.30
	Jet fuel	Balikpapan	35.00	24.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20	24.20
	Kerosene	Balikpapan	35.00	35.20	35.20	35.20	35.20	35.20	35.20	35.20	35.20	35.20	35.20	35.20	35.20	35.20	35.20	35.20	35.20
	A.D.O.	Balikpapan	35.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00
Transportation cost of oil products (10*3 $/year)				155,542	153,754	164,933	156,427	156,427	148,902	148,902	148,443	147,199	147,199	147,199	143,482	143,987	143,715	142,838	137,033

(4) Results of ethanol introduction cases

UNIT : 10*3 kl

CASES	A	A－C－1	A－C－2	A－C－3
[Precondition]				
Domestic demand Crude oil export price Ethanol production area Ethanol price	ASCOPE 30.5$/BBL No introduction	ASCOPE 30.5$/BBL Sumatra, Kalimantan ?	ASCOPE 30.5$/BBL Sumatra, Kalimantan ?	ASCOPE 30.5$/BBL Jawa ?
[RESULT]				
Crude oil export price	↑	↑	↑	↑
Ethanol price	--------	148$/kl	168$/kl	193$/kl
Amount of profit (10*3 $)	18,260	18,352	18,342	18,339
Crude oil production				
SLC	43,352	43,352	43,352	43,352
Arjuna	17,875	17,875	17,875	17,875
Attaka	4,701	4,701	4,701	4,701
Bekapai	3,888	3,888	3,888	3,888
Handil	9,692	9,692	9,692	9,692
Arun condensate	7,545	7,545	7,545	7,545
TOTAL	87,053	87,053	87,053	87,053
Import of AL	3,636	3,636	3,636	3,636
Crude oil processed				
DUMAI				
SLC	6,979	6,690	6,690	6,691
PLAJU				
SLC	3,122	1,242	1,242	1,242
Arjuna	3,174	5,054	5,054	5,054
CILACAP				
Arjuna	6,181	6,181	6,181	6,181
Attaka	4,701	4,701	4,701	4,701
Import of AL	3,636	3,636	3,636	3,636
BALIKPAPAN				
Bekapai	3,888	3,888	3,888	3,888
Handil	8,442	8,442	8,442	8,442
TOTAL	40,123	39,834	39,834	39,835
Crude oil exports				
SLC	33,251	35,420	35,420	35,419
Arjuna	8,520	6,640	6,640	6,640
Attaka	0	0	0	0
Bekapai	0	0	0	0
Handil	1,250	1,250	1,250	1,250
Arun condensate	7,545	7,545	7,545	7,545
TOTAL	50,566	50,855	50,855	50,854
Natural gas exports	23,000	23,000	23,000	23,000
Production volume				
Propane	593	648	647	646
Butane	969	1,056	1,056	1,056
Naphtha	3,740	4,537	4,435	4,435
Gasoline	6,042	5,489	5,765	5,930
Reformate	0	306	136	0
Jet fuel	621	621	621	621
Kerosene	7,410	8,708	9,337	9,315
A.D.O.	9,595	9,580	8,951	8,951
I.D.O.	1,540	1,540	1,540	1,540
Fuel oil	7,542	5,459	5,458	5,456
L.S.W.R.	0	0	0	0
Asphalt	300	300	300	300
Sulfur	64	42	42	42
Cokes	374	248	248	248
TOTAL	38,790	38,534	38,536	38,540
Kerosene imports	0	0	0	0
Total supply	38,790	38,534	38,536	38,540
Domestic demand				
Propane	463	463	463	463
Butane	0	0	0	0
Naphtha	0	0	0	0
Gasoline	6,042	6,042	6,042	6,042
Jet fuel	621	621	621	621
Kerosene	7,047	7,047	7,047	7,047
A.D.O.	7,170	7,170	7,170	7,170
I.D.O.	1,540	1,540	1,540	1,540
Fuel oil	3,250	3,250	3,250	3,250
L.S.W.R	0	0	0	0
Asphalt	300	300	300	300
TOTAL	26,433	26,433	26,433	26,433
Export volume				
Propane	130	185	184	183
Butane	969	1,056	1,056	1,056
Naphtha	3,740	4,537	4,435	4,435
Reformate	0	306	136	0
Kerosene	363	1,661	2,290	2,268
A.D.O.	2,425	2,410	1,781	1,781
I.D.O.	4,292	2,209	2,208	2,206
L.S.W.R.	0	0	0	0
Asphalt	0	0	0	0
Sulfur	64	42	42	42
Cokes	374	248	248	248
TOTAL	12,357	12,654	12,380	12,219
Processed volume (each unit)				
Topping				
Dumai	6,979	6,690	6,690	6,691
Plaju	6,296	6,296	6,296	6,296
Cilacap	14,518	14,518	14,518	14,518
Balikpapan	12,330	12,330	12,330	12,330
TOTAL	40,123	39,834	39,834	39,835
Reformer				
Dumai	792	792	792	746
Cilacap	1,784	1,784	1,784	1,784
Balikpapan	1,049	1,049	1,049	1,049
TOTAL	3,625	3,625	3,625	3,579
F.C.C.				
Plaju	944	944	944	944
Hydro cracking				
Dumai	1,991	2,886	2,886	2,886
Balikpapan	1,921	2,428	2,428	2,428
TOTAL	3,912	5,314	5,314	5,314
Ethanol introduction South sumatra→Demand area3 Gasoline(*0.70)		395	395	
Kalimantan→Demand area 5 Gasoline(*0.70)		395		
Jawa→Demand area 3 Gasoline(*0.70)				160
Total ethanol volume	0	790	395	160
Oil products replaced Gasoline	0	553	277	112

(5) Distribution cost and volume of oil products for ethanol introduction cases

UNIT : 10*3 kl/year

			Transportation cost ($/kl)	A	A-C-1	A-C-2	A-C-3
Demand area 1	L.P.G.	Dumai	5.60	35.64	35.64	35.64	35.64
	Gasoline	Dumai	5.60	660.10	660.10	660.10	660.10
	Jet fuel	Cilacap	32.20	61.40	61.40	61.40	61.40
	Kerosene	Dumai	5.60	781.50	781.50	781.50	781.50
	A.D.O.	Dumai	5.60	1117.50	1117.50	1117.50	1117.50
	I.D.O.	Dumai	5.60	52.40	52.40	52.40	52.40
	Fuel oil	Dumai	5.60	152.80	152.80	152.80	152.80
Demand area 2	L.P.G.	Plaju		10.80	10.80	10.80	10.80
	Gasoline	Plaju		419.40	419.40	419.40	419.40
	Jet fuel	Balikpapan	25.90	21.70	21.70	21.70	21.70
	Kerosene	Plaju		443.50	443.50	443.50	443.50
	A.D.O.	Plaju		859.60	859.60	859.60	859.60
	I.D.O.	Dumai	10.50	124.90	124.90	124.90	124.90
	Fuel oil	Plaju		39.00	39.00	39.00	39.00
Demand area 3	L.P.G.	Plaju Cilacap	7.70	101.70 177.55	101.70 177.55	101.70 177.55	101.70 177.55
	Gasoline	Plaju Cilacap	7.70	451.39 1952.61	451.39 1676.11	451.39 1676.11	451.39 1840.61
	Jet fuel	Cilacap		204.80	204.80	204.80	204.80
	Kerosene	Plaju Cilacap	7.70	470.62 2084.98	609.69 1945.91	609.69 1945.91	523.62 2031.98
	A.D.O.	Plaju Cilacap	7.70	 2313.70	 2313.70	 2313.70	86.06 2227.64
	I.D.O.	Dumai Plaju Cilacap	18.90 7.70	826.16 19.31 73.43	60.65 5.28 852.97	59.47 5.28 854.16	57.44 5.28 856.18
	Fuel oil	Plaju Cilacap	7.70	204.81 1257.68	239.14 1223.36	239.14 1223.36	239.14 1223.36
Demand area 4	L.P.G.	Cilacap	3.22	42.77	42.77	42.77	42.77
	Gasoline	Dumai Cilacap	21.00 3.22	349.12 354.68	 703.80	72.62 631.18	237.12 466.68
	Jet fuel	Cilacap Balikpapan	3.22 16.10	21.10	21.10	21.10	21.10
	Kerosene	Cilacap Balikpapan	3.22 16.10	223.18 790.62	304.77 709.03	283.49 730.31	197.11 816.69
	A.D.O.	Cilacap Balikpapan	3.22 16.10	713.78 88.52	716.24 86.06	716.24 86.06	802.30
	I.D.O.	Dumai Balikpapan	21.00 16.10	134.10	 134.10	 134.10	 134.10
	Fuel oil	Cilacap	3.22	409.50	409.50	409.50	409.50
Demand area 5	L.P.G.	Cilacap		79.71	79.71	79.71	79.71
	Gasoline	Cilacap Balikpapan	 12.60	288.11 1072.69	215.49 868.81	288.11 1072.69	288.11 1072.69
	Jet fuel	Balikpapan	12.60	206.60	206.60	206.60	206.60
	Kerosene	Balikpapan	12.60	1753.00	1753.00	1753.00	1753.00
	A.D.O.	Balikpapan	12.60	1497.10	1497.10	1497.10	1497.10
	I.D.O.	Cilacap Balikpapan	 12.60	294.50	 291.50	 294.50	 294.50
	Fuel oil	Cilacap Balikpapan	 12.60	1020.50	623.08 397.42	622.02 398.48	620.22 400.28
Demand area 6	L.P.G.	Balikpapan	7.84	15.25	15.25	15.25	15.25
	Gasoline	Balikpapan	7.84	265.23	265.23	265.23	265.23
	Jet fuel	Balikpapan	7.84	57.10	57.10	57.10	57.10
	Kerosene	Balikpapan	7.84	260.50	260.50	260.50	260.50
	A.D.O.	Balikpapan	7.84	286.50	286.50	286.50	286.50
	I.D.O.	Balikpapan	7.84	15.40	15.40	15.40	15.40
	Fuel oil	Balikpapan	7.84	165.80	165.80	165.80	165.80
Demand area 7	Gasoline	Balikpapan	13.58	169.30	169.30	169.30	169.30
	Jet fuel	Balikpapan	13.58	23.60	23.60	23.60	23.60
	Kerosene	Balikpapan	13.58	204.20	204.20	204.20	204.20
	A.D.O.	Balikpapan	13.58	207.70	207.70	207.70	207.70
Demand area 8	Gasoline	Balikpapan	35.00	59.30	59.30	59.30	59.30
	Jet fuel	Balikpapan	35.00	24.20	24.20	24.20	24.20
	Kerosene	Balikpapan	35.00	35.20	35.20	35.20	35.20
	A.D.O.	Balikpapan	35.00	86.00	86.00	86.00	86.00
Transportation cost of oil products (10*3 $/year)				155,542	140,503	144,628	147,541

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