6-2 IMPLEMENTATION OF CONCEPTUAL PLANT DESIGN

Taking into consideration the site characteristics mentioned in 6-1 and the results of the master plan executed in the strategic study stage (FY1984), the conceptual plant design was carried out with the choise of plant location and equipment transportation means.

6-2-1 Plant Location

As a result of site reconnaissance, the three areas shown in Fig. 6-2-1 were proposed as the plant site.

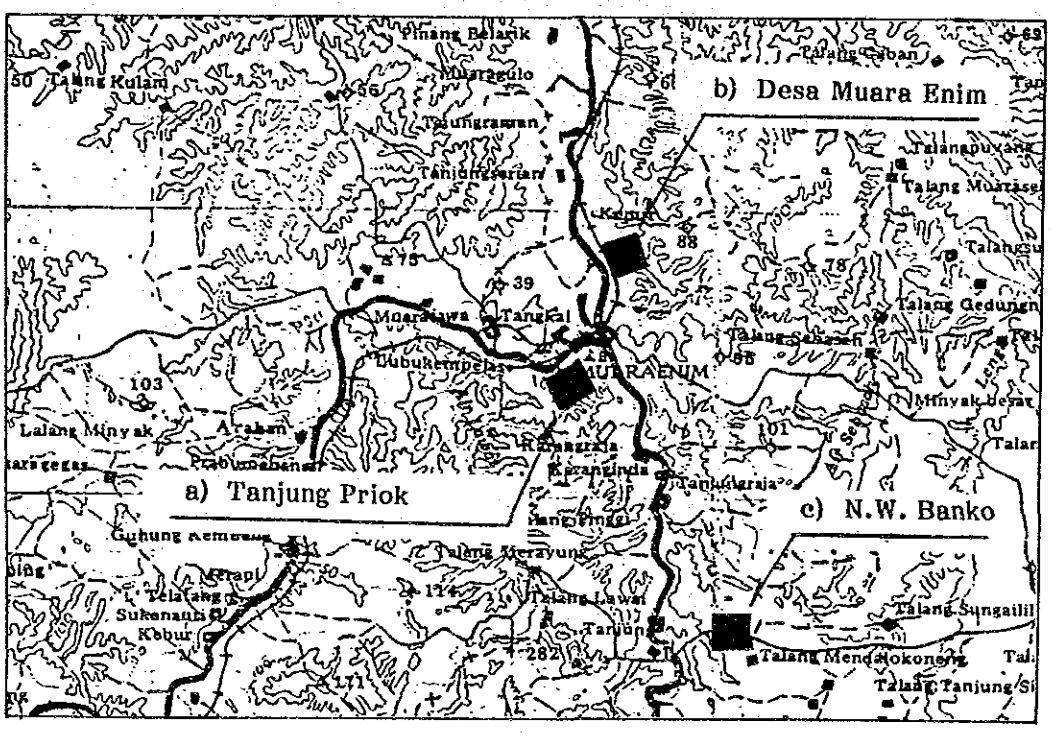


Fig. 6-2-1 Proposed Plant Site Locations

a) Tanjung Priok

Location; On the south of Muara Enim and about 10 km to the northwest of N.W. Banko.

Desirable Features;

- o Relatively spacious and flat

- o Proximity to river
- o Proximity to mine

b) Desa Muara Enim

Location; About 15 km to the north of N.W. Banko

Desirable Features;

- o Relatively spacious and flat
- o Proximity to river
- o Proximity to mine

c) N.W. Banko

Location; On the north of N.W. Banko area, and 5-10 km to the east of the Enim River

Desirable Features;

- o Close proximity to mine site
- o Spacious and flat
- o No influence of flood anticipated
- o Seemingly stable soils

In this study, Tanjing Priok is taken as the plant site on the assumption that geological conditions are adequate. However, this assumption as well as other features must be confirmed in the final stage.

6-2-2 Outline of Coal-to-Methanol Plant

(1) Design Basis

i)	Methanol Production Rate	;	160,000 ton/year (5,000 ton/day)
ii)	Annual Operation Days	;	320 days/year
iii)	Planet Location	;	Tanjing Priok
iv)	Product Specification	;	Chemical Grade (99.9% CH_3OH)

v) Feed Coal Specification ;

C, %	;	27.4
V.M., %	;	32.8
Ash, %	;	4.8
Mo, %	;	35.0
Total, %	;	100.0
HV, Kcal/kg	;	4,430

vi) Coal Receiving ; Bunker Hopper at Mine Site

vii) Product Shipping ; Plant Gate

viii) Utilities ; All the utilities except raw water and coal are generated inside the plant

Conditions;

HP St'm	;	480°C, 65 kg/cm^{2}G
MP St'm I	;	350°C, 40 kg/cm^{2}G
MP St'm II	;	250°C, 40 kg/cm^{2}G
LP St'm	;	155°C, 3.5 kg/cm^{2}G
BFW	;	110°C, 55kg/cm^{2}G
C. Water	;	30°C (Supply)/37°C (Return)

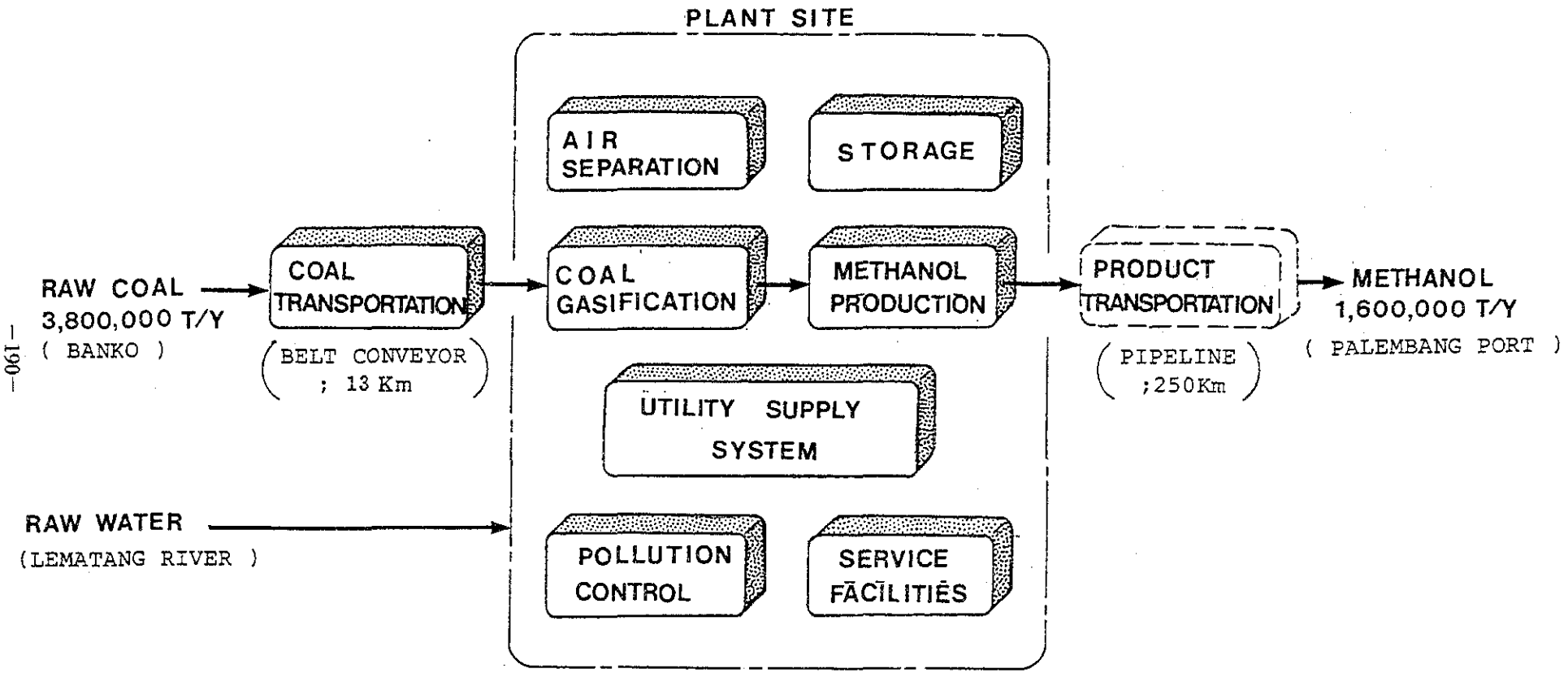
(2) Plant Configuration

Fig. 6-2-2 shows the scope of the methanol production complex devided into eight blocks each of which has its individual function.

Note) Product transportation is not included in this complex, but its cost effect on the project is discussed in 6-3-4.

The component facilities in each block are listed in Table 6-2-1. The coal transportation, coal gasification and methanol production blocks, which are directly concerned to the coal-to-methanol conversion, are described in the following pages.

Fig. 6-2-2 Overall Block Flow Diagram



* Component facilities consisting each block are listed in Table

Table 6-2-1 Plant Configuration

1) Belt Conveyor System

Primary Crusher/Feeder
Overland Coal Conveyor

2) Coal Gasification

Coal Storage and Handling
Coal Pretreatment
Coal Gasification
Gas Cooling/Dedusting
Calcination

3) Methanol Plant

Gas Compression
Gas Treating
Methanol Synthesis
Methanol Distillation

4) Air Separation Plant

Air Separation
Liquid Oxygen Tank
Liquid Nitrogen Tank

5) Utility System

Power Generation
Power Distribution
Steam Boiler
Water Cooling
Raw Water Intake/Pretreatment
Instrument/Plant Air Supply

6) Pollution Control/Safety System

Waste Water Treatment
Solid Waste Disposal
Flare/Blowdown
Fire Fighting

7) Storage

Product Tank
Chemicals Tank
LPG Tank
Fuel Oil Tank
Lubricating Oil Tank

8) Service Facilities

Administration Office
Laboratory
Warehouse
Accommodation
Canteen
Cafeteria
Leisure Center
Mosque
Communication System
Maintenance Shop
Portable Water Supply

(3) Belt Conveyor system

1) Route

With the limited data in hand, the route was determined tentatively as shown Fig. 6-2-3. After received in a bunker hopper, the mined coal is crushed into appropriate size and then carried to the plant site by two-parallel conveyor lines. The conveyor extends about 13 km crossing over a road and a river.

2) Major Equipment

Specifications and the number of units of major equipment are listed in Table 6-2-2, and sketches for conveyor, gallery bridge (on-road) and suspension bridge (on-river) are shown in Fig. 6-2-4, Fig. 6-2-5 and Fig. 6-2-6, respectively.

Table 6-2-2 Major Equipment List
(Belt Conveyor System)

Description	Q'ty	Specification
Bunker hopper	1	350 m^3
Vibrating feeder	2	Max. 300 t/h, 1x2 kw
Crusher (Impact or Jaw type)	2	Max. 300 t/h, 1x132 kw
Belt conveyor No. 1, A/B	2	Q=282 t/h BW800, L=3,890 m, 2x132 kw
Belt conveyor No. 2, A/B	2	Q=282 t/h BW800, L=1,200 m, 1x90 kw
Belt conveyor No. 3, A/B	2	Q=282 t/h BW800, L=1,840 m, 1x132 kw
Belt conveyor No. 4, A/B	2	Q=282 t/h BW800, L=2,050 m, 1x132 kw
Belt conveyor No. 5, A/B	2	Q=282 t/h BW800, L=1,420 m, 1x90 kw
Belt conveyor No. 6, A/B	2	Q=282 t/h BW800, L=1,700 m, 1x132 kw
Belt conveyor No. 7, A/B	2	Q=282 t/h BW800, L=990 m, 1x90 kw

Crusher house	1	10 m x 15 m x 3 floors
Suspension bridge on river	1	Span 150 m x 3.4 m for two conveyors
Gallery bridge on road with two approach bridges	5	Span 30 m x 3.4 m for two conveyors

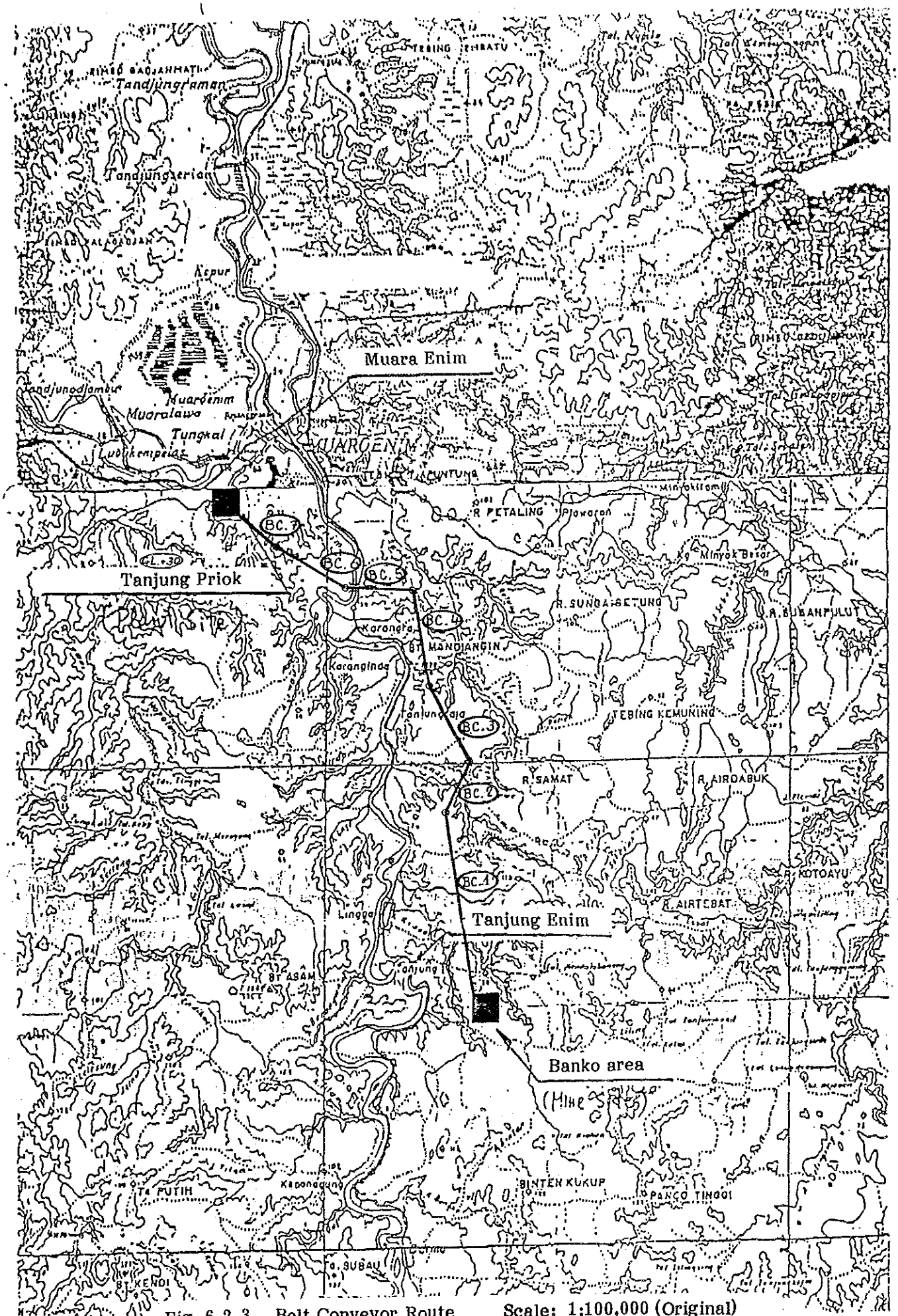


Fig. 6-2-3 Belt Conveyor Route Scale; 1:100,000 (Original)

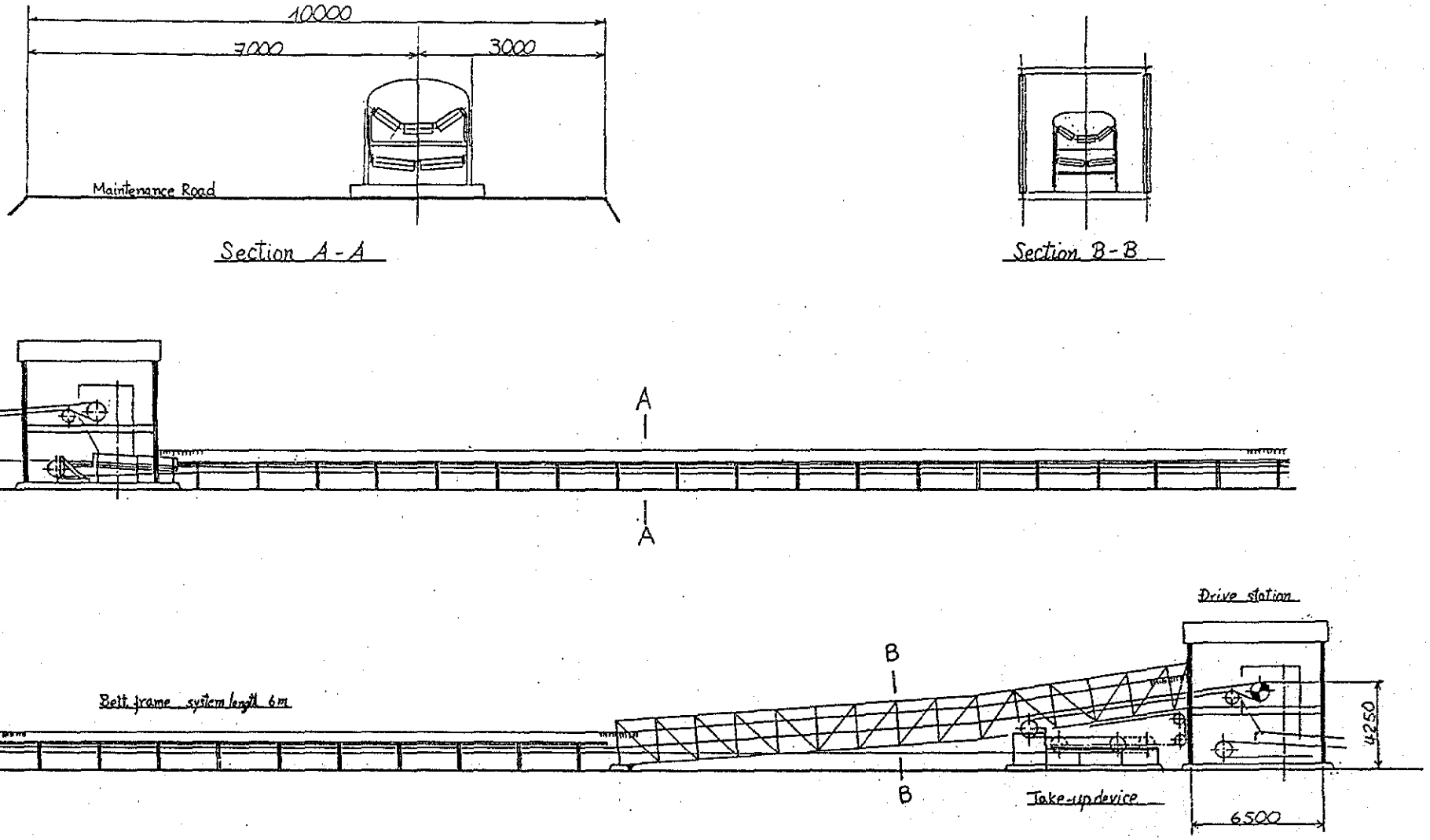
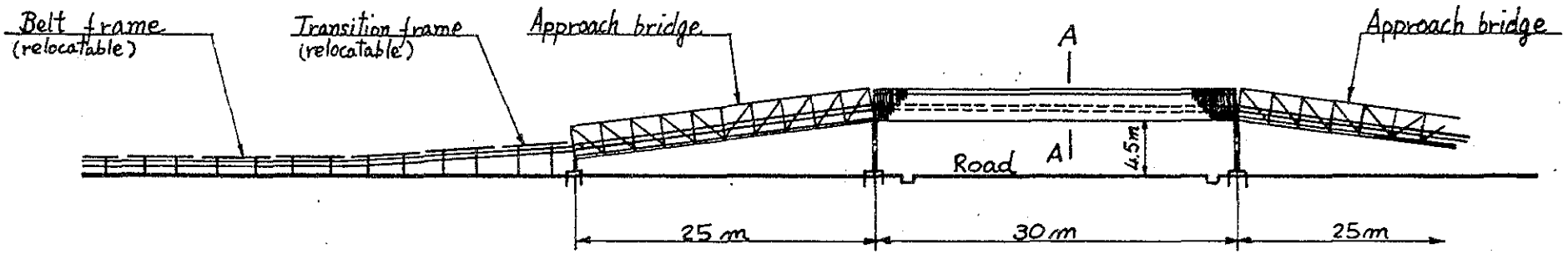


Fig. 6-2-4 Typical Layout of Conveyor



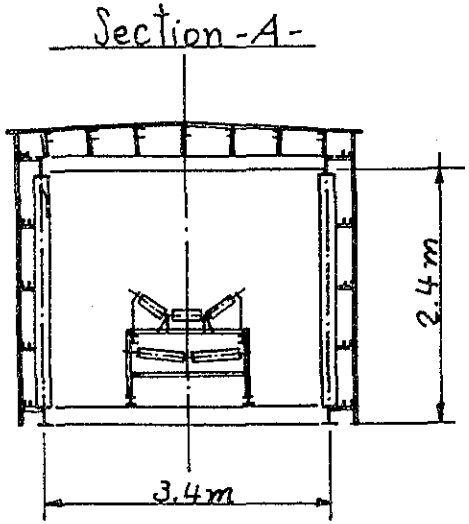


Fig. 6-2-5 Gallery Bridge

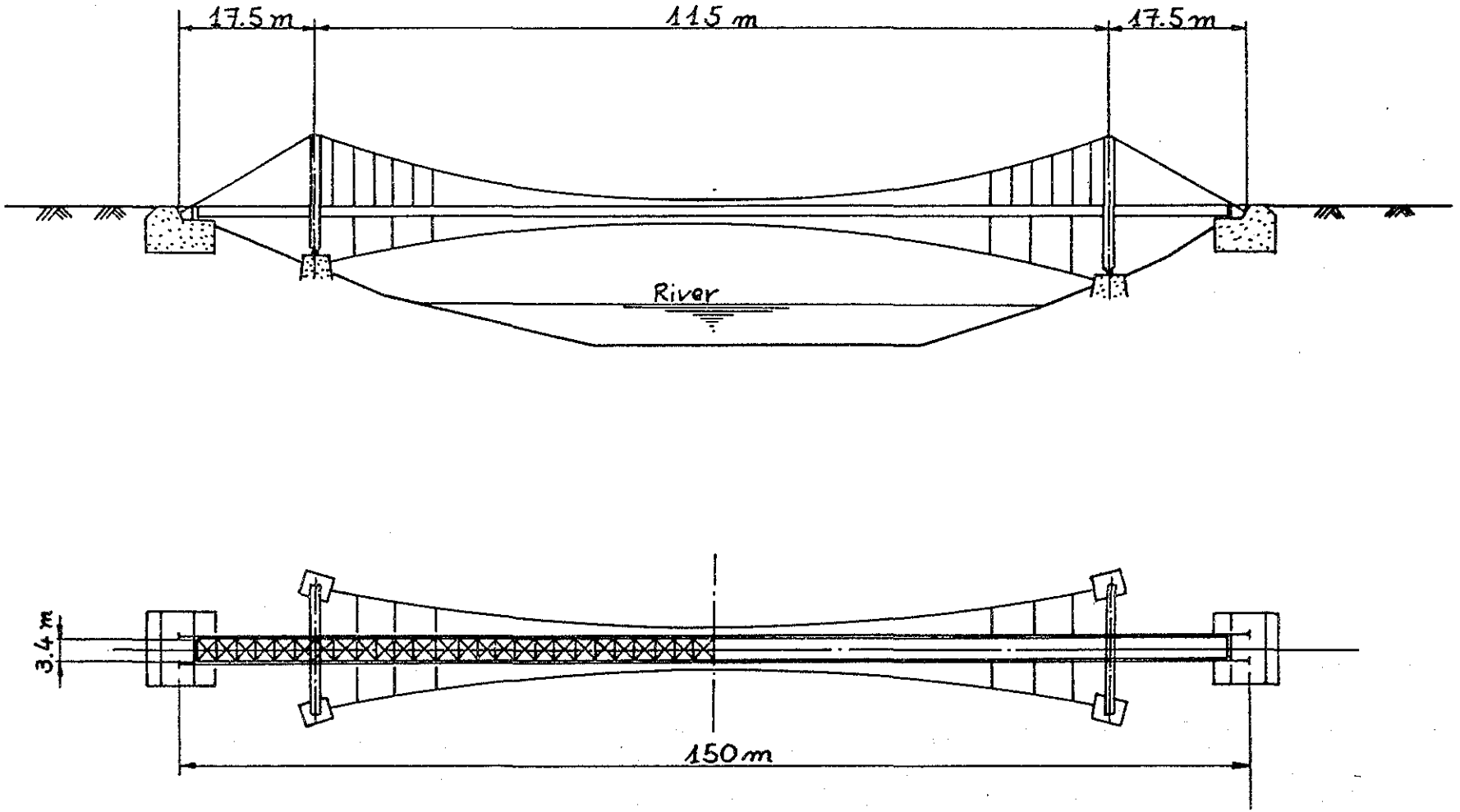


Fig. 6-2-6 Suspension Bridge

(4) Coal Gasification

1) Process Flow Diagram

See Fig. 6-2-7.

2) Process Description

(For details, see the interim report, page 234-237)

a) Coal Pretreating

The coal (Moisture=35%), carried from the mine site by conveyor, is fed to the pulverizer through the primary crusher and dewatering drum. After dried and pulverized, the coal is then carried pneumatically to the coal feed system. The pulverized coal is at first stored in a feed tank, and then supplied continuously to the gasifier.

b) Gasification

The gasifier is a simple furnace with firebrick lining. The furnace holds several hundred tons of molten iron at a temperature of 1,400-1,600°C. Coal, oxygen and steam are blown onto the surface of this molten iron at high speed through a specially designed non-submersion-type lances; this brings about an instantaneous gasification reaction in the iron bath.

The coal ashes, formed as molten slag, float on the iron bath surface by gravity and scrubbed from the gasifier.

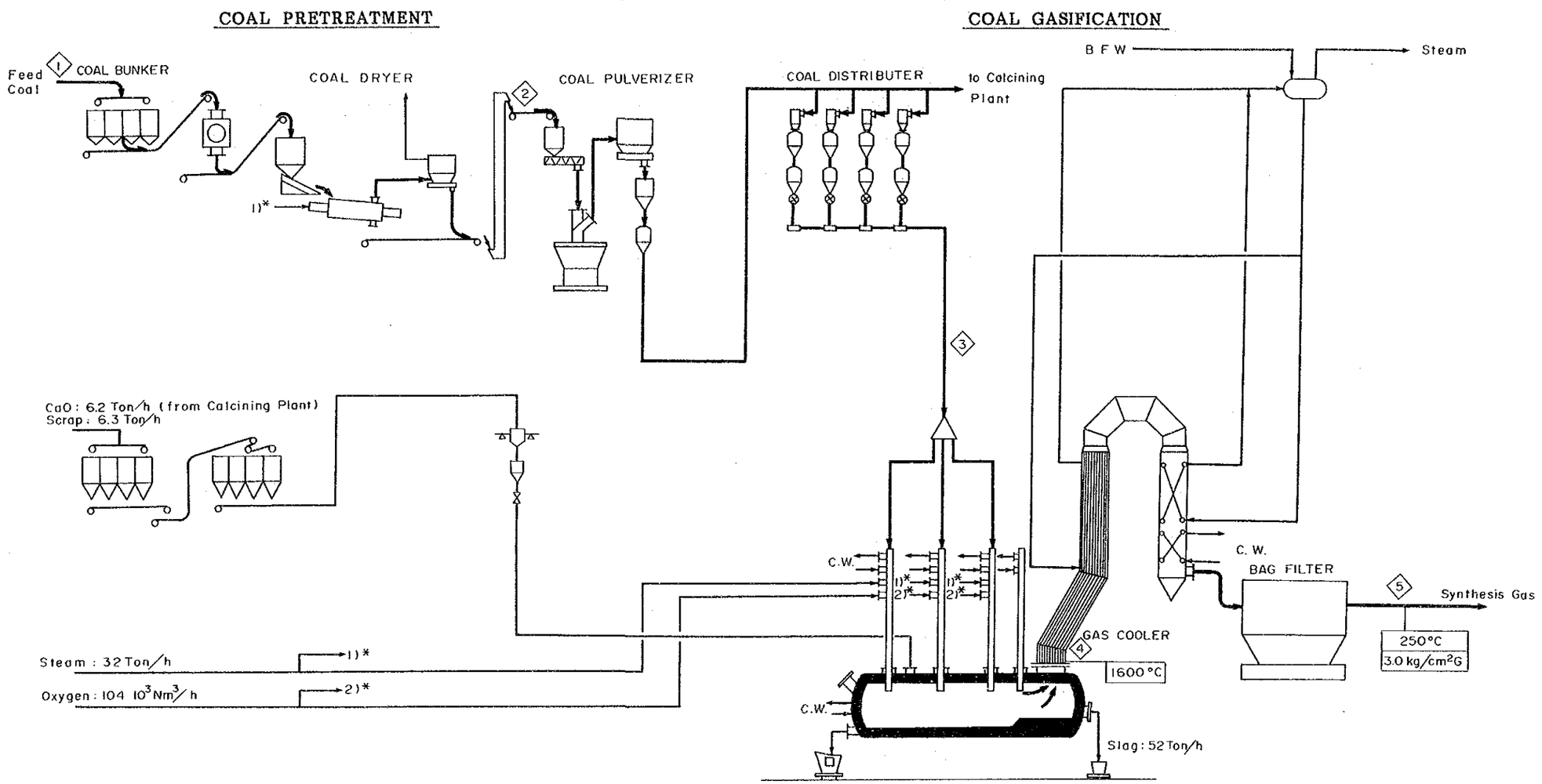
c) Product gas treatment

The high temperature gas produced in the gasifier is cooled by a two-stage gas cooler where the sensible energy of the gas is recovered by generating steam, and a small amount of dust in the gas is removed in a bag house.

3) Major Equipment

Specifications and the number of units of major equipment are listed in Table 6-2-3.

Fig. 6-2-7 SIMPLIFIED PROCESS FLOW DIAGRAM
- COAL PRETREATMENT GASIFICATION -



MATERIAL BALANCE COAL GASIFIER

	①	②	③
Coal Rate, Ton/h	399	305	285
Moisture, %	35	15	10
Size, mm	<40	<3	-74 (>70%)

	④	⑤
Gas Rate (Dry), $10^3Nm^3/n$	509.2	509.2
Comp. CO, vol%	60.2	60.2
H_2, "	35.1	35.1
CO_2, "	4.3	4.3
N_2, "	0.4	0.4
H_2S/COS, ppm	65/22	65/22
T.S, "	87	87
Dust, g/Nm^3	25.0	0.01 - 0.05

Table 6-2-3 Major Equipment
(Coal Gasification)

Description	Q'ty	Capacity	Specification
1. Coal Handling Section			
1.1 Primary Crusher	4	120 T/H	Dimension: 3,560W x 2,690L x 1,890H Weight: 30 T/unit
1.2 Dewatering Drum	4	100 T/H	Dimension: 4,800 ϕ x 29,000L Weight: 540 T/unit
1.3 Coal Pulverizer	4	80 T/H	Dimension: 5,300 ϕ x 8,300H Weight: 280 T/unit
2. Gasification Process Section			
2.1 Gasifier	3+1	100 T/H coal	Shell dimension: 5,400ϕ x 17,700H Weight: 670 T/unit
2.2 Ladle	3	290 Tonnes	Dimension: 4,800ϕ x 6,700 H Weight: 65 T/unit
2.3 Ladle Crane	1	450 Tonnes	Span: 14,000 mm Weight: 670 T/unit
3. Gas Treatment Section			
3.1 Radiation Cooler	3+1	170 KNm3/H	Dimension: 4,100ϕ x 30,600H Weight: 450 T/unit
3.2 Convection Cooler	3+1	170 KNm3/H	Demension: 4,100ϕ x 17,300H Weight: 450 T/unit
3.3 Heat Exchanger	3+1	170 KNm3/H	Dimension: 4,100ϕ x 20,400H Weight: 540 T/unit

(5) Methanol Production

1) Process Flow Diagram

See Fig. 6-2-8.

2) Process Description

(For details, see the interim report, page 245-249)

a) Dust Removal and 1st Compression

The raw gas leaving the gasifier at 3 kg/cm^2G contains 10-50 mg/Nm^3 dust.

The dust in the raw gas is reduced to 5 mg/Nm^3 and this gas is compressed to 20 kg/cm^2G.

b) CO-Shift Conversion/COS Hydrolysis

In order to adjust hydrogen/carbon monoxide ratio as required for the methanol production, 55% of the raw gas goes to CO-shift convertor and 45% of raw gas to the COS hydrolizer.

Both gas streams are then mixed together after being cooled by generating steam, and introduced to the acid gas removal unit.

c) Acid Gas Removal

Acid gases such as H_2S and CO_2 are removed from the raw gas by hot potassium carbonate (HPC) solution.

The raw gas containing about 27% of CO_2 and 200 ppm of H_2S is reduced to 3.5% and a few ppm of CO_2 and H_2S, respectively.

d) Methanol Synthesis

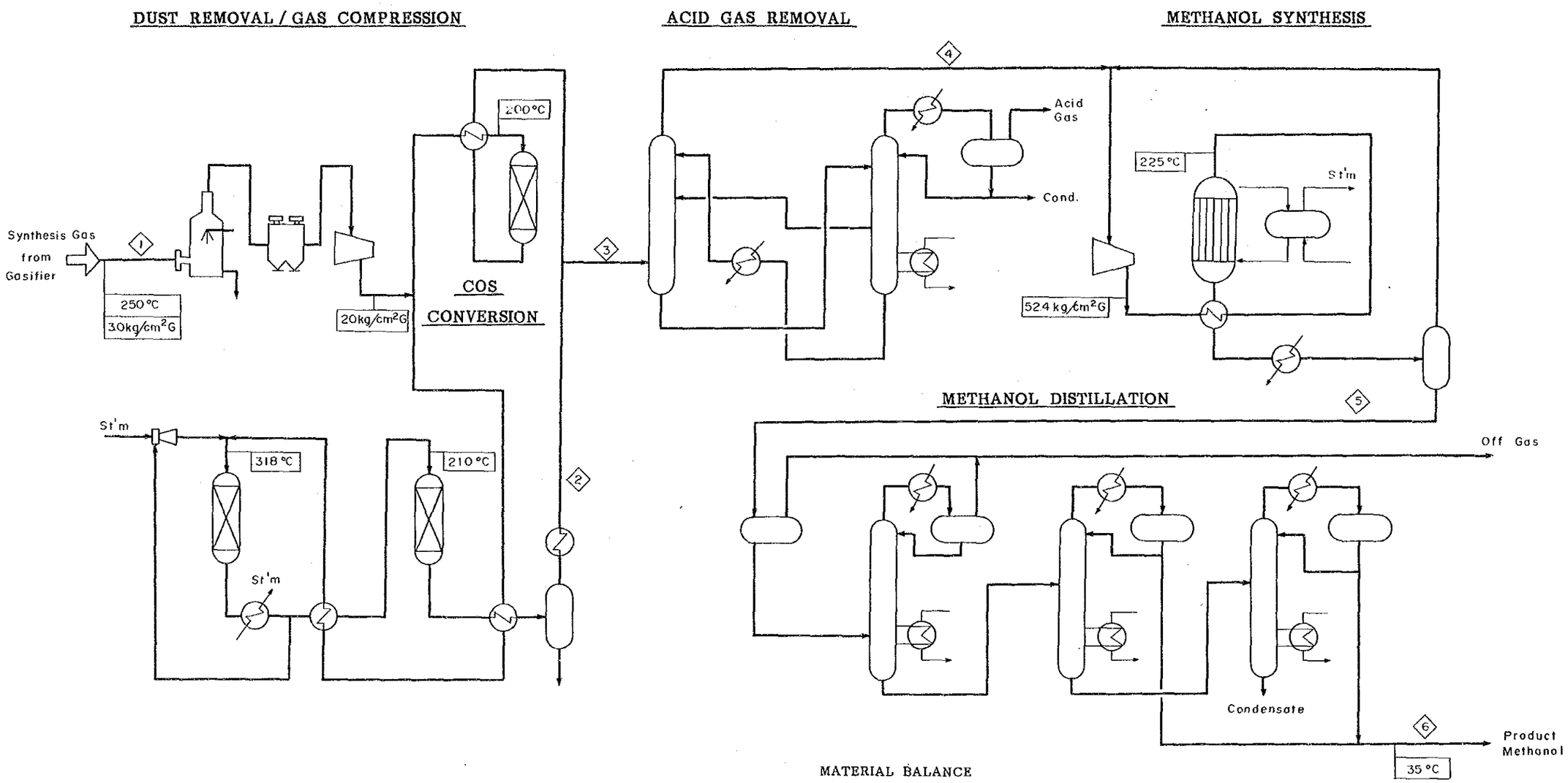
After compressed to 52 kg/cm^2G, the synthesis gas is fed to the catalytic reactor at 225°C after heat exchange with the reactor effluent. As the catalyst cannot tolerate the adiabatic temperature rise of this exothermic reaction, the heat is removed by generating 40 kg/cm^2G steam in the shell side of the reactor.

The produced methanol, after cooled, is separated from the unconverted gas in the separator and then sent to the distillation section via a depressuring valve. The raw methanol from synthesis unit is purified to 99.9% through three distillation columns before storage.

3) Major Equipment

Specifications and the number of units of major equipment are listed in Table 6-2-4.

Fig. 6-2-8 SIMPLIFIED PROCESS FLOW DIAGRAM
- GAS PRETREATMENT · METHANOL PRODUCTION -



MATERIAL BALANCE

	①	②	③	④
Flow Rate (Dry), $10^3 Nm^3/h$	509.2	435.0	664.2	504.8
Comp. CO, , vol %	60.2	1.2	21.5	28.4
H_2, , "	35.1	60.1	51.5	67.7
CO_2 , "	4.3	38.4	26.7	3.5
N_2, , "	0.4	0.3	0.3	0.4
H_2S/COS, ppm	65/22	55/-	66/-	-
Dust, g/Nm^3	0.01	-	-	-

	⑤	⑥
Flow Rate, Ton/h	223.3	208.3
Comp. CH_3OH, wt%	94.2	≧ 99.9
Inerts, "	0.4	-
H_2O, "	5.4	≦ 0.1

Table 6-2-4 Major Equipment
(Methanol Production Section)

Description	Q'ty		Specification
Dedusting (3 trains)		Capacity ;	170,000 Nm^3/h/train
o Dust Washer	3+1S	Dust, In/out ;	50/5 mg/Nm^3
CO Shift (2 trains)		Capacity ;	140,000 Nm^3/h/train
o High Temp. Converter	2	CO, In/Out ;	59.6/1.2 vol.%
o Low Temp. Converter	2	Type ;	Vertical, Cylindrical with catalyst
COS Hydrolysis (2 trains)		Capacity ;	116,000 Nm^3/h/train
COS Converter	2	COS, In/Out ;	50/0.1 ppm
Acid Gas Removal (2 trains)		Capacity ;	338,000 Nm^3/h/train
o Absorber	2	CO_2, In/Out ;	26.1/3.5 vol.%
o Regenerator	2	H_2S, In/Out ;	200/0.1 ppm
Methanol Synthesis (2 trains)		Capacity ;	253,000 Nm^3/h/train
o Methanol Reactor	2	Type ;	Vertical, Cylindrical with Catalyst
Methanol Distillation (2 trains)		Capacity ;	2,500 ton/h-Methanol/Train
o Pre-run Column	2	Type ;	Vertical, Cylindrical with Tray
o Pressure Column	2		
o Pressureless Column	2		

(6) Utility Requirement

See Table 6-2-5 and Fig. 6-2-9.

Table 6-2-5 Utility Requirement

Coal	96 T/h	(external supply)
Raw Water	2,480 T/h	(ditto)
Electricity	70,700 kw	(internal supply)
Cooling Water	64,000 T/h	(ditto)
BFW	1,332 T/h	(ditto)
HP Steam	458 T/h	(ditto)

(7) Plant Layout

The exact layout cannot be determined in this stage, but the image of the layout as well as the required area will be of help to the study in the final step. In this regards, the plant layout is roughly estimated as shown in Fig. 6-2-10.

6-2-3 Equipment Transportation

(1) Transportation Means

Generally speaking, the condition of equipment transportation route is an important factor as well as the plant site condition and plant design since it affects on the economic aspect of the project.

If the existing way to the plant site is inadequate to transport a large amount of equipment including heavy and sizable vessels, the expense spent on the route improvement may become enormous. After the quipment manifactured in Japan are shipped to the Port of Palembang, there are two ways to transport the equipment from there to the plant site;

i) by land through Sumatra Highway
ii) by water through the Musi and the Lematang River

Although hydrographical data are insufficient at this stage, water way was chosen as transportation route in this study on the ground of the following facts.

For the land transportation, it is impossible to transport the equipment heavier than 35 tons at a time unless almost all the bridges (more than 20) are to be reinforced through the route while there are a lot of equipment for the plant exceeding 35 tons.

For the water route, there seems to be no problem to barge the equipment even heavier than 500 tons such as gasifier as far as the hydrographic data (see 6-1-5) indicates.

In addition to it, a 150-ton container was barged without trouble through the same route in dry season.

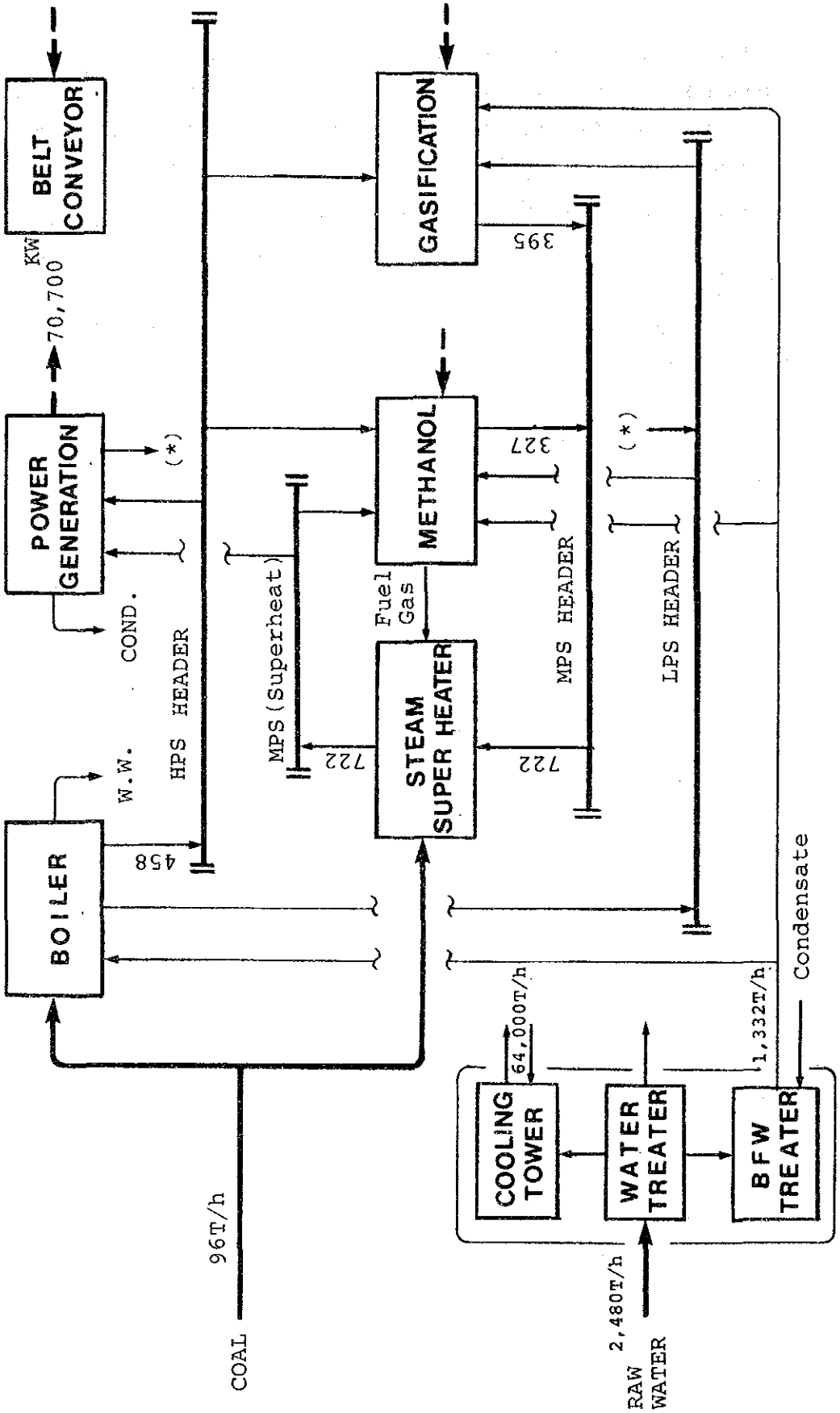


Fig. 6-2-9 Utility Flow Diagram

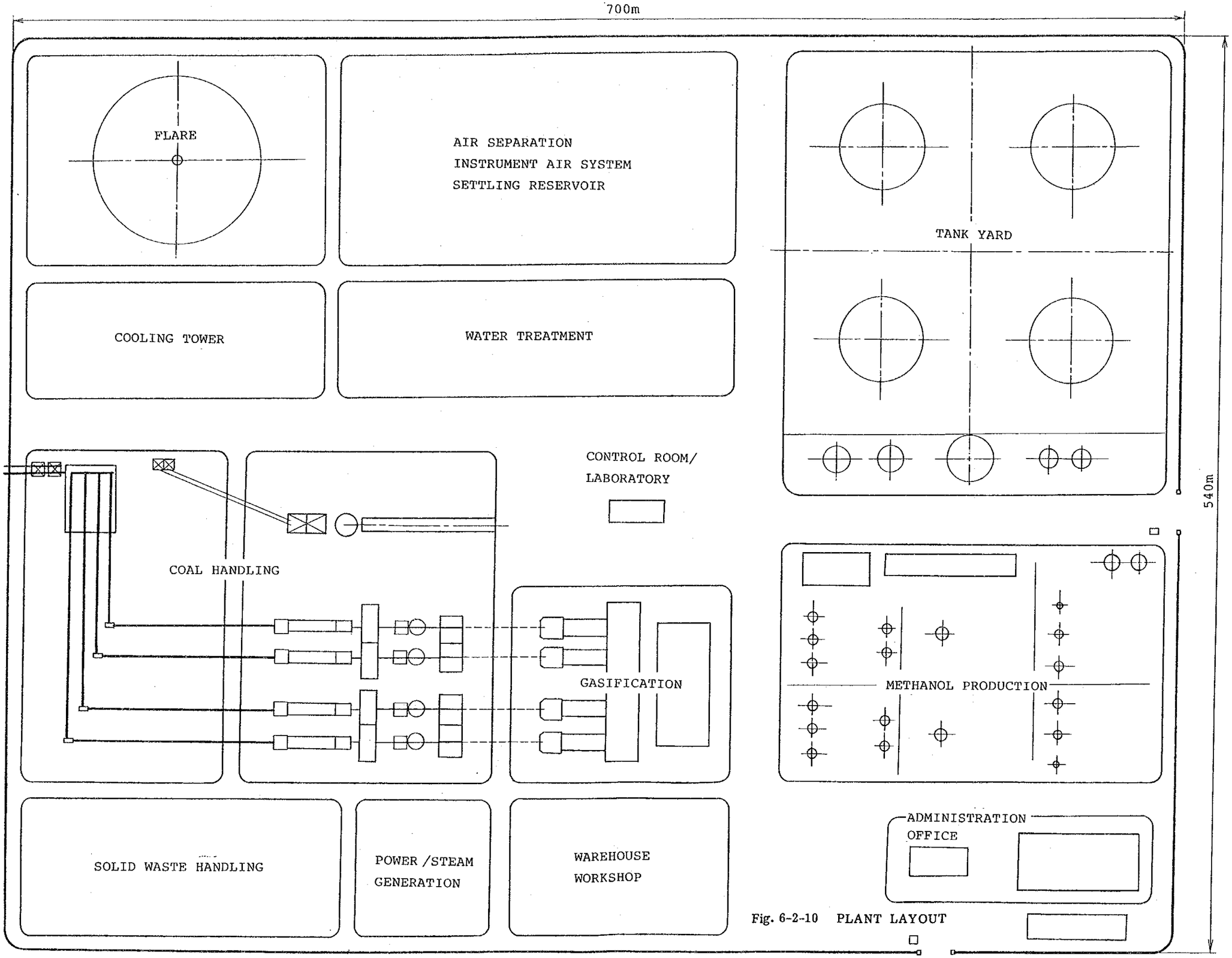


Fig. 6-2-10 PLANT LAYOUT

(2) Transportation Plan

1) Shipment

Cargos are loaded to freighters at the Japanese ports such as Yokohama, Hiroshima or Hakata whichever closer to the manufacturing factories and shipped to the Port of Palembang. (See Fig. 6-2-11)
Taking into consideration the water depth, the transshipment and rotation of barges at the Palempang Port, 10,000 DWT class freighter is suitable.

2) Transshipment

At the Port of Palembang, the cargos are transshipped to six barges (3,000 DWT/each) which are moored in the Port. (See ① and ② in Fig. 6-2-12) Unloading work will take about 3 days/voyage.

3) Barge Towing

Each barge is towed by one tug boat (single towing) for about 250 km to the unloading site through the Musi and the Lematang River. (See ③ in Fig. 6-2-12)

Tug Boat ; 1,500 HP
barge ; 3,000 DWT (20 m x 60 m x 4.2 m)

4) Equipment Unloading

A slope jetty and a floating barge is provided at the unloading site to cope with the fluctuation of water level between a dry and a rainy seasons.
A heavy cargo is rolled off by a dolly through a slope jetty while general cargos are unloaded to a trailer by a crawler crane installed on the floating barge. (See 4 in Fig. 6-2-12)

Examples of major equipment are listed in Table 6-2-6.

Table 6-2-6 Examples of Major Equipment

Item	Q'ty	Size (mm)	Weight (ton/unit)
Gasifier	4	5,400ϕ x 17,700^{H}	670
Radiation Cooler	4	4,100ϕ x 30,600^{H}	450
Convection Cooler	4	4,100ϕ x 17,300^{H}	450
Heat Exchanger	4	4,100ϕ x 20,400^{H}	540
Methanol Reactor	2	6,000ϕ x 12,000^{T-T}	360
Pressure Column	2	3,500ϕ x 42,000^{T-T}	150
Pressureless Column	2	4,500ϕ x 42,000^{T-T}	150

Annex 5. Transportation Route Map

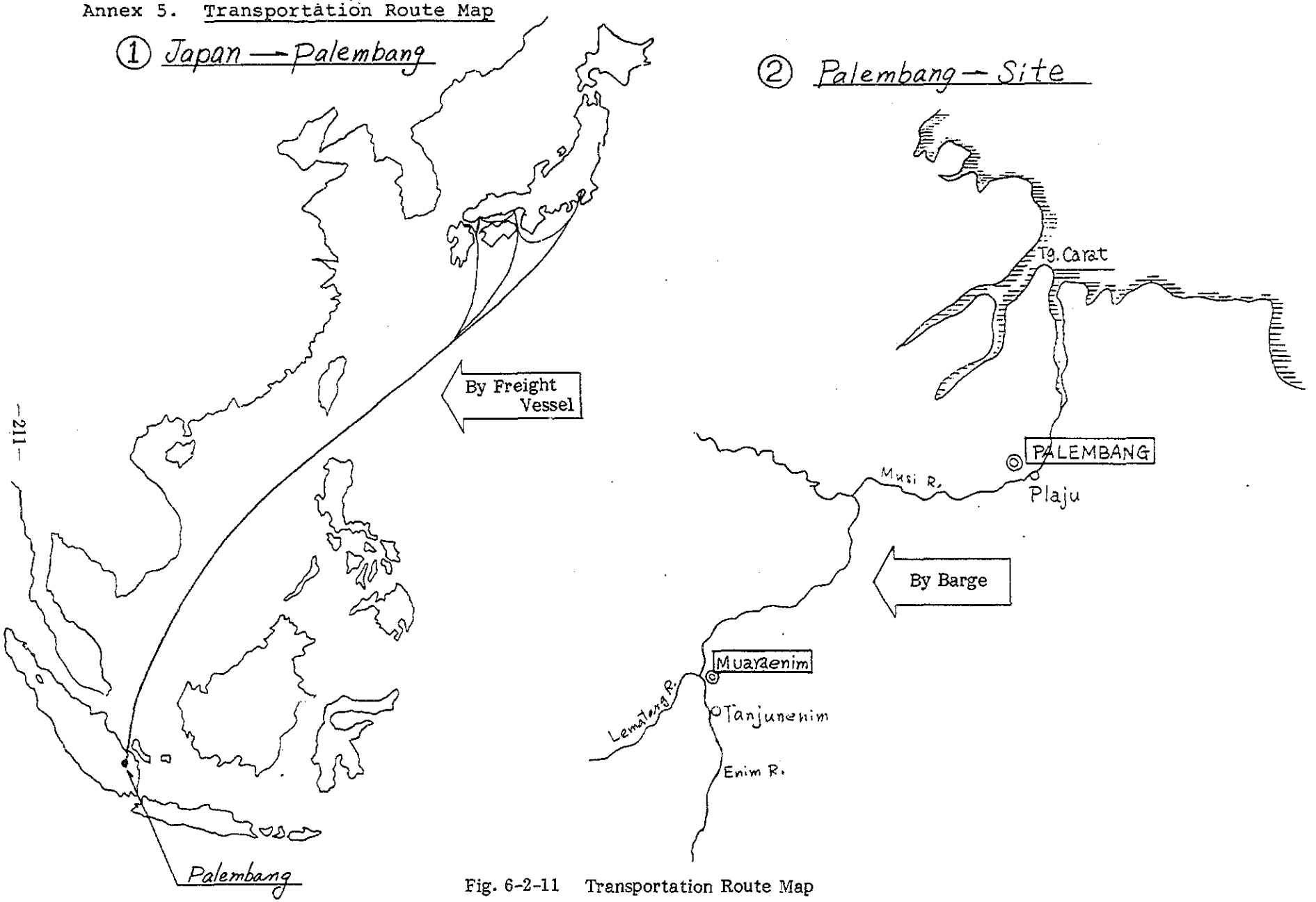


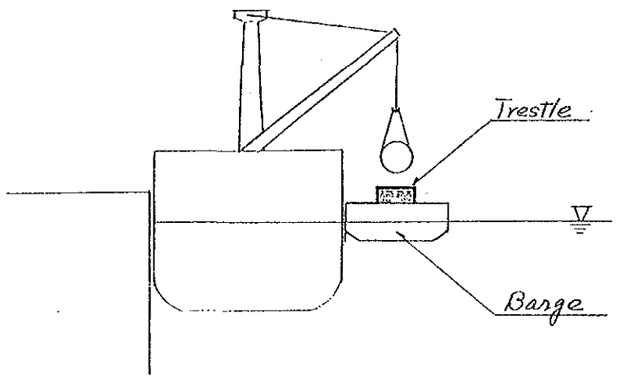
Fig. 6-2-11 Transportation Route Map

REV. NO.	DATE	DESCRIPTION	SIGN

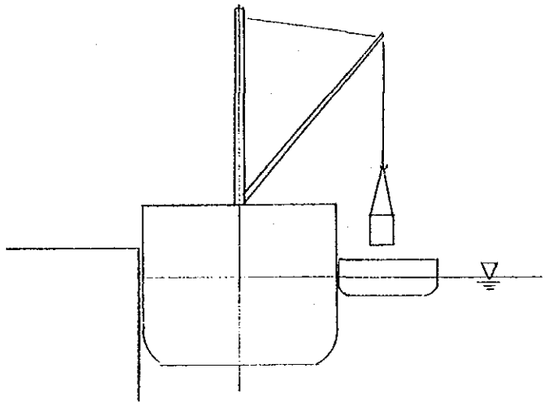
Fig. 6-2-12 Transportation Plan (1/2)

① Unloading at Palembang

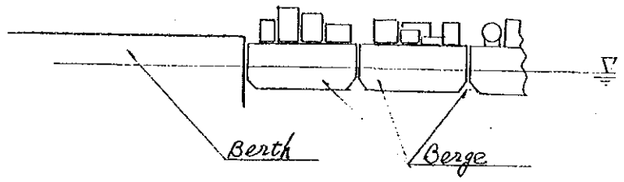
a. Heavy Cargo



b. General Cargo

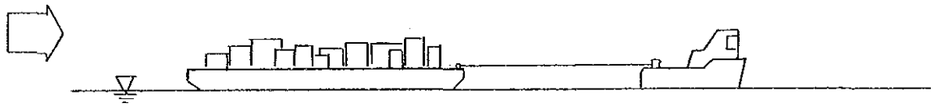


② Barge Mooring to Berth at Palembang Port



③ Barge Towing

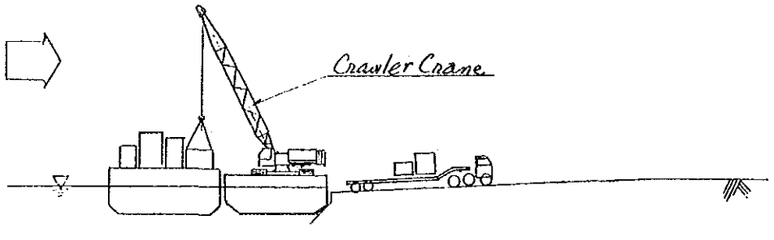
Single towing



Palembang → Site (250km)

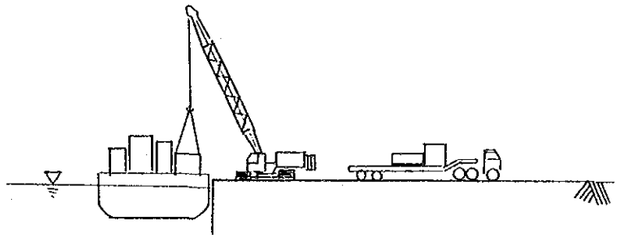
④ Unloading General Cargo

a. By Crane on Barge



④ Unloading General Cargo

b. By Crane on Ground



APP'D		INDONESIA METHANOL PJ.	
CHK'D			
DRW'N	H. Yokeshiji	Transportation Plan (1/2)	
TRC'D			
SCALE	DATE	DWG.NO. SA-F-1001	

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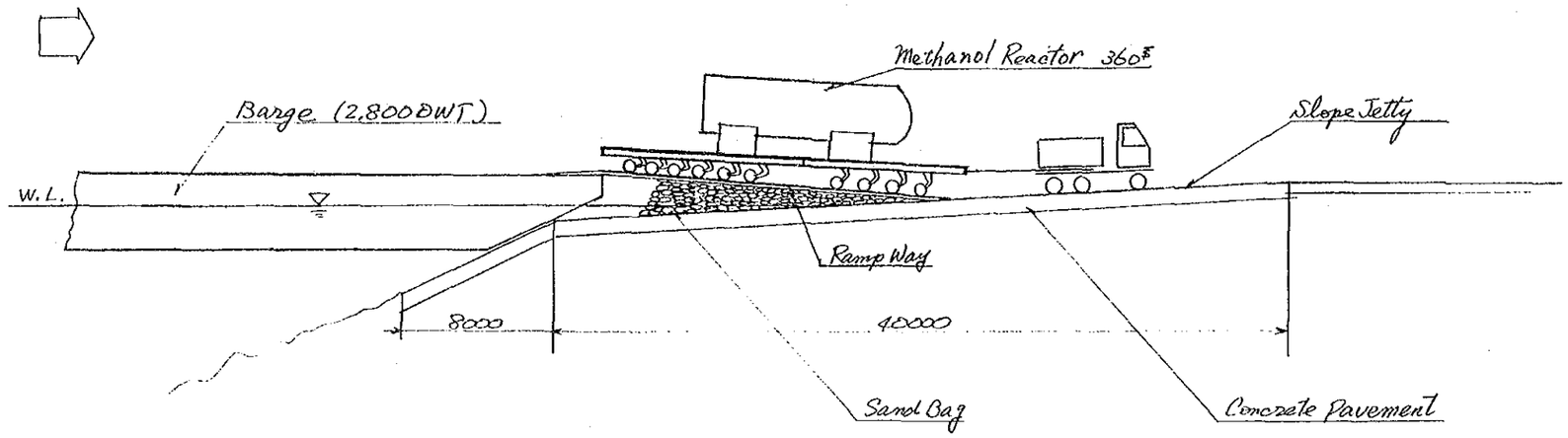
REV. NO.	DATE	DESCRIPTION	SIGN

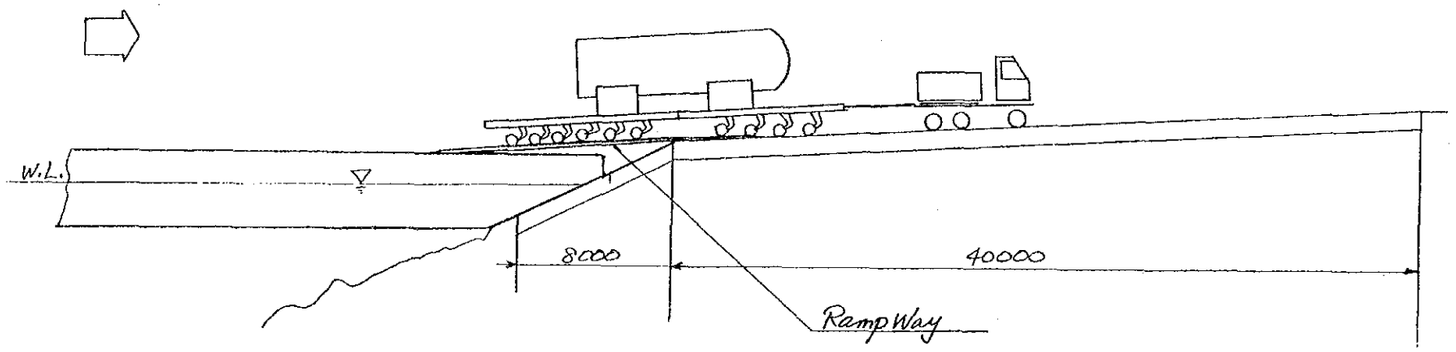
④ Unloading Heavy Cargo

Fig. 6-2-12 Transportation Plan (2/2)

a. Max. High Water Level



b. Low Water Level



APP'D		INDONESIA METHANOL P.J.
CHK'D		
DRW'N	M. Yokoyama	Transportation Plan (2/2)
TRC'D		Roll-off Work for Heavy Cargo
SCALE	DATE	DWG.NO. SA-F-1002

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6-3 FINANCIAL ANALYSIS

Financial viability and profitability of the project was evaluated by means of financial statements* and internal rate of return (hereafter referred to as IRR) on total project investment.

* Projected Profit & Loss Statement
Projected Cash Flow Statement
Projected Balance Sheet

6-3-1 Assumptions

(1) Production Schedule

1) Annual Production ; 1,600,000 ton of chemical grade methanol

2) Plant Construction Period ; 1990-1993 (4 years)

where 30% Completion at the end of 1990
60% Completion at the end of 1991
80% Completion at the end of 1992
100% Completion at the end of 1993

3) Project Life ; 1994-2023 (30 years)

where 70% of full operation in 1994
85% of full operation in 1995
100% of full operation in 1996 and after

4) Annual Operation Days ; 320 days

(2) Finance

1) Debt/Equity Ratio ; 75/25

2) Currency

For Annual Revenue/Expenditure ; Rupiah
For Capital Investment ; Yen
Exchange Rate ; 0.18 Yen/Rupiah

Accordingly, debt is repayed by exchanging Rupiah for yen at the above exchange rate.

3) Debt Repayment Schedule

Terms of 12 years after commitment, including 4 years of grace period with 8 years equal payments of principal.

4) Interest

i) Long-term Loan ; 8% per annum
Assumed supplyer's credit (7.2% p.a.) plus bank loan and project risk premium.

ii) Short-term Loan ; 8% per annum
A short term loan would be raised commensurate with annual cash deficiency and would be repayed after development loan.

iii) Interest during Construction Period
In accordance with a general rule in similar projects, interest paid or accrued during construction period is capitallized and amortized over a 10-year period from 1994.

(3) *Escalation*

No escalation is assumed.

(4) Price and Costs

i) Sales Price of Methanol ; 194 Rupiah/kg (35 Yen/kg)

Note*; Sales price was assumed referring to Table 6-3-1. By the final stage, it is necessary to estimate the sales price by considering the advantages and disadvantages of methanol as fuel in contrast with other transportation fuels.

Advantages; of Fuel Methanol	o Low NOx, smoke and other pollutants in exhaust gas
	o High combustion efficiency
	o High octane number

Disadvantages: o Corrosive against metals and gums
of Fuel Methanol o High latent heat

Table 6-3-1 CIF Price of Import Methanol @ Japan

Unit; Yen/kg

	1983	1984	1985(1Q)	1985(2Q)	1985(3Q)
Major Export Contries					
. USA	42.8	40.6	42.4		
. Saudi Arabia	37.6	35.4	36.6	35.8	36.7
. Canada	43.7	36.1	37.6	36.7	36.8
Average	42.3	35.8	37.2	36.4	36.6

ii) Capital Investment Costs

a) Fixed-capital Investment ;

	10^6 Rupiah	(10^6 Yen)
Coal Gasification	369,500	(66,700)
Gas Treatment/Methanol	188,400	(34,000)
Coal Transportation	41,000	(7,400)
Support Facilities	279,800	(50,500)
Equipment Transportation	63,700	(11,500)
Contingency	47,100	(8,500)
Total	989,500	(178,600)

b) Working Capital ;

10^6 Rupiah/year	(10^6 Yen/year)
48,382	(8,733)

Note*) Working capital is added as cash-inflow at the end of the project.

c) Start-up Expense ; 6,382 (1,152)

d) Operator Training Cost ; 2,604 (470)

Table 6-3-2 Investment Schedule

Yen	1990	1991	1992	1993
Fixed Capital	30%	30%	20%	20%
Working Capital	-	-	-	100%
Start-up Expense	-	-	-	100%
Operator Training	-	-	-	100%

iii) Annual Expense

a) Fixed Costs

o Depreciation and Amortization[1)]*

	Period	Amount	
	Years	10^6 Rupiah/year	(10^6 Yen/year)
· Boiler, Power Plant, Cooling Tower, Buildings	15	15,180	(2,740)
· Others	10	91,516	(16,519)
o Maintenance		23,061	(4,162)
o Insurance		9,224	(1,665)

	10^6 Rupiah/year	(10^6 Yen/year)
b) Variable Costs		
o Raw Material (Coal)[2)]*	62,555	(11,291)
o Superviser and Operating Labor		
· Foreign Staff[3)]*		
· Local Labor	2,715	(490)
o Catalysts and Chemicals	3,413	(616)
c) Plant Overhead Costs	10,615	(1,916)
d) Administration Expenses	5,307	(958)

Note*; 1) Capital investment for the plant construction including expenses and interests during construction period is depreciated and amortized based on straight line method.

2) In the strategic study in FY1984, mining cost was estimated at $13.88/ton-coal. In this study, $14.85/ton-coal is assumed as raw material costs by adding 7% to the mining cost as overhead.

3) Foreign staff decrease in number as the project proceeds.

Table 6-3-3 Costs for Foreign Staffs

Op. Year	1st	2nd	3rd	4th	5th	6th-30th
Year	1994	1995	1996	1997	1998	1999-2023
% on 1st year	100	70	50	30	10	0
Cost, 10^6 rupiah/year	7,900	5,530	3,950	2,730	790	0
(Cost, 10^6 yen/year)	(1,426)	(998)	(713)	(428)	(143)	(0)

(5) Evaluation Criteria

1) Financial Statement

- o Profit and Loss Statement
- o Cash Flow Statement
- o Balance Sheet

2) IRR on Total Project Cost before Tax

In accordance with the following equation, cash flow is discounted to the present value as of 1985.

$$\sum_{i=0}^{n} \frac{(Cin, i - Cout, i)}{(1 + r)^i} = 0 \quad \text{..... eq. (1)}$$

where,

Cin, i ; cash-inflow at ith year from 1985

Cout, i ; cash-outflow at ith year from 1985

r ; discount rate (= IRR)

n ; project life (1990-2023)

i = 0 at 1985

Cash-inflow	Cash-outflow
· Sales Proceeds	· Investment including interest during construction period
· Residual value of investment	· Total operating expenditure excluding depreciation and interest

6-3-2 Results and Evaluation

Results are summarized in Table 6-3-4.

Table 6-3-4 Results of Financial Analysis

IRR on Total Investment	13.5%
First Year to Have Profit before Tax	3rd year
Clear off of Accumulated Loss	5th year from the start of operation
Pay off of All the Debts	12th year from loan raised

(1) Profit and Loss

Fig. 6-3-1 shows the cost and profit structure through the project. From the viewpoint of profitability, this project is financially viable. After the project records deficit for the first two years, it records surplus from the third year onward.

The cumulative deficit is cleared off in the 5th year and the income tax is levied on the profit from the fifty year onward.

The net profit increases sharply at the 11th year (2004) because most of the initial investment are depreciated and amortized during the previous years.

(2) Internal Rate of Return before Tax

Discounted Cash Flow as well as Cash Flow are shown in Fig. 6-3-2.
As far as IRR is concerned, the resulting 13.5% of IRR cannot be considered as a high rate in general standard due to large investment costs and low sales price. Being linked with the price of crude oil, the methanol price was set rather low in this study reflecting the current oil price which is extremely declined.

Note; 13.5% of IRR means that if the interest rate is lower than 13.5%, e.g. 8% assumed in this study, this project yields profit.

(3) Debt Repayment

As shown in Fig. 6-3-3, debt repayment is accomplished in 8 years where a short term loan is raised commensurate with the annual cash defficiency from 1996 to 1999.

In later stages, however, the repayment schedule must be adjusted so as to fit expected cash flow, thus cash flow deficiency can be avoided.

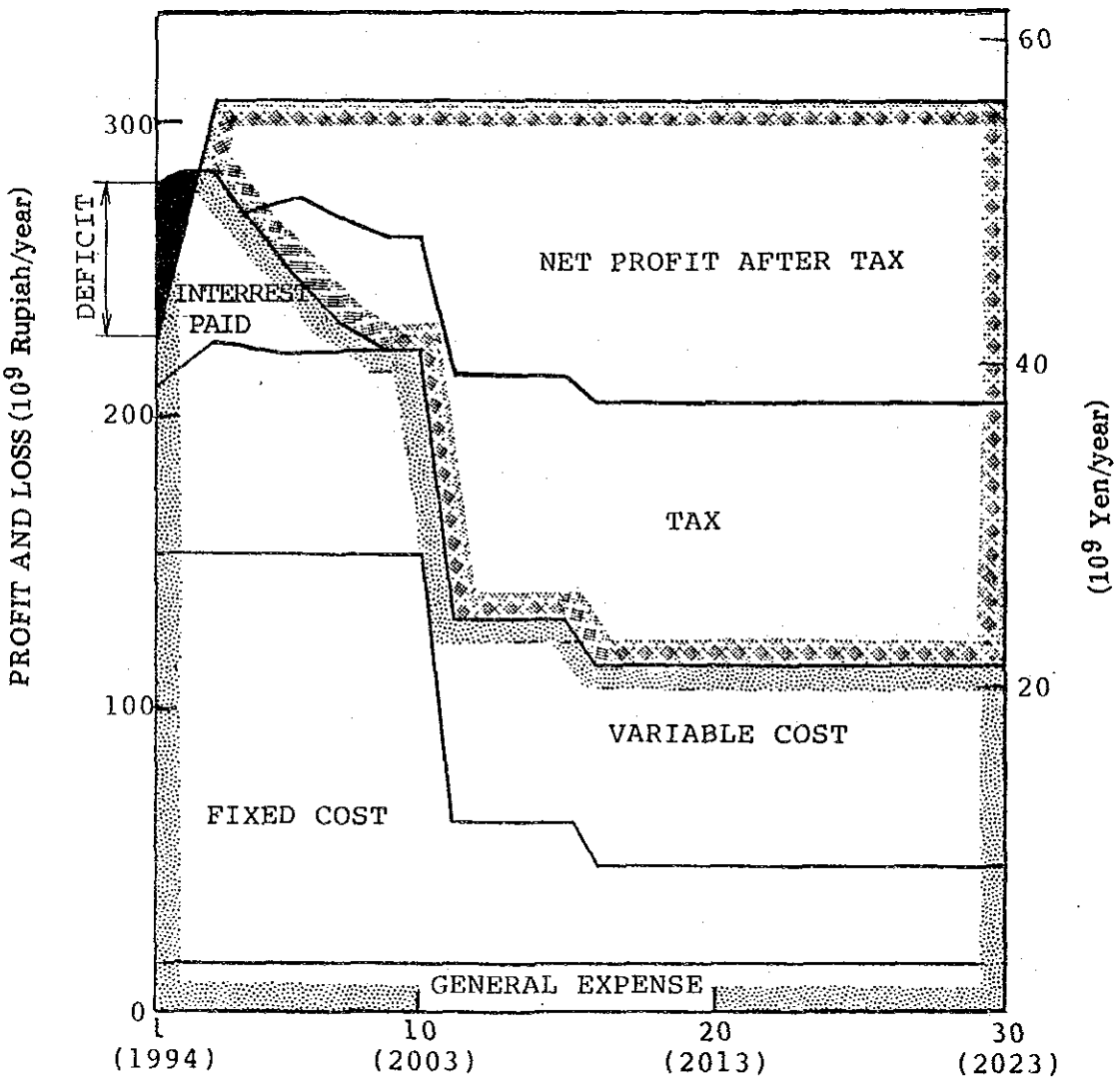
(4) Evaluation

Provided that the crude oil price rises higher than 30$/bbl which corresponds to 150 Yen/l of retail price of gasoline, for example, the viability of the project would be enhanced because the noncommercial Banko coal is not affected by oil price.

It should be noted that the final judgment must be based on the recognition that a quantified profitability standard can serve only as a guide. Because the basic aim of a profitability analysis is to give a measure of the attractiveness of the project for comparison to other possible projects, the results must be dealt with accordingly.

Aside from the profitability the project itself has, the government policy on alternative energy development and environmental control sometimes exerts a great influence on the implementation of this kind of project. Financial status, security structure and prestige of the project executing organization are also important to raise funds for the investment.

Fig. 6-3-1 Profit and Loss



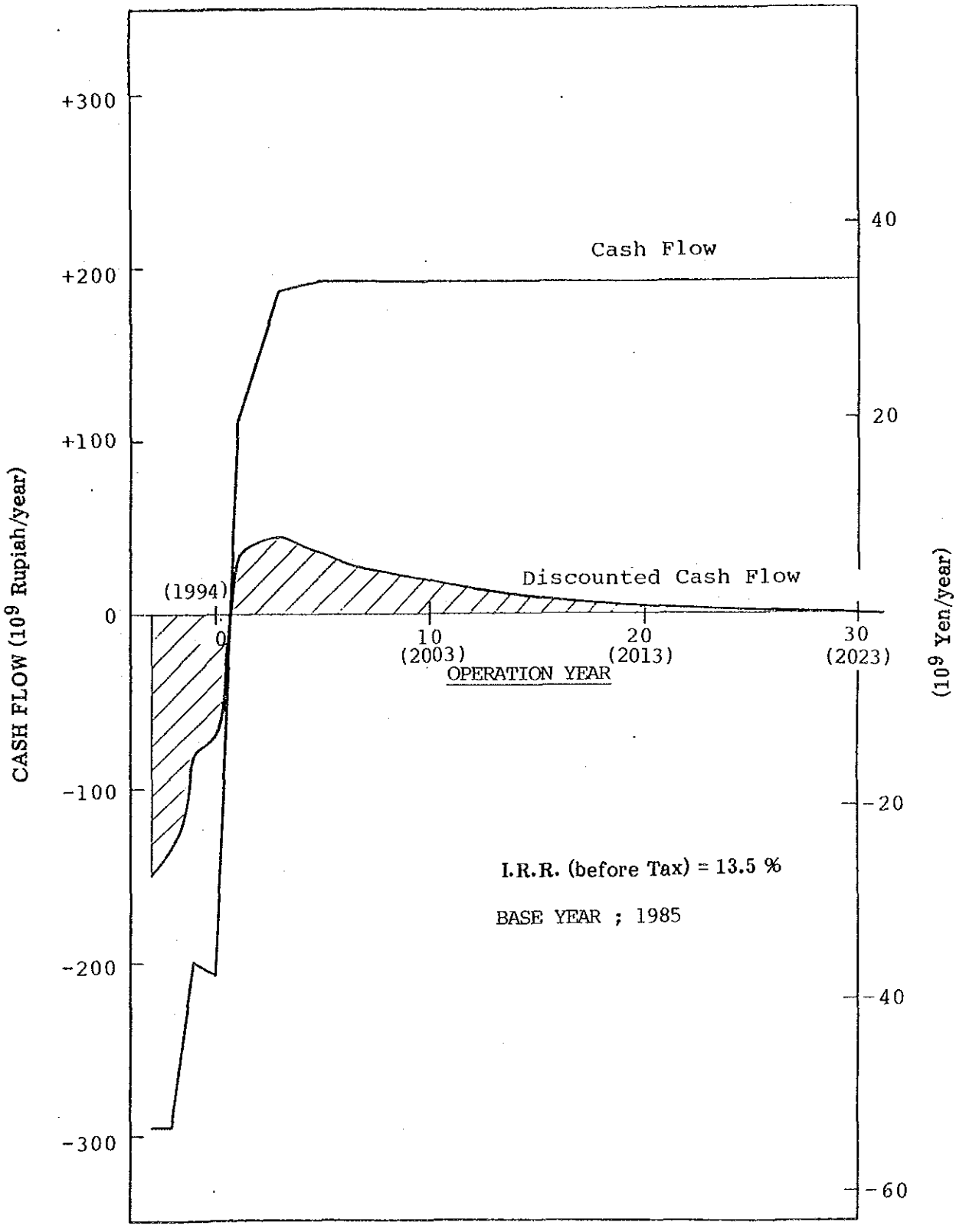


Fig. 6-3-2 Cash Flow Before Tax, Interest

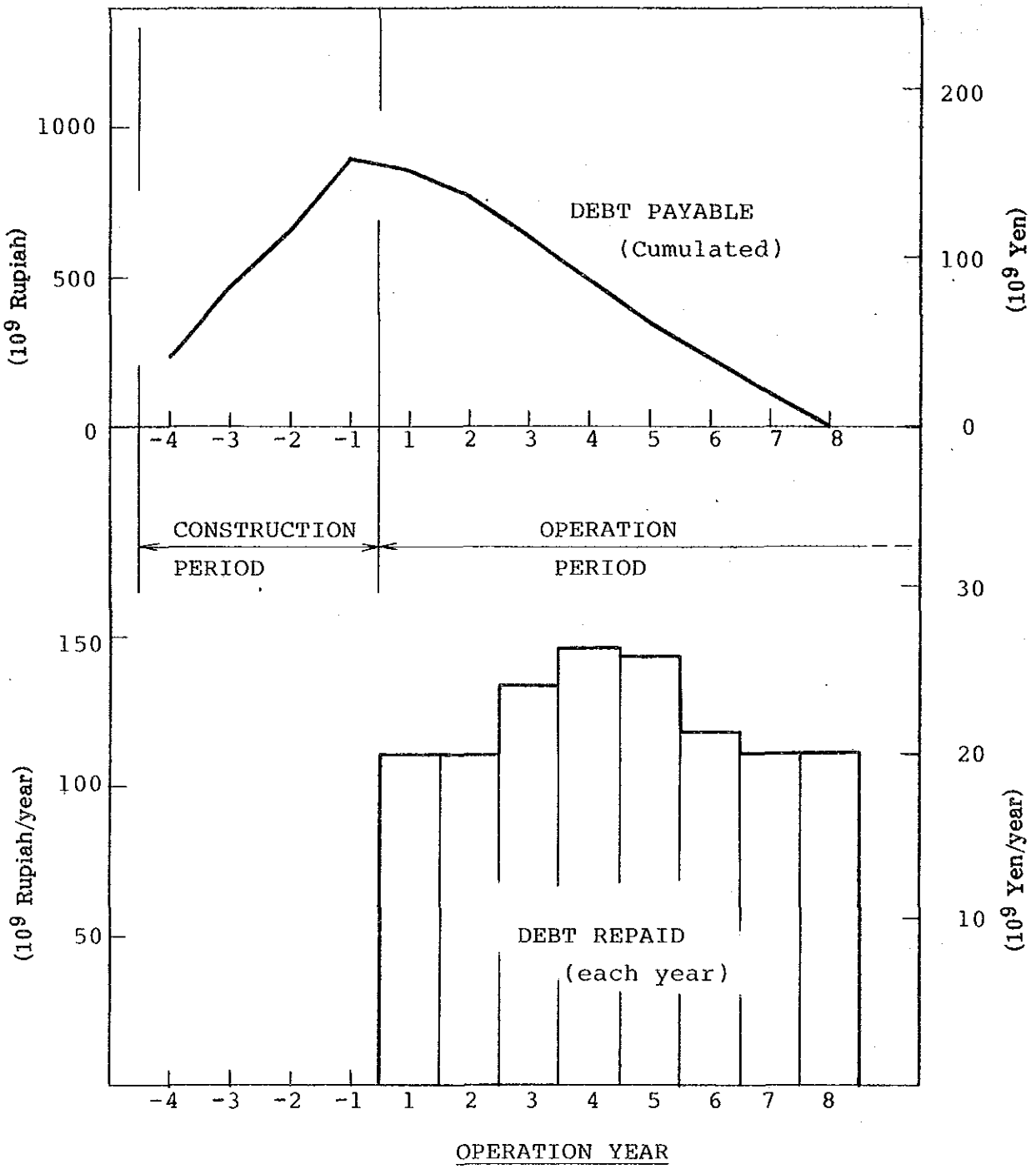


Fig. 6-3-3 Debt Repayment Schedule

6-3-3 Sensitivity Analysis

(1) Cases for Sensitivity Analysis

Since the assumptions for the financial analysis at this stage have uncertainties more or less, major cost-effective factors such as sales price, construction cost, material (coal) costs and exchange rate (from Rupiah to Yen) are examined from the viewpoint of their sensitivity on the profitability of the project.

Table 6-3-5 shows the cases to be analysed.

Table 6-3-5 Cases for Sensitivity Analysis

Base Case;

Sales Price	194 Rupiah/kg (35 Yen/kg)
Construction Costs	989,500 10^6 Rupiah (178,600 10^6 Yen)
Material Costs	62,555 10^6 Rupiah/year (11,291 10^6 Yen/year)
Exchange Rate	0.18 Yen/Rupiah

I. Variation of Sales Price

Case I-1 ; 30% decrease
Case I-2 ; 30% increase
Case I-3 ; 70% increase

II. Variation of Construction Costs

Case II-1 ; 20% decrease
Case II-2 ; 20% increase

III. Variation of Material Costs

Case III-1 ; 30% decrease
Case III-2 ; 30% increase

IV. Variation of Exchange Rate

Case IV-1 ; 20% decrease (from rupiah to yen)
Case IV-2 ; 30% decrease (from rupiah to yen)

(2) Results and Evaluation

Results are summarized in Table 6-3-6, and the sensitivity of each cost-effective factor on IRR is graphically expressed in Fig. 6-3-4.

Sales Price affects on the profitability of the project to a large extent. Case I-1 (30% decrease) shows that the project is obviously not feasible due to low IRR and long deficit period, while Case II-2 (30% increase) shows good financial results. Since these sales prices are assumed based on the price variation in the past 6 years, this change of the price within this range is likely to occur.

Minimum Sales

When IRR is assumed to be equivalent to the interest rate which is 8% in this study, the sales price resulted from eq. (1) is 143 Rupiah/kg (25.9 yen/kg) which can be regarded as the minimum sales price.

Break-even Price

The discrete sales price at break-even point for each year was calculated by the following formula.

$$\text{Break-even Price} = \frac{F}{1 - \frac{V}{R}} \times \frac{1}{P} \quad \cdots\cdots \text{eq (2)}$$

where,

F ; Annual expenditures excluding variable costs and tax

V ; Annual variable costs

P ; Annual production rate

The results are summarized in Table 6-3-7.

Table 6-3-7 Break-even Price

Op. Year	Year	Break-even Price Rupiah/kg (Yen/kg)	
1	1994	314	(56.6)
2	1995	249	(45.0)
3	1996	206	(37.2)
4	1997	201	(36.3)
5	1998	195	(35.3)
.	.	.	
.	.	.	
.	.	.	
10	2003	173	(31.2)
11	2004	86	(15.5)
.	.	.	
.	.	.	
15	2008	64	(11.6)
.	.	.	
.	.	.	
20	2013	43	(7.8)
.	.	.	
.	.	.	
25	2018	43	(7.8)
.	.	.	
.	.	.	
30	2023	43	(7.8)

Construction Costs are also a crucial factor for the financial aspect of the project. In case that the construction costs increased for 20% (Case II-2), it is undesirable that the project makes no profit for the first 4 years and that cumulative deficit is cleared off at the eleventh year. However, the estimated figure may not coincide with the actual costs of this kind of a long-term project. In this regards, construction costs may as well to be taken with a certain range of allowance at this feasibility study stage, and this range of allowance should be reduced as detailed design proceeds. To avoid the cost-overrun during the construction stage, lump sum contract with an experienced contractor is indespensable.

Material Costs affect not so much on IRR as sales price and construction costs. Furthermore, Banko coal cannot be commercially transacted owing to its low quality, therefore its price may not be influenced by the price change of other commercial energies. However, mining cost must be estimated precisely because it highly depends on the site conditions which has not adequately been investigated so far.

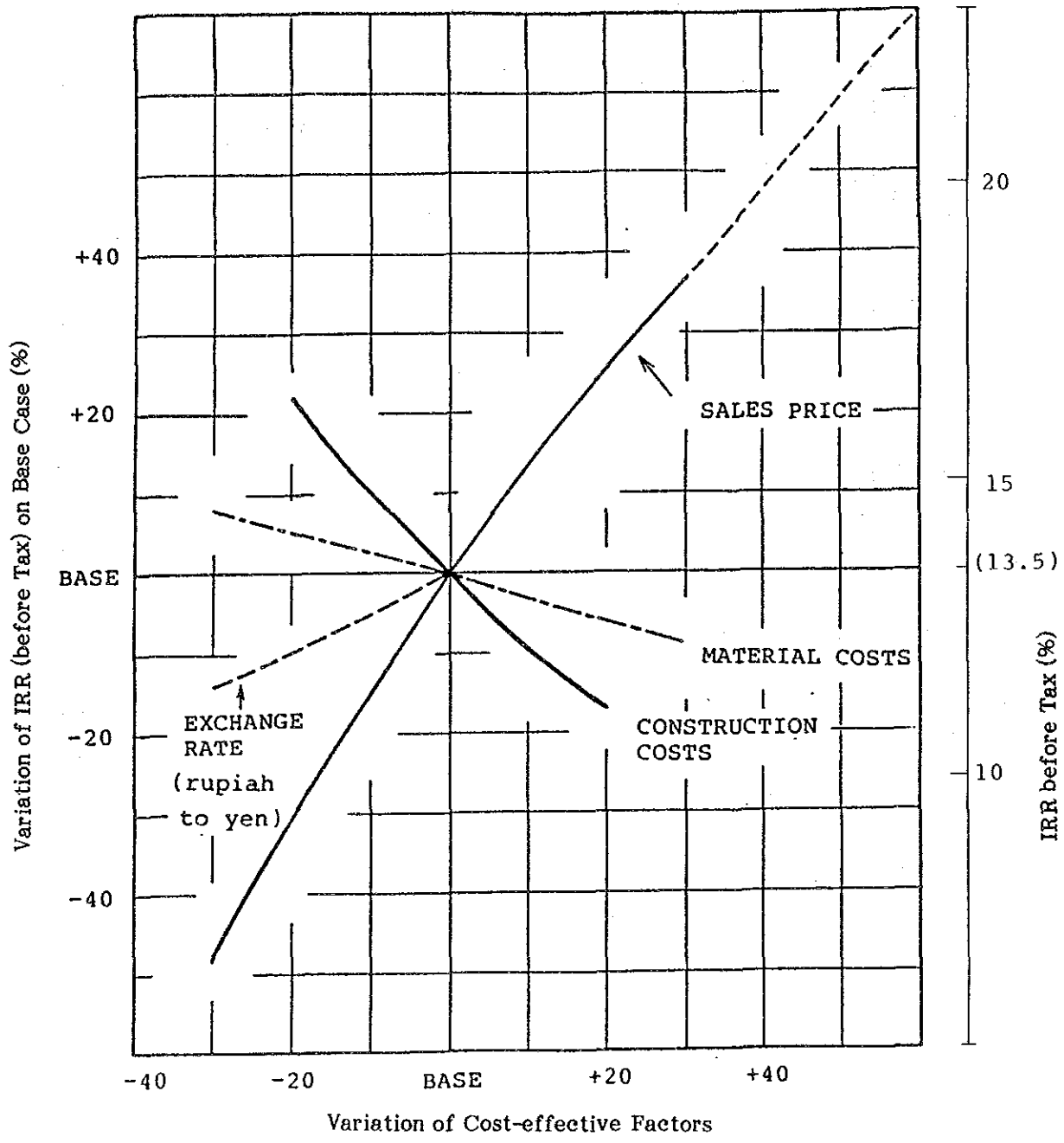
Appreciation of yen for 20-30% (Case IV-1, 2) delays the time for the project to record surplus and deteriorates the cash inflow as the revenue comes in rupiah while the debt must be repayed in yen. Exchange rate between Yen and Rupiah may substantially fluctuate for a long term. The considerable counter-measures to avoid the risk of exchange rate is;

- o to conclude a pre-agreement with the Project Sponsor as to link the methanol price with the exchange rate.
- o to conclude a currency swapping contract beforehand with the companies which intend to sell yen for rupiahs.

Table 6-3-6 Results of Sensitivity Analysis

		IRR On Total Investment before Tax	First Year to have profit before tax (year from operation starts)	Clear off of accumulated loss (year from operation starts)	Pay off of all the debts (year from loan raised)
Case-I	Base Case	13.5%	3rd	5th	12th
Case-II-1	Sales price 30% down	7.0%	11th	27th	27th
II-2	Sales Price 30% up	18.5%	1st	1st	12th
II-3	Sales Price 70% up	24.2%	1st	1st	11th
Case III-1	Construction Cost 20% down	16.5%	2nd	2nd	12th
	Construction Cost 20% up	11.2%	5th	11th	13th
Case IV-1	Material Costs 30% down	14.6%	3rd	4th	12th
Case IV-2	Material Costs 30% up	12.3%	3rd	7th	12th
Case V-1	Exchange Rate (Rupiah to Yen) 20% down	12.2%	5th	10th	13th
Case V-2	Exchange Rate (Rupiah to Yen) 30% down	11.6%	6th	12th	14th

Fig. 6-3-4 Sensitivity of Cost-effective Factors



SALES PRICE (Yen/kg)	25	35	45	55
CONST.COSTS (10^6 yen)	150,000	(179,000)	200,000	250,000
MAT'L COSTS ($/ton)	10	(14.85)	20	
EXCH. RATE (yen/rupiah)	0.12	0.15	0.18	

6-3-4 Product Methanol Transportation

Though product transportation is out of scope in this study, an idea of transportation means and costs was briefly conceived and summarized.

(1) Transportation Means

Pipeline transportation from the methanol plant to the Port of Palembang seems to be most economical. The following facilities are to be newly built.

a) Pipeline

Route	;	Plant -- Palembang (Methanol Stockyard)
Distance	;	200-300 km
Size	;	6" or smaller

Note) Pipeline possibly be laid along the road for the most part because there are existing oil and gas pipelines running from Perabumlih to Palembang on the same route.

b) Methanol Stockyard and Offshore Berth

As described in 6-1-4, methanol tanks are to be built in the residential area near the port and the existing offshore berth to be extended for a methanol tanker anchoring.

Methanol is unloaded from the onshore tank to the offshore berth by pipeline.

(2) Transportation Costs

In general, transportation costs are less than one-tenth of manufacturing costs.

For inland transportation, costs for the 1st year of operation were roughly estimated as follows:

Depreciation	;	417	Yen/ton-methanol
Interest	;	250	"
others	;	74	"
Total		741	"

Assumption;

1) Construction costs ; 10,000 10^6 Yen
   Depreciation ; 15 years leaving no residual value
2) Interest ; 4 % p.a. (OECF rate)
3) Other Costs ; 10 % of total is assumed for maintenance, labor cost and general expense.

For total transportation costs including ocean transportation expenses, Table 6-3-8 shows two expamples.

Taking these examples into consideration, transportation costs may be 2,000 - 3,000 Yen/ton-methanol if the methanol is shipped to Japan.

Table 6-3-8 Examples of Estimated Cost for Methanol Transportation

		Example 1	Example 2
Inland (Pipeline)			
Distance,	km	800	100
Cost,	Yen/ton	1,600 @ 1983	1,200
Ocean (Tanker)		Vancouver - Japan	S.E. Asia - Japan
Distance,	km	8,000	5,000 - 6,000
Cost,	Yen/ton	3,100 @ 1983	1,200
Source		Potential of Methanol Supply from Overseas, 1984, NRI	Stage Development and Utilization of Synfuels, 1985, the Agency of Natural Resources and Energy

6-4 CONSIDERATION ON VIABILITY OF METHANOL AS TRANSPORTATION FUEL

The relative value and competitiveness of methanol as transportation fuel was roughly estimated in terms of economic and pollution control aspects compared with commercially used fuels such as gasoline and diesel oil supposing that produced methanol in Banko area is imported to Japan.

In this evaluation, fixed costs such as for the modification of fuel delivery system and automobile engine specifications required for fuel methanol application are not taken into account.

6-4-1 Assumptions

(1) Methanol price at plant gate;

Base Case	;	35.0 Yen/kg	@IRR = 13.5%
Case I-1	;	24.5 "	@IRR = 7.0%
Case I-2	;	45.5 "	@IRR = 18.5%
Case I-3	;	59.5 "	@IRR = 24.2%

(2) Transportation fee (inland and ocean);

2.0 Yen/kg is assumed

(3) Following data are cited from, H. Yoshimoto, Y. Ishihara, "Present Status and Utilization Potential of Fuel Methanol," Shigen Technology, No. 221, (July 1985)

1) Product delivery costs ; 15 Yen/ℓ in Japan

2) Fuel efficiency and price

	Efficiency Rate (Kcal/km)	Retail Price (Yen/ℓ)
Methanol	253	-
Gasoline	335	Before Tax 96 (After Tax 150)
Diesel Oil	253	Before Tax 81 (After Tax 105)

6-4-2 Results and Discussion

(1) Comparison of Fuel Prices

Table 6-4-1 shows the sales price of methanol in Japan including transportation and delivery costs from the plant gate.

By using the fuel efficiency (Kcal/km) and the price (Yen/ℓ) of methanol, gasoline and diesel oil, the required volumetric ratio and fuel cost equivalent to 1 of methanol were calculated and summarized in Table 6-4-2.

To help understand visually, the results were illustrated in Fig. 6-4-1 showing the relation between IRR and the sales price of methanol in contrast to the equivalent gasoline and diesel oil prices.

As Table ___ and Fig. ___ indicates, the sales price of methanol is rather low than that of gasoline & eqivalent energy within a reasonable IRR range even if the existing taxation system is applied to fuel methanol. Conversely, fuel methanol is inferior to diesel oil in price as long as no adjustment of taxation regulation is taken.

(2) Effect on Environmental Pollution

Environmental pollution caused mainly by exhaused gas emission from automobiles is one of the urban problems especially in Japan where the NOx emission standard (0.06 ppm) has not yet been cleared.

Among all transportation fuels, diesel fuel is supposed to be the main source of NOx emission, and the effective technology to clear the standard has not been developed so far.

According to Table 6-4-3 and Table 6-4-4 reported by the Ministry of Transport, on the other hand, the methanol engine exhaust lower quantities of these pollutants than the diesel-fueled engine does.

Table 6-4-3 Analysis of Exhaust Gas

	NOx (10 mode)	Soot (Free Accelerator)
Methanol Engine	0.29 (g/km)	0 %
Diesel Engine	1.08 (g/km)	24 %

Table 6-4-4 Exhaust Gas from Methanol-fueled Vehicle

Unit g/km

	CO	HC	NOx
Vehicle Test Result	1.19	0.05	0.29
Regulation Figure*	2.70	0.39	0.48

* established in 1978 for gasoline-fueled cars

It is inferred among specialists concerned with environmental pollutions that the allowable level of NOx emission for NOx can be maintained if one half of diesel-fueled cargo trucks and buses are replaced by methanol-fueled ones.

(3) Conclusion

In view of economic and pollution control aspects combined, methanol is worth considering to be commercially utilized as transportation fuel in Japan. In this case, adjustment of taxation regulations between transportation fuels is required such as to impose lower tax on fuel methanol than on gasoline and diesel oil.

Table 6-4-1 Sales Price of Methanol in Japan

CASE	IRR	Plant Gate Price		Transport Costs		CIF Price		Delivery Costs	Sales Price @ Japan
	%	Yen/ℓ	(Yen/kg)	Yen/ℓ	(Yen/kg)	Yen/ℓ	(Yen/kg)	Yen/ℓ	Yen/ℓ
I-1	7.0	19.5	(24.5)	1.6	(2.0)	21.1	(26.5)	15	36.1
Base	13.5	27.8	(35.0)	1.6	(2.0)	29.4	(37.0)	15	44.4
I-2	18.5	36.2	(45.5)	1.6	(2.0)	37.8	(47.5)	15	52.8
I-3	24.2	47.3	(59.5)	1.6	(2.0)	48.9	(61.5)	15	63.9

Table 6-4-2 Economic Comparison of Transportation Fuels

	L.H.V kcal/ℓ	Consumption Rate (kcal/km)	Retail Price (Yen/ℓ)	Required Volumetric Ratio (Equiv. to 1ℓ of Methanol)	Fuel Cost (Yen/ℓ-methanol equiv.)
Methanol	3,800	253	-	1.0	36 (Case I-1) 44 (Base) 53(Case I-2) 64 (Case I-3)
Gasoline	7,950	335	B.Tax 96 (A.Tax 150)	0.63 1)*	B.Tax 60 (A.Tax 95)
Diesel Oil	8,650	253	B.Tax 81 (A.Tax 105)	0.44 2)*	B.Tax 36 (A.Tax 46)

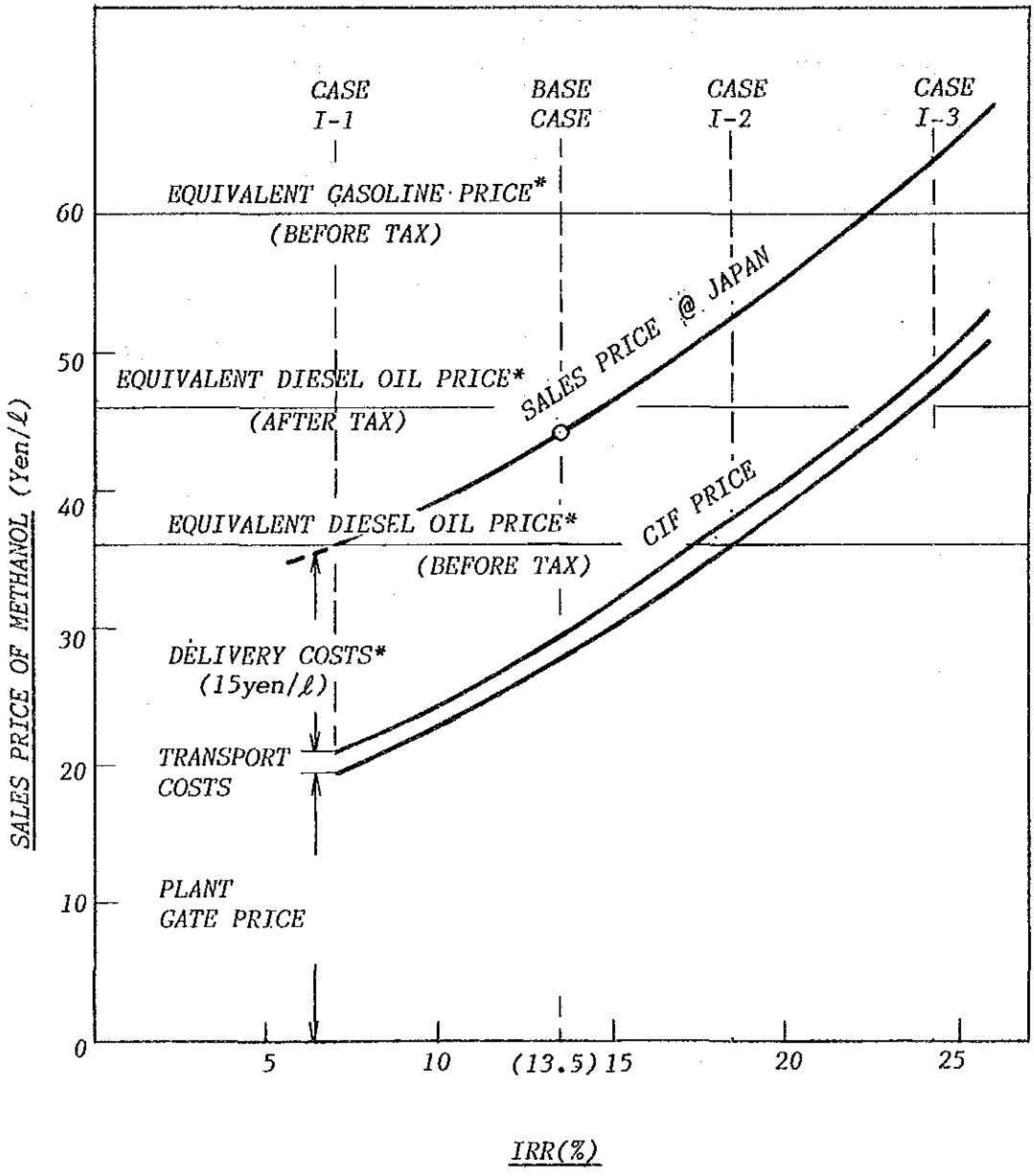
$$1)^{*}\quad \text{Req.Vol.Ratio} = \frac{\text{Gasoline}(\ell/\text{km})}{\text{Methanol}(\ell/\text{km})} = \frac{335(\text{kcal/km})}{7,950(\text{kcal}/\ell)} \Big/ \frac{253(\text{kcal/km})}{3,800(\text{kcal}/\ell)}$$

$$= 0.63\ \ell\text{ - gasoline } /\ \ell\text{ - methanol}$$

$$2)^{*}\quad \text{Req.Vol.Ratio} = \frac{\text{Diesel Oil}(\ell/\text{km})}{\text{Methanol }(\ell/\text{km})} = \frac{253(\text{kcal/km})}{8,650(\text{kcal}/\ell)} \Big/ \frac{253(\text{kcal/km})}{3,800(\text{kcal}/\ell)}$$

$$=0.44\ \ell\text{ - diesel oil } /\ \ell\text{ - methanol}$$

Fig. 6-4-1 Economic Evaluation of Fuel Methanol in Japan



* Source; Present Status and Utilization Potential of Fuel Methanol, NO.221, Resources Technology (July 1985)

6-5 CONCLUSION

(1) A hypothetical project, producting 1,600,000 ton/year of methanol from Banko coal, was evaluated preliminarily in terms of its financial viability and profitability with the result showing 13.5% of IRR before tax and interest when the sales price of methanol was set at 194 Rupiah/kg (35 Yen/kg).

As far as IRR is concerned, the resulting 13.5% of IRR cannot be considered as high rate in general standard due to large investment costs and low sales price. Being linked with the price of crude oil, the methanol price was set rather low in this study reflecting the current oil price which is extremely declined. Because the sales price of methanol was found to be the dominant factor for the profitability of the project as a result of sensitivity analysis, this project has the possibility to be appraised as viable in case of oil price hike (higher than 30$/BBL).

(2) As for the viability of methanol as transportation fuel, the estimated sales price (before tax) of methanol is lower than that of gasoline but inferior to that of diesel oil on the equivalent energy base assuming that methanol produced in Banko area is imported to Japan and delivered through the existing supply system.
In order to promote the utilization of fuel methanol in Japan which may decrease NOx emission rate from vehicles, the adjustment of taxation regulations for transportation fuels is required.

Prior to evaluate the viability of fuel methanol in Indonesia, it is necessary to investigate the policy of fuel price control taken by the Government.

(3) The following items should be investigated in the latter half of the economic evaluation stage.

1) Current status of fuel methanol technology and specification of fuel methanol
2) Market and delivery system of transportation fuels in Indonesia
3) Viability of methanol as transportation fuel in Indonesia based on the preceding two items.

7. INVESTIGATION OF THE MARKET FOR FINAL PRODUCTS

PART SUMMARY

As to R & D activities of fuel methanol mainly in industrialised countries, most R & D efforts have been concentrated to gasoline engines and followed by those for diesel engines. They are oriented for automotive use. R & D efforts for power generation use such as boiler and gas turbine have not been so positively done and are rather geographically limited to the U.S.A. and Japan. These are done from environmental point of view because of its cleanness.

For the time being, fuel alcohol is paid attention as octane-enhancer point of view.

And also, in longer perspective neat methanol usage seems to be most promising among several usages of fuel methanol for automobiles. Though no significant technological problems are expected for methanol use in gasoline and diesel engines, distribution system of fuel methanol and commercial production of methanol-fueled vehicles will probably be significant problems in the future.

7-1 INTRODUCTION

This part deals with the possible usage of fuel methanol (methanol, ethanol or these mixture), which is one of promising final products from "Banko Coal Utilization Project" as a result of literature survey. This survey is to contribute to give certain view for possible fuel methanol market, which is one of indispensable elements in case of future commercialization of coal-based methanol project in Indonesia.

Though many countries are involved in R & D activities of fuel methanol (or alcohol) use, each country has specific condition and strategy behind its programme. Those strategies can be classified into following 6 groups. That is,

1) to save foreign currency through reducing crude oil imports (Sweden, F.R.G., Brazil and N.Z. are in this group.)
2) to partially make up the decreasing production of domestic petroleum products (F.R.G.)
3) to provide many options for alternative energy source to oil (this is common to almost every country concerned)
4) to offer countermeasures for agricultural products and farmers (U.S.A. and Brazil are in this category.)
5) to utilize such raw material for producing methanol as natural gas and/or coal (N.Z. and Canada are classified into this category.)
6) to utilize fuel methanol as one of effective means for reducing SOx and NOx (State of California in the U.S. and Japan are classified into this group.)

Though usages of fuel methanol, which is classified to oxygenates, are categorized into that for transportation and that for power generation, the most R & D efforts up to now are concentrated to the use for transportation, especially methanol blending into gasoline in various levels and utilization of methanol in diesel engine is followed after that.

Those following technological evaluation about fuel methanol as automotive fuel were confirmed in 6th International Symposium on AFT (Alcohol Fuel Technology) held in Ottawa, May 1984 and later recognized as prevailing opinions.

1) Relatively solid view to methanol was recognized as one of most promising alternative fuels for automotive engine.
There are two types of utilization of methanol i.e. neat (M85 and above) and low blending ratio (M5 and less than that). Although once such options were discussed very much, middle blending ratio like M10, M15, M20 are not so popular any more because of necessity of modification of engine and of additional investment for distribution network system.

2) For blending methanol into gasoline, cosolvents are needed. This methanol and other oxygenates blending are rather classified into octane enhancer in the U.S.A. and European countries in terms of lead phase down programme.

3) The most promising usage of methanol is recognized to be neat one. In most countries concerned, R & D activities are focused on tests of neat methanol.

4) Supply and distribution problems of fuel methanol is one of biggest themes and therefore, big concerns are paid for that. In introducing fuel methanol, methanol-fueled vehicles are discussed to be limited to local areas at first and within those areas, methanol fueled vehicles and methanol fuel are supplied as one set. In the next step, such supply and distribution pattern is to be increased in number to other areas.

7-2 MARKET FOR AUTOMOBILE

Methanol fuels are fundamentally suitable for use in automobiles.
As to the use of fuel methanol for automobile, development of engine as well as examination of specification of fuel methanol has been done.

(1) Spark-ignition otto engine

Modification of so-called "gasoline engine" for methanol fueling is internationally recognised already completed. There still remains such problems as startability in cold weather abraision of cylinder but these are considered to be technically solvable.

(2) Use in diesel engines

The use of methanol in diesel engines will be a much more costly business than in so-called gasoline engines. Considerable problems are caused by the low ignition quality (low cetan numbers) and in particular by the power lubricating action in the injection nozzles.

At present, main stream of R & D activities in neat methanol is oriented to diesel engine.

1) Blended fuels

The addition of methanol to diesel fuel, although possible, would seem to be an expensive process (higher co-solvent requirement). Furthermore, depending on the type of engine and the basic fuel used, an ignition improver has to be added to the fuel beyond a certain methanol concentration in order to facilitate easy starting and cold running of the engine. Research on ways to improve this situation is still in progress.

2) Neat methanol with ignition improvers

The addition of ignition improvers enhances the ignition performance of pure methanol to an extent where it can be used in normal diesel engines without significant extra engine modifications:

- the system offers great flexibility as retrofitting for diesel fuel is readily possible;
- at the same efficiency level as with diesel fuel, there is a decrease in exhaust emissions and the soot emission is almost nil;

The technical feasibility and economic viability of this concept must be further investigated.

3) Dual-fuel system

A number of engine options are suitable for dual-fuel systems using methanol and diesel fuel; one proven system (the KHD system) involves the separate injection of methanol and diesel fuel into the combustion chamber. Operating experience with this system - including that gained under the BMFT fleet test in F.R.G. - has been obtained with methanol meeting up to 90% of the energy requirement.

Engines with spark-ignition and direct injection (stratified charge engines) are largely unaffected by fuel quality. A practical possibility is the MAN/FM system which is undergoing usual operation tests including the current BMFT fleet test. This method is also adopted by Komatsu (Japan).

A further possibility is offered by the methanol-gas engine (also with spark-ignition) being developed by Daimler-Benz. In this system, the methanol is vaporized with heat from the cooling water prior to mixing with the combustion air. Practical tests are currently being carried out in various locations in West Germany.

(3) Other types of engines

The use of methanol in continuous combustion engines (gas turbines, Stirling engines, etc) would present no fundamental problems if one of such engine systems were to emerge as a strong competitor to conventional engines. Methanol has already proved itself in fuel cells, being not able, however, to remove the basic disadvantages of the fuel cell (ie low power, high weight, large overall dimensions control effort required) to any remarkable extent.

7-3 MARKET FOR POWER GENERATION

R & D efforts for utilizing methanol for power generation use has not actively been done. Combustion test, however, both in boilers and gas turbines has been operated in the U.S.A. and Japan from environmental point of view.

Though conventional fuels for combined cycle power generation have been LNG and LPG, new idea of substituting with methanol has been examined. As to this point, gas turbine with methanol reformer is considered to be promising because of better energy efficiency, better combustion characteristics and reduced corrosion in turbine.

And also, further study on the possibility of using methanol for traditional diesel power generator is worth being considered from Indonesian situation of power generation.

7-4 RECENT SITUATION OF R & D EFFORTS IN SEVERAL COUNTRIES

(1) U.S.A.

Several oxygenates for unleaded gasoline are shown in Table 7-4-1, to which EPA in the U.S. has provided permission. In the U.S., demand for high octane gasoline is more than 25% of total gasoline demand and these oxygenates are considered to be octane enhancer, while in Japan, lead pahse out programme was almost completed around ten years ago. As to neat methanol-fueled car, enough information and knowledge has already been gained and no significant obstacles are expected in the future.

Commercial use of fuel alcohol started in 1979 as gasoline. In California, fleet test using neat methanol has been continued as one of countermeasures for environmental improvement. California Energy Commission has been in operation of fleet test by 500 vehicles of Escort, Ford.

And also, Bank of America has been operating fleet test with 300 vehicles of its own, which were modified for methanol fueling.

(2) Canada

Fleet test of 140 vehicles are being operated in federal government level and local government level, of which some are in blend use and others are in neat use.

As to fuel methanol project, in the methanol utilization project named as MILE, 1985-1989, fleet test using bus and truck with M-100 or M-85 is scheduled.

However, federal government seemed to be rather positive as a whole on introducing CNG and LPG than fuel alcohol.

(3) F.R.G.

Fleet test with 1182 vehicles both in blend and neat methanol started in 1979 funded by federal government. And also, new programmes is now in progress from Jan. 1984, using 300 vehicles of M-100. Following 9 companies participate in this programme such as automobile manufacturers (Volkswagen, Benz, KHD, MAN, Porsche) and oil refining companies (Aral, BP, Shell, U.K. Wesseling).

Methanol-fueled bus is recognized to be in commercial stage and 30 to 40 vehicles are running for commercial use.

M-3 gasoline (3% of Methanol, 2% of TBA as co-solvent and 95% of gasoline) is being sold in domestic market and its share in total gasoline sales is said to be above 70%.

However, M-3 gasoline is based upon gentlemen's agreement between federal government and private sector and, therefore, there occurs some violation of blending methanol more than 10%.

And also, tax preferential measures for lead phase out in gasoline has been taken in accordance with strengthening regulations for automobile exhaust gas, leading other EC countries. To cope with this change, oil refining industry is responding with methanol blend as octane booster as well as modification of gasoline specification and upgrading existing refining facility.

(4) Sweden

M-15 gasoline (15% of Methanol, 2% of iso-butanol and 83% of unleaded gasoline) fleet test was carried out during the period of 1974 to 1978. This fleet test was promoted by its policy toward energy independence. R & D efforts being shifted to higher blending ratio like M-85 and M-100, M-100 study is in progress during the period of July 1984 to Nov. 1986 by SDAB as the project manager.

(5) New Zealand

CNG and LPG are mainly used as alternative transportation fuels to petroleum products in N.Z. MTG (Methanol to Gasoline) plant is reported to be completed by the end of 1985. For the time being, fuel methanol utilization is not considered fully yet. However, neat methanol use for diesel engines is evaluated to be promising in the future. As a matter of fact, neat methanol-fueled bus is running as a test case in Auckland.

(6) Japan

R & D efforts to introduce alternative energy sources to oil have been accelerated since 1st Oil Crisis. Above all, fuel methanol has been recognised as one of main alternative energy sources since 1980 after 2nd Oil Crisis.

In Jan. of 1985, task force group for introducing new-type of energy was established in Agency of Natural Resources and Energy. And mainly in Ministry for

Transportation they think fuel methanol as a promising means to reduce NOx and SOx in exhaust gas from automotive diesel engine.

That Ministry has an idea for methanol-fueled vehicle as of intermediate function followed by electric vehicle in the future.

It is quite unique that fuel methanol has no function as octane booster but is expected to be used from environmental point of view in Japan, because she had already finished the lead phase-out program in gasoline, while U.S. and European countries are still on the way for it.

And also, at the end of 1985, there was a meeting toward establishing "council on introducing fuel methanol for automobiles", which consists of methanol manufacturers, oil refining companies, oil marketing companies and Agency for Natural Resources and Energy. This council will examine supply problems of fuel methanol, which will come out with commercial use of fuel methanol for automobiles.

Now under MITI (Ministry for International Trade and Industry), there have been several kinds of such preparatory studies as specification of fuel methanol, supply problems, distribution problems, environmental impact of unburned methanol and safety problems and on the other hand, demonstration test of fuel methanol for automotive use. These are being carried out in cooperation with oil industry, automobile manufacturers and chemical industry.

Table 7-4-1 Permission of Oxygenates by EPA

	Allowance blended into gasoline		Content	Date of permission	Remarks
	O_2 wt%	Allowance vol%			
Ethanol		10.0 max		Dec. 16, 1978 Apr. 5, 1982	Waiver from EPA through Energy Policy and Conservation Act.
General Regulation	2.0 max			Oct. 10, 1980 July, 28, 1981	Except methanol
MTBE	2.0 max.	11.0 max			
Alcohol	2.0 max.				Propyl alcohol, Buthyl alcohol et.
Ether	2.0 max.				t-Amyl·Methyl·Ether et.
Arcohol	3.5	16.0 max.	GTBA	Nov. 16, 1981	ARCO
Methanol		0.3			General regulation
Methanol + C_4 Alcohol		3.5	Methanol and C_4^+ alcohol are blended in equal volume.	July 28, 1981	General regulation
Oxinol 50	3.5	9.5	Methanol and GTBA are blended in equal volume.	Nov. 16, 1981	ARCO
Oxinol	3.5	9.0 max.	Methanol content in GTBA should be less than 50 vol%.	Nov. 16, 1981	ARCO
Petrocoal		15% max. of alcohol volume 12% max. of methanol volume	Contains methanol, C_4 alcohol (6.5: 1 max) and corrosion inhibitor	Oct. 5, 1981	American Methyl Corp.
Du Pont	3.7		Methanol: less than 5% Cosolvent: more than 2.5% Corrosion inhibitor	Jan. 14, 1985	Co-solvents will probably be ethanol, butanol, propanol and GTBA.

Table 7-4-2

Specification of Oxygenates in EC

	Mandatory lower limit % volume	Without marking Upper limit % volume
Methanol, suitable stabilizing agents must be added (1)	3%	3%
Ethanol, stabilizing agents may be necessary (1)	5%	5%
Iso-propyl alcohol	5%	10%
TBA	7%	7%
Iso-butyl alcohol	7%	10%
Ethers containing 5 or more carbon atoms per molecule (1)	10%	15%
Other organic oxygenates defined in paragraph 1	7%	10%
Mixture of any organic oxygenates defined (2) in paragraph 1 oxygen content	2,5% oxygen weight not exceeding the individual limits fixed above for each component	3,7% oxygen weight, not exceeding the individual limits fixed above for each component

(1) In accordance with national specifications or, where these do not exist, industrial specifications.

(2) Acetone is authorized up to 0,8% by volume when it is present as a by-product of the manufacture of certain organic oxygenates.

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Appendices

Fig. 7-1 Fuel Usage of Methanol

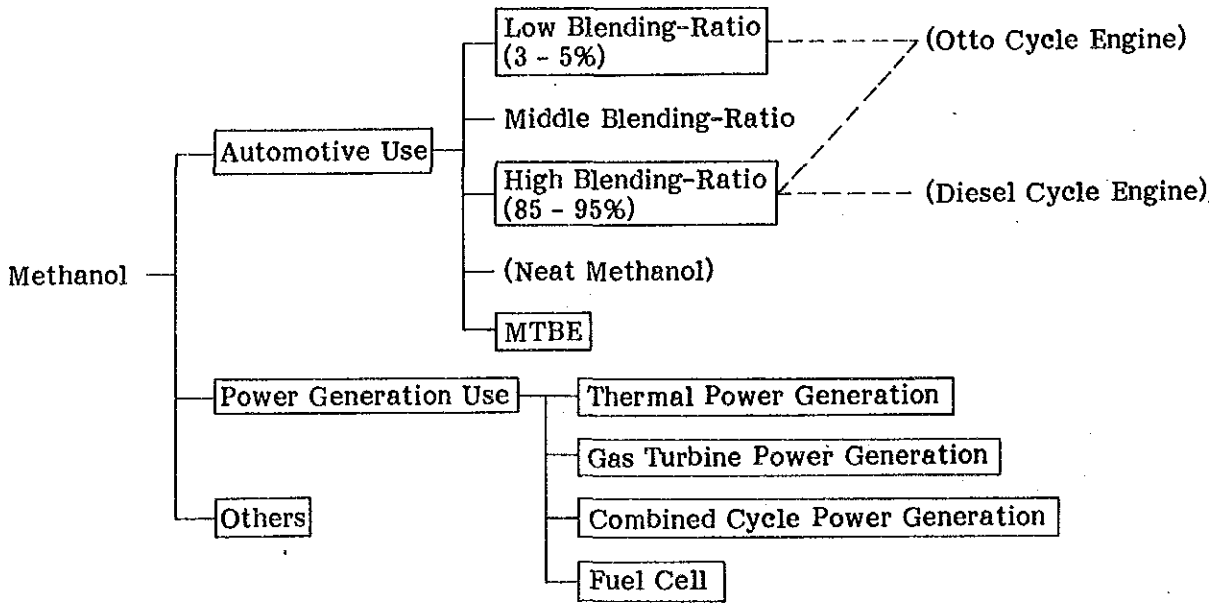


Fig. 7-2 Present Situation of Oxygenates Utilization

	Methanol	Ethanol	TBA	MTBE	Remarks
Europe					
F.R.G.	M3/TBA2			X	In test of M100
Austria	M2/TBA2				Supply from OMV
Netherland			X	X	
Sweden				X	In test of M-100
Swiss	M3/TBA2			X	
Denmark				X	
Finland				X	Supply from NESTE
France					
U.K.					
Belgium					
Norway					Methanol and Superior Alcohols
Italy	M3(MAS)			X	
N. America					
U.S.A.*)	M5/TBA5	E10	X	X	In test of M-100
Canada	X				
S. America					
Brazil		E20, E100			
Argentina		E15			
Paraguay		E20, E100			
Guatemala		?			
Africa					
S. Africa		E12			
Kenya		E15			
Malawi		X			
Zimbabwe		X			
Far East					
Thailand		X			
Malaysia		?			
Philippines		?			
Papua New Guinea		X			
N.Z.					In test of M-100

X = Now in use but each percentage varies from company to company.

? = Under consideration

Source: Deutsche Shell AG

*)

	ARCO	AMOCO	CHEVRON	TEXACO	EXXON	SHELL
ETHANOL		0	0	0		
OXINOL	0					
TBA	0					
MTBE	0	0	0	0	0	0

Figure7-3 Selected Criteria Affecting Utilization of Alternative Fuels in Vehicles

Fuel/Engine	Vehicle Performance	Exhaust Emission Control Techniques	Vehicle Tankage	Extent of Modification	Customer Acceptability	Maintenance Extent	Safety	Resource Availability	Fuel/ Distribution System Compatibility	Fuel Production Technology
Gasoline/Spark Ignition	+ +	+ [3]	+ +	+ +	+ +	+ +	+ +	+ + [1]	+ +	+ +
Diesel Fuel/Diesel	+ +	+ +	+ +	+ +	+ +/+	+ +	+ +	+ + [1]	+ +	+ +
Diesel-Methanol/ Diesel	+ +	+ +	+ +	+ +	+ +/+	+ +	+ +	+ + [1]	+ +/+	+ +/+
LPG/Spark Ignition	+ +	+ [3]	+/-	+	+	+ +	+	+ + [1]	- [2]	+ +
CNG/Spark Ignition	+	+ [3]	- -	-	- -	+ +	+	+ +	-	+ +
Ethanol/Spark Ignition	+	+ [3]	+ ++	+	+ +/+	+ +	+ +	-	+	+
Methanol/Spark Ignition	+ +	+	+	+	+ +/+	+ +	+ +	+ +	+	+ +/+
Electricity/Battery-Electric	- -	+ +	- -	- -	-	-	+ +	+ +	-	+ +
Electricity-Gasoline/ Electric Hybrid	-	+ [3]	-/+	+	-	+	+ +	+ +	+	+ +

1) At Present, May Create Problems in the Far Term
2) At Present, May Not Create Problems in the Far Term
3) Catalytic Exhaust Treatment Necessary Depending on Stringency of Emission Legislation

Scale: - - Serious Difficulty
- Some Difficulty
+ No Great Difficulty
+ + No Difficulty

Source: V.W. Research and Development

Table 7-1 Specification of Fuel Methanol (draft by V.W. AG)

		summer	winter	Test method
METHANOL	wt-%	min. 82		GC
HYDROCARBONS HC total*)	wt-%	min. 10 - max. 13		GC
BUTANE C_4	wt-%	max. 1.5	max. 2.5	GC
DENSITY d_{15}	kg/m³	770 - 790		DIN 51757, ASTM D 941
VAPOR PRESSURE RVP (DRY)	mbar	550-700**)	750-900**)	DIN 51754, PREN12, ASTM D 323
WATER	ppm	min. 2000-max. 5000***)		DIN 51777, ASTM D 1744
HIGHER ALCOHOLS	wt-%	max. 5		GC
FORMIC ACID	ppm	max. 5		
ACIDITY CALCULATED AS ACETIC ACID	ppm	max. 20		ASTM D 1613
EXISTENT GUM	mg/kg	max. 5		DIN EN5, washed with MEOH
CHLORINE	ppm	max. 2		DIN 51408, Teil 1 ASTM D 3120, mod. & ASTM D 2988
LEAD	ppm	max. 30		ASTM D 3237
PHOSPHORUS	ppm	max. 10		ASTM D 3231
SULFUR	ppm	max. 100		ASTM D 3120
ADDITIVES	%	max. 1		

*) Species, boiling range and quantity of HC depending from cold start and safety requirements.

**) Example for Middle Europe, different values according to local gasoline possible.

***) with corrosion inhibitor.

Source : Volkswagen Methanol Workshop June 4. 1985

Participants	Government and others	Manufacturers of Diesel Engines	Manufacturers of automobiles	Oil Companies and others	
	BMFT (F.R.G.)	TUV Rheinland (F.R.G.)	MAN	VW, VW Brazil	Shell AG	Exxon Chemical
	DGMK (F.R.G.)		KHD	GM	BP AG	Lubrizol
	Ministry of Transportation (Canada)			Porsche	Exxon	BASF
	Automotive Fuel Authority (Canada)			Daimler Benz	Aral	Veba Oel
	DOE (U.S.A.)			Ford	UK Wesseling	
	SANTA Clara Univ. (U.S.A.)				Shell U.K.	

Table 7-2
Allowance of Lead Content in Gasoline by EPA

Present	1.1	gram/Gallon
July 1, 1985 —	0.5	gram/Gallon
Jan.1, 1986 —	0.1	gram/Gallon

Source : Chemical & Engineering News (July 15, 1985)

Table 7-3
Comparison of Gasoline Specification in F.R.G.

	DIN 51 600				DIN 51 607			
	Premium		Regular		Premium		Regular	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Density at 15°C g/ml	0,730-0,780		0,715-0,765		0,740-0,790		0,720-0,770	
RON min.	98,0		91,0		96,0		91,0	
MON min.	88,0		82,7		86,0		82,5	
Lead content max. g/l	0,15				0,01			
Distillation:								
at 70°C % vol	15-40	20-45	15-40	20-45	15-42	20-47	15-42	20-47
at 100°C % vol.	42-65	45-70	42-65	45-70	40-65	42-70	40-65	42-70
at 180°C % vol.	90				85			
Final boiling point max. °C	215				215			

Source : Deutsche Shell A G

Table 7-4

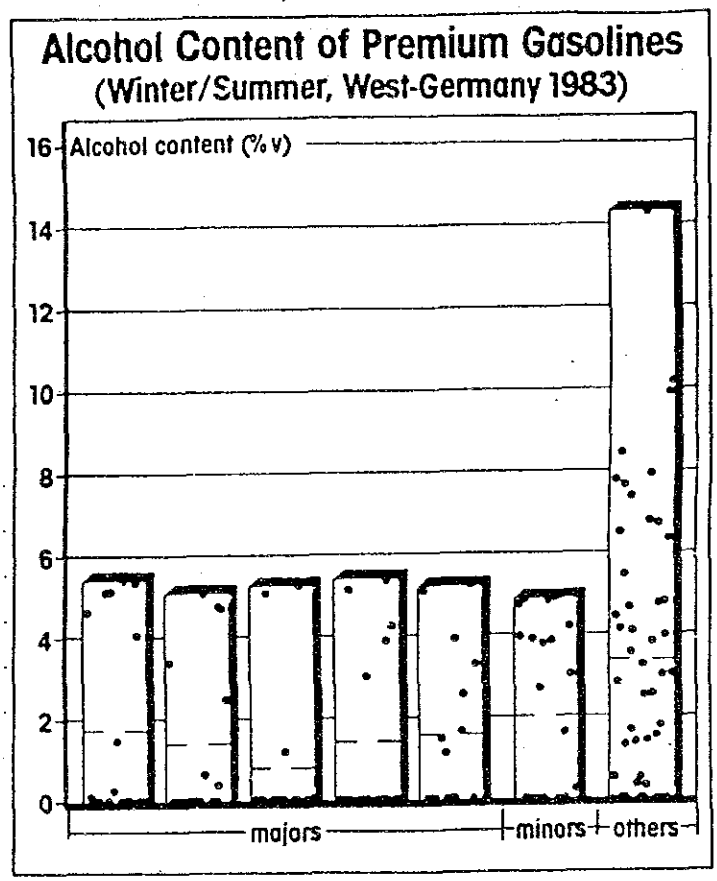
Service Stations of Unleaded Gasoline Now in Operation

in Western European Countries

	Number	Price(DM/l)
Belgium	21	1.85
Denmark	36	1.89 -- 1.92
France	37	2.17 -- 2.23
U.K	0	
Italy	0	
Netherland	93	1,82
Switzerland	most of them	1.53 — 1.70
Austria	most of them	1.61 — 1.68
Spain	0	
Sweden	49	1.68
F.R.G.	1500	N.A.

Source : Information from JETRO (July 30,1985)

Fig. 7-4



Source : Deutsche Shell AG

Table 7-5

Methanol Combustion Tests in Gas Turbines

Year	Country	Company	Remarks
1974	U.S.A.	Florida Electric Power Company	34 MW
1978-79	U.S.A.	Southern Calif. Edison	26 MW
1981	Japan	N.A.	1.2 MW (Combustion Chamber)
1983	U.S.A.	Solar Energy Institute	0.132 MW (Gas Turbine with Methanol Reformation)

Table 7-6

Methanol Combustion Tests in Boilers

Year	Country	Company	Remarks
1971	U.S.A.	Cohen	Combustion Test-Furnace
1972	U.S.A.	New Orleans Public Service Electric Power	50 MW Boiler for Electric Utility
1973-74	JAPAN	CRIEPI	Small-Scale Combustion Test-Furnace
1974	JAPAN	A	Boiler for Auto-Generation
1975	JAPAN	B	Boiler for ElectricUtility
1981	U.S.A.	Southern Calif. Edison Electric Power	Mixed Combustion with Heavy Fuel Oil in Boiler

Note: CRIEPI: Central Research Institute of Electric Power Industry

8. CONCLUSION AND RECOMMENDATION

(1) Conclusion

All of the studies scheduled in FY 1985 have successfully been completed.

1) Detailed design of the coal gasification test facilities has been carried out and completed in September, 1985.
JICA has started the procurement of the equipment in accordance with the Scope of Work.
BPPT has continued the construction work of the pilot plant building in PUSPIPTEK and almost completed, excepting maintenance facilities.

2) Coal sampling study was carried out including shallow boring and deep boring in North West Banko and West Banko (partially).

The following were clarified:

i) The outcrop lines and coal seam structure in NW Banko and West Banko were grasped in detail.

ii) Sodium content in coal is maximum 0.6%, however sodium in ash is in the range of 0 - 40%.

iii) Coal samples (200 kg/sample x 10 samples) for the coal gasification test will be taken in NW Banko using two sets of 101 mm core drilling machines in FY 1986.

3) The project, producing 1,600,000 ton/year of methanol from Banko coal, was preliminarily evaluated in terms of financial viability and profitability.

i) The results show relatively low IRR of 13.5% (before tax) because the sales price of methanol (35¥/kg at gate, before tax) was assumed to be rather low, reflecting the current crude oil prices which have been extremely declined. Since the viability as well as profitability of the project highly depends on the sales price, there is a possibility that this project is appraised as viable in case of higher oil price than 30$/bbl.

ii) Provided that produced methanol is imported to Japan as transportation fuel, the estimated methanol sales price in Japan (44¥/l before tax) is

between those of gasoline (96¥/l) and diesel oil (81¥/l), considering difference of overall energy efficiency for automobiles, while fuel methanol serves benefits to air pollution improvement.

4) According to the literature-study, fuel alcohol is paid attention as octane-enhancer point of view, while the U.S.A. and Japan are doing research and development efforts from environmental point of view.

Though no significant technological problems are expected for methanol use in gasoline and diesel engines, distribution system of fuel methanol and commercial production of methanol vehicles will probably be significant problems in penetration of fuel methanol.

(2) Recommendation

1) As conclusion of the strategic investigation in FY 1984 and the results of the study in FY 1985, the effective utilization of Banko coal seams to be feasible in technical and economic view point. Therefore it is recommended that the study in FY 1986 shall be proceeded as scheduled on Scope of Work.

2) It is recommended that "the Study on Market for Fuel Alcohol and its Supply System in Indonesia" shall be carried out in FY 1986 as one of subjects of the Feasibility Study, in response to the request of the Counterpart.

APPENDIX I.

Minutes of Meeting

MINUTES OF MEETING

FIELD REPORT

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 (No. A) headed by Mr. Takehiko Sato to the Republic of Indonesia from May 21 to June 1, 1985.

   According to the prepared program BPPT (the counterpart team) and the study team have discussed implementation plan of the coal gasification test stage, detailed implementation plan of coal sampling work and detailed design of chemical laboratory for coal analysis work.

2. The study team prepared the field report (draft) summarizing the results of discussions.

3. After discussions, BPPT and the study team agreed on the field Report on June 1, 1985.

4. 15 Copies of the Field Report were provided to BPPT.

5. 15 Copies of the Inception Report (stage II) were provided to BPPT and relevant organizations by JICA.

Jakarta, June 1, 1985

For Japan International Cooperation Agency

For the Agency for the Assessment and Application of Technology

T. Sato June 1. 1985

TAKEHIKO SATO
Leader of the Study Team
Japan International Cooperation Agency

Wardiman 1. 6. 1985

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

MINUTES OF MEETING

FIELD REPORT

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 (No. B) headed by Mr. Takehiko Sato to the Republic of Indonesia from July 3 to 13, 1985.

   According to the prepared program, BPPT (the counter part team) and the study team have discussed the detailed engineering of the coal gasification test facilities and recent coal exploration activity in North West Banko and other areas.

2. The study team provided to BPPT 15 copies of the Interim Report summarizing the result of the strategic investigation carried out in FY 1984.

   After discussion, BPPT and the study team agreed on the Interim Report on July 12, 1985.

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

   After discussions, BPPT and the study team agreed on the Field Report on July 12, 1985. 15 copies of the Field Report were provided to BPPT.

4. Both teams confirmed to start the coal sampling work in accordance with the original program from July 25, 1985.

For JAPAN INTERNATIONAL COOPERATION AGENCY	For the AGENCY for the ASSESSMENT AND APPLICATION of TECHNOLOGY
July 12, 1985	12.7.85
TAKEHIKO SATO Leader of the Study Team Japan International Cooperation Agency	WARDIMAN DJOJOMEGORO Deputy Chairman for Administration Agency for the Assessment and Application of Technology

MINUTES OF MEETING

FIELD REPORT

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 (No. C) headed by Mr. Takehiko Sato to the Republic of Indonesia from August 22 to 30, 1985.

   According to the prepared program, BPPT (the counterpart team) and the study team have discussed the final detailed engineering of the coal gasification test facilities, recent coal sampling activity in North West Banko and others.

2. The study team provided to BPPT 15 copies of the Final Engineering Report summarizing the result of the detailed engineering carried out in FY 1985.

   After discussion, BPPT and the study team agreed on the Final Engineering Report on August 29, 1985.

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

   After discussions, BPPT and the study team agreed on the Field Report on August 29, 1985. 15 copies of the Field Report were provided to BPPT,

4. Both teams confirmed to start the coal analysis work from November 25, 1985.

For JAPAN INTERNATIONAL COOPERATION AGENCY

T. Sato Aug 29. 1985

TAKEHIKO SATO
Leader of the
Study Team
Japan International
Cooperation Agency

For the AGENCY for the ASSESSMENT AND APPLIATION of TECHNOLOGY

Wardiman

WARDIMAN DJOJONEGORO
Deputy Chairman for
Administration
Agency for the
Assessment and Appliation of
Technology

MINUTES OF MEETING

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 (No. 8) headed by Mr. Shozo Ida to the Republic of Indonesia from the 3rd July to the 30th September, 1985.

2. Although the coal sampling study program was fixed, and agreed among BPPT, PPTM and JICA beforehand, the schedule is two month late as of the 28th September and deep hole drilling has not started.

   One deep hole machine has been sent by PPTM and has arrived at the site, however, needed fund to execute the full-scale works has not remitted to PPTM from BPPT and the field manager of PPTM was not given enough fund to hire a dozer which is needed to pull the above machine, overcoming muddy road, to the drilling station from the unloaded place, because official approval letter relative to the revised budget has not been issued by BAPPENAS, therefore, the machine is left by the side of the road.

3. The above mentioned drastic delay is caused by budgetary and subsequent procedure taken by BPPT. The Japanese team expressed regret for drastic delay of the work caused by BPPT, furthermore, requested strongly that BPPT should make greater effort continuously to solve following pending matters immediately.

   a) concluding the agreement relative to the coal sampling study

   b) obtaining official approval letter relative to the revised budget from BAPPENAS.

The Japanese team also requested to apply the needed fund to the project from other project temporarily.

The coal project manager of BPPT explained vindicate shown in appendix-1, on the subject.

4. The Japanese Team presented the writing request shown in appendix-2 to get BPPT to make up the proper budget in the 1986/87 fiscal year, in answer to BPPT's request.

BPPT promised to make up the budget in the 1986/87 fiscal year, paying regard to the above request, to carry out the works smoothly in the next fiscal year.

5. The Japanese team also presented the writing request an executing the works without interruption after the Japanese team leave the site to Mr. Bruhandin, the field manager of PPTM. (Appendix-3).

The field manager of PPTM promised that the works shall be carried out, according to the above request.

6. It has been confirmed to start the coal analysis work from the end of November under the minutes of meeting dated August 29.

The Japanese team presented the list of needed tools and supplies procured by BPPT and requests to procure them till the end of November. (Appendix-4).

BPPT agreed to the above request and to arrange needed number of counterparts till the above term.

7. The Japanese team presented the writing request (see Appendix-5) to Mr. Komar P.A., the project manager of PPTM, and the project manager of PPTM agreed to cooperate with the Japanese team.

8. The Japanese team handed over technical data and maps, drawn up or collected at the site to the coal project manager of BPPT.

On behalf of
THE JAPAN INTERNATIONAL
COOPERATION AGENCY

井田昭三

SHOZO IDA
Chief of the Study Team
sent by the Japan
International Cooperation
Agency

On behalf of
THE AGENCY FOR THE ASSESSMENT
AND APPLICATION OF TECHNOLOGY

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

On behalf of
THE MINERAL TECHNOLOGY DEVELOPMENT CENTRE

YUYUN BASYUNI
Head of the Experimental Plant Section

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 March 12 to 21, 1986.

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

   1) The draft Progress Report (FY 1985)

   2) The implementation plan of the Study in FY 1986

   3) The implementation plan of the study on market for fuel alcohol and its supply system

   4) Coal sampling method in FY 1986

   5) Detailed engineering and construction of the coal gasification test facilities

   6) Coal analysis and its result.

2. The study team provided to BPPT 15 copies of the draft Progress Report summarizing the result of the Study carried out in FY 1985.

   After discussion, BPPT and the study team agreed on the draft Progress Report on March 20, 1986.

3. The implementation plan of the Study (the feasibility study on effective utilization of Banko coal) in FY 1986 was discussed.

After discussion, BPPT and the study team agreed upon the implementation plan as shown in APPENDIX I.

Technical and financial undertakings by each side were explained and discussed on the basis of Scope of Work.

The major items of undertakings which were discussed 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 and/or inclined shaft method.
BPPT and MTDC will confirm the availability of core boring machines and their accessories, including spare parts (by BPPT).

(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).

4. The implementation plan of the study on market for fuel alcohol and its supply system was discussed.

After discussion, BPPT and the study team agreed on the implementation plan as shown in APPENDIX II.

Technical and financial undertakings by both sides were also discussed on the basis of Scope of Work.

i) The study shall be carried out by a market and economic evaluation group of the study team

ii) BPPT explained that a working group shall be organized by the following relevant organizations:

BPPT
DG of MIGAS
DG of ENE
Ministry of Industry
Ministry of State for Population and Environment
Ministry of Communication
PERTAMINA
PLN

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

After discussions, BPPT and the study team agreed on the Field Report on March 20, 1986, as shown in APPENDIX III. 15 copies of the Field Report were provided to BPPT.

i) Both sides confirmed that the construction of the coal gasification test facilities shall be carried out on the schedule of Scope of Work.

ii) The technical and financial undertaking by both sides for the Study in FY 1986 was discussed.

a) Cooling tower
b) Air compressor
c) Engine for cooling water pump
d) 101 mm core boring machine
e) consumerable materials for coal gasicifation test.

The counterpart requested for JICA to provide accessories of 101 mm core boring machine in order to achieve a smooth coal sampling in FY 1986.

APPENDIX

I : Implementation plan of the feasibility study on effective utilization of Banko coal in FY 1986.
II : Implementation plan of the study on market for fuel alcohol and its supply system
III : Field Report.

For JAPAN INTERNATIONAL COOPERATION AGENCY

T. Sato march 20 '86

TAKEHIKO SATO
Leader of the Study Team
Japan International
Cooperation Agency

For THE AGENCY FOR THE ASSESSMENT AND APPLICATION OF TECHNOLOGY

Wardiman 20.3.86.

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

APPENDIX II.

Schedule, Organization and Program,
Visited by the Study Team in FY 1985

SCHEDULE, ORGANIZATION AND PERSONNEL VISITED BY THE STUDY TEAM (NO.B;C)

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
May 22 (Wed)	14.00-16.00	BPPT	Mr. Wardiman Djojonegoro Mr. Subagio Imam Bakri Mr. Bambang Suwondo Mr. Achmad Setiadi
May 23 (Thu)	09.00-12.00	PUSPIPTEK BPPT	Mr. Bambang Suwondo Mr. Achmad Setiadi Mr. Sulaiman Kurdi
May 23 (Fri) May 25 (Sat)	09.00-13.00	MTDC	Mr. Bambang Sulasmoro Mr. Komar P.A Mr. Zurni M. Nur Mr. J.K. Massora Mr. Y. Basyuni Mr. Samsa Mr. Arifin Karim Mr. Hadi Nursaya Mr. Subagio Imam Bakri Mr. Bambang Suwondo Mr. Achmad Setiadi

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANTS
May 27 (Mon)	8.00-09.30 (Office)	BPPT	Mr. Achmad Setiadi Mr. Bambang Suwondo
May 30 (Thu)	9.30-18.00 (Site Survey)	PTBA	Mr. Soetjipto Wijodi Mr. As, Suhatri Arif Mr. Andi Massalangka Mr. Rachman Soekandi Mr. C.S.Jauary
		DOC	Mr. Brawi Hendarto
		BPPT	Mr. Bambang Suwondo Mr. Achmad Setiadi
		MTDC	Mr. Y. Basyuni Mr. Hadi Nursaya
May 30 (Thu)	10.30-12.30	BPPT	Mr.Wardiman Djojonegoro
May 31 (Fri)	9.00-12.00	PUSPIPTEK Jakarta	Mr. Sulaiman Kurdi Mr. Subagio Imam Bakri Mr. Bambang Suwondo
May 27 (Mon)	19.00-20.00	MARUBENI	Mr.H. Mizuochi
May 28 (Tue)	11.00-12.00		Mr.Y. Takaba

Schedule, Organization and Personnel visited by the Study Team (No. A)

Date	Time	Name of Organization	Name of Attendant
July 4	09.00-11.00	JICA Jakarta Office	Mr. AOKI
	11.00-11.30	The Embassy of Japan	Mr. FUKUSHIMA
	13.00-15.00	BPPT	Mr. Wardiman Djojonegoro Mr. Subagio Imam Bakri Mr. Bambang Suwondo Mr. Achmad Setiadi
July 5	09.00-12.00	BPPT	Mr. Subagio Imam Bakri Mr. Bambang Suwondo Mr. Achmad Setiadi
	13.30-15.00	PUSPIPTEK (JAKARTA)	Mr. Subagio Imam Bakri Mr. Sulaiman Kurdi Mr. Rustamadji
July 8	09.00-12.00 13.00-15.30	BPPT	Mr. Subagio Imam Bakri Mr. Djoko Sulaksono Mr. Achmad Setiadi Mr. Herry Supriyanto Mr. Suharjono

Date	Time	Name of Organization	Name of Attendant
		MTDC	Mr. Komar P.A.
			Mr. Y. Basyuni
			Mr. Hadi Nursaiya
	(13.00-15.30)	PUSPIPTEK	Mr. Subagio Imam Bakri
		(JAKARTA)	Mr. Sulaiman Kurdi
July 9	09.00-12.00	BPPT	Mr. M. Harsono
			Mr. Subagio Imam Bakri
			Mr. Djoko Sulaksono
			Mr. Achmad Setiadi
			Mr. Herry Supriyanto
			Mr. Suharjono
		MTDC	Mr. Y. Basyuni
	(10.00-11.30)	BPPT	Mr. Zuhal
	13.30-17.00	PUSPIPTEK	Mr. Subagio Imam Bakri
		(SERPONG)	Mr. Bambang Suwondo
			Mr. Achmad Setiadi
			Mr. Herry Supriyanto
			Mr. Suharjono
		MTDC	Mr. Y. Basyuni
July 10	10.00-11.00	JETRO	Mr. R. NAMIKAWA
	11.00-12.30	BPPT	Mr. Subagio Imam Bakri
	13.30-15.00	TAISEI CORPORATION	Mr. Y. KAKUTANI
July 11	09.00-	BPPT	Mr. Subagio Imam Bakri

Schedule Organization and Personnel Visited
by the Study Team (No. B)

No. 1

Date	Time	Name of Organization	Name of Attendants
July 11	9:00 - 16:00	BPPT	Mr.Djoko Sulaksono
			Mr.Subagio Imam Bakri
			Mr. Bambang Suwondo
			Mr. Achmad Setiadi
July 13-16	9:00 - 18:00	PTBA	Mr. Soetjipto Wijodi
	(Tanjing Enim)		Mr. A. Suhatri Arif
			Mr. Andi Massalangka
			Mr. C.S.Jauary
		BPPT	Mr. Subagio Imam Bakri
		MTDC	Mr. Hadi Nursarya
			Mr. Burjandin
July 17	9:00 - 16:00	BPPT	—same as July 11—
July 19-24			—same as July 11—
July 25	9:00 - 12:00	BPPT	Mr. Wardiman Djojonegoro
			—same as July 11—
July 27	9:00 - 16:00	BPPT	—same as July 11—
July 29	9:00 - 16:00	BPPT	—same as July 25—
July 30	9:00 - 14:00	BPPT	—same as July 11—
July 31	9:00 - 12:00	JATIFIC	Mr. Won
	13:00 - 16:00	BPPT	—same as July 11—
August 1	9:00 - 16:00	BPPT	—same as July 11—
August 2	9:00 - 14:00	MTDC	Mr. Y. Basyuni
	(Bandung)		Mr. Hadi Nursarya
			Mr. Burhandin
		BPPT	Mr. Subagio Imam Bakri
August 3	9:00 - 14:00	MTDC	Mr. Komar P.A.
	(Bandung)		Mr. Y. Basyuni
			Mr. Hadi Nursarya
August 5	9:00 - 16:00	BPPT	—same as July 11—
August 6	9:00 - 11:00	JATIFIC	Mr. Won
	12:00 - 16:00	BPPT	—same as July 25—
August 8-9	9:00 - 16:00	BPPT	—same as July 11—
August 13	9:00 - 10:00	PTBA	—same as July 13-16—
	(Tanjing Enim)		

No. 2

Date	Time	Name of Organization	Name of Attendants
August 14	8:00 - 16:00 (Tanjing Enim)	MTDC	Mr. Bruhandin Mr. Kusunawan
August 15	14:00 - 16:00	BPPT	—same as July 11—
August 16	9:00 - 16:00	BPPT	—same as July 11—
August 17-25	8:00 - 16:00	MTDC	Mr. Bruhandin Mr. Kusunawan
		BPPT	Mr. Subagio Imam Bakri Mr. Bambang Suwondo
August 29- September 2	8:00 - 16:00 (Tanjing Enim)	MTDC	Mr. Kusunawan Mr. Komar P.A.
September 4-6	9:00 - 16:00 (Bandung)	MTDC	Mr. Y. Basyuni Mr. Hadi Nursarya Mr. Bruhandin Mr. Kusunawan
September 9-11	9:00 - 16:00	BPPT	—same as July 11—
September 14	10:00 - 12:00 (Tanjing Enim)	PTBA	—same as July 13-16—
September 20	9:00 - 16:00	MTDC	Mr.Bruhandin
September 21	10:00 - 12:00 (Tanjing Enim)	PTBA	—same as July 13-16—
	14:00 - 16:00 (Tanjing Enim)	MTDC	Mr.Bruhandin
September23-25	9:00 - 16:00 (Tanjing Enim)	BPPT	—same as July 11—
September 26	9:00 - 14:00	BPPT	—same as July 11—
September 27	9:00 - 14:00 (Bandung)	MTDC	Mr. Komar P.A. Mr. Y. Basyuni Mr. Hadi Nursarya Mr. Kusunawan Mrs. Nungnung
September 28	10:00 - 12:00 (Bandung)	MTDC	—same as September 27—
September 29	10:00 - 12.00	BPPT	—same as July 25—
		MTDC	Mr.Y.Basyuni Mrs. Nungnung

Schedule, Organization and Personnel visited by the Study Team (No.BC)

Date	Time	Name of Organization	Name of Attendent
August 23	09.00-12.00	BPPT	Mr. Djoko Sulaksono
	14.00-17.30	PUSPIPTEK SELPONG	
August 24	08.30-10.00	JICA Jakarta Office	Mr. S. Aoki
	11.00-12.00	PP TAISEI	Mr. Hasegawa
			Mr. A. Kashiwagi
			Mr. S. Maeda
			Mr. K. Yoshimura
	13.00-15.00	PRESIDENT HOTEL	Mr. Djoko Sulaksono
			Mr. Subagio Iman Bakri
			Mr. Bambang Suwondo
August 27	08.30-15.00	BPPT	Mr. Djoko Sulaksono
			Mr. Bambang Suwondo
			Mr. Achmad Setiadi
August 28	08.30-14.30	BPPT	Mr. Djoko Sulaksono
			Mr. Herry Supriyanto
		PUSPIPTEK (JKT)	Mr. Sulaiman Kurdi
		MTDC	Mr. Y. Basyuni
August 29	13.00-14.00	BPPT	Mr. Djoko Sulaksono
		MTDC	Mr. Y. Basyuni

DATE	TIME	NAME OF ORGANIZATION	NAME OF ATTENDANT
August 24	10.00 - 11,20	P L N	Mr.R.M.Sayid Budihardjo (Deputy Director Operations)
			Mr.Sugeng Pribadi
			Mr. Lumbangaol
August 27	10.30 - 12.00	Pertamina (Non-BBM Division)	Mr.H.Arifin Abubaka
			Mr.R.Siregar
			Mr.Ing. Susilo Martodiwirjo
			Mrs.T. Indrawanti Pudiyanto
			Mr.P.Agus Budiasto
			Mr. Imam Soeharto
	14.00 - 15.00	Pertamina (Marketing Division)	Mr. Abdul Gani
			Mr. Yan Iskandar
	15.00 - 16.00	Pertamina (Supply Division)	Mr.M.S.Mustafa
August 28	09.00 - 10.00	Ministry of State for Population & Environment	Prof.Dr.Koesnadi Hardjasoemantri (Executive Secretar
	13.00 - 13,40	Directorate General of Sea Communication	Mr.Zainal Abidin
			Drs.M.Soewignjo.

Schedule Organization and Personnel Visited
by the Study Team (No. B)

Date	Time	Name of Organization	Name of Attendants
December 2	9.00 - 16:00	BPPT	Mr. Subagio Iman Bakri Mr. Bambang Suwondo Mr. Achmad Setiadi
December 3	9:00 - 15:00	PUSPIPTEK	Mr. Sulaiman Kurdi
December 4	9:00 - 16:00	BPPT	Mr. Subagio Iman Bakri Mr. Bambang Suwondo Mr. Achmad Setiadi
		MTDC	Mr. Komar P.A. Mr. Y. Basyuni Mr. Nadi Nursarya
December 5	9:00 - 16:00		—same as December 2—
December 6	9:00 - 16:00	BPPT	—same as December 2—

APPENDIX III.

List of Documents, DWGs and Date
Submitted by the Counterpart

1. KABUPATEN MUARAENIM DALAM ANGKA 1982
   (Muaraenim district Statistic Data Book)

2. Data of Musi and Lematang Rivers, South Sumatra, Indonesia

3. Geological Map of N.W. Banko and West Banko, South Sumatra, Indonesia

4. Boring data of N.W. Banko and West Banko by D.O.C., Indonesia

5. Port of Palembang (Catalogue)

APPENDIX IV.

Member List of the JICA Mission

STUDY TEAM(A)

The Coal Gasification Test Facilities

NAME	*UNDERTAKING*	*AREA OF EXPERTISE*
Takehiko SATO	*Team Leader*	*Registered Consulting Engineer in Mechanical Engineering*
Shozo OKAMURA	*Pilot Plant Building*	*Authorized Building Engineer*
Toshitaka YANAGI	*Pilot Plant Building*	*Authorized Building Engineer*
Katsunobu UDAGAWA	*Pilot Plant Building*	*Authorized Building Engineer*
Naomichi NIRE	*Pilot Plant Building*	*Authorized Building Engineer*

STUDY TEAM(B)

The Investigation of Coal Quality

NAME	*UNDERTAKING*	*AREA OF EXPERTISE*
Takehiko SATO	*Team Leader*	*Registered Consulting Engineer in Mechanical Engineering*
Shozo IDA	*Assistant Leader Coal Sampling*	*Mining Engineer*
Tomoya KIKUCHI	*Coal Mining*	*Mining Engineer*
Kimihiko ITO	*Coal Mining*	*Mining Engineer*
Yutaka KAMBAYASHI	*Coal Analysis*	*Analyst*
Atsushi NAKAI	*Equipment Installation*	*Chemical Analyst*

STUDY TEAM(C)

The Overall Evaluation of Coal Gasification Test

NAME	*UNDERTAKING*	*AREA OF EXPERTISE*
Taizo HAYASI	*Assistant Leader Energy Demand/ Supply for Transportation*	*Evaluation of Alternative Energy*
Akira IKEZAWA	*Methanol Cost*	*Project Engineer*
Shigeo NAKAJIMA	*Methanol Cost*	*Registered Consulting Engineer*

STUDY TEAM(D)

The Field Report and Meeting

NAME	*UNDERTAKING*	*AREA OF EXPERTISE*
Takehiko SATO	*Team Leader*	*Registered Consulting Engineer in Mechanical Engineering*
Shozo IDA	*Assistant Leader Coal Sampling*	*Mining Engineer*
Tomoya KIKUCHI	*Coal Mining*	*Mining Engineer*
Akira IKEZAWA	*Methanol Cost*	*Project Engineer*
Hisao NISHIMURA	*Pilot Plant Building*	*Authorized Building Engineer*
Mitsuichiro FUKUDA	*Pilot Plant Building*	*Authorized Building Engineer*
Toshitaka YANAGI	*Pilot Plant Building*	*Authorized Building Engineer*

APPENDIX V

Detailed Design Packege of Coal Gasification Test Facilities

APPENDIX VI

Technical Specification for Erection Work

Technical Specification for Erection Work

1. Mechanical Work

(1) General

1) The Contractor shall install the plant always bearing in mind that the plant after completed will function most satisfactorily.
2) The Contractor shall always use his best expertise in carrying out the installation work.
3) The installation process, installation procedure, welding procedure, piping procedure, painting procedure, inspection standard and so on, which are necessary for the erection work will be informed by the Consultant with drawing or documents principally.
4) The Contractor shall give a notice to the Consultant immediately after occurrence of any unexpected trouble while performing the works.
5) The Contractor shall ensure that the tools and measuring instruments shall be handled by skilled workers well acquainted with the mechanism and function of such tools and instruments.
6) All tools and measuring instruments for the installation work shall function properly and shall be checked at regular intervals and maintained in good condition.
7) Existing overhead crane in the building shall be available for the erection of the plant.
8) Temporary facilities and services (electrical power, air and water, etc.) necessary for erection of the plant shall be available at the battery limit.

(2) Preparing for Installation

1) The Contractor shall visually examine to see if the floor is sufficiently dry and free from cracks.
Morever, the Contractor shall visually inspect all anchor bolt holes to ensure absence of foreign matters which, if found, shall be removed.

2) The contractor shall confirm, together with the Consultant's and Supplier's, datum line and datum levels, for deciding to the levels, positions and direction of the plant to be installed.

3) Temporary bench marks shall be fixed by the Contractor on the floor surface for the identification of the accurate level of equipment to be installed.

4) Permanent bench marks and permanent center marks shall be fixed by the Contractor.

The Permissible tolerances in levels of bench marks shall be +1.0 mm from the datum levels.

(3) Installation of Machines

1) Alignment of Machines

a) Prior to the installation of machines, the lower part of machines and the top surface of the floor shall be thoroughly cleaned so as to be free from rust preventive paint, oil grease, dust, etc., and covers of anchor holes and foreign materials in the anchor bolt holes shall be removed.

b) Positioning of machines shall be determined using bench marks and center marks.

The Contractor shall carry out the alignment.

c) Grouting for the anchor bolt hole shall be carried out always after temporary alignment of machines.

d) After the grout in the anchor bolt holes has completely hardened, the anchor bolts shall be tightened and the final alignment shall be made.

e) The final inspection of alignment shall be made generally in presence of the Consultant's and Supplier's Supervisor, the results of which shall be submitted to the Consultant for his approval.

2) Assembling of Machine Parts

a) Each machine shall be assembled in compliance with drawings and documents.

b) Where required, rust preventive paint and/or oil coated at the shop must be thoroughly washed of, prior to be the assembling at the site, and any rust, foreign matter, etc., if found, must be removed.

c) During the site assembling of the machine, special attention must be paid to the matchmarks.

d) Seals, gasket and the like shall be set at the correct positions and shall be tightened uniformly.

e) Wood, synthetic resin, copper hammer, etc. shall be used for insertion of parts in assembling.

f) In the handling of parts during assembling, care shall be taken for the following:

- In the lifting of temporary storage of heavy and long items, no strain must be generated.
- In temporary storage of parts, suitable blocks shall be provided.

  Precision parts in particular must be protected with a cover provided.

(4) Field Bolting

Unless stipulated otherwise in the drawing, the tightening of bolts at the site shall be performed as stated below. Field connection of other materials if required shall also be in accordance with the drawings or the Consultant's specific instruction.

1) Tools used shall be suitable for the dimensions of bolts and nuts and the tightening work.

2) The tightening force shall be determined by the Contractor referring to appropriate standards and a most suitable method shall be selected such as torque wrench, turn-of-nut or bolt elongation, etc.

3) The Contractor shall submit to the Consultant for prior approval a proposal for the method and operating procedure of such tightening work.

(5) Inspection

1) Upon completion of the alignment work of each equipment and before grouting, the Contractor shall carry out an alignment inspection which shall generally be witnessed by consistent with drawings and documents.
The Contractor shall not proceed to further work without the said inspection.

2) After inspection of equipment, the Contractor shall carry out the final inspection, generally in presence of the Consultant's or Supplier's Supervisor.
In the final inspection, the Contractor shall inspect and measure main parts of equipment and ensure that the equipment has been correctly assembled and installed with satisfactory accuracy.
Due care of the following in particular shall be taken.

a) Condition of bolts as tightened particularly those subjected to vibration.
b) Lubrication of where friction and rotating motions take place.
c) Should any defects be detected during the final inspection, the Contractor shall repair the defects so that they will not pose any hindrance to the subsequent tests and testing, etc.
d) The Contractor shall submit without delay a written report on the final inspection results to the Consultant for approval.

2. Piping Work

(1) General

1) This specification covers the general requirements for installation of all piping and piping system at the site.
2) Piping system covered herein are for fluids such as oxygen, nitrogen, LPG, compressed air, cooling water, oil and pulverized coal, etc.
3) Piping materials shall be prefabricated by the Client prior to shipment.

4) Flushing work for piping shall be performed by the Contractor according to the provisions Japanese Standards, drawings and documents.

Prior to flushing work, instruments and control valves, etc. shall be removed and short pipes and/or hoses shall be installed for the portion of instruments and control valves, etc.

Short pipes and/or hoses and other necessary equipment and materials for flushing work shall be provided by the Contractor according to the provisions of the drawings and documents.

(2) General Precautions

In carrying out piping work the Contractor shall be fully aware of piping systems, pressure, flow amount, temperature, fluid characteristics in order to prevent any accidents which may result from defective work.

(3) Pipe Work

1) Pipes shall, as a rule, be cut mechanically be mean of pipe cutters, pipe gas cutters, high-speed cutters or the like.

2 Bevels for welding shall be cut as accurately as possible in according with the drawings.

3) Cut faces and bevel faces shall be free from cracks, flaws or slags.

4) Welding

Prior to welding, surfaces to be welded shall be completely cleaned to be free from such detrimental objects as rest, oil grease, etc.

Welding shall be in accordance with JIS standards.

Pipe jointing except by welding:

a) *Threads shall be cut by treading machines which shall* be provided by the Contractor.

b) Compounds or Teflon seal tapes shall be used for screwing and rejoining, except when a seal weld is specified, and these materials shall be provided. Packing such as hemp, jute, etc. shall not uses for

screwing.

Projection of seal tape to internal pipe shall be avoided.

c) After pipes have been screwed in screw type flange, pipe edges shall be flush with the flange surface.

If pipe edges project from the flange surface such edges shall be finished by a grinder or file without damaging flange surfaces.

In all cases, screwing less than the specified length of thread engagement shall be avoided.

5) Flushing for Piping

General:

The flushing work shall be to clean the inside of pipes by removing rust and other foreign matters.

All equipments and materials necessary for flushing work shall be provided by the Contractor.

Flushing oil, if required, shall be disposed most carefully.

The used oil shall be disposed in an appropriate manner off the site.

6) Inspection & Testing at the Site

All pipe works installed at the site prior to flushing shall be air pressure tested by the Contractor.

The test pressure shall be maintained for more than one hour.

3. Electrical Work

The electrical installation shall be complete in all respects and any item not included in the specification but essential for proper installation and functioning of the electrical system shall be deemed to be included in the scope of the specification whether specifically mentioned in this specifications or not.

(1) Conduit

1) Exposed conduit shall be installed either parallel with or perpendicular to structural members, unless impractical, and grouped wherever possible.
Conduits shall have a sufficient number of supports to structure framework by means of approved pipe straps, brackets, racks or other approved means.

2) Where all thread nipples are used between boxes and electrical equipment, they shall be installed so that no treads are exposed.

3) Conduit attachment to all electrical equipment including junction boxes, pull boxes, switches, push button stations, starters, etc., shall be made by the use of double steel locknuts.
Threaded insulated bushing shall be used on the end of each conduit terminating in such equipment.

4) Conduit will be cut square and reamed.
Joint will be coated with an electrical conductive sealant, and screwed tight to a shoulder in fittings and bushings to complete a continuity bond.

5) At the switchboard end, threaded insulated bushings for power and control conduits shall be installed.
For power conduit 1 1/2" and larger, an installed washer drilled with the correct size holes for the individual power conductors shall be installed.

6) Conduit shall be protected immediately after installation by means of installing flat non-corrosive metallic discs and steel bushings at each end.
Discs shall not be removed until it is necessary to clean conduit and pull cable or wire.

7) Prior to pulling in cables, each conduit shall be thoroughly cleaned inside by pulling a wire brush cleaner and then a swab through the conduit to remove all sand and particles of concrete.

8) No more than the equivalent of three 90 degree bends will be placed in any one conduit run.
Field bent, with approved tools, or factory bent elbows may be used on circuits 1000 volts and below.

9) Heating of conduit to facilitate bending is prohibited.

(2) Pullboxes, Junction Boxes and Supports

1) Pullbox shall be provided on all conduit runs exceeding 200-ft. and at a maximum of 200-ft. intervals.

2) All pullboxes, junction boxes, cabinets, switches and other electrical equipment shall be solidly supported prior to installation of conduit.

3) Holes for necessary conduit shall be made in each pullbox, junction box, cabinet, switch or other enclosure.

4) Pullboxes, junction boxes and enclosures shall be surface mounted, set true and plumb and shall be secured rigidly to the building or supporting steel or masonry walls.

(3) Cable Racks

1) Cable racks shall be installed either parallel with or perpendicular to structure members and shall be rigidly secured to structure steel, supporting steel, concrete slabs or masonry walls.

2) Cable rack supports shall be installed at 0'0" centers or less.

3) All cables or wire shall be lashed to the rungs of the cable trays on all vertical runs and at all points of taken-off or entry.

4) All cables or wires places in cable racks shall be aligned to make a neat looking installation.

5) All cable or wire take-offs from cable racks shall be supported in such a manner as to make a neat rigid installation.

(4) Wiring

1) Once a cable having paper of V.C. insulation is opened preparatory to splicing or terminating, the splicing or terminating shall proceed immediately and continue uninterrupted until completed.

2 All cable or wire take-offs from cable racks to conduit shall be supported in a manner so they will not rub the sides of the rack.

3) All equipment requiring control wiring must be wired with multiconductor color coded control cable.

4) Control cable through five conductor will be installed in 1" conduit.

   Control cable of six conductor and above will be installed 1 1/4" conduit.

   Control cable shall be run separate to power cables.

5) Circuits of different voltage shall not be included in one conduit or cable.

   All lighting circuits shall be run in conduit separate from equipment and control circuits.

6) When cables are laid at the high temperature places, trays, duct and rucks shall be protected by sheet steel covers, asbestos and so on.

7) Where there is a possibility of mechanical damage, cable trays, ducts, racks shall be protected by sheet steel covers.

8) In general, wires and cables for instruments except instrument panel shall be as follows:

USE	WIRES and/or CABLES
Instrument signal	600 V grade PVC insulated and sheathe control cables with copper shield tape. 2.0 mm^2 or above
Control signal	600 V grade PVC insulated and sheathed control cables. 2.0 mm^2 or above
Thermocouple line	Compensating lead wires

(5) Instrument Piping

1) Tap hole for pressure and/or differential pressure of Vena-contracta tapes orifice, in general, shall be 12 mm diameter, and tape tubing to be welded to tap hole shall generally be 100 mm long and 21.7 mm outer diameter.

2) Tap tubing from tap tubing with process isolation valve to instrument such as pressure and/or differential pressure transmitter shall be 21.7 mm outer diameter.

3) Tubing for pressure and/or differential pressure shall generally be carbon steel pipes.
Material of tubing shall be selected in accordance with process requirements.

4) Pneumatic control lines shall be 6 mm inside diameter and 8 mm outside diameter, copper tubing.

(6) Grounding

1) Grlounding conditions shall have the following sizes:

EQUIPMENT	CONDUCTOR SIZE
Motor below 3.7 kw	5.5 mm^2 or above
7.5 kw	8.0 mm^2 or above
15.0 kw	14.0 mm^2 or above
37.0 kw	22.0 mm^2 or above
above 37.0 kw	38.0 mm^2 or above
High voltage	38.0 mm^2 or above
Main line of grounding	100.0 mm^2 or above
Low voltage panel	5.5 mm^2 or above

2) Grounding conductors shall be laid in such a manner as not to touch other cable and conductors.

3) The earthing electrodes for the following equipment shall be installed separately from the ones for motors and motor control to avoid malfunction of the equipment.

EQUIPMENT	EARTHING RESISTANCE
PLC	less than 10 ohm
Thyristor unit (Induction heater)	less than 10 ohm

(7) Tests

1) Contractor shall perform test to insure the workmanship, methods, inspection and materials used in the erection and installation of the equipment.
He shall provide all necessary test equipment and provide reasonable cooperation to manufacturer's representatives who will witness the test.

2) All test shall be scheduled by the Contractor and cleared by the Owner's engineer.
No testing shall be performed without this clearance.

3) The Owner will approve final acceptance of the power wiring when all wiring considered as a complete system functions to operate all connected electrical equipment in the proper manner.

4) Upon completing wiring works, the following tests and inspections shall be made before energizing cables and wires.
   a) Measurement of earth resistance
   b) Measurement of insulation resistance
   c) Check of phase rotation
   d) Check of cable connection
   e) Others

5) After completing the above tests and inspections, the Contractor shall furnish four copies of all test data. If, in the opinion of Engineers, test results shown improper performance and such deficiencies are due to negligence or unsatisfactory installation by the Contractor, the Contractor shall furnish all labor and materials required to remedy the situation to the satisfaction of the engineer.

6) During no load and load test, the Contractor shall keep several reliable men on duty to repair, adjust or modify.

APPENDIX VII.

Computer Printout,
Financial Analysis-Base Case

Profit and Loss Statement

(Unit 10^9 million rupiah)

Year	Op Year	REVENUE	EXPENDITURE					PROFIT			Retained Earning
			Variable cost	Fixed cost	General	Interest Paid	Total	Before Tax	(Tax)	Net Profit	
1994	1	217.2	56.8	139.0	15.9	69.8	281.5	-64.3	0	-64.3	-64.3
1995	2	263.7	64.3			64.6	283.8	-20.1	0	-20.1	-84.4
1996	3	310.2	72.6			55.8	283.4	26.9	0	26.9	-57.5
1997	4		71.1			44.6	270.6	39.7	0	39.7	-17.9
1998	5		69.5			33.0	257.4	52.9	16.1	36.8	18.9
1999	6		68.7			22.6	246.2	64.1	29.5	34.6	53.5
2000	7					13.4	237.0	73.3	33.7	39.6	93.1
2001	8					4.5	228.1	82.2	37.8	44.4	137.5
2002	9					0	223.6	86.7	39.9	46.8	184.3
2003	10			139.0			223.6	86.7	39.9	46.8	231.1
2004	11			47.5			132.1	178.2	82.0	96.2	327.3
2005	12						132.1	178.2	82.0	96.2	423.5
2006	13						132.1	178.2	82.0	96.2	519.7
2007	14						132.1	178.2	82.0	96.2	615.9
2008	15			47.5			132.1	178.2	82.0	96.2	712.1
2009	16			32.3			116.9	193.7	88.9	104.4	816.5
2010	17										921.0
2011	18										1,025.4
2012	19										1,129.8
2013	20										1,234.2
2014	21										1,338.6
2015	22										1,443.0
2016	23										1,547.4
2017	24										1,651.9
2018	25										1,756.3
2019	26										1,860.7
2020	27										1,965.1
2021	28										2,069.5
2022	29										2,173.9
2023	30	310.2	68.7	32.3	15.9	0	116.9	193.4	88.9	104.4	2,278.3
		9,167.9	2,051.3	2,111.4	477.7	308.3	4,948.7	4,219.2	1,940.8	2,278.3	

Cash Flow Statement

(Unit ; 10^9 rupiah)

Year	Op Year	INVESTMENT	Profit Before Tax	Depreciation/ Amortization	Interest Paid	CASH FLOW	DCF (Base; 1985)
1990		-296.8	-	-	-	-296.8	-157.8
1991		-296.8	-	-	-	-296.8	-139.1
1992		-197.9	-	-	-	-197.9	-81.7
1993		-255.3	-	-	-	-255.3	-92.9
1994	1	-	-64.3	106.7	69.8	111.2	36.0
1995	2	-	-20.1		64.6	151.2	42.7
1996	3	-	26.9		55.8	189.4	47.2
1997	4	-	39.7		44.6	191.0	41.9
1998	5	-	52.9		33.0	192.6	37.3
1999	6	-	64.1		22.6	193.4	33.0
2000	7	-	73.3		13.4		29.1
2001	8	-	82.2		4.5		25.6
2002	9	-	86.7		0		22.6
2003	10	-	86.7	106.7			19.9
2004	11	-	178.2	15.2			17.5
2005	12	-	178.2				15.5
2006	13	-	178.2				13.6
2007	14	-	178.2				12.0
2008	15	-	178.2	15.2			10.6
2009	16	-	193.4	0			9.3
2010	17	-					8.2
2011	18	-					7.2
2012	19	-					6.4
2013	20	-					5.6
2014	21	-					5.0
2015	22	-					4.4
2016	23	-					3.8
2017	24	-					3.4
2018	25	-					3.0
2019	26	-					2.6
2020	27	-					2.3
2021	28	-					2.0
2022	29	-				193.4	1.8
2023	30	-	193.4	0	0	241.7	2.0
	Total	-1,046.8	4,219.2	1,142.9	308.3	4,671.8	0

UNIT= MILLION RUPIAH

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* P / L *											
VOLUME (M.M.TON)	0.00	0.00	0.00	0.00	1.12	1.36	1.60	1.60	1.60	1.60	1.60
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
REVENUE	0	0	0	0	217,175	263,712	310,249	310,249	310,249	310,249	310,249
VARIABLE COSTS TOTA	0	0	0	0	56,792	64,318	72,633	71,053	69,473	68,683	68,683
RAW MATERIALS	0	0	0	0	43,789	53,172	62,555	62,555	62,555	62,555	62,555
CATALYST/CHEMICALS	0	0	0	0	2,389	2,901	3,413	3,413	3,413	3,413	3,413
PERSONALS	0	0	0	0	10,615	8,245	6,665	5,085	3,505	2,715	2,715
(LOCAL STAFF)	0	0	0	0	2,715	2,715	2,715	2,715	2,715	2,715	2,715
(JAPANESE STAFF)	0	0	0	0	7,900	5,530	3,950	2,370	790	0	0
CONSTANT COSTS TOTA	0	0	0	0	138,981	138,981	138,981	138,981	138,981	138,981	138,981
DEP & AMORT	0	0	0	0	106,696	106,696	106,696	106,696	106,696	106,696	106,696
MAINTENANCE	0	0	0	0	23,061	23,061	23,061	23,061	23,061	23,061	23,061
INSURANCE	0	0	0	0	9,224	9,224	9,224	9,224	9,224	9,224	9,224
OTHER DIRECT COSTS	0	0	0	0	10,615	10,615	10,615	10,615	10,615	10,615	10,615
ADMINISTRATIVE COST	0	0	0	0	5,307	5,307	5,307	5,307	5,307	5,307	5,307
INTEREST PAID	0	0	0	0	69,779	64,620	55,814	44,615	33,022	22,576	13,401
(LONG)	0	0	0	0	67,007	58,073	49,139	40,204	31,270	22,336	13,401
(SHORT)	0	0	0	0	2,771	6,547	6,675	4,411	1,752	241	0
TOTAL EXPENSES	0	0	0	0	281,475	283,841	283,350	270,571	257,398	246,162	236,988
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	0	0	0	0	-64,300	-20,129	26,899	39,678	52,851	64,087	73,262
TAX	0	0	0	0	0	0	0	0	16,100	29,480	33,700
NET PROFIT	0	0	0	0	-64,300	-20,129	26,899	39,678	36,751	34,607	39,561
RETAINED EARNING	0	0	0	0	-64,300	-84,429	-57,530	-17,852	18,900	53,507	93,068

UNIT= MILLION RUPIAH

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* P / L *											
VOLUME (M.M.TON)	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
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
REVENUE	310,249	310,249	310,249	310,249	310,249	310,249	310,249	310,249	310,249	310,249	310,249
VARIABLE COSTS TOTA	68,683	68,683	68,683	68,683	68,683	68,683	68,683	68,683	68,683	68,683	68,683
RAW MATERIALS	62,555	62,555	62,555	62,555	62,555	62,555	62,555	62,555	62,555	62,555	62,555
CATALYST/CHEMICALS	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413
PERSONALS	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715
(LOCAL STAFF)	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	138,981	138,981	138,981	47,465	47,465	47,465	47,465	47,465	32,285	32,285	32,285
DEP & AMORT	106,696	106,696	106,696	15,180	15,180	15,180	15,180	15,180	0	0	0
MAINTENANCE	23,061	23,061	23,061	23,061	23,061	23,061	23,061	23,061	23,061	23,061	23,061
INSURANCE	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224
OTHER DIRECT COSTS	10,615	10,615	10,615	10,615	10,615	10,615	10,615	10,615	10,615	10,615	10,615
ADMINISTRATIVE COST	5,307	5,307	5,307	5,307	5,307	5,307	5,307	5,307	5,307	5,307	5,307
INTEREST PAID	4,467	0	0	0	0	0	0	0	0	0	0
(LONG)	4,467	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENSES	228,053	223,586	223,586	132,070	132,070	132,070	132,070	132,070	116,890	116,890	116,890
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	82,196	86,663	86,663	178,179	178,179	178,179	178,179	178,179	193,359	193,359	193,359
TAX	37,810	39,865	39,865	81,962	81,962	81,962	81,962	81,962	88,945	88,945	88,945
NET PROFIT	44,386	46,798	46,798	96,217	96,217	96,217	96,217	96,217	104,414	104,414	104,414
RETAINED EARNING	137,454	184,252	231,050	327,267	423,483	519,700	615,917	712,133	816,547	920,961	1,025,375

UNIT= MILLION RUPIAH

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* P / L *											
VOLUME (M.M.TON)	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
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
REVENUE	310,249	310,249	310,249	310,249	310,249	310,249	310,249	310,249	310,249	310,249	310,249
VARIABLE COSTS TOTA	68,683	68,683	68,683	68,683	68,683	68,683	68,683	68,683	68,683	68,683	68,683
RAW MATERIALS	62,555	62,555	62,555	62,555	62,555	62,555	62,555	62,555	62,555	62,555	62,555
CATALYST/CHEMICALS	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413	3,413
PERSONALS	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715
(LOCAL STAFF)	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715	2,715
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	32,285	32,285	32,285	32,285	32,285	32,285	32,285	32,285	32,285	32,285	32,285
DEP & AMORT	0	0	0	0	0	0	0	0	0	0	0
MAINTENANCE	23,061	23,061	23,061	23,061	23,061	23,061	23,061	23,061	23,061	23,061	23,061
INSURANCE	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224	9,224
OTHER DIRECT COSTS	10,615	10,615	10,615	10,615	10,615	10,615	10,615	10,615	10,615	10,615	10,615
ADMINISTRATIVE COST	5,307	5,307	5,307	5,307	5,307	5,307	5,307	5,307	5,307	5,307	5,307
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	116,890	116,890	116,890	116,890	116,890	116,890	116,890	116,890	116,890	116,890	116,890
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359
TAX	88,945	88,945	88,945	88,945	88,945	88,945	88,945	88,945	88,945	88,945	88,945
NET PROFIT	104,414	104,414	104,414	104,414	104,414	104,414	104,414	104,414	104,414	104,414	104,414
RETAINED EARNING	1,129,789	1,234,203	1,338,616	1,443,030	1,547,444	1,651,858	1,756,272	1,860,686	1,965,100	2,069,513	2,173,927

UNIT= MILLION RUPIAH

	2023	TOTAL
* P / L *		
VOLUME (M.M.TON)	1.60	47.28
PRICE (RUPIAH/TON)	193,906	
REVENUE	310,249	9,167,867
VARIABLE COSTS TOTA	68,683	2,051,332
RAW MATERIALS	62,555	1,848,504
CATALYST/CHEMICALS	3,413	100,847
PERSONALS	2,715	101,981
(LOCAL STAFF)	2,715	81,440
(JAPANESE STAFF)	0	20,541
CONSTANT COSTS TOTA	32,285	2,111,418
DEP & AMORT	0	1,142,858
MAINTENANCE	23,061	691,828
INSURANCE	9,224	276,731
OTHER DIRECT COSTS	10,615	318,449
ADMINISTRATIVE COST	5,307	159,224
INTEREST PAID	0	308,294
(LONG)	0	285,898
(SHORT)	0	22,397
TOTAL EXPENSES	116,890	4,948,716
INTEREST RECEIVED	0	0
PROFIT BEF TAX	193,359	4,219,150
TAX	88,945	1,940,809
NET PROFIT	104,414	2,278,341
RETAINED EARNING	2,278,341	

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	-64,300	-20,129	26,899	39,678	52,851	64,087	73,262
DEPREC. & AMORT.	0	0	0	0	106,696	106,696	106,696	106,696	106,696	106,696	106,696
EQUITY	76,506	81,238	60,761	79,305	0	0	0	0	0	0	0
DEBT (LONG)	229,517	243,714	182,283	237,916	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	69,283	25,112	0	0	0	0	0
TOTAL	306,023	324,952	243,045	317,221	111,679	111,679	133,595	146,374	159,547	170,783	179,958
CASH-OUT											
INVESTMENT TOTAL	306,023	324,952	243,045	317,221	0	0	0	0	0	0	0
(PROCESS)	208,421	208,421	138,947	138,947	0	0	0	0	0	0	0
(OTHER PLANT)	68,310	68,310	45,540	45,540	0	0	0	0	0	0	0
(WORKING)	0	0	0	48,382	0	0	0	0	0	0	0
(OPENING)	0	0	0	6,382	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	2,604	0	0	0	0	0	0	0
(IDCP)	9,181	28,110	45,150	61,958	0	0	0	0	0	0	0
TAX PAID	0	0	0	0	0	0	0	0	16,100	29,480	33,700
REPAYMENT TOTAL	0	0	0	0	111,679	111,679	133,595	146,374	143,447	117,694	111,679
(LONG)	0	0	0	0	111,679	111,679	111,679	111,679	111,679	111,679	111,679
(SHORT)	0	0	0	0	0	0	21,916	34,695	31,768	6,015	0
TOTAL	306,023	324,952	243,045	317,221	111,679	111,679	133,595	146,374	159,547	194,391	214,536
CASH (NET C/F)	0	0	0	0	0	0	0	0	0	23,609	34,578

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* B / S *											
CASH	0	0	0	0	0	0	0	0	0	23,609	58,187
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	0	0	0	48,382	48,382	48,382	48,382	48,382	48,382	48,382	48,382
FIXED ASSET	276,731	553,463	737,950	922,438	837,784	753,130	668,476	583,823	499,169	414,515	329,861
DEFERRED ASSET	29,291	77,512	136,069	220,420	198,378	176,336	154,294	132,252	110,210	88,168	66,126
TOTAL ASSET	306,023	630,975	874,019	1,191,240	1,084,545	977,849	871,153	764,457	657,761	574,674	502,557
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	229,517	473,231	655,515	893,430	781,751	670,073	558,394	446,715	335,036	223,358	111,679
DEBT (SHORT)	0	0	0	0	69,283	94,395	72,479	37,784	6,015	0	0
EQUITY	76,506	157,744	218,505	297,810	297,810	297,810	297,810	297,810	297,810	297,810	297,810
RETAINED EARNINGS	0	0	0	0	-64,300	-84,429	-57,530	-17,852	18,900	53,507	93,068
TOTAL LIABIL & CAP	306,023	630,975	874,019	1,191,240	1,084,545	977,849	871,153	764,457	657,761	574,674	502,557

UNIT= MILLION RUPIAH

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* C / F *											
CASH-IN											
PROFIT BEF TAX	82,196	86,663	86,663	178,179	178,179	178,179	178,179	178,179	193,359	193,359	193,359
DEPREC. & AMORT.	106,696	106,696	106,696	15,180	15,180	15,180	15,180	15,180	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	188,892	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359
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	37,810	39,865	39,865	81,962	81,962	81,962	81,962	81,962	88,945	88,945	88,945
REPAYMENT TOTAL	111,679	0	0	0	0	0	0	0	0	0	0
(LONG)	111,679	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	228,295	346,853	346,853	304,756	304,756	304,756	304,756	304,756	297,773	297,773	297,773
CASH (NET C/F)	39,403	153,494	153,494	111,397	111,397	111,397	111,397	111,397	104,414	104,414	104,414
* B / S *											
CASH	97,590	251,084	404,578	515,974	627,371	738,768	850,164	961,561	1,065,975	1,170,389	1,274,803
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	48,382	48,382	48,382	48,382	48,382	48,382	48,382	48,382	48,382	48,382	48,382
FIXED ASSET	245,208	160,554	75,900	60,720	45,540	30,360	15,180	0	0	0	0
DEFERRED ASSET	44,084	22,042	0	0	0	0	0	0	0	0	0
TOTAL ASSET	435,264	482,062	528,860	625,077	721,293	817,510	913,727	1,009,943	1,114,357	1,218,771	1,323,185
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	297,810	297,810	297,810	297,810	297,810	297,810	297,810	297,810	297,810	297,810	297,810
RETAINED EARNINGS	137,454	184,252	231,050	327,267	423,483	519,700	615,917	712,133	816,547	920,961	1,025,375
TOTAL LIABIL & CAP	435,264	482,062	528,860	625,077	721,293	817,510	913,727	1,009,943	1,114,357	1,218,771	1,323,185

UNIT= MILLION RUPIAH

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* C / F *											
CASH-IN											
PROFIT BEF TAX	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359
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	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359	193,359
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	88,945	88,945	88,945	88,945	88,945	88,945	88,945	88,945	88,945	88,945	88,945
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	297,773	297,773	297,773	297,773	297,773	297,773	297,773	297,773	297,773	297,773	297,773
CASH (NET C/F)	104,414	104,414	104,414	104,414	104,414	104,414	104,414	104,414	104,414	104,414	104,414

* B / S *											
CASH	1,379,217	1,483,630	1,588,044	1,692,458	1,796,872	1,901,286	2,005,700	2,110,114	2,214,527	2,318,941	2,423,355
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	48,382	48,382	48,382	48,382	48,382	48,382	48,382	48,382	48,382	48,382	48,382
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	1,427,599	1,532,013	1,636,427	1,740,840	1,845,254	1,949,668	2,054,082	2,158,496	2,262,910	2,367,324	2,471,737
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	297,810	297,810	297,810	297,810	297,810	297,810	297,810	297,810	297,810	297,810	297,810
RETAINED EARNINGS	1,129,789	1,234,203	1,338,616	1,443,030	1,547,444	1,651,858	1,756,272	1,860,686	1,965,100	2,069,513	2,173,927
TOTAL LIABIL & CAP	1,427,599	1,532,013	1,636,427	1,740,840	1,845,254	1,949,668	2,054,082	2,158,496	2,262,910	2,367,324	2,471,737

UNIT= MILLION RUPIAH

	2023	TOTAL
* C / F *		
CASH-IN		
PROFIT BEF TAX	193,359	4,219,150
DEPREC. & AMORT.	0	1,142,858
EQUITY	0	297,810
DEBT (LONG)	0	893,430
-//- (SHORT)	0	94,395
TOTAL	193,359	6,647,644
CASH-OUT		
INVESTMENT TOTAL	0	1,191,240
(PROCESS)	0	694,737
(OTHER PLANT)	0	227,701
(WORKING)	0	48,382
(OPENING)	0	6,382
(TRANSPORTATION)	0	67,036
(TRAINING)	0	2,604
(IDCP)	0	144,398
TAX PAID	88,945	1,940,309
REPAYMENT TOTAL	0	987,826
(LONG)	0	893,430
(SHORT)	0	94,395
TOTAL	297,773	9,175,413
CASH (NET C/F)	104,414	2,527,769

* B / S *	
CASH	2,527,769
RECEIVABLE ASSET	0
INVENTORIES	48,382
FIXED ASSET	0
DEFERRED ASSET	0
TOTAL ASSET	2,576,151
PAYABLES	0
DEBT (LONG)	0
DEBT (SHORT)	0
EQUITY	297,810
RETAINED EARNINGS	2,278,341
TOTAL LIABIL & CAP	2,576,151

86/02/07

I.R.R. (109) = 13.467 %

	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	-296842.094	-157827.610
6	-296842.094	-139095.948
7	-197894.730	-81724.960
8	-255263.148	-92905.219
9	112174.289	35981.297
10	151186.587	42739.383
11	189408.857	47189.651
12	190988.913	41935.917
13	192568.968	37264.542
14	193358.996	32976.561
15	193358.996	29062.760
16	193358.996	25613.467
17	193358.996	22573.550
18	193358.996	19894.423
19	193358.996	17533.267
20	193358.996	15452.344
21	193358.996	13618.393
22	193358.996	12002.103
23	193358.996	10577.642
24	193358.996	9322.241
25	193358.996	8215.838
26	193358.996	7240.747
27	193358.996	6381.383
28	193358.996	5624.013
29	193358.996	4956.531
30	193358.996	4368.269
31	193358.996	3849.824
32	193358.996	3392.910
33	193358.996	2990.225
34	193358.996	2635.332
35	193358.996	2322.559
36	193358.996	2046.908
37	193358.996	1803.972
38	241741.265	1987.686
TOTAL	4671842.708	0.000

86/02/07

I.R.R. (208) = 13.889 %

	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	-296842.094	-154925.801
6	-296842.094	-136032.727
7	-197894.730	-79629.098
8	-206880.879	-73093.301
9	112174.289	34799.276
10	151186.587	41182.224
11	189408.857	45301.905
12	190988.913	40109.199
13	192568.968	35509.274
14	193358.996	31306.861
15	193358.996	27489.015
16	193358.996	24136.752
17	193358.996	21193.295
18	193358.996	18608.790
19	193358.996	16339.463
20	193358.996	14346.879
21	193358.996	12597.289
22	193358.996	11061.060
23	193358.996	9712.173
24	193358.996	8527.781
25	193358.996	7487.825
26	193358.996	6574.691
27	193358.996	5772.913
28	193358.996	5068.911
29	193358.996	4450.761
30	193358.996	3907.995
31	193358.996	3431.418
32	193358.996	3012.959
33	193358.996	2645.531
34	193358.996	2322.911
35	193358.996	2039.634
36	193358.996	1790.902
37	193358.996	1572.503
38	193358.996	1380.738
TOTAL	4671842.708	0.001

UNIT= MILLION YEN

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
* P / L *											
VOLUME (M.M.TON)	0.00	0.00	0.00	0.00	1.12	1.36	1.60	1.60	1.60	1.60	1.60
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
REVENUE	0	0	0	0	39,200	47,600	56,000	56,000	56,000	56,000	56,000
VARIABLE COSTS TOTA	0	0	0	0	10,251	11,609	13,110	12,825	12,540	12,397	12,397
RAW MATERIALS	0	0	0	0	7,904	9,598	11,291	11,291	11,291	11,291	11,291
CATALYST/CHEMICALS	0	0	0	0	431	524	616	616	616	616	616
PERSONALS	0	0	0	0	1,916	1,488	1,203	918	633	490	490
(LOCAL STAFF)	0	0	0	0	490	490	490	490	490	490	490
(JAPANESE STAFF)	0	0	0	0	1,426	998	713	428	143	0	0
CONSTANT COSTS TOTA	0	0	0	0	25,086	25,086	25,086	25,086	25,086	25,086	25,086
DEP & AMORT	0	0	0	0	19,259	19,259	19,259	19,259	19,259	19,259	19,259
MAINTENANCE	0	0	0	0	4,162	4,162	4,162	4,162	4,162	4,162	4,162
INSURANCE	0	0	0	0	1,665	1,665	1,665	1,665	1,665	1,665	1,665
OTHER DIRECT COSTS	0	0	0	0	1,916	1,916	1,916	1,916	1,916	1,916	1,916
ADMINISTRATIVE COST	0	0	0	0	958	958	958	958	958	958	958
INTEREST PAID	0	0	0	0	12,595	11,664	10,074	8,053	5,960	4,075	2,419
(LONG)	0	0	0	0	12,095	10,482	8,870	7,257	5,644	4,032	2,419
(SHORT)	0	0	0	0	500	1,182	1,205	796	316	43	0
TOTAL EXPENSES	0	0	0	0	50,806	51,233	51,145	48,838	46,460	44,432	42,776
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	0	0	0	0	-11,606	-3,633	4,855	7,162	9,540	11,568	13,224
TAX	0	0	0	0	0	0	0	0	2,906	5,321	6,083
NET PROFIT	0	0	0	0	-11,606	-3,633	4,855	7,162	6,634	6,247	7,141
RETAINED EARNING	0	0	0	0	-11,606	-15,240	-10,384	-3,222	3,411	9,658	16,799

UNIT= MILLION YEN

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* P / L *											
VOLUME (M.M.TON)	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
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
REVENUE	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000
VARIABLE COSTS TOTA	12,397	12,397	12,397	12,397	12,397	12,397	12,397	12,397	12,397	12,397	12,397
RAW MATERIALS	11,291	11,291	11,291	11,291	11,291	11,291	11,291	11,291	11,291	11,291	11,291
CATALYST/CHEMICALS	616	616	616	616	616	616	616	616	616	616	616
PERSONALS	490	490	490	490	490	490	490	490	490	490	490
(LOCAL STAFF)	490	490	490	490	490	490	490	490	490	490	490
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	25,086	25,086	25,086	8,567	8,567	8,567	8,567	8,567	5,827	5,827	5,827
DEP & AMORT	19,259	19,259	19,259	2,740	2,740	2,740	2,740	2,740	0	0	0
MAINTENANCE	4,162	4,162	4,162	4,162	4,162	4,162	4,162	4,162	4,162	4,162	4,162
INSURANCE	1,665	1,665	1,665	1,665	1,665	1,665	1,665	1,665	1,665	1,665	1,665
OTHER DIRECT COSTS	1,916	1,916	1,916	1,916	1,916	1,916	1,916	1,916	1,916	1,916	1,916
ADMINISTRATIVE COST	958	958	958	958	958	958	958	958	958	958	958
INTEREST PAID	806	0	0	0	0	0	0	0	0	0	0
(LONG)	806	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL EXPENSES	41,164	40,357	40,357	23,839	23,839	23,839	23,839	23,839	21,099	21,099	21,099
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	14,836	15,643	15,643	32,161	32,161	32,161	32,161	32,161	34,901	34,901	34,901
TAX	6,825	7,196	7,196	14,794	14,794	14,794	14,794	14,794	16,055	16,055	16,055
NET PROFIT	8,012	8,447	8,447	17,367	17,367	17,367	17,367	17,367	18,847	18,847	18,847
RETAINED EARNING	24,810	33,257	41,705	59,072	76,439	93,806	111,173	128,540	147,387	166,233	185,080

UNIT= MILLION YEN

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* P / L *											
VOLUME (M.M.TON)	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
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
REVENUE	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000
VARIABLE COSTS TOTA	12,397	12,397	12,397	12,397	12,397	12,397	12,397	12,397	12,397	12,397	12,397
RAW MATERIALS	11,291	11,291	11,291	11,291	11,291	11,291	11,291	11,291	11,291	11,291	11,291
CATALYST/CHEMICALS	616	616	616	616	616	616	616	616	616	616	616
PERSONALS	490	490	490	490	490	490	490	490	490	490	490
(LOCAL STAFF)	490	490	490	490	490	490	490	490	490	490	490
(JAPANESE STAFF)	0	0	0	0	0	0	0	0	0	0	0
CONSTANT COSTS TOTA	5,827	5,827	5,827	5,827	5,827	5,827	5,827	5,827	5,827	5,827	5,827
DEP & AMORT	0	0	0	0	0	0	0	0	0	0	0
MAINTENANCE	4,162	4,162	4,162	4,162	4,162	4,162	4,162	4,162	4,162	4,162	4,162
INSURANCE	1,665	1,665	1,665	1,665	1,665	1,665	1,665	1,665	1,665	1,665	1,665
OTHER DIRECT COSTS	1,916	1,916	1,916	1,916	1,916	1,916	1,916	1,916	1,916	1,916	1,916
ADMINISTRATIVE COST	958	958	958	958	958	958	958	958	958	958	958
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	21,099	21,099	21,099	21,099	21,099	21,099	21,099	21,099	21,099	21,099	21,099
INTEREST RECEIVED	0	0	0	0	0	0	0	0	0	0	0
PROFIT BEF TAX	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901
TAX	16,055	16,055	16,055	16,055	16,055	16,055	16,055	16,055	16,055	16,055	16,055
NET PROFIT	18,847	18,847	18,847	18,847	18,847	18,847	18,847	18,847	18,847	18,847	18,847
RETAINED EARNING	203,927	222,774	241,620	260,467	279,314	298,160	317,007	335,854	354,700	373,547	392,394

UNIT= MILLION YEN

	2023	TOTAL
* P / L *		
VOLUME (M.M.TON)	1.60	47.28
PRICE (YEN / TON)	35,000	
REVENUE	56,000	1,654,800
VARIABLE COSTS TOTA	12,397	370,265
RAW MATERIALS	11,291	333,655
CATALYST/CHEMICALS	616	18,203
PERSONALS	490	18,408
(LOCAL STAFF)	490	14,700
(JAPANESE STAFF)	0	3,708
CONSTANT COSTS TOTA	5,827	381,111
DEP & AMORT	0	206,286
MAINTENANCE	4,162	124,875
INSURANCE	1,665	49,950
OTHER DIRECT COSTS	1,916	57,480
ADMINISTRATIVE COST	958	28,740
INTEREST PAID	0	55,647
(LONG)	0	51,605
(SHORT)	0	4,043
TOTAL EXPENSES	21,099	893,243
INTEREST RECEIVED	0	0
PROFIT BEF TAX	34,901	761,557
TAX	16,055	350,316
NET PROFIT	18,847	411,241
RETAINED EARNING	411,241	

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	-11,606	-3,633	4,855	7,162	9,540	11,568	13,224
DEPREC. & AMORT.	0	0	0	0	19,259	19,259	19,259	19,259	19,259	19,259	19,259
EQUITY	13,809	14,663	10,967	14,315	0	0	0	0	0	0	0
DEBT (LONG)	41,428	43,990	32,902	42,944	0	0	0	0	0	0	0
-//- (SHORT)	0	0	0	0	12,506	4,533	0	0	0	0	0
TOTAL	55,237	58,654	43,870	57,258	20,158	20,158	24,114	26,421	28,798	30,826	32,482
CASH-OUT											
INVESTMENT TOTAL	55,237	58,654	43,870	57,258	0	0	0	0	0	0	0
(PROCESS)	37,620	37,620	25,080	25,080	0	0	0	0	0	0	0
(OTHER PLANT)	12,330	12,330	8,220	8,220	0	0	0	0	0	0	0
(WORKING)	0	0	0	8,733	0	0	0	0	0	0	0
(OPENING)	0	0	0	1,152	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	470	0	0	0	0	0	0	0
(IDCP)	1,657	5,074	8,150	11,183	0	0	0	0	0	0	0
TAX PAID	0	0	0	0	0	0	0	0	2,906	5,321	6,083
REPAYMENT TOTAL	0	0	0	0	20,158	20,158	24,114	26,421	25,892	21,244	20,158
(LONG)	0	0	0	0	20,158	20,158	20,158	20,158	20,158	20,158	20,158
(SHORT)	0	0	0	0	0	0	3,956	6,262	5,734	1,086	0
TOTAL	55,237	58,654	43,870	57,258	20,158	20,158	24,114	26,421	28,798	35,088	38,724
CASH (NET C/F)	0	0	0	0	0	0	0	0	0	4,261	6,241

* B / S *											
CASH	0	0	0	0	0	0	0	0	0	4,261	10,503
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	0	0	0	8,733	8,733	8,733	8,733	8,733	8,733	8,733	8,733
FIXED ASSET	49,950	99,900	133,200	166,500	151,220	135,940	120,660	105,380	90,100	74,820	59,540
DEFERRED ASSET	5,287	13,991	24,560	39,786	35,807	31,829	27,850	23,872	19,893	15,914	11,936
TOTAL ASSET	55,237	113,891	157,760	215,019	195,760	176,502	157,243	137,985	118,726	103,729	90,712
PAYABLES	0	0	0	0	0	0	0	0	0	0	0
DEBT (LONG)	41,428	85,418	118,320	161,264	141,106	120,948	100,790	80,632	60,474	40,316	20,158
DEBT (SHORT)	0	0	0	0	12,506	17,038	13,082	6,820	1,086	0	0
EQUITY	13,809	28,473	39,440	53,755	53,755	53,755	53,755	53,755	53,755	53,755	53,755
RETAINED EARNINGS	0	0	0	0	-11,606	-15,240	-10,384	-3,222	3,411	9,658	16,799
TOTAL LIABIL & CAP	55,237	113,891	157,760	215,019	195,760	176,502	157,243	137,985	118,726	103,729	90,712

UNIT= MILLION YEN

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
* C / F *											
CASH-IN											
PROFIT BEF TAX	14,836	15,643	15,643	32,161	32,161	32,161	32,161	32,161	34,901	34,901	34,901
DEPREC. & AMORT.	19,259	19,259	19,259	2,740	2,740	2,740	2,740	2,740	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	34,095	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901
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	6,825	7,196	7,196	14,794	14,794	14,794	14,794	14,794	16,055	16,055	16,055
REPAYMENT TOTAL	20,158	0	0	0	0	0	0	0	0	0	0
(LONG)	20,158	0	0	0	0	0	0	0	0	0	0
(SHORT)	0	0	0	0	0	0	0	0	0	0	0
TOTAL	41,207	62,607	62,607	55,008	55,008	55,008	55,008	55,008	53,748	53,748	53,748
CASH (NET C/F)	7,112	27,706	27,706	20,107	20,107	20,107	20,107	20,107	18,847	18,847	18,847

* B / S *											
CASH	17,615	45,321	73,026	93,133	113,240	133,348	153,455	173,562	192,408	211,255	230,102
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	8,733	8,733	8,733	8,733	8,733	8,733	8,733	8,733	8,733	8,733	8,733
FIXED ASSET	44,260	28,980	13,700	10,960	8,220	5,480	2,740	0	0	0	0
DEFERRED ASSET	7,957	3,979	0	0	0	0	0	0	0	0	0
TOTAL ASSET	78,565	87,012	95,459	112,826	130,193	147,561	164,928	182,295	201,141	219,988	238,835
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	53,755	53,755	53,755	53,755	53,755	53,755	53,755	53,755	53,755	53,755	53,755
RETAINED EARNINGS	24,810	33,257	41,705	59,072	76,439	93,806	111,173	128,540	147,387	166,233	185,080
TOTAL LIABIL & CAP	78,565	87,012	95,459	112,826	130,193	147,561	164,928	182,295	201,141	219,988	238,835

UNIT= MILLION YEN

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
* C / F *											
CASH-IN											
PROFIT BEF TAX	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901
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	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901	34,901
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	16,055	16,055	16,055	16,055	16,055	16,055	16,055	16,055	16,055	16,055	16,055
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	53,748	53,748	53,748	53,748	53,748	53,748	53,748	53,748	53,748	53,748	53,748
CASH (NET C/F)	18,847	18,847	18,847	18,847	18,847	18,847	18,847	18,847	18,847	18,847	18,847
* B / S *											
CASH	248,949	267,795	286,642	305,489	324,335	343,182	362,029	380,875	399,722	418,569	437,416
RECEIVABLE ASSET	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	8,733	8,733	8,733	8,733	8,733	8,733	8,733	8,733	8,733	8,733	8,733
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	257,682	276,528	295,375	314,222	333,068	351,915	370,762	389,608	408,455	427,302	446,149
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	53,755	53,755	53,755	53,755	53,755	53,755	53,755	53,755	53,755	53,755	53,755
RETAINED EARNINGS	203,927	222,774	241,620	260,467	279,314	298,160	317,007	335,854	354,700	373,547	392,394
TOTAL LIABIL & CAP	257,682	276,528	295,375	314,222	333,068	351,915	370,762	389,608	408,455	427,302	446,149

UNIT= MILLION YEN

	2023	TOTAL
* C / F *		
CASH-IN		
PROFIT BEF TAX	34,901	761,557
DEPREC. & AMORT.	0	206,286
EQUITY	0	53,755
DEBT (LONG)	0	161,264
-//- (SHORT)	0	17,038
TOTAL	34,901	1,199,900
CASH-OUT		
INVESTMENT TOTAL	0	215,019
(PROCESS)	0	125,400
(OTHER PLANT)	0	41,100
(WORKING)	0	8,733
(OPENING)	0	1,152
(TRANSPORTATION)	0	12,100
(TRAINING)	0	470
(IDCP)	0	26,064
TAX PAID	16,055	350,316
REPAYMENT TOTAL	0	178,303
(LONG)	0	161,264
(SHORT)	0	17,038
TOTAL	53,748	1,656,162
CASH (NET C/F)	18,847	456,262

* B / S *		
CASH	456,262	
RECEIVABLE ASSET	0	
INVENTORIES	8,733	
FIXED ASSET	0	
DEFERRED ASSET	0	
TOTAL ASSET	464,995	
PAYABLES	0	
DEBT (LONG)	0	
DEBT (SHORT)	0	
EQUITY	53,755	
RETAINED EARNINGS	411,241	
TOTAL LIABIL & CAP	464,995	