Chapter 2   Economic Analysis

2-1   Introduction

Economic cost-benefit analysis on the project is made herebelow to justify this project from national economic point of view by evaluation of expected contribution to national economy.

The economic costs and benefits caused by the project are classified into two categories of direct and indirect costs and benefits.

An analysis of the direct economic cost and benefit is applied as a major mean to justify propriety of the project from national economic point of view. Some of indirect benefits will be quantitatively or discriptively evaluated in the certain extent but other intangible economic costs and benefits including socio-economic consequences are not studies herein.

2-2   Analysis on Direct Economic Costs and Benefits

Evaluation of direct economic costs and benefits is made by means of economic internal rate of return (EIRROI) and economic net present value (ENPV).

2-2-1   Major Assumptions

(1) Currency and exchange rate

U.S. currency is used as the standard currency for economic analysis with following exchange rates which is prevailing at March, 1984, because there is no appropriate mean to assume opportunity exchange rate (such as shadow rate) to U.S. currency.

$$U.S.\$1.00 = 23.0 \text{ Thai Bahts}$$
$$= 230 \text{ Japanese Yen}$$

(2) Escalation rates and deflator

All economic costs and benefits are assumed to be escalated as the same rates as in the financial analysis. The same rates of deflator as in the financial analysis is used for adjustment of current term flows of costs (outflow) and benefit (inflow).

(3) Cut off rate

For calculation of economic net present value (ENPV) which represents net total direct benefit in amount, twelve percent of (12%) cut-off rate is assumed to be used.

2-2-2 Economic Direct Benefits

Economic value of the products consisting lube base oil, by products and intermediates are assumed to be opportunity prices either in the domestic market or in the export market depending on assumed marketability.

All governmental impositions in Thailand such as import duties, business taxes, corporate income tax, etc. are excluded from the benefits as transferable cost.

Economic value of the products are assumed as shown in Table V-4 considering following assumptions.

(1) Among the products, currently imported items such as lube base oil, sulfur and refined wax are assumed as CIF prices.

(2) Other products including intermediates which are not practically marketable items are assumed to be the same prices as in the financial analysis because prevailing level of the prices in Thailand is nearly the same as that in international market.

2-2-3 Economic Direct Costs

Economic direct costs for the project are consisting two major costs i.e.;

- Economic Project Costs
- Economic Operating Costs

In principle, economic costs are assumed to be the same as in the financial analysis provided that all of transferable costs are excluded.

Economic project cost and operating costs applicable in the economic analysis are as shown in Table V-5, V-6, V-7 and V-8.

2-2-4 Economic Internal Rate of Return (EIRROI)

Calculated EIRROI are as follows:

Case	EIRROI (%)	
	Current	Constant
BANGCHAK-A	16.60	11.36
BANGCHAK-B	19.15	13.77
SRIRACHA-A	15.58	10.39
SRIRACHA-B	17.91	12.64
BANGCHAK-AX	15.36	10.18
BANGCHAK-AY	16.48	11.25

2-2-5 Economic Net Present Value (ENPV)

Calculated ENPV are as follows:

| | ENPV (CONSTANT) ('000 US$) CUT-OFF RATE | |
	10%	12%
BANGCHAK-A	19,152	-7,378
BANGCHAK-B	51,411	21,075
SRI RACHA-A	5,119	-17,676
SRI RACHA-B	32,147	6,428
BANGCHAK-AX	2,701	-22,974
BANGCHAK-AY	17,472	-8,595

2-2-6 Significance of EIRROI and ENPV

Justification of calculated EIRROI could be discussed on the standard level of social opportunity cost rate of capital resource in the country.

It is quite common, however, that no particular social opportunity cost of capital resource or social discount rate is publicly practised by the government. And, there is no authorized methodology to assume such social discount rate though various logical methods are known, so far. It is emphasized, therefore, that certain discount rate is to be arbitrally assumed by mutual discussions, and in order to cover risk range anticipated to be fluctuated from such rate are to be covered by sensitivity tests.

For the purpose of discussions, some trial assumption is made as follows:

(1) General Tendency of Capital Requirement

General tendency of capital requirement in Thailand could be observed in the past trend of money market situation.

As shown in the Figure V-3 and Table V-9 attached hereto, by August 1981, inter-bank rate (call rate) reached at about 19

percent which is legally restricted rate as ceiling, since then, interest rate have been decreased up to 12.5 percent at June 1982.

This general tendency is assumedly explained as follows:

a. As bank rate (discount rate by central bank) in U.S.A. had decreased as per attached Table V-9, interest rate of Bahts of which money market links up with U.S. Dollar market also followed such changes.

b. Despite of vital money supplies from outside, demand for money in Thailand is getting stagnant due to low motivation in capital investment.

c. An intensive repayments of foreign debts by commercial banks in the latter half of 1982 which were caused by re-effectuation of with-holding tax on introduced foreign money at 1982 end.

(2) Foreign Exchange Rate

As general tendency, exchange rate of Bahts to U.S. Dollar is slightly getting weak.

(3) Long Term Government Bond

Yield rate of long term government bond, which is sometime applied as social discount rate, in Thailand is also lowered to 12 percent level (1984) from 13.85 percent in 1982.

(4) Assumption of Social Discount Rate

Collectively considering the above observations, arbitral social discount rate (in U.S. Dollar Term) applicsable for long term project is assumed being in the range of 8% to 12%.

If ten (10) percent of social discount rate is applicable in this study, all of EIRROI figures in Part V 2-2-4 are justified as economically feasible.

ENPV figures are as given in Part V 2-2-5 under cut-off rate of 10% where all figures show positive value.

2-3   Evaluation of Other Economic Benefit

2-3-1 Foreign Exchange Savings

This project is envisaged with major interest of import substitution of the lube base oil which is currently imported by the lube oil blenders in Thailand.

In order to review the effect of expected foreign currency savings by this project, total balance of foreign exchange outflow-inflow are analysed on the Base Case (BANGCHAK-A) as per Table V-10.

2-3-2 Creation of Employment Opportunity

Employment opprtunity will be created during the construction stage and throughout the plant operating period. The parmanent employment will be expected about 300 and 200 employees for "A" case and "B" case respectively.   Income distribution also will we realized by such employment.

2-3-3 Value Added and Co-efficient

Value added created during those operating years and value added co-efficient are as per Table V-11. Those value added will contribute to growth of national product also.

2-3-4 Contribution to Regional Development

This project investment will cause certain regional development including various commercial activities, catering services, public investments including transportation, education, etc.

2-3-5 Industrial Technology Transfer

This project investment will contribute for transfer of industrial technologies related to the project.

2-3-6 Impacts on Other Industries

This project investment will have impact on the other industrial fields including industrial supplies (chemicals, consumable, etc.), maintenance services and supplies, transportation of products, industrial construction, supply of local equipment and materials, etc.

Chapter 3 Conclusion and Comments on Financial and Economic Analysis

3-1   Financial Analysis

(1)   In general, this project will be financially viable.

(2)   Bangchak project site is more advantageous than Sri Racha site because of proximity to the blender's factories.

(3)   Higher viability will be expected in the case that this project is implemented by an existing petroleum refining company as its additional investment (i.e. Case "B").

(4)   Asphalt production will contribute to improve financial viability.

(5)   Wax production will not contribute to improve financial viability.

(6)   Due to characteristics of regretion formula for price projection of petroleum products including base oils, rise of crude oil price will cause improvement in financial viability.

(7)   As it is seen in productin cost analysis, share of variable cost is extremely high as eighty to ninety percent of total production cost.

(8)   In connection with the above (6) and (7), it will be critical for the project in case that balance of the prices among crude oil, raw material (long residue) and products (base oil, fuel oil, etc.) is suffered by reason such as change in supply-demand relation.

(9) Although it is anticipated that this project could be eligible for promoted industry and would be granted with priviledges including various tax insentives by office of the Board of Investment of Thailand, this study has been made without such priviledges. if such conditions are taken into assumptions for the study, further improvement in financial viability is expected.

(10) Since cash position in the operating years are fairly good, initially calculated working capital is seemed excessive, therefore, practical adjustment to decrease in the initial working capital is to the required.

(11) No remarkable problem is identified in the figures of financial indicators including ratio analysis where fairly good profitability and financial stabilities are observed.

3-2   Economic Analysis

(1) In general, this project will be economically justifiable, and it may largely contribute to the Thai national economy.

(2) The alternatives of Bangchak-B and Sri Racha-B are most favorable cases in economical aspect while other cases show negative ENPV (Economic Net Present Value) when twelve percent (12%) of cut-of rate is applied.

(3) Among other economic benefits, remarkable contribution to national economy is observed inforeign exchange saving effect where expected net saving will be approximately fifty percent of total foreign exchange outflow due to importation of base oil.

(4) Other economic indirect benefits including creation of employment opportunity, creation of value added, contribution to regional development, industrial technology transfer, impacts on other industries are anticipated to be caused by this project.

Chapter 4 Supplementary Studies on Selected Cases

In addition to the analytical studies in preceeding chapters, supplementary studies on selected cases are made as follows:

4-1 Additional Sensitivity Analysis on Bangchak-B and Sri Racha-B Case

4-1-1 Interest rate

Interest rate on long term loan will be applied to study effect to IRR after tax and financial viabilities. Applicable interest rates are:

A: 6% p.a.
B: 9% p.a.
(Original interest rate: 8% p.a.)

4-1-2 Base oil price

Base oil price (in form of regression formula) in 1991 is modified as follows, and the prices are assumed to vary according to crude price thereafter.

a) +10%

Bangchak	$73.084 + 2.409x + 23.936 \, (1.06)^n$
Sri Rahca	$73.084 + 2.4035x + 23.936 \, (1.06)^n$

b) -10%

Bangchak	$59.796 + 1.971x + 19.584 \, (1.06)^n$
Sri Racha	$59.796 + 1.9665x + 19.584 \, (1.06)^n$

c) +20%

Bangchak	$79.728 + 2.628x + 26.112 \, (1.06)^n$
Sri Racha	$79.728 + 2.622x + 26.112 \, (1.06)^n$

d) -20%

Bangchak	$53.152 + 1.752x + 17.408 (1.06)^n$
Sri Racha	$53.152 + 1.748x + 17.408 (1.06)^n$

4-1-3 Fuel oil/long residue price

a) Long residue +10%

+10%	$8.9925 + 0.93489x$
-10%	$7.3575 + 0.76491x$
+20%	$9.81 + 1.01988x$
-20%	$6.54 + 0.67992x$

b) Fuel Oil (Bangchak)

+10%	$8.99074 + 0.93467x$
-10%	$7.35606 + 0.76473x$
+20%	$9.80808 + 1.01964x$
-20%	$6.53872 + 0.67976x$

c) Fuel Oil (Sri Racha)

+10%	$8.85731 + 0.91652$
-10%	$7.24689 + 0.74988$
+20%	$9.66252 + 0.99984$
-20%	$6.44168 + 0.66656$

d) FCC Feeds (Sri Racha)

+10%	$8.7567 + 1.0989x$
-10%	$7.1645 + 0.8991x$
+20%	$9.5527 + 1.1988x$
-20%	$6.3685 + 0.7992x$

e) T/C Feeds (Sri Racha)

+10%	7.2962 + 0.7585x
-10%	5.9696 + 0.6206x
+20%	7.9595 + 0.8274x
-20%	5.3063 + 0.5516x

4-1-4 Operational rate

Assumed demand projection of lube base oil is as follows:

	Projected Demand kl/y	Demand/Rated Capacity (%)	Capacity Utilization Rate (%)
1991	216,311	86.52	80.0
1992	236,773	94.71	90.0
1993	246,070	98.43	95.0
1994	255,741	102.30	100.0
1995 -	x $(1.0393)^n$		

Based on the above demand projection and corresponding possible operational rate of the plant (Demand/Rated Capacity), sensitivity tests are made for following cases;

A Demand: (-)10%
B Demand: (-)20%

Applicable operational rate for the above cases are assumed as per attached Table V-12 hereto. For the increased demand case (eg. (+)10%, (+)20%), operational rate of the plant is the same as original case.

4-1-5 Result of sensitivity analysis

Result of sensitivity analysis are as shown in Table V-13 (Bangchak-B), Table V-14 (Sri Racha-B) and Figure V-4 and V-5.

4-2   Case Studies with Alternative Assumptions on Bangchak-B and
       Sri Racha-B Case

4-2-1 Case study for alternative escalation rates

An alternative case with different escalation rates which are assumed on
the basis of past ten years average instead of twenty years average in
the original cases. Projected escalation rates are as follows:

	Foreign Currency Items	Local Currency Items
Past 10 years Average	7.88%	9.69%
1984	3.0%	3.5%
1985	4.0	4.5
1986	5.0	6.0
1987	6.5	8.0
1988	7.5	9.5
1989 -	8.5	10.5
1984 - 2010 Ave.	7.88%	9.70%

Since there is no particular data for prediction of deflator applicable to
this project, comparing general tendencies in the past ten years and
twenty years following arbitrary deflator is assumed.

1984	6.0
1985	6.0
1986	6.0
1987	6.5
1988 -	6.5
Average (1984 - 2010)	6.44%

Further, since prices of petroleum products including long residue, fuel
oil, intermediates and asphalt and lube base oil are assumed to be varied
according to the crude oil price in the international market as mentioned
in the paragraph 3-2-3 of Part IV, it is assumed that prices of such

items are varied according to the same formula where crude oil price component will be varied as per escalation rate applicable for foreign currency costs.

4-2-2   Case study for tax incentive case

Major privileges which may be granted by Thai Government (BOI) are assumed as follows:

(1)   Exemption of import duties (including business tax) on imported equipment and materials.

- Machinery: Machinery and equipment x 56%
- Spare parts: Not constitute "machinery"
- Catalyst & Chemicals: Not applicable

Revised project costs due to above conditions are as per Table V-17 and 18.

(2)   Exemption of import duties on imported materials for production.

Catalyst and chemicals (imported) and other consumables (imported) are assumed to be exempted from estimated import duties for the period of initial five (5) years or 1991 through 1995.

(3)   Tax holidays

Initial five (5) years (1991/1995) of income tax holidays is assumed to be granted.

4-2-3   Result of case studies

Result of case studies are as shown in Table V-19.

4-3   Effect of Fuel Oil Price Variation

In general, variation in demand/supply balance of fuel oil (including long residue) may cause change in applicable price to the study.

For purpose of the study, FOB Bangkok price for export will be applicalbe in the case of fuel oil supply exceeding domestic demad while CIF Bangkok price imported to Thailand will be applicable in the case of fuel oil supply shortage in the domestic market.

Nevertheless, due to difficulty in assumption of marketable price corresponding to the each specification of fuel oil related to the project, difference of CIF bangkok price and FOB Bangkok price or ocean freight between Singapore port and Bangkok port will be applicable representing such difference.

A. F/O Short Case

```
(from          Long Residue    ┌─────────┐
                ──────────────▶ │ Lube    │
Singapore)     CIP  Bangkok    │ Base Oil│
                                │ Plant   │  Fuel Oil       (to domestic
                                └─────────┘ ──────────▶      market)
                                            CIF Bangkok
```

B. F/O Surplus Case

```
(from          Long Residue    ┌─────────┐
                ──────────────▶ │ Lube    │
Refinery)      FOB Bangkok     │ Base Oil│
                                │ Plant   │  Fuel Oil       (to export
                                └─────────┘ ──────────▶      market)
                                            FOB Bangkok
```
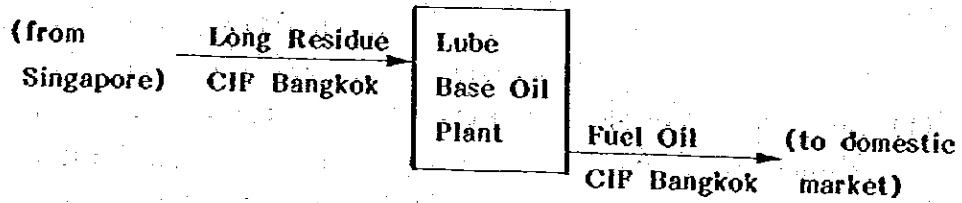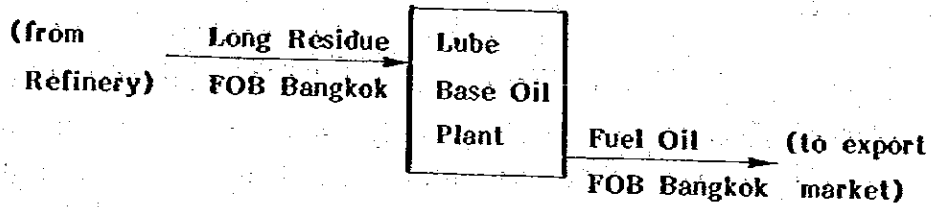
Since import duty on imported fuel oil is negligibly small as one bahts per kilo liter, it is abandoned.

Ocean freight between Singapore and Bangkok is given as follows:

$$P = 17.77 \ (1 + 0.06)t$$

Unit: US$/kl

t: number of year, 1991 = 0

The result of the study is as shown in the attached Table V-20.

4-4   "Effective Fuel Oil Reduction as Refinery Total" and "Effect on Solving Fuel Oil Surplus Problem in Thailand" with the Installation of the Lube Oil Plant

(1)   As is observed in this study, for Sri Racha case the direct FO output from the plant is apparently very low (167,000 kl/y) compared with that of Bangchak case (760,000 kl/y). This is because in Sri Racha case a part of fuel oil is supplied to TORC refinery as feedstock of FCC and thermalcracker. In this connection reference is made to the attached Figure V-6 and Figure V-7.

Figure V-6 and V-7 show total material balances of the long residues and related products in combination with the relevant existing refineries for the both cases of before and after installation of the LO plant.

In Table V-21, the effects of the installation of the LO plant are highlighted as for the balances of the fuel oil and related products converted from long residue.

As it is known from the Table V-21, the production of the fuel oil as total will be reduced by 5,730 BPCD in Bangchak case and 5,060 BPCD in Sri Racha (TORC) case.

In conclusion, with respect to the effective FO reduction there is no significant difference between Bangchak and Sri Racha case.

(2)   In addition to the above figures approximate 1,700 BPCD of the fuel oil is consumed for the plant itself as refinery fuel.

Accordingly, under the heading of "Effect on solving FO surplus problem in Thailand" it can be said that the reduction of salable fuel oil with the installation of the LO plant which needs 20,540 BPCD long residue feed could be 7,430 BPCD for Bangchak case and 6,790 BPCD for Sri Racha (TORC) case.

These figures correspond to 80 - 90% of the expected surplus fuel oil in Thailand in 1996 without the installation of the LO plant (i.e. 8,340 BPCD). (Refer to Table II-20 "Demand/Supply Balance of Petroleum Products")

Table V-1   SENSITIVITY ANALYSIS
(BANGCHAK-A)

		Current (%)		Constant (%)	
		Before Tax	After Tax	Before Tax	After Tax
Base		21.24	18.46	15.69	13.09
Crude Oil	+20	24.26	20.94	18.57	15.46
	+10	22.79	19.74	17.18	14.32
	-10	19.57	17.05	14.10	11.75
	-20	17.76	15.48	12.38	10.25
Plant Cost	+20	18.47	16.11	13.05	10.84
	+10	19.77	17.23	14.29	11.91
	-10	22.92	19.84	17.30	14.41
	-20	24.89	21.44	19.18	15.95
Capacity Utilization Down		21.18	18.42	15.64	13.05

Table V-2 PRODUCTION COST ANALYSIS (BASE CASE)

Cost Item	PRODUCTION COST					
	1991		2000		2010	
	Amount 1,000 US$	%	Amount 1,000 US$	%	Amount 1,000 US$	%
Variable Costs						
Long Residue	230,195	74.79	589,018	88.47	1,319,421	93.24
Utilities	10,040	3.26	23,073	3.47	45,387	3.21
Electricity	8,080	2.62	18,568	2.79	36,527	2.58
Hydrogen	1,960	0.64	4,504	0.68	8,860	0.63
Catalyst & Chemicals	413	0.14	877	0.13	1,581	0.11
Imported	385	0.13	812	0.12	1,455	0.10
Local	28	0.01	64	0.01	127	0.01
Other Chemicals	669	0.22	1,175	0.18	2,201	0.16
Imported	369	0.12	623	0.09	1,116	0.08
Local	300	0.10	552	0.03	1,085	0.08
Variable Cost Total	241,316	78.41	614,142	92.25	1,368,591	96.72
Fixed Costs						
Labor Cost & Payroll Burden	2,139	0.69	3,931	0.59	7,734	0.55
Administrative Overhead	855	0.28	1,573	0.24	3,094	0.22
Maintenance Cost	7,877	2.56	14,482	2.17	28,487	2.01
Operating Supplies	485	0.16	820	0.12	1,463	0.10
Tax & Insurance	2,854	0.93	2,854	0.43	2,854	0.20
Direct Fixed Cost Total	14,210	4.62	23,659	3.55	43,637	3.08
Cash Factory Cost	255,526	83.03	637,801	95.80	1,412,227	99.80
Depreciation	25,518	8.29	25,518	3.83	1,133	0.08
Amortization	9,665	3.14	-	-	-	-
Depreciation & Amortization	35,183	11.43	25,518	3.83	1,133	0.08
Total Factory Cost	290,709	94.46	663,319	99.63	1,413,360	99.88
Other Costs						
Sales Expenses	295	0.09	763	0.12	1,691	0.12
Operating Expenses	291,005	94.55	664,082	99.75	1,415,051	100.00
Interest on Long Term Debt	16,769	5.45	1,677	0.25	-	-
Total Production Cost	307,773	100.00	665,759	100.00	1,415,051	100.00
Unit Production Cost*	1,5389	-	2.6630	-	5.6562	-

Note: * The unit production cost hereabove are nominal figures and does not reflect actual production
cost of base oil only because the figures are obtained as unit cost of total production cost
divided by production volume of only base oil.

Table V-3   PROFITABILITY AND FINANCIAL INDICATORS
(BANGCHAK-A CASE)

YEAR	(1) AFT TAX PROFIT -TO- SALES REV (PCT)	(2) AFT TAX PROFIT -TO- S/H EQUITY (PCT)	(3) BFR TAX PROFIT -TO- INVESTMENT (PCT)	(4) AFT TAX PROFIT -TO- S/CAPITAL (PCT)	(5) CURRENT RATIO	(6) QUICK RAITO	(7) DEBT SERVICE RATIO	(8) L/T DEBT -TO- S/H EQUITY	(9)* PROFIT B.E.P. CAPACITY UTILIZE (PCT)	(10)* CASH B.E.P. SALES PRICE (PRICE)	(11)* CASH B.E.P. CAPACITY UTILIZE (PCT)
1991	0.6	1.3	0.8	1.3	1.01	0.60	1.43	54 / 46	98.2	1547.6	77.2
1992	2.1	5.2	3.4	5.5	1.12	0.67	1.61	50 / 50	79.9	1541.8	62.6
1993	3.6	9.2	6.7	10.9	1.18	0.72	1.86	43 / 57	73.0	1628.5	57.0
1994	4.9	12.5	10.4	16.9	1.24	0.75	2.16	36 / 64	67.2	1730.6	52.3
1995	5.6	13.3	12.7	20.7	1.27	0.78	2.39	28 / 72	61.6	1848.8	47.8
1996	7.4	16.0	18.1	27.5	1.30	0.80	2.56	20 / 80	48.0	1982.4	43.9
1997	7.9	15.7	21.1	34.3	1.33	0.82	2.90	12 / 88	44.2	2127.6	40.4
1998	8.4	15.2	24.1	39.2	1.36	0.84	3.28	5 / 95	40.7	2285.8	37.2
1999	8.8	14.7	27.3	44.4	1.40	0.86	3.74	0 / 100	37.5	2457.8	34.2
2000	9.2	14.2	30.7	50.0	2.01	1.24	4.29	0 / 100	34.7	2644.8	31.6
2001	11.4	16.0	41.6	67.0	1.99	1.24	**********	0 / 100	16.9	2764.1	16.2
2002	11.6	14.4	45.4	73.9	1.98	1.24	**********	0 / 100	16.6	2991.7	15.9
2003	11.6	13.9	49.2	80.9	1.98	1.24	**********	0 / 100	16.3	3238.7	15.7
2004	11.6	13.1	53.3	86.7	1.98	1.24	**********	0 / 100	16.0	3506.0	15.4
2005	11.6	12.4	57.8	94.0	1.98	1.24	**********	0 / 100	15.7	3796.1	15.2
2006	11.6	11.9	62.6	101.9	1.98	1.24	**********	0 / 100	15.4	4110.5	15.0
2007	11.6	11.6	67.9	110.5	1.98	1.24	**********	0 / 100	15.2	4451.3	14.7
2008	11.6	11.0	73.7	119.8	1.98	1.24	**********	0 / 100	14.9	4820.7	14.5
2009	11.6	10.7	79.9	130.0	1.98	1.24	**********	0 / 100	14.7	5221.5	14.3
2010	11.7	10.4	86.7	141.1	1.98	1.24	**********	0 / 100	14.4	5655.7	14.1
AVERAGE1	8.7	12.2	38.7	62.9	1.65	1.02	**********	12 / 88	37.1	3017.6	31.8
AVERAGE2	10.1	11.9	34.3	56.8	1.69	1.05	7.17	7 / 93			

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

Table V-4   ECONOMIC UNIT PRICE OF LONG RESIDUE & PRODUCTS

	Formula	a	b	c
			PRICING FORMULA	
Products				
60 S	y = a + bx + c *1	70.58640	1.40089	17.3400(1.06)t
150 N	y = a + bx + c	72.64960	1.44177	17.3700(1.06)t
300 N	y = a + bx + c	45.64540	1.69972	17.6500(1.06)t
500 N	y = a + bx + c	48.35320	1.80055	17.7700(1.06)t
150 B.S.	y = a + bx + c	59.52410	2.04120	18.0700(1.06)t
Weighted Average	y = a + bx + c	54.25960	1.79432	17.7716(1.06)t
Fuel Oil (Bangchak)	y = a + bx	8.17340	0.84970	-
Fuel Oil (Sri Racha)	y = a + bx	8.05210	0.83710	-
Asphalt	y = a + bx	5.80183	0.87686	-
Intermediates				
L.V.G.O./H.F.G.O.	y = a + bx	-1.22700	1.28120	-
V/B Naphtha	y = a + bx	10.94360	1.04250	-
FCC Feeds	y = a + bx	7.96060	0.99900	-
T/C Feeds	y = a + bx	6.63290	0.68950	-
By-products				
Sulfur	y = a x (1.06)t	232.40000	-	-
Wax	y = a x (1.06)t	842.12000	-	-
Raw Material				
Long Residue	y = a + bx	8.17500	0.84990	-

Notes: *1: c: Freight
        (Singapore -> Bangkok)
        x: Crude oil price (International FOB)
        t: Exponent of operating year (1991: t=0)

Table V-5   ECONOMIC PROJECT COST (B-A, B-B)

	Currency	1985	1986	1987	1988	1989	1990	Total
Bangchak-A								
Land & Site Preparation	L	-	3,320	5,980	-	-	-	9,300
Plant Construction Cost	P	-	2,280	-	57,579	84,853	9,092	153,804
	L	-	-	-	19,569	28,837	3,090	51,496
Total		-	2,280	-	77,148	113,690	12,182	205,300
Pre-operational Expenses	P	-	800	1,193	1,264	2,599	2,504	8,360
	L	37	242	316	370	530	7,792	9,287
Total		37	1,042	1,509	1,634	3,129	10,296	17,647
Initial Working Capital	P	-	-	-	-	-	167	167
	L	-	-	-	-	-	24,447	24,447
Total		-	-	-	-	-	24,614	24,614
Sub-total	P	-	3,562	1,193	58,843	87,452	11,763	162,813
	L	37	3,080	6,296	19,939	29,367	35,329	94,048
Total		37	6,642	7,489	78,782	116,819	47,092	256,861
Interest During Construction	P	11	1,658	1,393	10,411	8,821	1,135	23,429
P Total	P	11	5,220	2,586	69,254	96,273	12,898	186,242
P + L Total		48	8,300	8,882	89,193	125,640	48,227	280,290
Bangchak-B								
Land & Site Preparation	L	-	3,299	5,296	-	-	-	8,595
Plant Construction Cost	P	-	2,280	-	51,877	76,451	8,191	138,799
	L	-	-	-	15,644	23,055	2,470	41,169
Total		-	2,280	-	67,521	99,506	10,661	179,968
Pre-operational Expenses	P	-	800	1,193	1,264	2,546	2,504	8,307
	L	37	176	246	279	429	7,640	8,807
Total		37	976	1,439	1,543	2,975	10,144	17,114
Initial Working Capital	P	-	-	-	-	-	167	167
	L	-	-	-	-	-	22,731	22,731
Total		-	-	-	-	-	22,898	22,898
Sub-total	P	-	3,080	1,193	53,141	78,997	10,862	147,273
	L	37	3,475	5,542	15,923	23,484	32,841	81,302
Total		37	6,555	6,735	69,064	102,481	43,703	228,575
Interest During Construction	P	12	1,637	1,253	9,121	7,481	1,049	20,553
P Total	P	12	4,717	2,446	62,262	86,478	11,711	167,826
P + L Total		49	8,192	7,988	78,185	109,962	44,752	249,128

Notes: P: Foreign Currency Portion   L: Local Currency Portion

Table V-6 ECONOMIC PROJECT COST (S-A, S-B)

	Currency	1985	1986	1987	1988	1989	1990	Total
Sri racha-A								
Land & Site Preparation	L	-	3,320	1,025	-	-	-	4,345
Plant Construction Cost	F	-	2,280	-	58,763	86,598	9,279	156,920
	L	-	-	-	18,546	27,331	2,928	48,805
Total		-	2,280	-	77,309	113,929	12,207	205,725
Pre-operational Expenses	F	-	800	1,193	1,264	2,599	2,498	8,354
	L	37	242	316	370	530	7,884	9,379
Total		37	1,042	1,509	1,634	3,129	10,382	17,733
Initial Working Capital	F	-	-	-	-	-	162	162
	L	-	-	-	-	-	23,508	23,508
Total		-	-	-	-	-	23,670	23,670
Sub-total	F	-	3,080	1,193	60,027	89,197	11,939	165,436
	L	37	3,562	1,341	18,916	27,861	34,320	86,037
Total		37	6,642	2,534	78,943	117,058	46,259	251,473
Interest During Construction	F	12	1,658	470	10,442	8,846	1,115	22,543
F Total	F	12	4,738	1,663	70,469	90,043	13,054	187,979
F + L Total		49	8,300	3,004	89,385	125,904	47,374	274,016
Sri racha-B								
Land & Site Preparation	L	-	2,846	854	-	-	-	3,700
Plant Construction Cost	F	-	2,280	-	51,529	75,937	8,136	137,882
	L	-	-	-	14,303	21,078	2,258	37,639
Total		-	2,280	-	65,832	97,015	10,394	175,521
Pre-operational Expenses	F	-	800	1,193	1,264	2,546	2,498	8,301
	L	37	176	246	279	429	7,696	8,863
Total		37	976	1,439	1,543	2,975	10,194	17,164
Initial Working Capital	F	-	-	-	-	-	162	162
	L	-	-	-	-	-	21,771	21,771
Total		-	-	-	-	-	21,933	21,933
Sub-total	F	-	3,080	1,193	52,793	78,483	10,796	146,345
	L	37	3,022	1,100	14,582	21,507	31,725	71,973
Total		37	6,102	2,293	67,375	99,990	42,521	218,318
Interest During Construction	F	12	1,513	425	8,892	7,543	1,025	19,410
F Total	F	12	4,593	1,618	61,685	86,026	11,821	165,755
F + L Total		49	7,615	2,718	76,267	107,533	43,546	237,728

Notes: F: Foreign Currency Portion   L: Local Currency Portion

Table V-7   ECONOMIC PROJECT COST (B-AX, B-AY)

	Currency	1985	1986	1987	1988	1989	1990	Total
Bangchak-AX								
Land & Site Preparation	L	-	3,794	6,834	-	-	-	10,628
Plant Construction Cost	P	-	2,746	-	65,952	97,192	10,413	176,303
	L	-	-	-	21,389	31,520	3,377	56,286
	Total	-	2,746	-	87,341	128,712	13,790	232,589
Pre-operational Expenses	P	-	800	1,193	1,264	2,599	2,511	8,367
	L	37	242	316	402	597	10,814	12,408
	Total	37	1,042	1,509	1,666	3,196	13,325	20,775
Initial Working Capital	P	-	-	-	-	-	167	167
	L	-	-	-	-	-	25,430	25,430
	Total	-	-	-	-	-	25,597	25,597
Sub-total	P	-	3,546	1,193	67,216	99,791	13,091	184,837
	L	37	4,036	7,150	21,791	32,117	39,621	104,752
	Total	37	7,582	8,343	89,007	131,908	52,712	289,589
Interest During Construction	P	12	1,892	1,552	11,763	9,950	1,271	26,450
P Total	P	12	5,438	2,745	78,979	109,751	14,362	211,287
P + L Total		49	9,474	9,895	100,770	141,868	53,983	316,039
Bangchak-AY								
Land & Site Preparation	L	-	3,320	5,980	-	-	-	9,300
Plant Construction Cost	P	-	2,194	-	57,140	84,207	9,022	152,563
	L	-	-	-	19,682	29,004	3,108	51,794
	Total	-	2,194	-	76,822	113,211	12,130	204,357
Pre-operational Expenses	P	-	800	1,193	1,264	2,599	2,504	8,360
	L	37	242	316	370	530	7,743	9,238
	Total	37	1,042	1,509	1,634	3,129	10,247	17,598
Initial Working Capital	P	-	-	-	-	-	167	167
	L	-	-	-	-	-	24,355	24,355
	Total	-	-	-	-	-	24,522	24,522
Sub-total	P	-	2,994	1,193	58,404	86,806	11,693	161,090
	L	37	3,562	6,296	20,052	29,534	35,206	94,687
	Total	37	6,556	7,489	78,456	116,340	46,899	255,777
Interest During Construction	P	11	1,636	1,393	10,368	8,785	1,131	23,324
P Total	P	11	4,630	2,586	63,772	95,591	12,824	184,414
P + L Total		48	8,192	8,882	88,824	125,125	48,030	279,101

Notes: P: Foreign Currency Portion   L: Local Currency Portion

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Table V-8   ECONOMIC OPERATING COSTS/PRODUCTS

		Bangchok-A	Esc %	Bangchok-B	Esc %	Sri Racha-A	Esc %	Sri Racha-B	Esc %	Bangchok-AX	Esc %	Bangchok-AY	Esc %
Long Residue		$1,151.33/kl	*	$1,151.33/kl	*	$1,151.33/kl	*	$1,151.33/kl	*	$1,151.33/kl	*	$1,151.33/kl	*
Utilities													
Electric Power	L	$40.3686/kl	7	$37.1960/kl	7	$40.6968/kl	7	$37.1960/kl	7	$43.3224/kl	7	$40.3686/kl	7
Hydrogen	L	$9.8105/kl	7	$9.8105/kl	7	$9.8105/kl	7	$9.8105/kl	7	$10.2310/kl	7	$9.8105/kl	7
Industrial Water	L	-		-		$0.2870/kl	7	$0.2870/kl	7	-		-	
Catalyst & Chemicals	F	$1.4792/kl	6	$1.4792/kl	6	$1.4792/kl	6	$1.4792/kl	6	$1.5123/kl	6	$1.4792/kl	6
	L	$0.1410/kl	7	$0.1410/kl	7	$0.1410/kl	7	$0.1410/kl	7	$0.1410/kl	7	$0.1410/kl	7
Other Chemicals	F	$284.000/y	6	$284.000/y	6	$221.000/y	6	$221.000/y	6	$284.000/y	6	$284.000/y	6
	L	$300.000/y	7	$300.000/y	7	$233.000/y	7	$233.000/y	7	$300.000/y	7	$300.000/y	7
Labor Cost		$1,469.000/y	7	$784.000/y	7	$1,469.000/y	7	$784.000/y	7	$1,554.000/y	7	$1,469.000/y	7

Notes: *: Escalation is as per formula in Paragraph 3-2-3 in Part IV.
      F: Foreign Currency Portion
      L: Local Currency Portion

Table V-9   FINANCIAL DATA ON MONEY MARKET

| | THAILAND | | | U.S.A |
| | Bank Rate[1] | Inter-bank Rate | Gov. Bonds (Long Term) | Bank Rate[1] |
	% p.a.	% p.a.	% p.a.	% p.a.
1978	12.5	10.25	9.25	9.5
1979	12.5	12.75	13.25	12.00
1980	13.5	12.50	13.00	13.00
1981	14.5	19.00	13.06	12.00
1982	12.5	16.50	13.85	8.5
1983	13.0[2]	12.00	11.07[2]	8.5[2]
1984	13.0[3]	N.A.	12.07[3]	9.0[3]
Note	U.N. Statistics	rate in July of the year Bangkok Bank's call rate	U.N. Statistics	U.N. Statistics

Note: 1) Discount rate of Central Banks
       2) Q4
       3) Apr. '84

Table V-10 FOREIGN EXCHANGE BALANCE (BASE CASE)

(Unit: '000 US$)

| | Foreign Exchange Inflow | | | Foreign Exchange Outflow | | | | | | | |
	(1) Long Term Loan	(2) Saving (Base oil Sales)	(3) Total Inflow	(4) Payments To Foreign Parties	(5) L.T.Loan Repayment	(6) L.T.Loan Interest	(7) Raw Material	(8) Chemicals & Catalyst	(9) Maintenance Supplies	(10) Total Outflow	(11) Foreign Exchange Balance
1985	22	-	22	-	-	-	-	-	-	-	22
1986	4.187	-	4.187	2.845	-	-	-	-	-	2.845	1.342
1987	4.636	-	4.636	845	-	-	-	-	-	845	3.791
1988	61.406	-	61.406	58.843	-	-	-	-	-	58.843	2.563
1989	90.926	-	90.926	87.451	-	-	-	-	-	87.451	3.475
1990	48.430	-	48.430	11.757	-	29.431	-	-	-	41.188	7.242
1991	-	130.670	130.670	-	20.961	16.769	65.435	754	485	104.404	26.266
1992	-	165.810	165.810	-	20.961	15.092	78.573	850	514	115.990	49.820
1993	-	188.994	188.994	-	20.961	13.415	89.663	928	545	125.512	63.482
1994	-	214.346	214.346	-	20.961	11.738	102.161	1.012	578	136.450	77.896
1995	-	231.577	231.577	-	20.961	10.061	110.500	1.073	613	143.208	88.369
1996	-	249.690	249.690	-	20.961	8.384	119.649	1.137	649	150.780	98.910
1997	-	269.306	269.306	-	20.961	6.707	129.562	1.205	688	159.123	110.183
1998	-	290.601	290.601	-	20.961	5.031	140.331	1.278	730	168.331	122.270
1999	-	313.682	313.682	-	20.961	3.354	152.009	1.354	773	178.451	135.231
2000	-	338.724	338.724	-	20.961	1.677	164.688	1.435	820	189.581	149.143
2001	-	365.857	365.857	-	-	-	178.434	1.522	869	180.825	185.035
2002	-	395.300	395.300	-	-	-	193.357	1.613	921	195.891	199.409
2003	-	427.259	427.259	-	-	-	209.568	1.709	976	212.253	215.006
2004	-	461.866	461.866	-	-	-	227.128	1.812	1.035	229.975	231.891
2005	-	499.442	499.442	-	-	-	246.208	1.921	1.097	249.226	250.216
2006	-	540.163	540.163	-	-	-	266.893	2.036	1.163	270.092	270.071
2007	-	584.335	584.335	-	-	-	289.343	2.158	1.233	292.734	291.601
2008	-	632.238	632.238	-	-	-	313.703	2.289	1.306	317.298	314.940
2009	-	684.221	684.221	-	-	-	340.149	2.425	1.385	343.959	340.262
2010	-	740.559	740.559	-	-	-	368.825	2.571	1.468	372.864	367.695
Total	209.607	7,724.640	7,934.247	161.741	209.610	121.659	3,786.179	31.082	17.848	7,417.119	3,606.131

Note:

(1) Long Term foreign loan equivalent to 60 percent of total capital requirement.
(2) Amount of base oil sales at ex-refinery price basis.
(4) Foreign currency component in the project cost.
(7) Long residue cost minus all of by-products revenue.
(8) Foreign currency component in consumable costs during plant operation.
(11) = (3) All costs are expressed in current term basis.

Table V-11   VALUE ADDED AND VALUE ADDED CO-EFFICIENT (BANGCHAK-A)

(Unit: '000 US$)

Year	Total Sales Revenue	Total Variable Cost Total	Maintenance Cost	Operating Supplies	Tax & Insurance	Total	Value Added Total	Value Added Co-efficient (%)
1991	295.430	241.316	7.877	485	2.854	252.532	42.898	14.52
1992	367.441	293.494	8.428	514	2.854	305.290	62.151	16.91
1993	419.442	335.070	9.018	545	2.854	347.487	71.955	17.15
1994	477.005	381.617	9.650	578	2.854	394.699	82.306	17.25
1995	516.049	412.935	10.325	613	2.854	426.727	89.322	17.31
1996	557.780	446.948	11.048	649	2.854	461.499	96.281	17.26
1997	602.986	483.784	11.821	688	2.854	499.147	103.839	17.22
1998	652.076	523.774	12.649	730	2.854	540.007	112.069	17.19
1999	705.296	567.116	13.534	773	2.854	584.277	121.019	17.16
2000	763.054	614.142	14.482	820	2.854	632.298	130.756	17.14
2001	825.647	665.092	15.495	869	2.854	684.310	141.337	17.12
2002	893.588	720.379	16.580	921	2.854	740.734	152.854	17.11
2003	967.350	780.388	17.741	976	2.854	801.959	165.391	17.10
2004	1,047.244	845.369	18.982	1,035	2.854	868.240	179.004	17.09
2005	1,134.010	915.921	20.311	1,097	2.854	940.183	193.827	17.09
2006	1,228.062	992.378	21.733	1,163	2.854	1,018.128	209.934	17.09
2007	1,330.104	1,075.309	23.254	1,233	2.854	1,102.650	227.454	17.10
2008	1,440.789	1,165.243	24.882	1,306	2.854	1,194.285	246.504	17.11
2009	1,560.926	1,262.830	26.624	1,385	2.854	1,293.693	267.233	17.12
2010	1,691.155	1,368.591	28.487	1,468	2.854	1,401.400	289.755	17.13
Total (Ave.)	17,475.434					14,489.545	2,985.889	(17.09)

Table V-12   FOR SENSITIVITY ANALYSIS ON OPERATIONAL RATE

<-10% CASE>

	Sales (Sn)	Inventory (In)	Production (Pn)	Operational Rate (%)
				*)
1991	189,680	10,320	200,000	80.00
1992	213,097	713	213,810	85.52
1993	221,471	417	221,888	88.76
1994	230,175	451	230,626	92.25
1995	239,221	468	239,689	95.88
1996	248,623	486	249,109	99.64
1997	249,955	45	250,000	100.00
1998	250,000	0	250,000	100.00
1999	250,000	0	250,000	100.00
2000	250,000	0	250,000	100.00
↓	↓	↓	↓	↓
2010	250,000	0	250,000	100.00

Note: *) max. 82.11% possible

<-20% CASE>

	Sales (Sn)	Inventory (In)	Production (Pn)	Operational Rate (%)
1991	173,049	9,415	182,464	72.99
1992	189,419	378	189,797	75.92
1993	196,863	384	197,247	78.90
1994	204,600	400	205,000	82.00
1995	212,641	416	213,057	85.22
1996	220,998	432	221,430	88.57
1997	229,683	449	230,132	92.05
1998	238,709	467	239,176	95.67
1999	248,091	4885	248,576	99.43
2000	249,926	74	250,000	100.00
2001	250,000	0	250,000	100.00
2002	250,000	0	250,000	100.00
↓	↓	↓	↓	↓
2010	250,000	0	250,000	100.00

Table V-13   RESULT OF SENSITIVITY ANALYSIS
(BANGCHAK - 8)

Parameter	Current Term		Constant Price Term	
	Before Tax	After Tax	Before Tas	After Tax
Original Case	23.94	20.72	18.25	15.24
(1) Interest Rate				
6%	23.94	20.54	18.25	15.06
9%	23.94	20.82	18.25	15.33
(2) Base Oil Price				
+20%	30.96	26.50	24.91	20.71
+10%	27.63	23.77	21.75	18.12
-10%	19.70	17.19	14.25	11.90
-20%	14.55	12.58	9.39	7.58
(3) F/O, L/R Price				
-20%	28.51	24.54	22.56	18.81
-10%	26.31	22.70	20.48	17.09
+10%	21.36	18.56	15.83	13.21
+20%	18.50	16.12	13.14	10.94
(4) Base Oil Demand				
-10%	23.53	20.42	17.86	14.94
-20%	22.36	19.53	16.73	14.09

Table V-14 RESULT OF SENSITIVITY ANALYSIS
(SRI RACHA - B)

Parameter	Current Term		Constant Price Term	
	Before Tax	After Tax	Before Tax	After Tax
Original Case	23.37	20.24	17.73	14.80
(1) Interest Rate				
6%	23.37	20.05	17.73	14.62
9%	23.37	20.33	17.73	14.90
(2) Base Oil Price				
+20%	30.68	26.27	24.67	20.51
+10%	27.23	23.43	21.39	17.82
-10%	18.89	16.47	13.51	11.26
-20%	13.34	11.44	8.29	6.56
(3) F/O, L/R Price				
-20%	*28.28	*24.34	*22.36	*18.65
	(33.80)	(28.88)	(27.60)	(22.95)
-10%	*25.92	*22.37	*20.13	*16.80
	(28.98)	(24.90)	(23.04)	(19.19)
+10%	*20.54	*17.86	*15.08	*12.59
	(16.31)	(14.16)	(11.10)	(9.12)
+20%	*17.41	*15.14	*12.16	*10.06
	(5.02)	(5.02)	(0.70)	(0.70)
(4) Base Oil Demand				
-10%	23.31	20.22	17.67	14.78
-20%	22.15	19.35	16.56	13.94

Note: * F/O, L/R include long residue, fuel oil,
       FCC feeds and T/C feeds.

( ) F/O, L/R include long residue and fuel oil only.

Table V-15   PROJECT COST (BANGCHAK - B)
(ALT. ESCALATION RATES)

(1,000 US$)

		Land	Plant	Pre-ope.	Interest	W/Capit.	Total
1985	F			-			-
	L			18			18
	Total			18			18
1986	F		2,280	565			2,845
	L	1,013	221	304			1,538
	Total	1,013	2,501	869			4,383
1987	F			847			847
	L	5,692		440			6,132
	Total	5,692		1,287			6,979
1988	F		52,500	1,280			53,780
	L		36,874	672			37,546
	Total		89,374	1,952			91,326
1989	F		78,845	2,623			81,468
	L		55,877	1,036			56,913
	Total		134,722	3,659			138,381
1990	F		8,668	2,643	26,934	177	38,422
	L		6,182	8,926	-	24,775	39,883
	Total		14,850	11,569	26,934	24,952	78,305
Total	F	-	142,293	7,958	26,934	177	177,362
	L	6,705	99,154	11,396	-	24,775	142,030
	Total	6,705	241,447	19,354	26,934	24,952	319,392

Table V-16   PROJECT COST (SRI RACHA - B)
(ALT. ESCALATION RATES)

(1,000 US$)

		Land	Plant	Pre-ope.	Interest	W/Capit.	Total
1985	F	-	-	-	-	-	-
	L	-	-	18	-	-	18
	Total	-	-	18	-	-	18
1986	F	-	2,280	565			2,845
	L	3,038	221	304			3,563
	Total	3,038	2,501	869			6,408
1987	F	-		847			847
	L	918		440			1,358
	Total	918		1,287			2,205
1988	F		52,151	1,277			53,428
	L		34,978	670			35,648
	Total		87,129	1,947			89,076
1989	F		78,316	2,622			80,938
	L		52,999	1,037			54,036
	Total		131,315	3,659			134,974
1990	F		8,553	2,621	25,778	170	37,122
	L		5,864	8,985	-	23,729	38,578
	Total		14,417	11,606	25,778	23,899	75,700
Total	F	-	141,300	7,932	25,778	170	175,180
	L	3,956	94,062	11,454	-	23,729	133,201
	Total	3,956	235,362	19,386	25,778	23,899	308,381

Table V-17   PROJECT COST (BANGCHAK - B)
(TAX INCENTIVE CASE)

(1,000 US$)

		Land	Plant	Pre-ope.	Interest	W/Capit.	Total
1985	F			-			-
	L			18			18
	Total			18			18
1986	F	-	2,280	565			2,845
	L	1,010	220	304			1,534
	Total	1,010	2,500	869			4,379
1987	F	-		845			845
	L	5,638		436			6,074
	Total	5,638		1,281			6,919
1988	F		51,877	1,264			53,141
	L		30,924	654			31,578
	Total		82,801	1,918			84,719
1989	F		76,451	2,545			78,996
	L		45,534	981			46,515
	Total		121,985	3,526			125,511
					*)		
1990	F		8,191	2,498	24,088	167	34,944
	L		3,027	8,189	-	22,731	33,947
	Total		11,218	10,687	24,088	22,898	68,891
Total	F	-	138,799	7,717	24,088	167	170,771
	L	6,648	79,705	10,582	-	22,731	119,666
	Total	6,648	218,504	18,299	24,088	22,898	290,437

Note: *) Interest: $\dfrac{266,349}{281,410}$ x 25,450 = 24,088

Table V-18 PROJECT COST (SRI RACHA - B)
(TAX INCENTIVE CASE)

(1,000 US$)

		Land	Plant	Pre-ope.	Interest	W/Capit.	Total
1985	F			-			-
	L			18			18
	Total			18			18
1986	F	-	2,280	565			2,845
	L	3,030	220	304			3,554
	Total	3,030	2,500	869			6,399
1987	F	-		845			845
	L	909		436			1,345
	Total	909		1,281			2,190
1988	F		51,529	1,264			52,793
	L		29,063	654			29,717
	Total		80,592	1,918			82,510
1989	F		75,937	2,545			78,482
	L		42,790	981			43,771
	Total		118,727	3,526			122,253
1990	F		8,136	2,492	23,159 *)	162	33,949
	L		2,734	8,245	-	21,771	32,750
	Total		10,870	10,737	23,159	21,933	66,699
Total	F	-	137,882	7,711	23,159	162	168,914
	L	3,939	74,807	10,638	-	21,771	111,155
	Total	3,939	212,689	18,349	23,159	21,933	280,069

Note: *) Interest: $\dfrac{256,910}{272,001} \times 24,519 = 23,159$

Table V-19 RESULT OF CASE STUDY
(BANGCHAK - B)

	FIRR % in Current Term		FIRR % in Constant Price Term	
	Before Tax	After Tax	Before Tax	After Tax
Original Case	23.94	20.72	18.25	15.24
(1) Alternative Escalation Rate Case	26.96	23.36	19.49	16.17
(2) Tax Incentive Case	25.06	22.84	19.32	17.25

(SRI RACHA - B)

	FIRR % in Current Term		FIRR % in Constant Price Term	
	Before Tax	After Tax	Before Tax	After Tax
Original Case	23.37	20.24	17.73	14.80
(1) Alternative Escalation Rate Case	26.36	22.85	18.96	15.73
(2) Tax Incentive Case	24.48	22.26	18.80	16.73

Table V-20 EFFECT OF F/O PRICE VARIATION TO F.E. SAVING

Year	Fuel Oil Consumption (kl)	Unit Price Differ- ence (Unit Freight) (US$/kl)	Price Difference Total Amount (1,000 US$)	Percentage of Price Difference Against Total F.E. Balance (%)
1991	200,000	17.77	3,554	13.53
1992	225,000	18.84	4,239	8.51
1993	237,500	19.97	4,743	7.47
1994	250,000	21.16	5,290	6.79
1995	250,000	22.43	5,608	6.35
1996	250,000	23.78	5,945	6.01
1997	250,000	25.21	6,303	5.72
1998	250,000	26.72	6,680	5.46
1999	250,000	28.32	7,080	5.24
2000	250,000	30.02	7,505	5.03
2001	250,000	31.82	7,955	4.30
2002	250,000	33.73	8,433	4.23
2003	250,000	35.76	8,940	4.16
2004	250,000	37.90	9,475	4.09
2005	250,000	40.18	10,045	4.01
2006	250,000	42.59	10,648	3.94
2007	250,000	45.14	11,285	3.87
2008	250,000	47.85	11,963	3.80
2009	250,000	50.72	12,680	3.73
2010	250,000	53.76	13,440	3.66
Total or Average	—	—	161,811	(Ave.) 4.49

Table V-21   COMPARISON OF PRODUCTS CONVERTED FROM TOTAL LONG RESIDUE

(Unit: BPCD)

Location	Bangchak (MOR)			Sri Racha (TORC)		
Case	W/Lube Plant	W/O Lube Plant	Difference	W/Lube Plant	W/O Lube Plant	Difference
Long Residue (Whole refinery)	32,360	32,360	0	58,490	58,490	0
Thermal Cracked Naphtha	80	0	+80	660	660	0
L't Products from FCC	—	—	—	9,960	9,960	0
L't Products from H/C	—	—	—	17,440	17,440	0
HF Gas Oil	60	0	+60	60	0	+60
LVGO	340	0	+340	4,520	4,750	-230
Base Oils	4,310	0	+4,310	4,310	0	+4,310
Asphalt	920	0	+920	1,980	1,060	+920
Fuel Oil	26,630 (1)	32,360	-5,730	21,900 (1)	26,960	-5,060
Products Total	32,340	32,360	-20 (2)	60,830	60,830	0

Notes: (1) Includes refinery fuel oil for the lube base oil plant (approx. 1,700 BPCD)

(2) Cracking loss in the visbreaker

Figure V-1   SENSITYVITY CURVE
           BANGCHAK-A (CURRENT TERM)
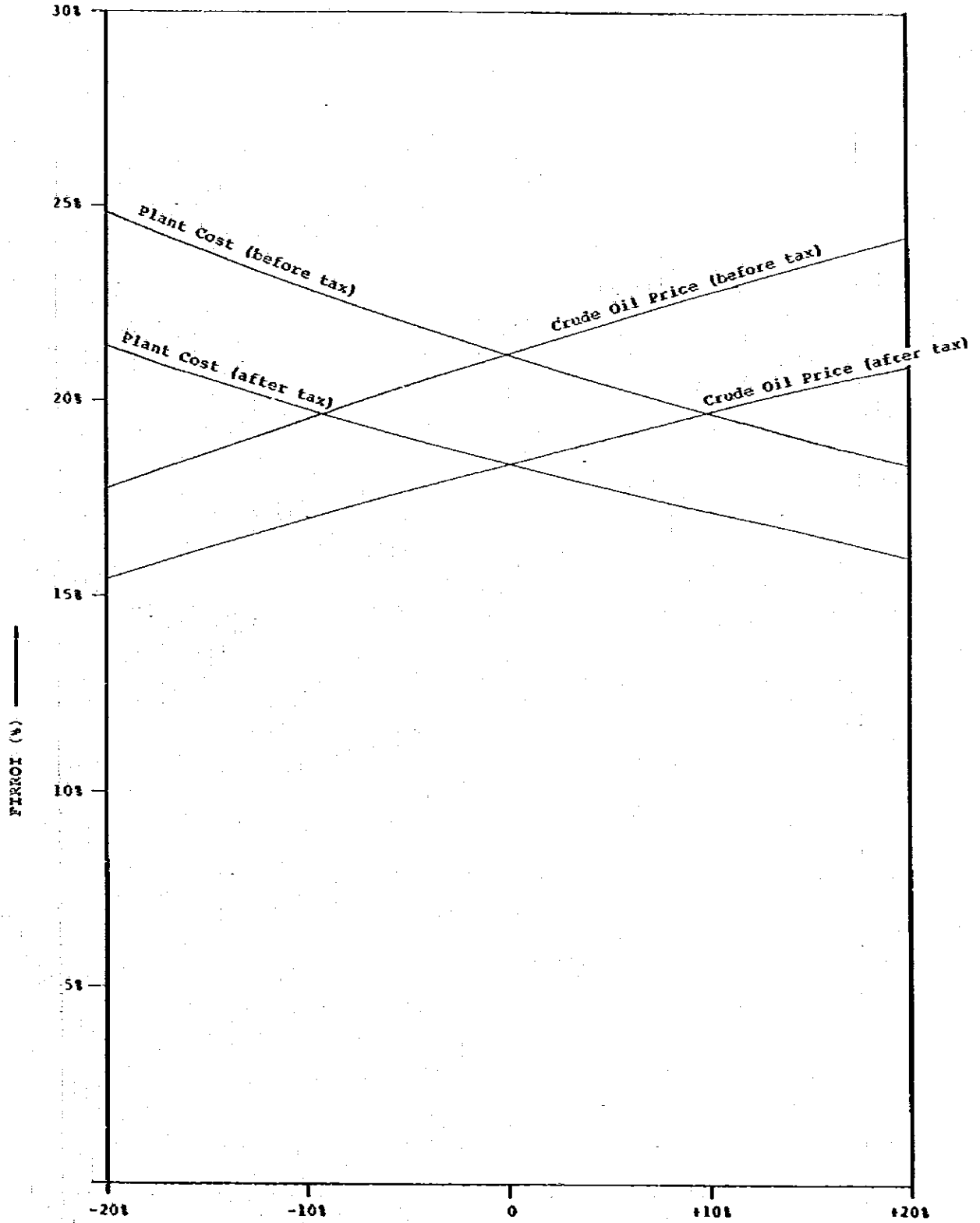
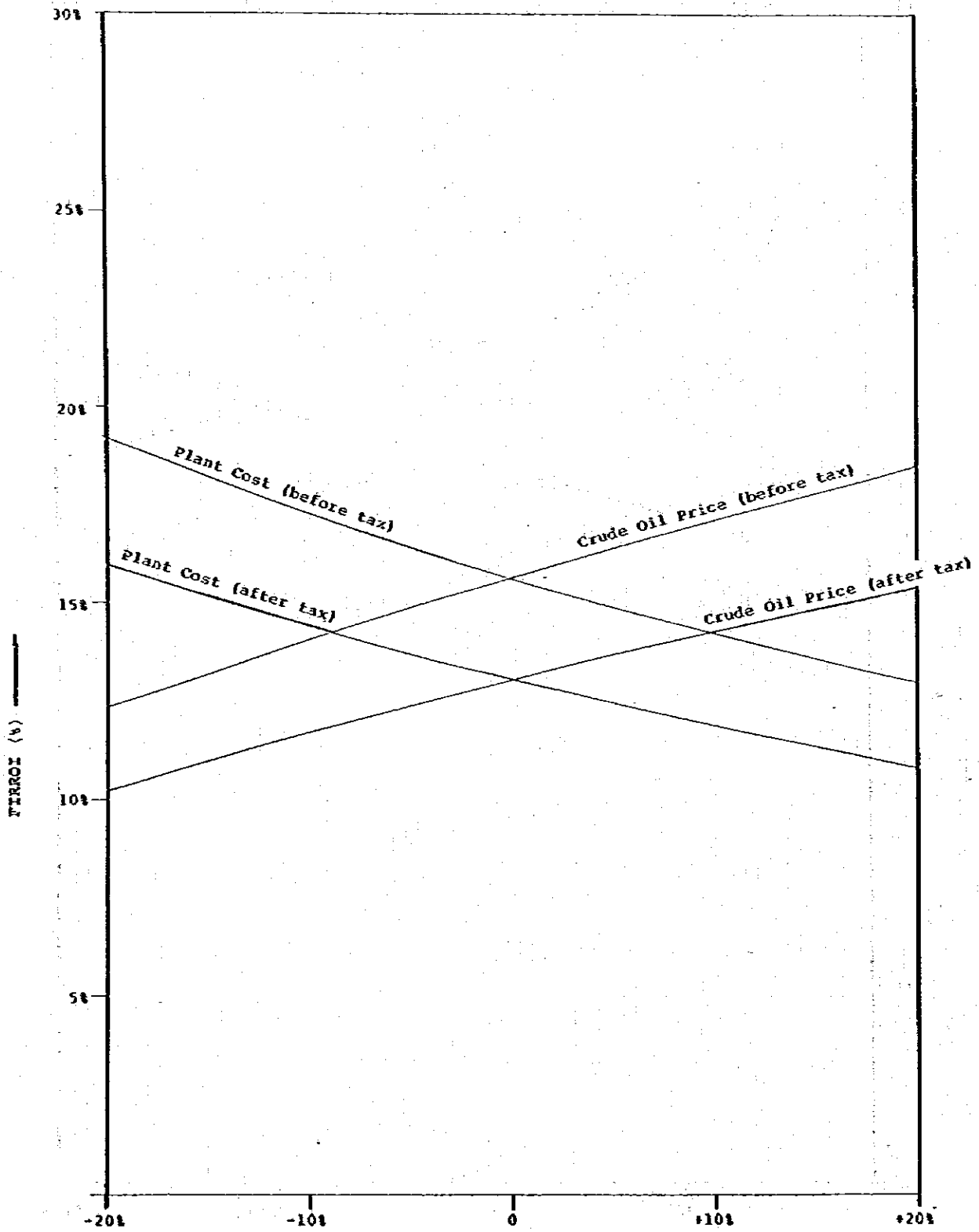Figure V-2 SENSITIVITY CURVE
BANGCHAK-A (REAL TERM)

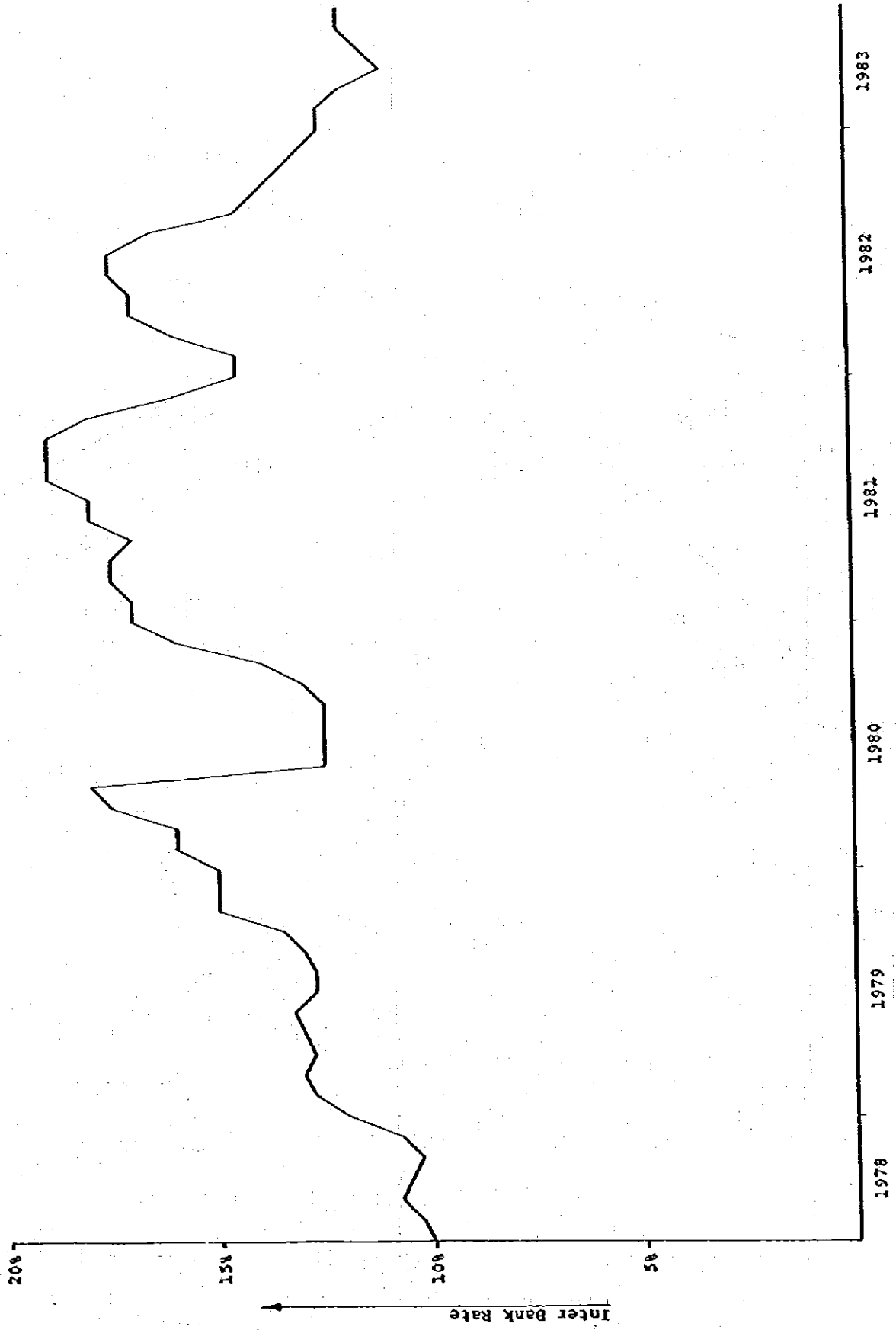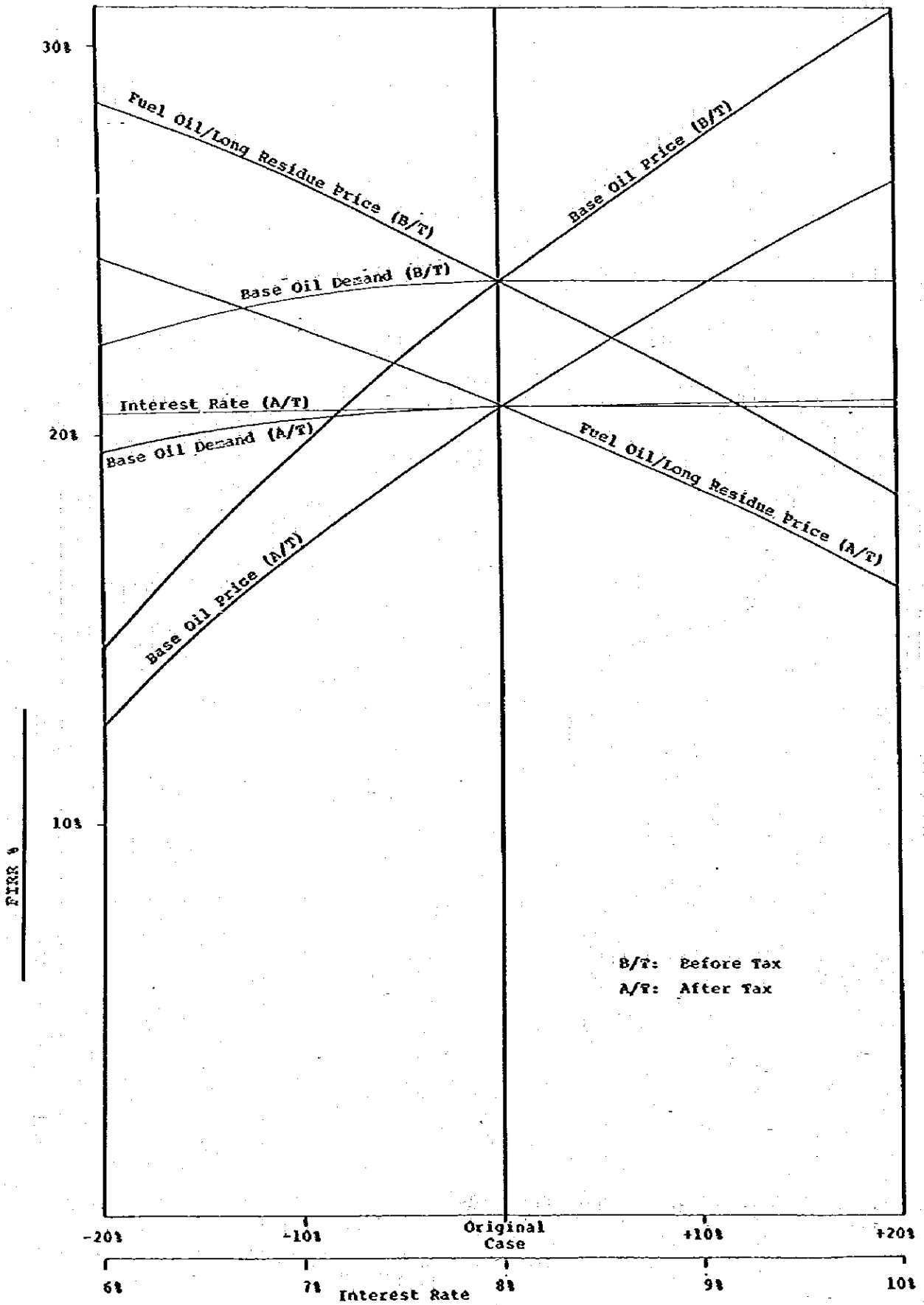Figure V-3   HISTORICAL CALL RATE
(BANGKOK BANK)

Inter Bank Rate
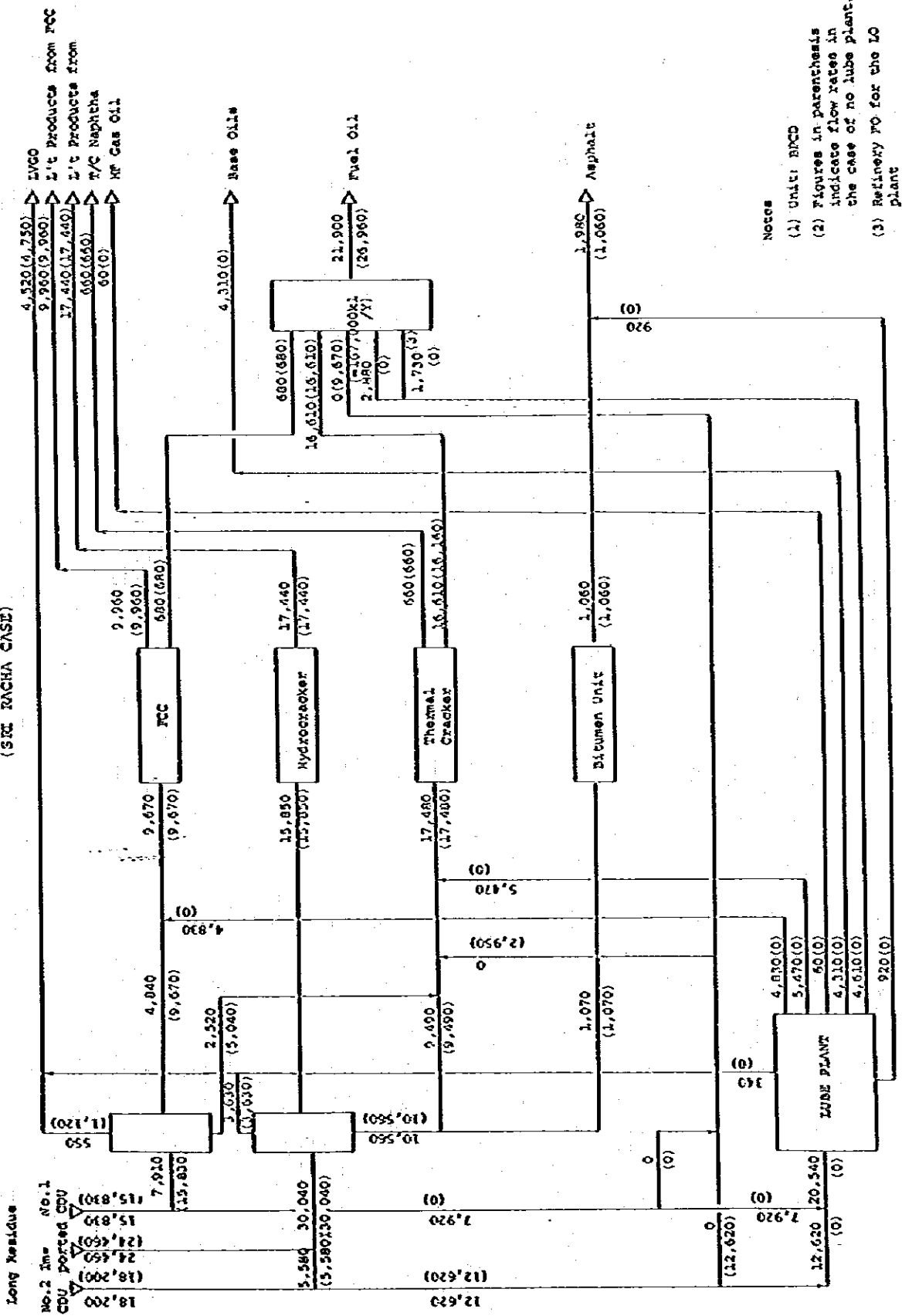
Figure V-4 SENSITIVITY CURVE (BANGCHAK-B CURRENT TERM)

B/T: Before Tax
A/T: After Tax

Figure V-5 SENSITIVITY CURVE (BANGCHAK-B REAL TERM)

B/T: Before Tax
A/T: After Tax

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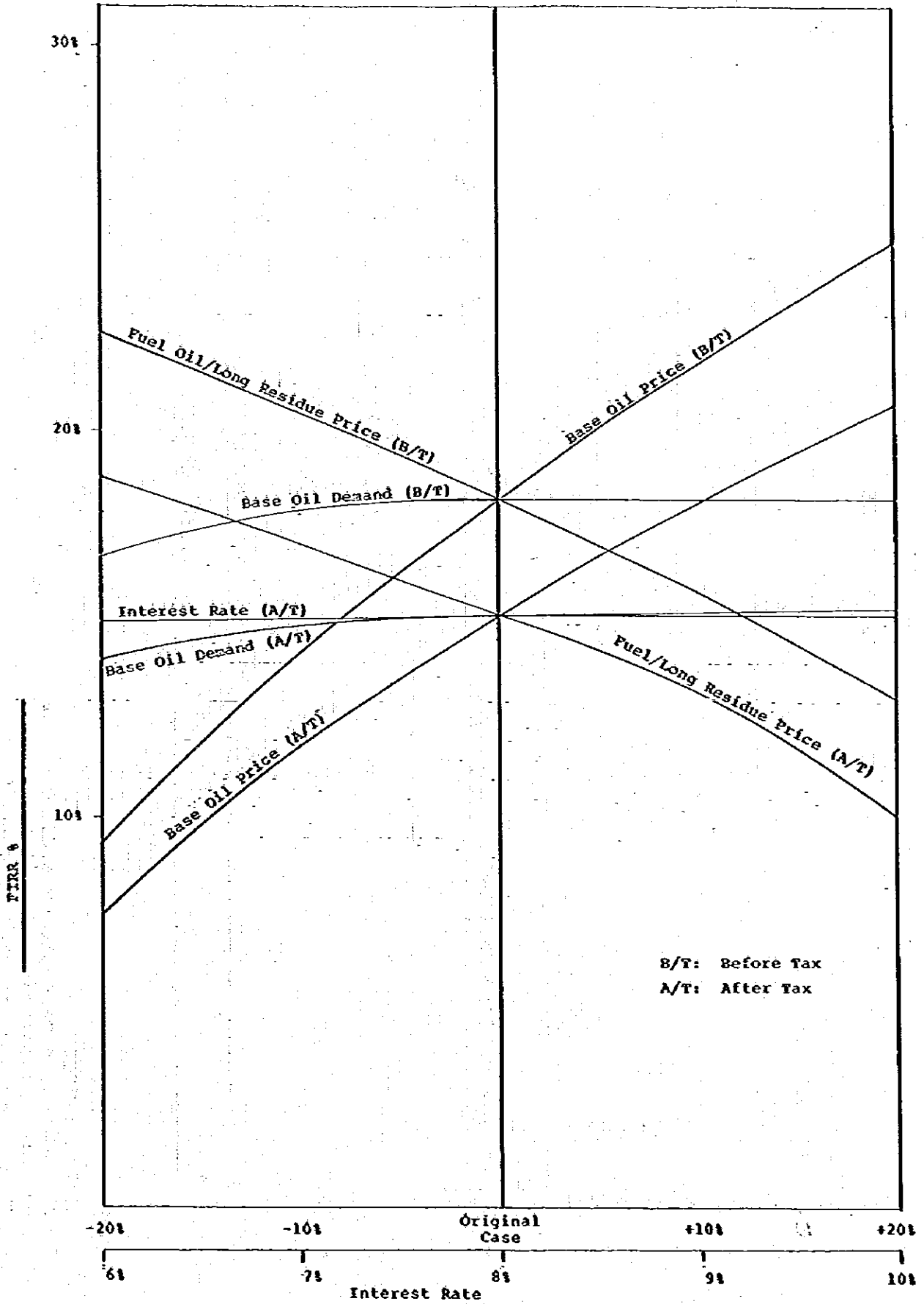
Figure V-6 MATERIAL BALANCE AROUND BOTTOM TREATING SECTION
(BANGCHAK CASE)

Long Residue
No.3 CDU No.2 CDU

LUBE PLANT

HF Gas Oil   60(0)
LVGO   340(0)
VB Naphtha   80(0)
Base Oils   4,310(0)

Fuel Oil   26,630
           (32,360)

Asphalt   920(0)

[=760,000 kl/y]
13,110(0)
1,700 (3) (0)
0(8,090)
11,820(24,270)

12,450(0)
8,090(0)   20,540(0)

8,090(8,090)
24,270(24,270)
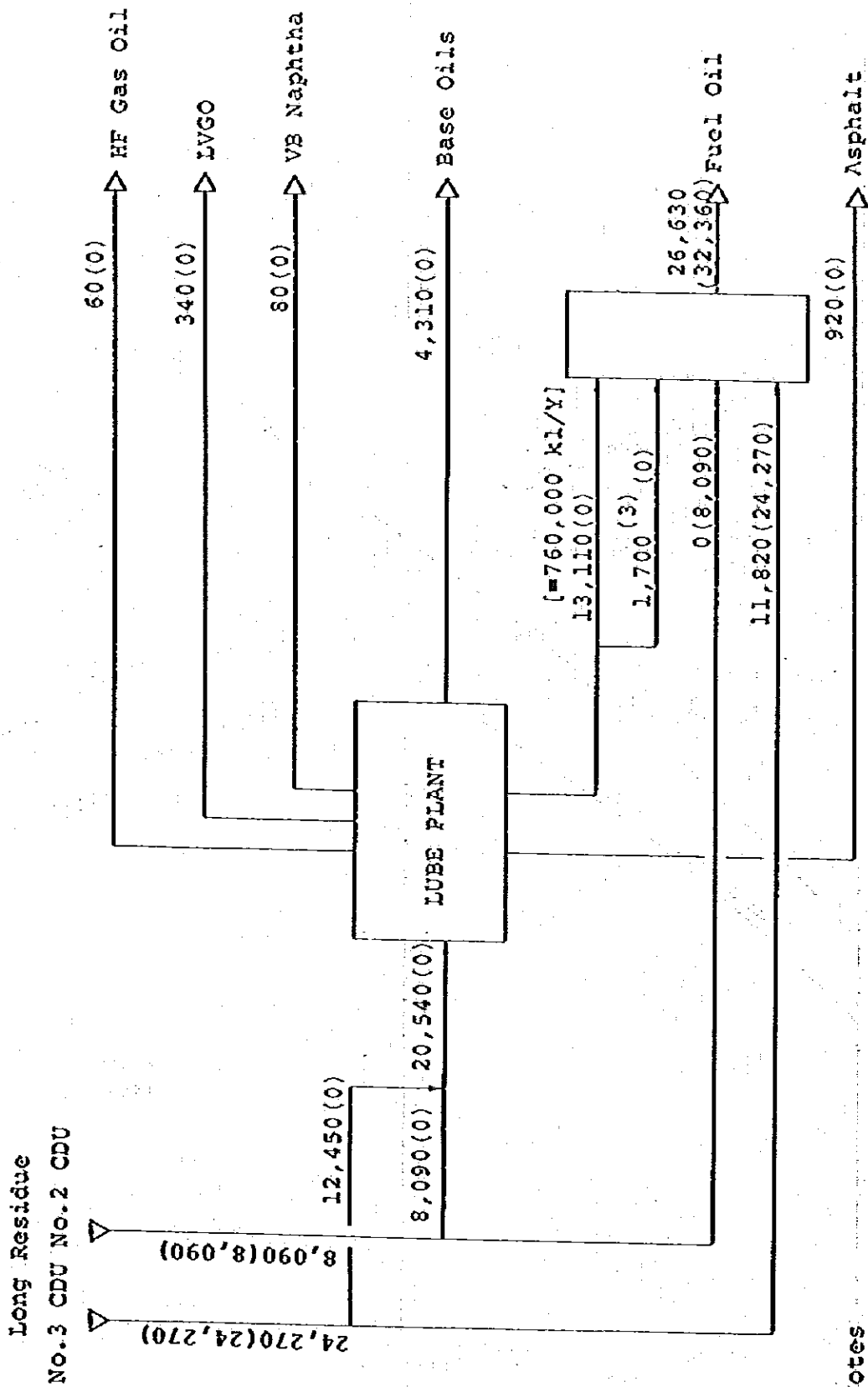
Notes

(1) Unit: BPCD
(2) Figures in parentheses indicate flow
     rates in the case of no lube plant.
(3) Refinery FO for the LO plant

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Figure V-7 MATERIAL BALANCE AROUND BOTTOM TREATING SECTION

(SRI RACHA CASE)

Notes

(1) Unit: BPCD

(2) Figures in parenthesis indicate flow rates in the case of no lube plant.

(3) Refinery FO for the LO plant

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JICA