

7.2 Analysis of current situation

7.2.1 Production and sales

Table 7.2.1-1 shows the change in the production and sales. As to the unit price per ton, the period of production and that of the sales calculation do not always correspond. Cast iron and cast steel naturally differ in their unit price. Accordingly, the unit price is not exact in a strict sense. Nevertheless, the unit prices in 1982 - 1984 have been shown and their average price during the two years have also been calculated for reference.

The annual production from the start of operation in 1975 up to 1981 registered 250 to 450 tons; and in and after 1982 the production has almost doubled to 700 to 850 tons.

The unit selling price in 1983 was 1,126 Rps per kg and in 1984 1,297 Rps per kg, although the price differs according to the quality of material and product.

The average unit selling price during the two years was about 1,200 Rps.

The sales ratio of P.T. BARATA to the entire sales was some 60% at the time when the operation was started, but it gradually decreased, and in the 1980s it dropped to half, about 30%, and in 1984 it declined to 6%.

7.2.2 Profit and loss

Table 7.2.2-1 shows the change in the profit and loss from 1975, when the operation was started, up to 1984. Table 7.2.2-2 shows the change in the cost ratio.

From 1975, the first year of operation, to 1980, the operation was in the red in terms of the gross profit on sales, and especially during the first three years of operation the production cost was more than two times the sales. However, the production cost/sales in 1978 and 1979 continued to drop, but in and after 1981 the gross profit on sales has gone into the black.

Table 7.2.1 - 1

Change in Production and Sales

Item	Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Total Production		422	424	455	451	339	257	367	860	690	801
Cast iron (ton)		165	218	176	317	260	164	141	681	597	
Cast steel (ton)		257	206	279	134	79	93	226	179	93	
Sales (1,000 Rp)		70,715	188,161	235,575	264,254	353,106	343,847	611,415	857,088	776,919	1,038,969
Unit selling price (Rp/kg)									997	1,126	1,297
Unit selling price (Rp/kg)											
Average for two years										1,054	1,218
Sales of BARATA (1,000 Rp)		43,669	114,343	167,575	135,996	125,554	111,733	186,199	228,262	255,209	59,201
Sales of BARATA/Total Sales		62 %	61 %	71 %	51 %	36 %	32 %	30 %	27 %	33 %	6 %

Table 7.2.2 - 1

Change in Profit and Loss

(Unit : 1,000 Rp)

Item	Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Sales		70,715	188,161	235,575	264,254	353,106	343,847	611,415	857,088	776,919	1,038,969
Production cost		441,907	523,631	620,553	505,985	394,023	571,480	490,404	561,688	743,242	907,848
Gross Profit on sales		(371,192)	(335,470)	(384,978)	(241,731)	(40,917)	(227,633)	121,011	295,400	33,677	131,121
Administrative express		-	-	-	67,699	98,018	56,964	56,037	77,410	89,274	111,604
Selling expenses		-	-	-	28,224	35,039	36,077	38,723	48,373	54,299	62,304
Operating profit		(371,192)	(335,470)	(384,978)	(337,654)	(173,974)	(320,674)	26,251	169,617	(109,896)	(42,787)
Interest payment (Non-operating expenses)		-	-	-	-	152,590	157,758	163,163	161,170	158,988	159,424
Ordinary profit		(371,192)	(335,470)	(384,978)	(337,654)	(326,564)	(478,432)	(136,912)	8,447	(268,884)	(202,211)
Extraordinary profit and loss		2,516	30,922	(251)	18,263	(32,410)	10,140	(5,088)	(10,867)	3,931	(2,322)
Profit before tax		(368,676)	(304,548)	(385,229)	(319,391)	(358,974)	(468,292)	(142,000)	(2,420)	(264,953)	(204,533)

Note: () : shows minus

Table 7.2.2 - 2

Change in the Ratio of Production Cost

Item	Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Japan in 1983 *1
Production cost/sales		6.2	2.8	2.6	1.9	1.1	1.7	0.8	0.66	0.96	0.87	0.77 [0.78]
Administrative and selling expenses/sales (%)		-	-	-	36	37	27	15	15	18	17	12 [14]
Operating profit/sales (%)		(525)	(178)	(163)	(128)	(49)	(93)	4	20	(14)	(4)	11 [7]
Interest payment/sales (%)		-	-	-	-	43	46	27	19	20	15	1.7 [4.1]

() : shows minus

*1 : Upper row ... Average of Japanese 46 pig iron foundries operating soundly

[] ... Average of Japanese 42 pig iron foundries in deficit

The ratio of the general administrative and selling expenses to sales was about 30% until 1980, while in and after 1981 it has fallen to some 15%.

As regards the operating profit, the operation was in the red of more than 300 million Rps almost every year from the start of operation until 1980, but in 1981 and 1982 the operation went into the black, while in 1983 and 1984 it again showed a loss. The amount of loss, however, has become much smaller compared with that up to 1980.

The payment of interest in terms of non-operating expenses showed some 150 million Rps every year since 1979, and its ratio to the sales and the production cost is considerably high.

As to the ordinary profit, it all showed red figures except in 1982. In 1981 the operating profit was in the black, while the ordinary profit was in the red, which indicates that the payment of interest is a heavy burden.

With regard to the profit before tax, it has shown red figures for eleven years in a row since the start of operation. Nevertheless, the absolute amount of loss is in the downward tendency when viewed over a long period.

7.2.3 Balance sheet

Table 7.2.3-1 indicates the change in the balance sheet from 1975, when operation began, up to 1984. Table 7.2.3-2 shows the change in the business index.

There has been no great change in the gross assets in the past ten years, but as sales increases, the relative importance of current assets is becoming greater.

In the current assets, the portion of the cash deposit has become much smaller, while the accounts receivable and stock have greatly swollen. This is a problem attributable to the turnover of receivables or to the production and collection of trade receivables.

Change in Balance Sheet

Table 7.2.3-1

(Unit: 1,000 Rp)

Item	Year	'75.12.31	'76.12.31	'77.12.31	'78.12.31	'79.12.31	'80.12.31	'81.12.31	'82.12.31	'83.12.31	'84.12.31
Total Assets		1,398,264	1,322,213	1,078,385	998,857	932,313	1,116,342	963,029	1,229,658	1,231,480	1,451,978
Total current assets		230,480	194,280	195,556	266,039	328,434	231,542	358,170	713,670	796,037	1,104,857
Cash deposit		668	2,371	4,166	44,072	6,137	11,725	20,367	119,188	29,004	5,420
Accounts receivable		9,623	23,222	32,329	40,286	89,565	30,178	127,653	117,074	163,726	523,162
Stock		220,189	167,687	159,061	181,681	232,732	189,639	210,150	477,408	603,207	576,275
Total of other assets		13,813	33,428	13,813	13,813	13,813	13,813	13,820	13,813	13,813	11,279
Total fixed assets		1,153,971	1,094,505	869,016	719,005	590,066	870,987	591,039	502,175	421,630	335,842
Tangible fixed assets		936,751	944,011	944,916	945,576	1,279,134	1,279,632	1,109,662	1,133,328	1,157,796	1,189,944
Depreciation		(70,244)	(109,853)	(283,896)	(385,781)	(689,068)	(408,665)	(518,623)	(631,153)	(736,166)	(854,102)
Total tangible fixed assets		866,507	834,158	661,020	559,795	590,066	870,987	591,039	502,175	421,630	335,842
Intangible fixed assets		315,802	315,802	332,515	332,515	-	-	-	-	-	-
Depreciation		(28,238)	(55,455)	(124,374)	(173,305)	-	-	-	-	-	-
Total Intangible fixed assets		287,464	260,347	207,996	159,210	-	-	-	-	-	-
Total of Liabilities and Capital		1,398,264	1,322,213	1,078,385	998,857	932,313	1,116,342	963,029	1,229,658	1,231,480	1,451,978
Current liabilities		370,270	539,168	948,611	1,284,659	1,651,523	2,012,481	2,261,239	2,494,951	2,650,336	3,014,173
Other Liabilities		135,385	(173,707)	(509,168)	(792,156)	(1,015,377)	(886,115)	(1,480,210)	(1,586,139)	(1,477,903)	(1,681,662)
Total of current and others		505,655	365,461	438,949	472,503	636,146	1,126,366	781,029	908,812	1,172,433	1,332,511
Long-term debt		1,261,285	1,261,300	1,024,665	845,745	655,161	458,268	324,000	324,000	324,000	324,000
Profit and loss		(368,676)	(304,548)	(385,225)	(319,391)	(358,974)	(468,292)	(142,000)	(2,420)	(264,953)	(204,533)

Note: () indicates minus

Table 7.2.3 - 2

Change in Business Index

Item	Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Japan in 1983
Gross assets turnover ratio		0.05	0.14	0.22	0.26	0.38	0.31	0.63	0.70	0.63	0.72	1.8
Current ratio (%)		46	53	45	56	52	21	46	79	68	83	171
Turnover of receivables		7.3	8.1	7.3	6.6	3.9	11.4	4.8	7.3	4.7	2.0	6.6
Turnover of tangible fixed assets (after depreciation)		0.08	0.23	0.36	0.47	0.60	0.39	1.03	1.71	1.84	3.09	4.7

Gross assets turnover = sales/gross assets

Current ratio = current assets/current liabilities x 100

Turnover of receivables = Sales/receivables

Turnover of fixed assets = sales/fixed assets (tangible)

Japan in 1983 = Average of the firms that are earning profit in Japan's pig iron casting industry.

As the current assets has increased as above, the current liabilities has also increased correspondingly. As a result, the burden of interest is pressing the profit and loss.

The turnover ratio of gross assets indicates the turnover speed of gross assets which was invested in the business. A high turnover ratio shows that capital is being used effectively.

The turnover ratio was extremely low in the beginning of operation, but in and after 1981 more than 0.6 has constantly been maintained. However, the capital turnover ratio in Japan's pig iron casting industry being 1.8 on an average, it needs to make more effort to use the gross assets effectively.

Current ratio compares the short-term debt with the source of revenue which is necessary to pay the debt. The greater the ratio is, the greater ability of payment indicates. It shows that the safety management is being kept. The index has much improved since 1982, but it is generally desired to secure more than 150%. When viewed from this point, it can not be said that the safety management is being maintained. The turnover of receivables ratio indicates the speed of collecting the price for the sold during the year.

A high turnover ratio means that the collection of the price for the sold is being made quickly.

The average turnover ratio in Japan's pig iron casting industry is 6.6. In general a high turnover ratio is being attained. However, the turnover ratio has recently dropped to 4.7 in 1983 and to 2.0 in 1984. Therefore, it needs to accelerate the collection of the price for the sold.

The tangible fixed assets turnover ratio indicates the use of fixed assets. The higher the ratio is, the greater use of equipment investment is being made. In the beginning of operation the amount of sales was small and the equipment depreciation made little progress, which resulted in an extremely low turnover ratio. However, since 1981 the ratio has rapidly improved, showing 3.09, although it is lower than 4.7, the average in Japan.

7.3 In case no renovation of the plant is made

Table 7.3-1 shows the estimated profit and loss statement for the years from 1986 to 2000 when no renovation of the plant is made. The 1985 budget was adopted for the sales and cost. The sales amount, material cost, personnel expenses and overhead expenses except depreciation expenses, were assumed to remain unchanged.

JFC has passed ten years since it began operation, and it may be necessary to make a small-scale reinvestment in order to keep the present production, the cost of which is supposed to be covered by the present level of maintenance expense.

Operating profit is anticipated for this year (1985), and its amount will become larger in and after 1987 when the burden of depreciation expenses is to be lightened.

However, ordinary profit will go into the red because of the payment of interest. In and after 1987, however, the amount of loss will become smaller.

Estimated Profit and Loss Statement
(In case no renovation is made)

Table 7.3-1

Item	(Unit: 1,000 Rp)														
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Sales	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000	1,010,000
Production cost	799,205	707,083	707,083	707,085	707,085	707,086	707,086	707,087	706,350	706,351	704,029	704,029	704,029	704,029	704,029
Gross Profit on sales	210,795	302,917	302,917	302,915	302,915	302,914	302,916	302,913	303,650	303,649	305,971	305,971	305,971	305,971	305,971
Administrative and selling expenses	157,341	157,341	157,341	157,341	157,341	157,341	157,341	157,341	157,341	157,341	157,341	157,341	157,341	157,341	157,341
Operating profit	53,454	145,576	145,576	145,574	145,574	145,573	145,573	145,572	146,309	146,308	148,630	148,630	148,630	148,630	148,630
Payment of interest	169,055	169,055	169,055	169,055	169,055	169,055	169,055	169,055	169,055	169,055	169,055	169,055	169,055	169,055	169,055
Ordinary profit	(115,601)	(23,479)	(23,479)	(23,481)	(23,481)	(23,482)	(23,482)	(23,483)	(22,746)	(22,747)	(20,425)	(20,425)	(20,425)	(20,425)	(20,425)
Extraordinary profit and loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Profit before tax	(115,601)	(23,479)	(24,479)	(23,481)	(23,481)	(23,482)	(23,482)	(23,483)	(22,746)	(22,747)	(20,425)	(20,425)	(20,425)	(20,425)	(20,425)

() : minus

7.4 In case renovation of the plant using the fran-process was made (Case "A")

7.4.1 Production plan and sales plan

Table 7.4.1-1 shows the production plan and sales plan which was prepared on the basis of the plant's production capacity and after conducting a market survey.

During the construction period, the production is anticipated to decrease for the time being, but the decrease was considered to be offset by contriving some means. The unit selling price differs according to the kind and grade of a product, and it varies in the range of 900 to 1,700 Rps per kg on the basis of the market price and of the production cost in Indonesia. The change in the average price per kg is shown in Table 7.4.1-1.

In the first six years of operation the average unit price is about 1,100 Rps, and in the subsequent two year 1,130 Rps, and after that it is 1,200 Rps. The rise in the average unit price is due to the alteration of the product items in the breakdown of the production plan. In other words, as the years roll by, the technical level improves, and consequently it leads to putting out mainly the products having high value added. The output in 1986 is 1,000 tons, and in 1995, ten years later, it becomes 2,650 tons. The production attains 2.65 times in ten years, and the sales amount about 3 times.

Selling price is a net selling price without the tax on value added. No consideration was given to the goods in process lying in stock, and the goods put out during the period are all to be sold.

7.4.2 Cost

The basis of cost calculation is shown on each of the following items: raw material and material expenses, utility expenses, personnel expenses, maintenance expenses, insurance premium, depreciation expenses.

Production Plan and Sales Plan

Table 7.4.1-1

Item	Year	(1) 1986	(2) 1987	(3) 1988	(4) 1989	(5) 1990	(6) 1991	(7) 1992	(8) 1993	(9) 1994	(10) 1995	(11) 1996	(12) 1997	(13) 1998	(14) 1999	(15) 2000
Production plan (ton)		1,000	1,400	1,800	2,100	2,250	2,400	2,500	2,600	2,650	2,650	2,650	2,650	2,650	2,650	2,650
Sales amount (1,000 Rp)		1,093,000	1,550,000	1,975,000	2,299,000	2,442,000	2,623,000	2,805,000	3,000,000	3,163,000	3,265,000	3,265,000	3,265,000	3,265,000	3,265,000	3,265,000
Average unit selling price per kg (Rp)		1093	1107	1085	1107	1085	1122	1122	1136	1194	1232	1232	1232	1232	1232	1232

1) Raw material and material expenses (variable cost).

The raw material and material expenses, which are needed for putting out one ton of product, is shown by year in Table 7.4.2-1.

2) Utility expenses

Electricity, fuel and water are included in the utility. The utility expenses was calculated separately for the direct variable cost and for the indirect fixed cost according to the actual figures in 1984.

3) Personnel expenses (fixed cost)

Personnel expenses is calculated separately for the factory and for the administrative and sales section. The result is shown in Table 7.4.2-2.

4) Preservation and maintenance expenses (fixed cost), insurance premium (fixed cost)

Preservation and maintenance expenses covers the preservation and maintenance of building, equipment machinery as well as tools. In calculating the expenses, the data obtained in Indonesia and the experiences in Japan were taken into account as follows:

Existing facilities : 1.5% of the acquisition cost of building, machinery and equipment.

New facilities : 0.5% of the acquisition cost of building, machinery and equipment for the first three years.

After that, 1.0% of the acquisition cost of building, machinery and equipment.

Table 7.4.2 - 1
Material Expenses by Year and Material Expenses by Year
which are needed for putting out one ton of Product (Case "A")

(Unit: 1,000 Rp)

Item	Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Melting material for part of FCD product		32,243	32,243	16,121	16,121	16,121										
		287,064	287,064	281,901	281,901	281,901	236,738	236,738	236,738	236,738	236,738	236,738	236,738	236,738	236,738	236,738
Melting material for part of FC product		5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014
		43,323	43,323	39,713	37,908	36,103	30,657	27,077	30,657	36,103	37,908	37,908	37,908	37,908	37,908	37,908
Green sand		208,240	208,240	213,720	216,460	219,200	227,420	232,900	227,420	219,200	216,460	216,460	216,460	216,460	216,460	216,460
Miscellaneous materials for finishing product		14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000
Sub total (Rp)		588,884	589,884	570,469	571,404	572,339	573,859	575,729	573,859	571,055	570,120	570,120	570,120	570,120	570,120	570,120
Others		76,934	51,290	34,228	25,713	21,463	19,368	17,272	17,216	17,132	17,104	17,104	17,104	17,104	17,104	17,104
A. Total		646,818	621,174	604,697	597,117	593,802	593,227	593,001	591,075	588,187	587,224	587,224	587,224	587,224	587,224	587,224
B. Output (in ton) in production plan		1,000	1,400	1,800	2,100	2,250	2,400	2,500	2,600	2,650	2,650	2,650	2,650	2,650	2,650	2,650
C. Material expenses (1,000 Rp) for (A x B) years		646,818	869,644	1,088,455	1,253,946	1,336,055	1,421,745	1,462,503	1,536,795	1,558,656	1,556,144	1,556,144	1,556,144	1,556,144	1,556,144	1,556,144

Table 7.4.2-2

Labor Cost (Case "A")

(Unit : Rp)

Item	Cost Classification	Number	Average Salary /person/Year	Average Bonus /person/Year	Welfare Expense /person/Year	Total	Grand Total
Work Shop	Manager	4	1,140,000	285,000	720,000	2,145,000	8,580,000
	Skilled	13	780,000	195,000	720,000	1,695,000	22,035,000
	Unskilled	106	480,000	120,000	720,000	1,320,000	139,920,000
Total		123	2,400,000	600,000	2,160,000	5,160,000	170,535,000
Administra- tion & Sales	Branch Manager	1	2,820,000	705,000	720,000	4,245,000	4,245,000
	Manager	3	1,200,000	300,000	720,000	2,220,000	6,660,000
	Senior	10	720,000	180,000	720,000	1,620,000	16,200,000
	Junior	54	480,000	120,000	720,000	1,320,000	71,280,000
Total		68	5,220,000	1,305,000	2,880,000	9,405,000	98,385,000
Grand Total		191	7,620,000	1,905,000	5,040,000	14,565,000	268,920,000

• Increased due to 2 shifts : $(480,000/2 * 0.5) * 106 \text{ men} = 12,720,000$ Grand total for workshop:

$(780,000/2 * 0.5) * 13 \text{ men} = 2,535,000$ $170,535,000 + 15,255,000 = 185,790,000$

Total 15,255,000

Insurance premium covers the insured machinery and equipment and building, which corresponds to 0.5% of the acquisition cost of machinery and equipment and building.

5) Education and training expenses (abroad)

This covers the expenses for the education and training abroad on the casting technique and molding technique.

6) Depreciation expenses

Straight line method is used for the depreciation of tangible fixed assets and intangible fixed assets.

The years, during which depreciation is made, are as below:

Machinery and equipment	: 10 years
Building	: 20 years
Intangible assets	: 5 years

7) Selling expenses and administrative expenses (variable cost)

Selling expenses and administrative expenses are 4% of the sales amount.

8) Interest rate and repayment

The borrowing-capital ratio, which covers the investment necessary for renovation, has been fixed as 6:4, and the borrowing is to be covered by a long-term debt. In case a shortage of cash should occur during the plant operation, it would be covered by a short-term debt. The interest rate on the borrowing and the terms of repayment are assumed as follows:

- (1) Long-term debt
 - Interest rate : 13%/year
 - Period of repayment : 12 years
 - Grace period : 3 years
- (2) Short-term debt
 - Interest rate : 15%/year
- (3) Deposit rate : 10%/year

The long-term debt remaining in the balance sheet as of the end of 1984 is 324,000,000 Rps, and all the debt is assumed to be repaid in 1985.

7.4.3 Other items

1) Corporation income tax

Tax rate is as follows:

Up to 10 million Rps of profit before tax	: 15%
From 10 million to 50 million Rps of profit before tax	: 25%
Over 50 million Rps of profit before tax	: 35%

- 2) Period of the project : 15 years
- 3) Others

The period for the following items has been assumed as below:

Raw material inventory	: One month
Accounts receivable	: One month
Accounts payable	: One month

7.5 In case renovation was made for the plant using the cement process (Case "B")

7.5.1 Production plan and sales plan

Table 7.5.1-1 shows the production plan and sales plan.

7.5.2 Cost

1) Raw material and material expenses (variable cost)

Table 7.5.2-1 shows the raw material and material expenses by year, which are needed for producing one ton of product.

The costs of Melting material, lining material and other materials necessary for finishing the product and the ratio of DFC to FC in the production plan are supposed to be the same as in Case "A". Also, the ratio of green sand to cement sand in the production plan are assumed to be the same as in Case "A".

2) Utility expenses

The unit price of utility per ton in the fixed cost and the variable cost was assumed to be the same as in Case "A" (See Table 7.4.2-2).

3) Personnel expenses (fixed cost)

Personnel expenses was supposed to be the same as in Case "A" (See Table 7.4.2-3).

Table 7.5.1 - 1

Production Plan and Sales Plan (Case "B")

Item	Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Production Plan (ton)		950	1,150	1,300	1,350	1,400	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450
Sales amount (1,000,000 Rp)		1,038	1,273	1,426	1,478	1,519	1,585	1,627	1,673	1,731	1,786	1,786	1,786	1,786	1,786	1,786

Material Expenses by Year and Material Expenses by Year
For Putting Out One Ton of Product (Case "B")

Table 7.5.2 - 1

(Unit: 1,000 Rp)

Item	Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Melting material		299,307	299,307	298,022	298,022	298,022	296,738	296,738	296,738	296,783	296,738	296,738	296,738	296,738	296,738	296,738
		5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014	5,014
Lining material		43,323	43,323	39,713	37,908	36,103	30,687	27,077	30,687	36,103	37,908	37,908	37,908	37,908	37,908	37,908
		92,932	92,932	95,378	95,601	97,824	91,492	103,838	101,492	97,824	96,601	96,601	96,601	96,601	96,601	96,601
Miscellaneous materials for finishing of product		14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000	14,000
		454,576	454,576	452,127	451,545	450,963	447,931	446,767	447,931	449,679	450,261	450,261	450,261	450,261	450,261	450,261
Sub total (Rp)		61,368	51,140	44,082	37,252	33,822	30,235	26,806	26,876	26,981	27,016	27,016	27,016	27,016	27,016	27,016
		515,944	505,716	496,209	488,797	484,785	478,166	473,373	474,807	476,660	477,277	477,277	477,277	477,277	477,277	477,277
A. Materials expenses per ton of product (Rp)		950	1,150	1,300	1,550	1,400	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450
		490,147	581,573	645,072	659,876	678,699	673,341	686,661	686,470	691,157	692,052	692,052	692,052	692,052	692,052	692,052
B. Output (in ton) in production plan																
C. Material expenses (1,000 Rp) for (A x B)																

4) Preservation and maintenance expenses (fixed cost)

Preservation and maintenance expenses

- Existing facilities : 1.5% of the acquisition cost of buildings, machinery and equipment.
- New facilities : 0.5% of the acquisition cost of buildings, machinery and equipment for the first three years. After that, 1.0% of the acquisition cost of buildings, machinery and equipment.
- Insurance premium : 0.5% of the acquisition cost of machinery and equipment and buildings.

5) Education and training expenses (abroad)

This was assumed to be the same as in Case "A".

6) Depreciation expenses

The same depreciation method as in Case "A" was adopted. The investment in the buildings and in the education and training is the same as in Case "A". As regards the investment in the machinery and equipment, the continuous mixer and sand reclamation, which are in Case "A", were excluded.

7) Selling expenses and administrative expenses (variable cost)

Selling expenses and administrative expenses are 4% of the sales amount.

8) Interest rate and repayment

The borrowing-capital ratio and the terms of borrowing and of repayment are the same as in Case "A".

7.5.3 Others

1) Corporation income tax

The tax rate is the same as Case "A".

2) Period of the project

The same as Case "A".

7.6 Financial analysis

7.6.1 Analysis of the internal rate of return and of the net present value

Regarding the result of calculation of the financial internal rate of return and of the net present value, Case "A" is shown in Fig. 7.6.1-1 and Case "B" in Fig. 7.6.1-2.

In Case "A", when the discount rate is 5%, the net present value shows 1,287,273,000 Rps, while when the discount rate is 10%, the net present value shows deficit of 367,215,000 Rps.

The financial internal rate of return is 8.9%.

In case "B", when the discount rate is 5%, the net present value shows a deficit of 729,191,000 Rps, and when the discount rate is 1%, the net present value shows Rps 276,854,000. The financial internal rate of return (FIRR) is 2.10%.

In case FIRR shows more than 10%, the project is generally considered feasible. Case "A" shows a figure near 10%, while the FIRR in Case "B" is very low, and is infeasible financially.

7.6.2 Analysis of profit and loss

1) Case "A"

As regards ordinary profit, it will show red figures for six years after renovation, most of this deficit consists of interest payment.

After that, the business will ameliorate rapidly, and in and after 1996, it is predicted to show the ordinary profit of over 1,000,000,000 Rps.

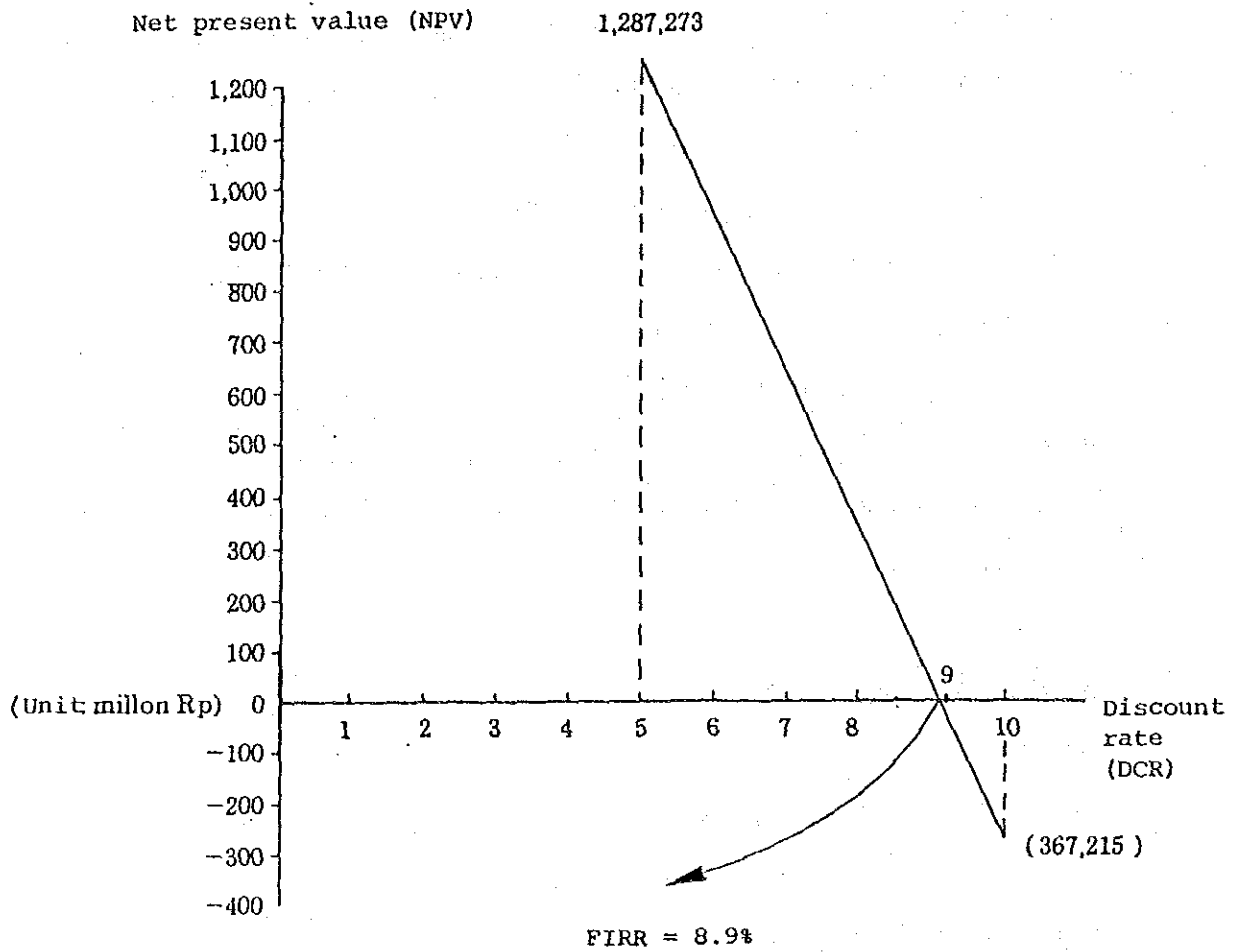


Fig. 7.6.1-1 Internal Rate of Return and Net Present Value (Case "A")

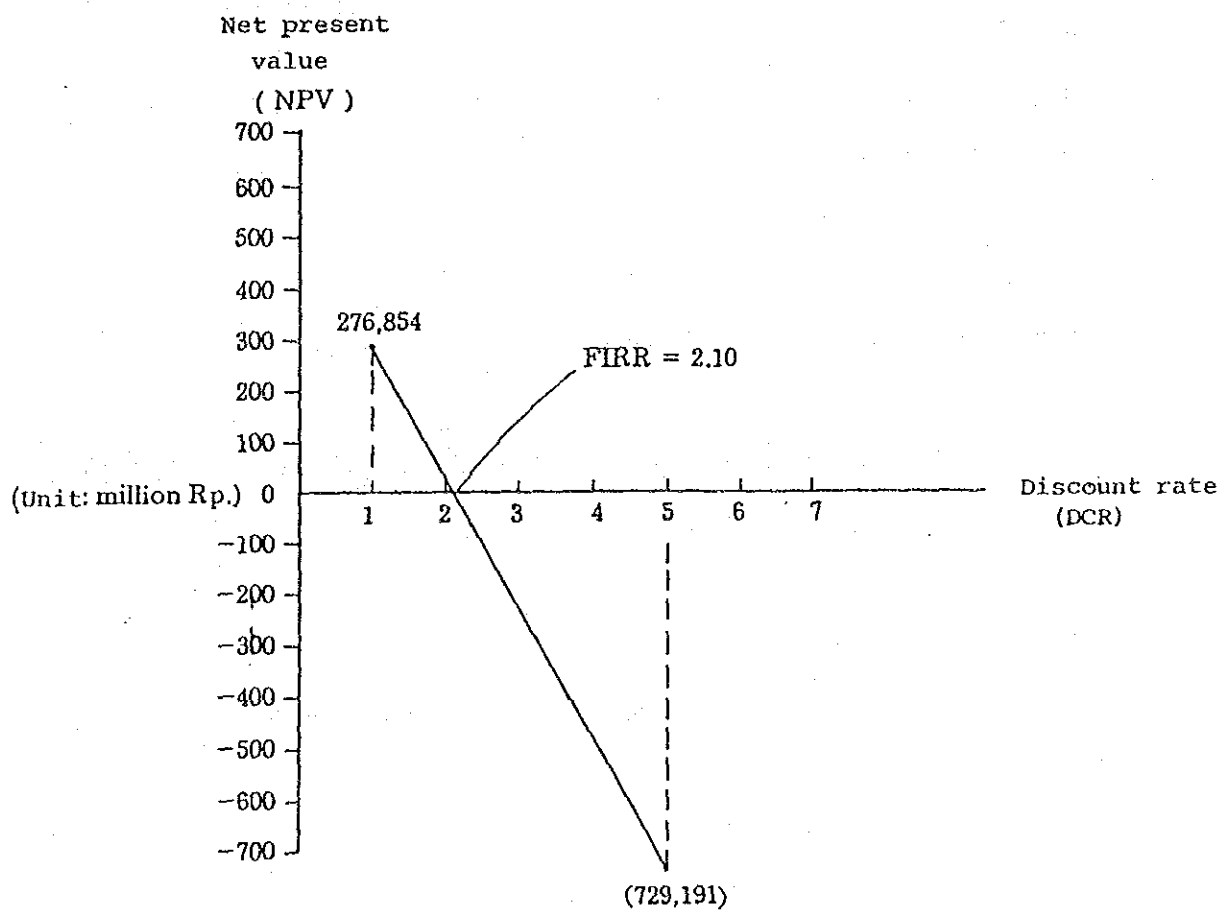


Fig. 7.6.1-2 Internal Rate of Return and Net Present Value (Case "B")

As to operating profit, it will show red figures for three years after renovation, but the business will improve rapidly after that, and in and after 1996, operating profit is expected to attain more than 900,000,000 Rps. This is attributable to the fact that the depreciation cost burden diminishes. Table 7.6.2-1 shows the forecast profit and loss statement for Case "A". The change in the profit and loss is shown in Fig. 7.6.2-1. The change in the production cost ratio is indicated in Table 7.6.2-3.

The change in profitability and productivity is shown in Table 7.6.2-4 and Fig. 7.6.2-3 respectively.

2) Case "B"

With regard to operating profit, it will show red figures for five years after renovation.

The estimated profit and loss statement for Case "B" is shown in Table 7.6.2-2, and the change in profit and loss in Fig. 7.6.2-2.

7.6.3 Sensitivity analysis

In Case "A" sensitivity analysis was performed for the following items by changing their figures:

Change in total investment

Change in selling price

Change in raw material expenses

The following shows the result of sensitivity analysis:

In case the total investment increases 20% in Case "A", its FIRR decreases to 7.05%, and when 10% increases, the FIRR decreases to 7.97%. On the other hand, when the total investment decreases 15%, its FIRR rises to 12.99%.

Estimated Profit and Loss Statement
(when renovation was conducted in Case "A")

Table 7.6.2 - 1

(Unit: 1,000 Rp)

Item	Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Sales		1,088,000	1,550,000	1,975,000	2,299,000	2,442,000	2,623,000	2,805,000	3,000,000	3,163,000	3,253,000	3,265,000	3,265,000	3,265,000	3,265,000	3,265,000
Production cost		1,381,144	1,550,714	1,888,375	2,085,721	2,162,468	2,251,259	2,299,598	2,261,224	2,265,803	2,293,252	2,090,844	2,090,844	2,090,844	2,090,844	2,090,844
Gross sales profit		(293,144)	(714)	86,625	217,279	279,532	351,741	505,402	738,766	877,197	961,748	1,174,156	1,174,156	1,174,156	1,174,156	1,174,156
Administrative, selling expenses (fixed cost)		98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385
Administrative, selling expenses (variable cost)		43,720	62,000	79,000	91,560	97,660	104,920	112,200	120,000	126,520	130,500	130,500	130,500	130,500	130,500	130,500
Administrative, selling expenses (total)		142,105	160,385	177,385	190,345	196,055	203,305	210,585	218,385	224,905	228,985	228,985	228,985	228,985	228,985	228,985
Operating profit		(423,249)	(161,069)	(90,760)	26,934	83,467	138,436	294,817	520,381	652,292	752,763	945,171	945,171	945,171	945,171	945,171
Interest on short-term debt		92,180	162,746	196,481	207,593	198,938	170,288	114,860	53,715	(12,217)	(61,677)	(104,938)	(148,033)	(190,820)	(253,360)	(289,828)
Payment of interest on long-term debt		215,800	223,960	228,560	208,890	190,300	117,720	152,640	133,560	114,480	95,299	76,319	57,229	38,159	19,079	-
Ordinary profit		(92,190)	(162,746)	(198,480)	(207,593)	(198,938)	(170,288)	(114,860)	(53,715)	12,217	61,677	104,938	148,033	190,820	233,360	289,828
Corporation tax		(649,049)	(350,059)	(319,720)	(182,946)	(107,553)	(12,284)	6,829	386,821	537,812	657,364	868,652	887,932	907,012	926,092	945,171
Profit after tax		(92,190)	(162,746)	(198,481)	(207,593)	(198,938)	(170,288)	(114,860)	(53,715)	12,217	61,677	104,938	148,033	190,820	233,360	289,828
		(649,049)	(350,059)	(319,720)	(182,946)	(107,553)	(12,284)	135,348	270,234	345,302	405,700	523,008	525,344	522,771	520,284	512,918

(): minus

Estimated Profit and Loss Statement
(In case renovation is made in Case B.)

(Unit: 1,000 Rp)

Item	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Sales	1,038,000	1,273,000	1,426,000	1,478,000	1,519,000	1,585,000	1,627,000	1,673,000	1,731,000	1,786,000	1,786,000	1,786,000	1,786,000	1,786,000	1,786,000
Production cost	1,194,432	1,208,605	1,367,686	1,389,239	1,403,181	1,401,238	1,378,120	1,280,454	1,282,404	12,83,300	1,115,770	1,115,770	1,115,770	1,115,770	1,115,770
Gross sales profit	(156,432)	64,395	58,314	88,761	115,819	183,762	248,880	392,546	418,596	502,700	670,230	670,230	670,230	670,230	670,230
Administrative, selling expenses (variable cost)	41,520	50,920	57,040	59,120	60,760	63,400	65,080	66,920	69,240	71,440	71,440	71,440	71,440	71,440	71,440
Administrative, selling expenses (fixed cost)	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385	98,385
Administrative expenses (total)	139,905	149,305	155,725	157,505	159,145	161,785	163,465	165,305	167,625	169,825	169,825	169,825	169,825	169,825	169,825
Operating profit	(296,337)	(84,910)	(97,111)	(68,744)	(43,325)	21,977	85,415	227,241	280,971	332,875	500,450	500,405	500,405	500,405	500,405
Interest payment (Interest on short term debt)	65,444	117,885	148,187	166,577	177,712	173,206	154,334	123,871	88,076	46,801	14,989	(9,309)	(28,586)	(47,824)	(80,487)
Interest payment (Interest on long term debt)	196,395	209,555	209,555	192,092	174,629	157,166	139,703	122,240	104,777	87,315	69,852	52,389	34,926	17,463	
Ordinary profit	(65,444)	(119,825)	(148,187)	(166,577)	(177,120)	(173,206)	(154,334)	(123,871)	(88,076)	(46,801)	(14,989)	9,309	28,586	47,824	80,487
Corporation tax	(492,732)	(294,465)	(306,666)	(260,836)	(217,955)	(135,189)	(54,288)	105,001	176,194	245,560	430,553	448,016	465,479	482,942	500,405
Profit after tax	(65,444)	(117,825)	(148,187)	(166,577)	(177,120)	(173,206)	(154,334)	(123,871)	(88,076)	(46,801)	(14,989)	9,309	28,586	47,824	80,487
	(492,732)	(294,465)	(306,666)	(260,836)	(217,955)	(135,189)	(54,288)	105,001	145,553	175,994	285,106	287,777	292,556	297,174	297,093

() : minus

Table 7.6.2-3 Change in Production Cost Ratio (Case "A")

Item	Year	JFC Past		JFC Future			#1 Japan in 1983	
		1983	1984	1986	1989	1993		1996
A. Production cost/sales		0.96	0.87	1.27	0.91	0.75	0.64	0.77 {0.78}
B. Administrative, selling expenses/sales (%)		18	17	13	8	7	7	12 [14]
C. Operating profit/sales (%)		(14)	(4)	(40)	(1)	17	29	11 [7%]
D. Interest payment/sales (%)		20	15	28	18	6	-	1.7 [4.1]

() : minus

#1 : Upper row : Average of Japanese 46 pig-iron foundries operating soundly
 [] : Average of Japanese 42 pig-iron foundries in deficit

Table 7.6.2 - 4

Change in Profitability and Productivity (Case "A")

Item	Year	1986	'89	'93	'96
Sales		1,093,000	2,299,000	3,000,000	3,265,000
(L,000 Rp)		100%	210%	274%	299%
Production cost		1,384,000	2,082,000	2,261,000	2,091,000
(L,000 Rp)		100%	150%	163%	151%
Material expenses		647,000	1,254,000	1,537,000	1,556,000
(L,000 Rp)		100%	194%	238%	240%
Value added		446,000	1,045,000	1,463,000	1,709,000
(L,000 Rp)		100%	234%	328%	383%
Value added per capita		2,335	5,471	7,660	8,948
(L,000 Rp)		100%	234%	328%	383%
Production amount		1,000	2,100	2,600	2,650
(ton)		100%	210%	260%	265%

Profit and Loss

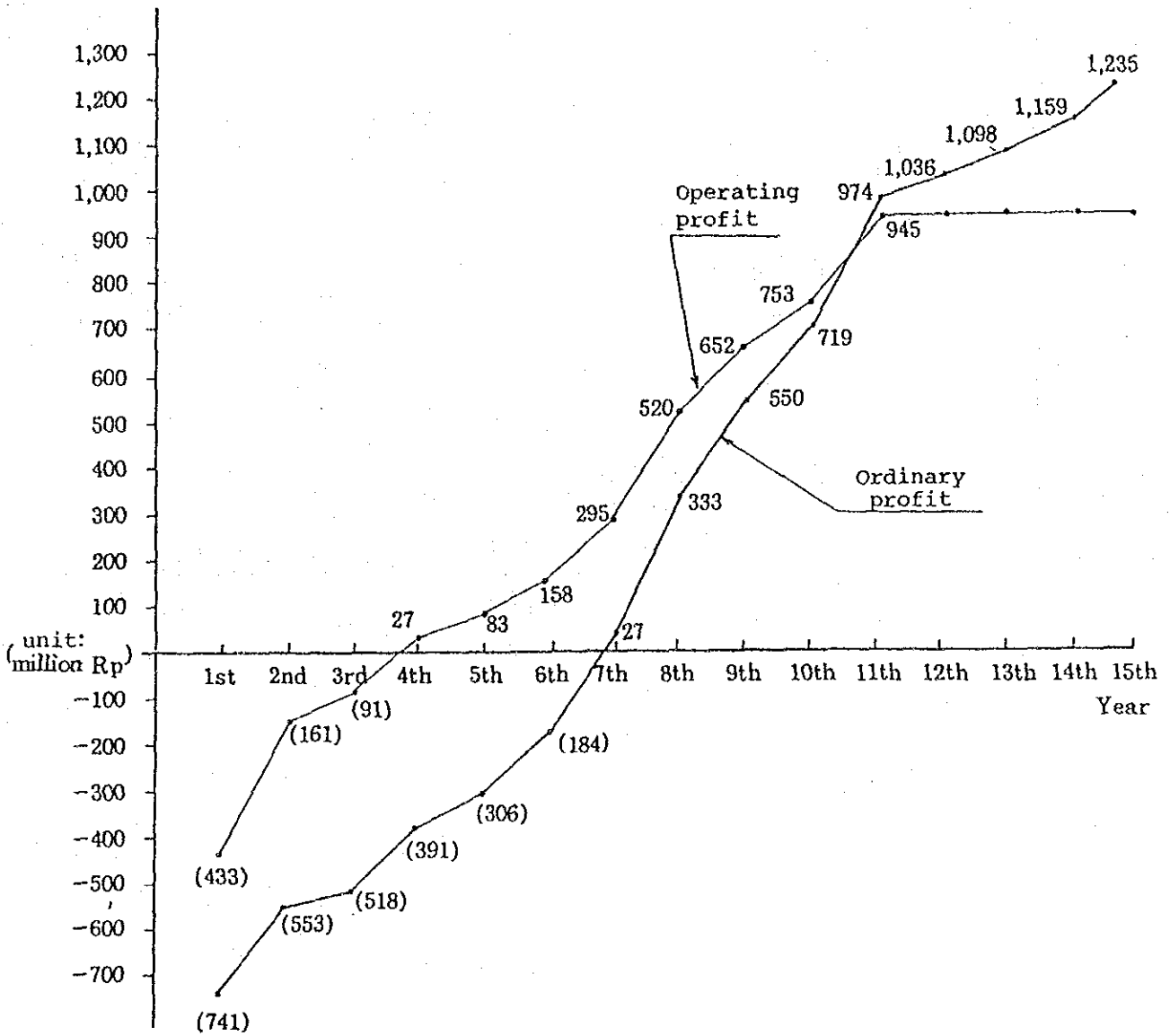


Fig. 7.6.2-1 Change in Profit and Loss in Case "A"

Profit and loss

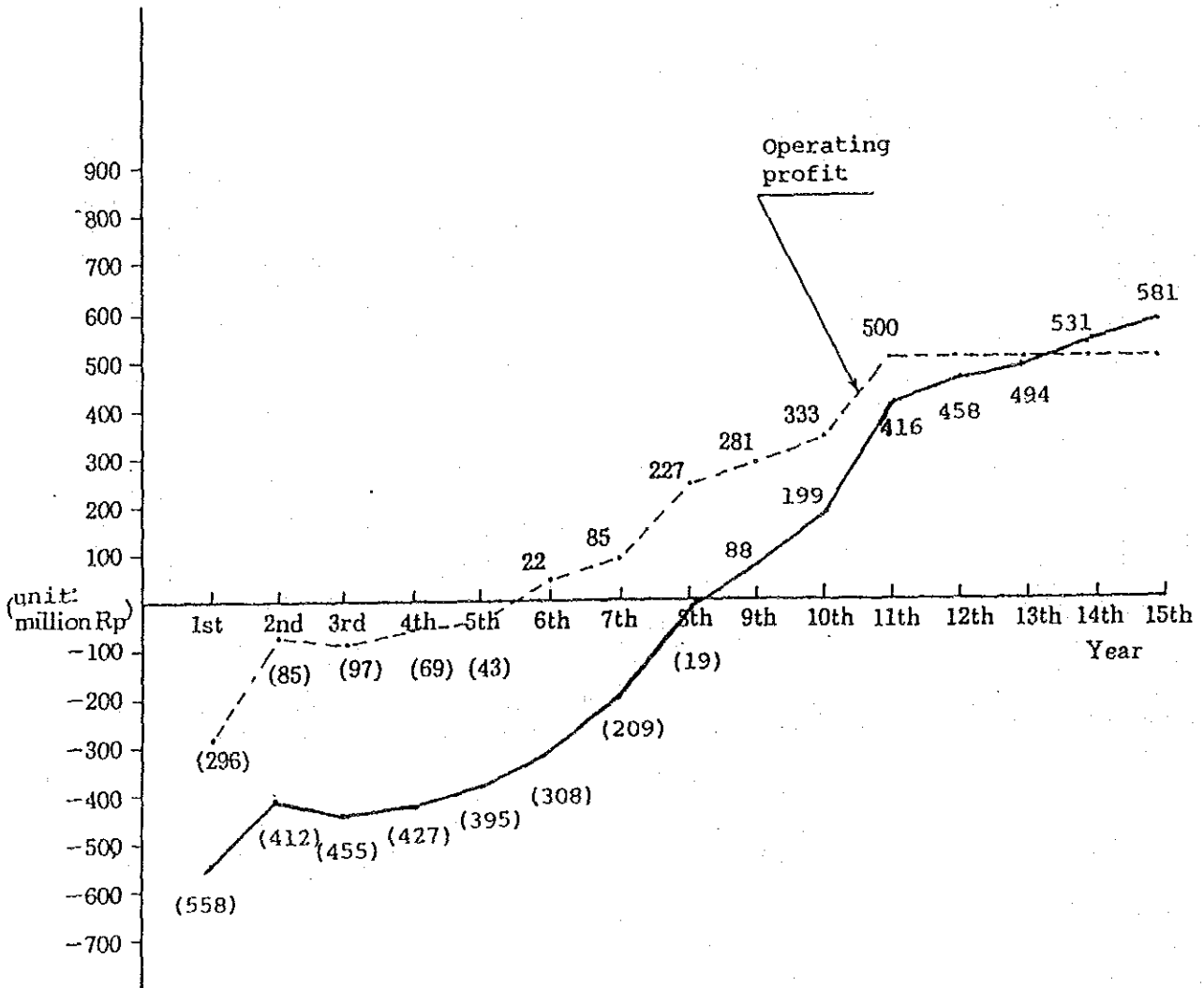


Fig. 7.6.2-2 Change in Profit and Loss in Case "B"

(Unit: Million Rp.)

(value Added per capita,
unit: 1,000 Rps)

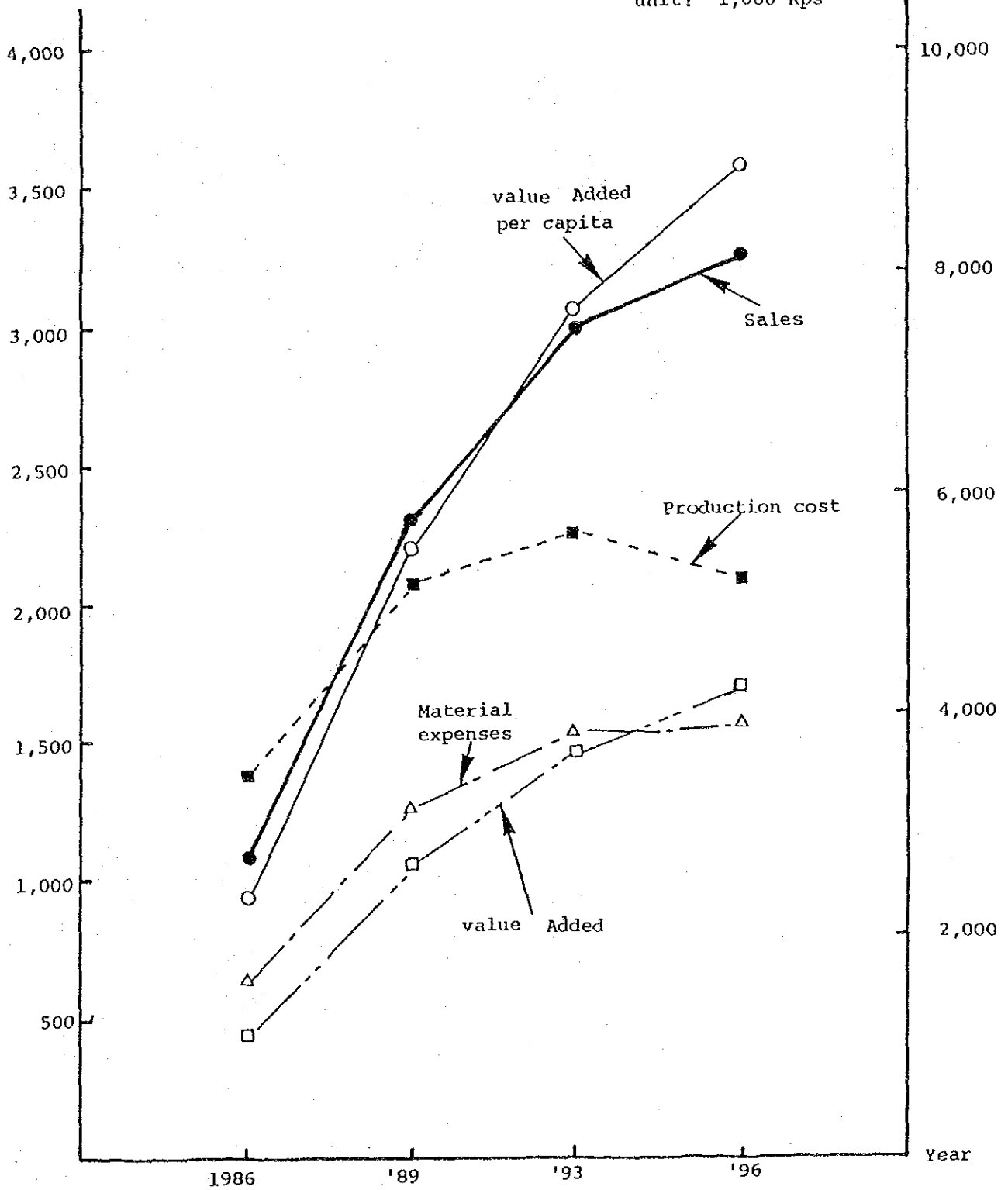


Fig. 7.6.2-3 Change in Profitability and Productivity (Case "A")

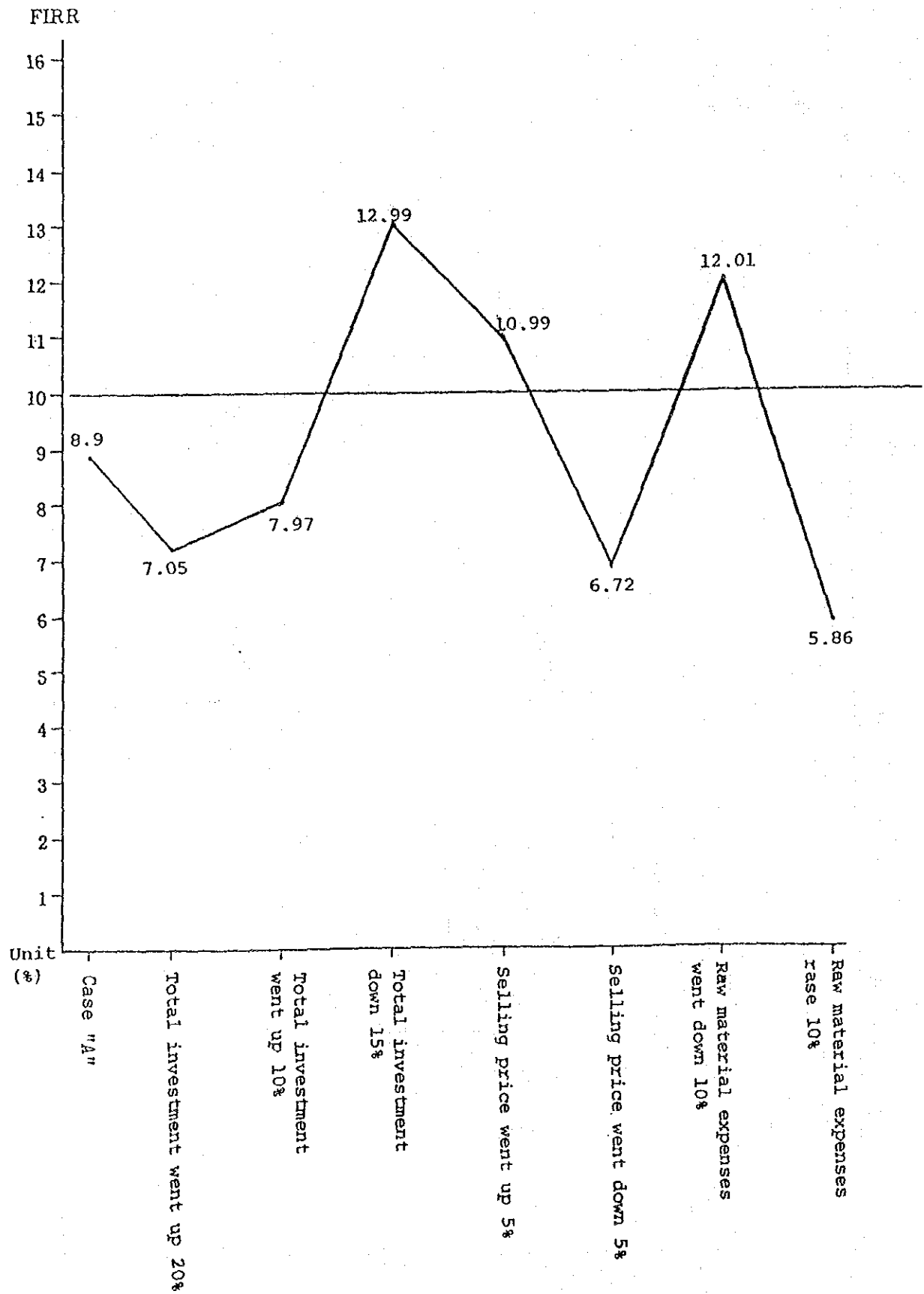


Fig. 7.6.3-1 Sensitivity Analysis (Case "A")

When the selling price rises 5%, FIRR becomes 10.99%, and when 5% reduced, FIRR becomes 6.72%.

When the raw material expenses goes down by 10%, FIRR goes up to 12.01%, and when rises 10%, FIRR drops to 5.86%.

Fig. 7.6.3-1 shows the result of sensitivity analysis.

7.6.4 Break-even point analysis

Break-even point analysis for Case "A" was conducted for the following three years:

1989 : Owing to renovation, the depreciation burden of major machinery and equipment, of technical guidance expenses, and of interest payment became heavier.

1993 : There was no depreciation burden of technical guidance expenses from renovation, and also the burden of interest payment became lighter.

1996 : There was no depreciation burden of major machinery and equipment nor the burden of interest payment to be caused by renovation.

An attempt was made to allocate the expenses into variable cost and fixed cost as Table 7.6.4-1.

As Fig. 7.6.4-1 indicates, the break-even point goes down as the years roll by. In terms of production tonnage, about 3,200 tons in 1989, 1,900 tons in 1993 and 800 tons in 1996 become the break-even production tonnage. (As to the basic data, see Table 7.6.4-1).

7.6.5 Balance sheet and fund raising table

Table 7.6.5-1 and Table 7.6.5-2 show the balance sheet and the fund raising for Case "A" respectively.

Basic Data on Break-even Point Analysis (Case "A")

Table 7.6.4 - 1

(Unit: 1,000 Rp)

Item	Year	1989	1993	1996
Planned Production in ton		2,100	2,600	2,650
Variable Cost	Material expenses	1,253,946	1,536,795	1,556,144
	Utility	195,447	177,060	180,465
	Administrative, selling expenses	91,960	120,000	130,600
	Variable cost (total)	1,541,353	1,833,855	1,867,209
Fixed cost	Labor cost	185,790	185,790	185,790
	Utility	54,000	54,000	54,000
	Preservation, maintenance expenses	42,577	44,797	44,797
	Insurance premium	18,256	19,366	19,366
	Depreciation (old)	4,276	4,278	1,220
	Depreciation (new)	216,948	239,148	49,062
	Technical guidance expenses	99,456		
	Education, training expenses	11,025		
	Administrative expenses	98,385	98,385	98,385
	Interest payment (short)	207,593	53,715	(104,988)
Interest payment (long)	209,880	133,560	76,319	
Fixed cost (total)	1,148,186	833,039	423,951	

Cost Sales (Million Rp)

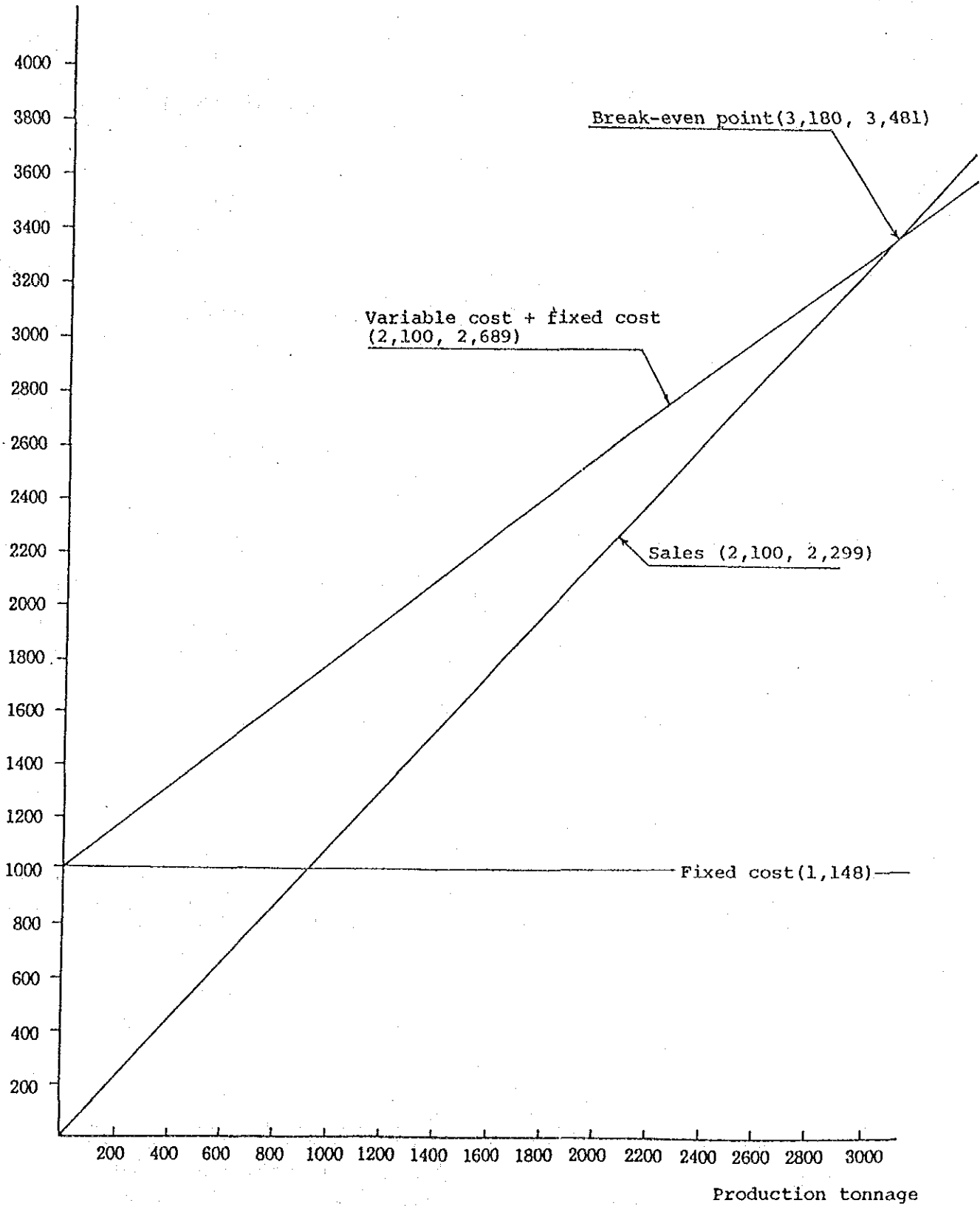


Fig. 7.6.4-1(1) Break-even Point Analysis
(Case "A") - 1989 -

Cost sales (Million Rp)

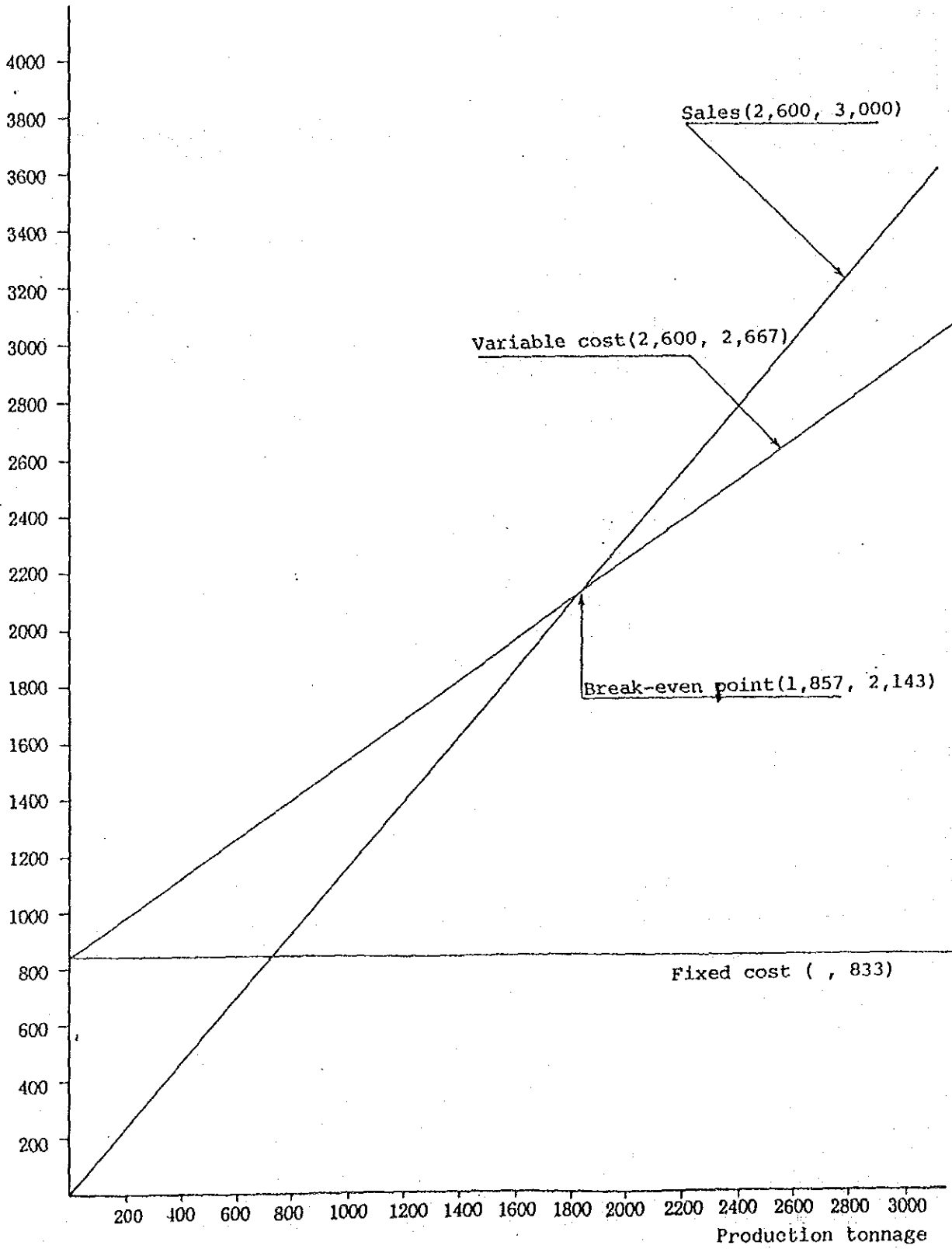


Fig. 7.6.4-1(2) Break-even Point Analysis
(Case "A") - 1993 -

Cost sales (Million Rp)

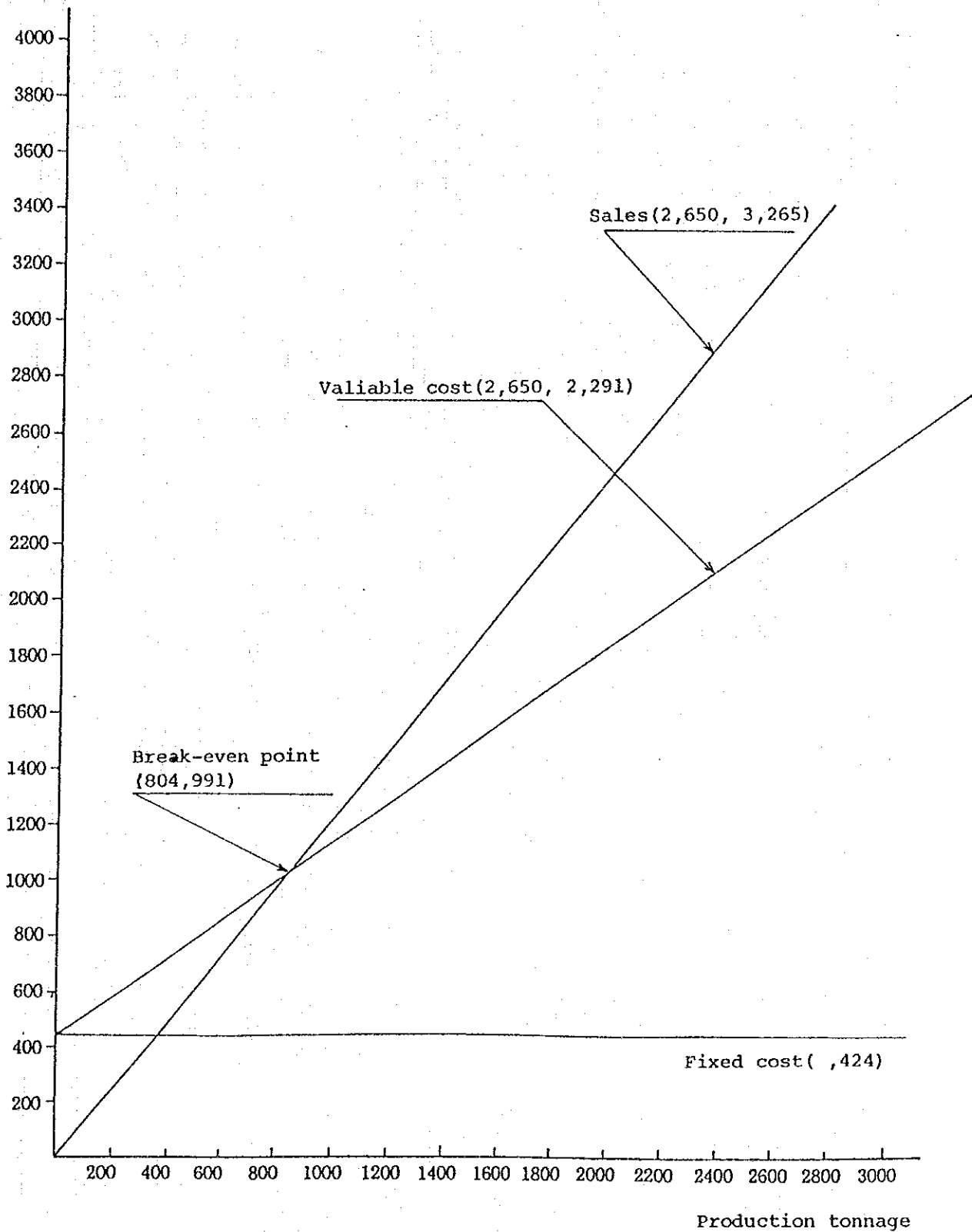


Fig. 7.6.4-1(3) Break-even Point Analysis
(Case "A") - 1996 -

Table 7.6.5-1

Estimated Balance Sheet (Case "A")

(Unit: 1,000 Rp)

Item	Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Current Assets	Cash on Hand	119,058	143,236	164,503	180,105	185,721	191,116	193,327	197,479	198,541	197,078	195,488	193,898	192,308	190,718	189,128
	Bank Deposit	91,083	129,167	164,583	191,583	203,500	218,583	233,750	250,000	263,583	272,083	272,083	272,083	2,099,020	2,566,954	3,188,222
	Account Receivable	53,902	72,470	90,706	104,496	111,338	118,645	123,524	128,066	129,891	129,679	129,679	129,679	129,679	129,679	129,679
	Inventory	284,043	344,873	419,791	476,184	500,559	528,244	550,619	573,545	726,420	1,277,288	1,752,119	2,224,020	2,693,096	3,159,434	3,779,112
	Sub-total	145,283	145,283	145,283	145,283	145,283	145,283	145,283	145,283	145,283	145,283	145,283	145,283	145,283	145,283	145,283
	Fixed Assets	2,438,106	2,438,106	2,438,106	2,438,106	2,560,106	2,660,106	2,660,106	2,660,106	2,660,106	2,660,106	2,660,106	2,660,106	2,660,106	2,660,106	2,660,106
	Building	96,396	100,670	104,944	109,220	113,496	117,773	122,051	126,329	129,880	133,422	134,642	135,862	137,082	138,302	139,522
	Machinery Equipment	216,948	433,896	650,844	867,792	1,084,740	1,303,888	1,563,036	1,802,184	2,046,332	2,290,480	2,329,542	2,378,604	2,427,666	2,476,728	2,525,790
	Accumulated Depreciation	2,270,045	2,048,823	1,827,501	1,506,377	1,507,153	1,303,728	1,120,282	876,266	654,177	391,487	341,205	290,923	240,641	190,359	140,077
	Book Value	328,560	497,280	609,605	930,729	1,052,953	1,364,160	1,539,814	1,826,118	2,392,161	2,968,993	3,318,347	3,687,681	4,247,045	4,986,073	5,809,822
	Intangible Assets	328,560	497,280	609,605	930,729	1,052,953	1,364,160	1,539,814	1,826,118	2,392,161	2,968,993	3,318,347	3,687,681	4,247,045	4,986,073	5,809,822
	Accumulated Amortization	328,560	497,280	609,605	930,729	1,052,953	1,364,160	1,539,814	1,826,118	2,392,161	2,968,993	3,318,347	3,687,681	4,247,045	4,986,073	5,809,822
	Book Value	2,598,605	2,546,103	2,228,425	1,904,745	1,806,065	1,463,184	1,120,292	876,866	634,177	391,487	341,205	290,923	240,641	190,359	140,077
	Sub-total	2,862,648	2,890,976	2,645,216	2,330,929	2,306,624	1,991,528	1,670,911	1,452,411	1,360,397	1,568,775	2,093,324	2,514,943	2,963,731	3,349,753	3,919,189
Total Assets	Current Liabilities	53,902	72,470	90,706	104,496	111,338	118,645	123,524	128,066	129,891	129,679	129,679	129,679	129,679	129,679	129,679
	Account Payable	614,399	1,084,974	1,323,204	1,383,954	1,326,255	1,145,256	765,736	358,103	0	0	0	0	0	0	0
	Short Term Loan	0	148,770	148,770	148,770	148,770	148,770	148,770	148,770	148,770	148,770	148,770	148,770	148,770	148,770	148,770
	Current Portion of L.T.L	688,501	1,304,214	1,550,679	1,535,220	1,584,363	1,400,671	1,036,048	632,939	276,661	276,449	276,449	276,449	276,441	129,679	129,679
	Sub-total	1,761,232	1,614,462	1,467,692	1,320,922	1,174,152	1,027,382	880,612	733,842	587,072	440,302	293,332	146,762	0	0	0
	Long Term Liabilities	1761,232	1,614,462	1,467,692	1,320,922	1,174,152	1,027,382	880,612	733,842	587,072	440,302	293,332	146,762	0	0	0
	Sub-total	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154	1,174,154
	Shareholders Equity	(92,190)	(162,746)	(198,461)	(207,593)	(199,538)	(170,228)	(114,860)	(53,715)	12,217	61,677	104,988	148,033	190,820	233,360	289,888
	Capital	(649,049)	(1,039,108)	(1,358,828)	(1,541,774)	(1,649,107)	(1,662,391)	(1,527,043)	(1,258,809)	(911,507)	(505,807)	22,291	547,545	1,070,316	1,590,600	2,103,518
	Retained Earning	432,915	(27,700)	(863,155)	(575,213)	(451,891)	(458,525)	(245,749)	95,630	496,864	982,024	1,523,343	2,091,732	2,657,250	3,220,114	3,789,510
	Sub-total	2,862,648	2,890,976	2,645,216	2,330,929	2,306,624	1,991,528	1,670,911	1,452,411	1,360,397	1,568,775	2,093,324	2,514,943	2,963,731	3,349,753	3,919,189
Total Liability & Equity																

() : minus

Table 7.6.5-2

Estimated Balance Sheet (Case "A")

(Unit: 1,000 Rp)

Item	Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Source of Funds																
Profit Before Tax		(92,190)	(70,856)	(35,735)	(19,112)	8,655	28,650	55,428	61,145	65,932	49,460	43,511	43,045	42,757	42,540	56,478
		(649,049)	(390,059)	(319,720)	(182,946)	(107,333)	(19,284)	142,177	366,821	537,812	657,364	868,852	887,932	907,012	926,092	945,171
Depreciation		96,396	4,274	4,274	4,276	4,276	4,277	4,288	4,278	3,541	3,542	1,220	1,220	1,220	1,220	1,200
		216,948	216,948	216,948	216,948	216,948	229,148	229,148	229,148	229,148	229,148	49,062	49,062	49,062	49,062	49,062
Amortization		0	0	99,456	99,456	99,456	99,456	99,456	0	0	0	0	0	0	0	0
Share Capital		1,174,154	0	0	0	222,000	0	0	0	0	0	0	0	0	0	0
Long Term Debt		1,761,232	(146,770)	0	0	0	0	0	0	0	0	0	0	0	0	0
		146,770	146,770	238,230	60,750	(57,699)	(190,999)	(369,520)	(407,633)	(358,103)	0	0	0	0	0	0
Short Term Debt		514,599	470,375	18,235	13,791	6,842	7,307	4,897	4,524	1,825	(212)	0	0	0	0	0
Increase in Account Payable		53,902	18,568	18,235	13,791	6,842	7,307	4,897	4,524	1,825	(212)	0	0	0	0	0
Sub-total		3,175,992	249,550	221,638	203,163	393,145	174,555	175,874	288,293	490,155	949,302	962,445	981,259	1,000,031	1,013,914	1,051,931
Uses of Funds																
Building & Machinery Investment		2,583,369	0	0	0	222,000	0	0	0	0	0	0	0	0	0	0
Deferred Assets Investment		328,560	168,720	0	0	0	0	0	0	0	0	0	0	0	0	0
Increase in Account Receivable		91,063	38,084	35,416	27,000	11,917	18,083	15,167	16,250	13,583	8,500	0	0	0	0	0
Increase in Inventory		53,902	18,568	18,235	13,791	6,842	7,307	4,897	4,524	1,825	(212)	0	0	0	0	0
Repayment on Long Term Loan		0	0	146,770	146,770	146,770	146,770	146,770	146,770	146,770	146,770	146,770	146,770	146,770	146,762	0
Increase of Bank Deposit		0	0	0	0	0	0	6,829	116,587	134,405	544,043	476,421	473,491	470,560	467,934	621,258
Income Tax Payment		0	0	0	0	0	0	0	0	192,510	251,664	340,644	362,588	384,241	405,808	452,253
Sub-total		3,056,934	225,372	200,421	197,561	387,529	199,160	173,663	284,131	489,093	950,765	954,005	982,849	1,001,571	1,020,504	1,053,521
Cash Generation		119,058	24,178	21,267	15,602	5,616	5,395	2,211	4,152	1,062	(1,463)	0,590	(1,590)	(1,590)	(1,590)	(1,590)
Cum Cash		119,058	143,236	164,503	180,105	185,712	191,116	193,327	197,479	198,541	197,078	195,468	193,888	192,208	190,713	167,128

() : minus

Both Tables clarify the following: From 1986 for six years after renovation the ordinary profit indicates a loss. And to cover this deficit the acquirement of working capital (a short-term debt) becomes important in raising the fund, which results in increasing the amount of debt on the balance sheet.

In 1993, the middle of the project implementation, the gross assets turnover (sales/gross assets) is 2.07, current ratio (current assets/current liabilities) is 91%, and tangible fixed assets turnover (the book value of sales/tangible fixed assets) is 3.4. Compared with the gross assets turnover and tangible fixed assets turnover in the Japanese casting industry, they show no great difference. Only current ratio is a half, which shows low liquidity. (As to Japan's figures, see Table 7.2.3-2).

When seen from the elapse of time, the nearer to the time of renovation, the lower the gross assets turnover and tangible fixed assets turnover and liquidity. However, in and after 1993 the financial situation gets better.

7.6.6 Analysis of JFC's renovation plan

The renovation plan which is being contemplated by JFC was pointed out several problems from the technical point in Chapter 6. The most important problem is adopting centrifugal casting process for the production of chilled roll which account for over 50 percent of total production.

From the technical point of view, this plan can not be realized, however, this plan was analyzed by taking into account the following premises by way of precaution:

1) Premises

(1) Production plan and sales plan

Table 7.6.6-1 shows the production plan and sales plan.

JFC's tentative plan of putting out 3,000 tons a year is to be attained in ten years.

(2) Investment

Investment in the building and in the invitation of instructors from a foreign country is the same with that of Case "A" of JICA's plan. Investment in the machinery and equipment involves the centrifugal casting machine, but does not include the pattern making and machining process. That would make the comparison between JICA's plan and JFC's plan meaningful by putting the both plans on the same foundation.

2) Analysis

Financial internal rate of return and the result of calculation of the net present value are shown in Fig. 7.6.6-1.

With a 5% discount rate, the net present value is 1,035,991,000 Rps. A 10% discount rate produces net present value of minus 745,211,000 Rps.

As the same as Case "A" of JICA's plan, operating profit during the first three years after operation is in the red. The investment being higher than that of JICA's plan, the interest burden is heavier.

Fig. 7.6.6-2 indicates the break-even point analysis made for three years as in Case "A". In terms of production tonnage, the break-even production tonnage is about 2,850 tons in 1989, about 2,300 tons in 1993, and some 1,000 tons in 1996.

(As to the basic data, see Table 7.6.6-3)

Table 7.6.6 - 1

Production Plan and Sales Plan
(JFC's renovation plan)

	1986	'87	'88	'89	'90	'91	'92	'93	'94	'95 - 2000
Production (ton)	1,000	1,345	1,690	2,035	2,280	2,425	2,635	2,780	2,900	3,000
Sales amount (1,000,000 Rp)	1,190	1,519.5	1,894	2,188.5	2,403	2,377.5	2,553.5	2,688	2,800	2,880

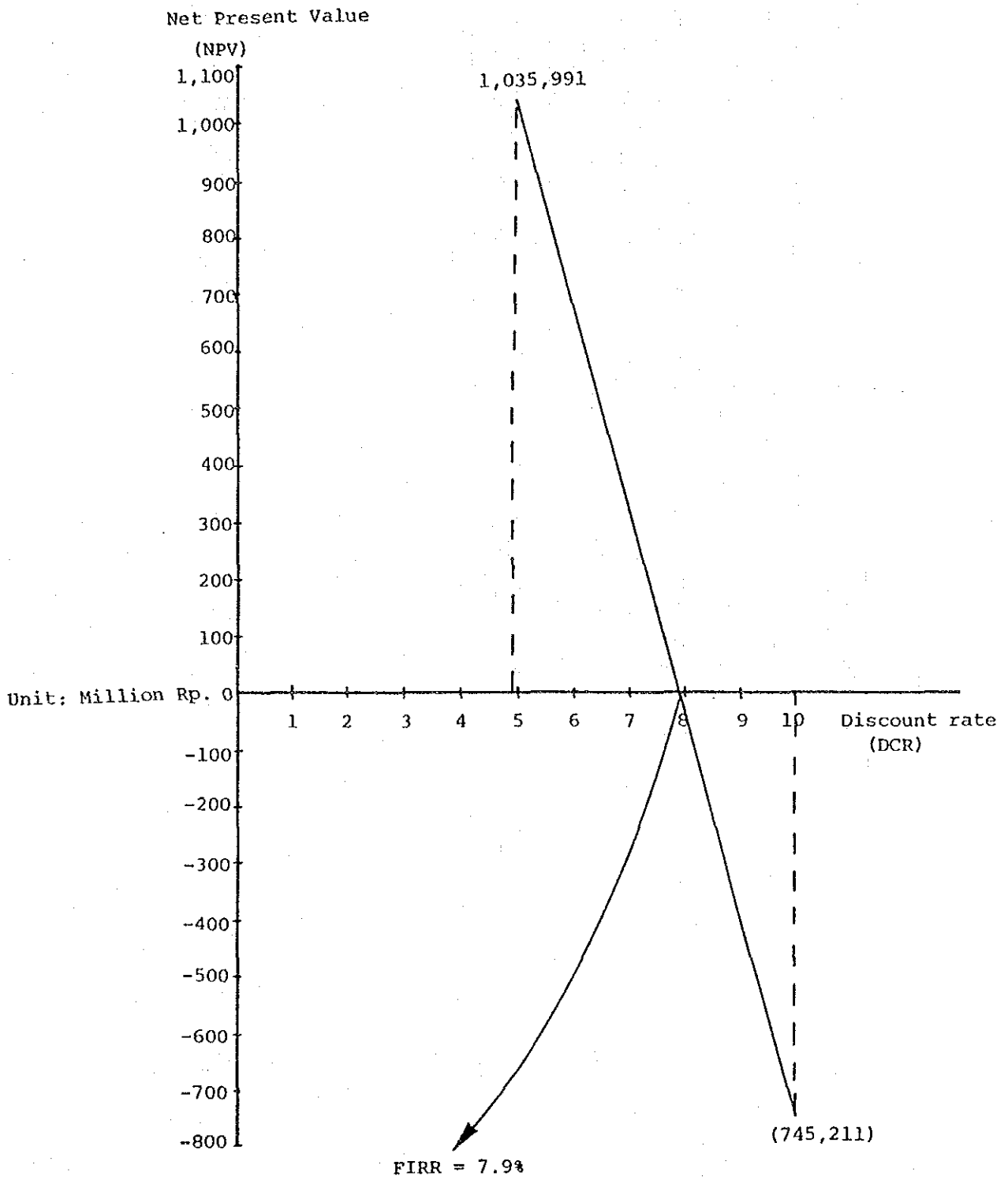


Fig. 7.6.6-1 Internal rate of return and Net Present Value (JFC's renovation plan)

Estimated Profit and Loss Statement
(JFC's renovation plan)

Table 7.6.6 - 2

(Unit: 1,000 Rp)

Item	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Sales	1,190,000	1,519,500	1,894,000	2,188,500	2,403,000	2,577,500	2,553,500	2,688,000	2,800,000	2,880,000	2,880,000	2,880,000	2,880,000	2,880,000	2,880,000	2,880,000
Production cost	1,398,572	1,470,915	1,723,315	1,885,225	1,980,834	1,989,734	2,044,455	2,014,256	2,068,627	2,110,617	1,774,308	1,774,308	1,774,308	1,774,308	1,774,308	1,774,308
Gross sales profit	(208,572)	48,585	170,685	303,275	422,166	387,746	509,045	673,744	731,373	769,383	1,105,692	1,105,692	1,105,692	1,105,692	1,105,692	1,105,692
Administrative, selling expenses	98,285	98,285	98,285	98,285	98,285	98,285	98,285	98,285	98,285	98,285	98,285	98,285	98,285	98,285	98,285	98,285
(Fixed cost)																
(Variable cost)	47,600	60,780	75,760	87,540	96,120	95,100	102,140	107,520	112,000	115,200	115,200	115,200	115,200	115,200	115,200	115,200
Operating profit	(354,557)	(110,580)	(3,460)	117,330	227,661	194,261	308,520	467,839	520,988	555,798	892,107	892,107	892,107	892,107	892,107	892,107
Interest payment (short term)	92,190	162,746	198,481	207,593	198,938	170,288	114,860	53,715	(12,217)	(61,677)	(104,908)	(148,033)	(190,820)	(233,360)	(289,838)	
Interest payment (long term)	328,042	341,202	341,202	312,769	284,335	255,901	227,468	199,034	170,601	142,167	113,733	85,300	56,866	28,433	0	
Ordinary Profit	(92,190)	(162,746)	(198,481)	(207,593)	(198,938)	(170,288)	(114,860)	(53,715)	12,217	555,798	104,988	148,033	190,820	233,360	289,838	
	(682,399)	(451,782)	(344,662)	(195,412)	(56,674)	(61,640)	81,052	268,805	350,387	413,631	778,574	806,807	835,241	863,674	892,107	

Basic Data on Break-even Point Analysis
(JFC's renovation plan)

Table 7.6.6 - 3

		(Unit: 1,000Rp.)		
Item	Year	1989	1993	1996
Planned production in ton		2,035 tons	2,780 tons	3,000 tons
Variable cost	Material expenses	877,352	1,110,635	1,189,754
	Utility	210,059	216,286	234,264
	Administrative, selling expenses	87,540	107,520	115,200
	Variable cost (total)	1,174,951	1,434,441	1,539,218
Fixed cost	Labor cost	185,790	185,790	185,790
	Utility	54,000	54,000	54,000
	Preservation, maintenance expenses	56,967	56,967	56,967
	Insurance premium	25,451	25,451	25,451
	Depreciation expenses (old)	4,276	4,278	1,220
	Depreciation expenses (new)	360,849	360,849	26,862
	Technical guidance expenses	99,456	-	-
	Education, training expenses	11,025	-	-
	Administrative, selling expenses	98,385	98,385	98,385
	Interest payment (short-term)	207,593	53,715	(104,988)
Interest payment (long-term)	312,769	199,034	113,733	
Fixed cost (total)		1,416,561	1,038,469	457,420

Cost sales (Million Rp.)

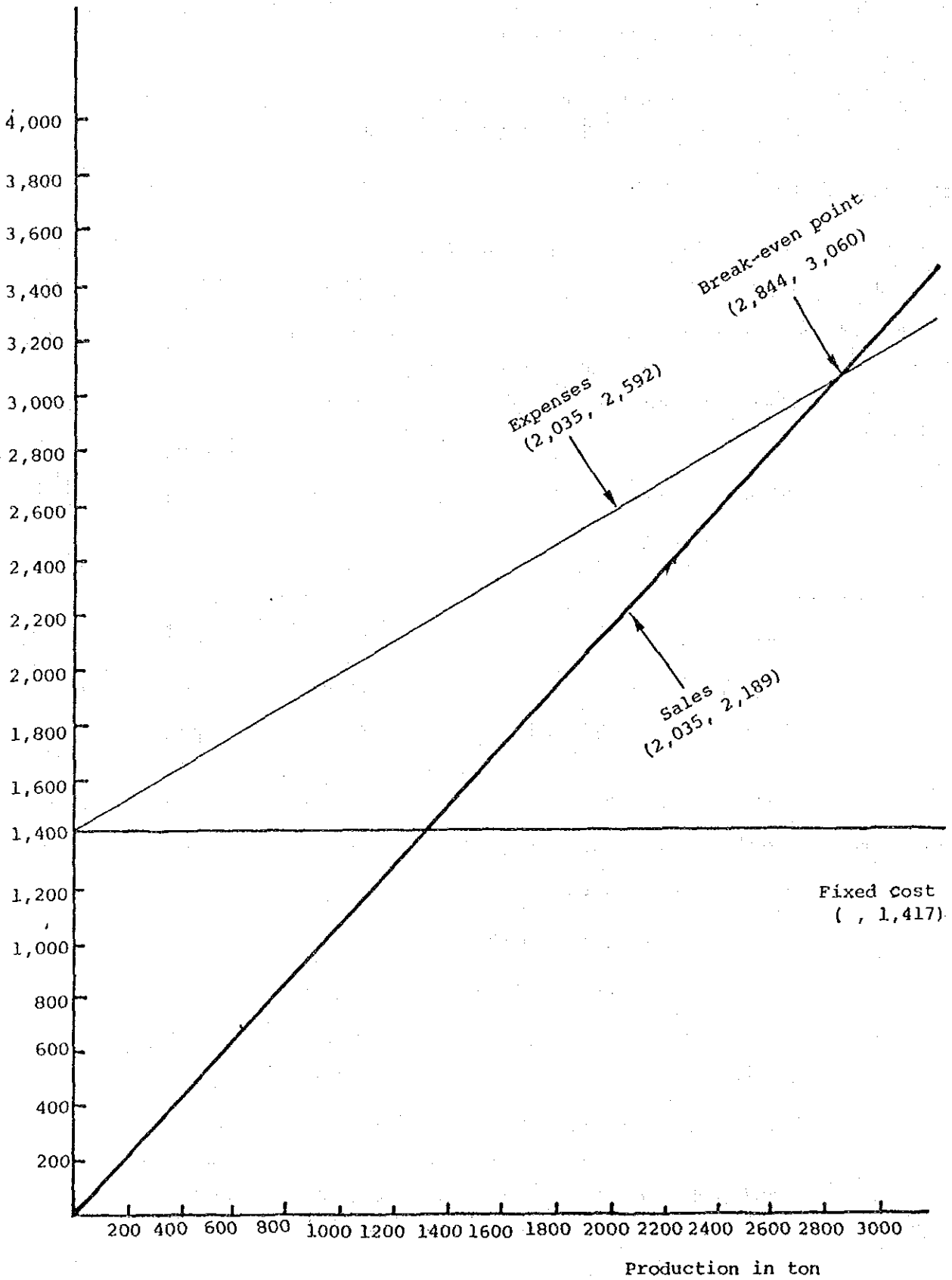


Fig. 7.6.6-2(1) Break-even Point Analysis (1989)
(JFC's renovation plan)

Cost Sales (Million Rp.)

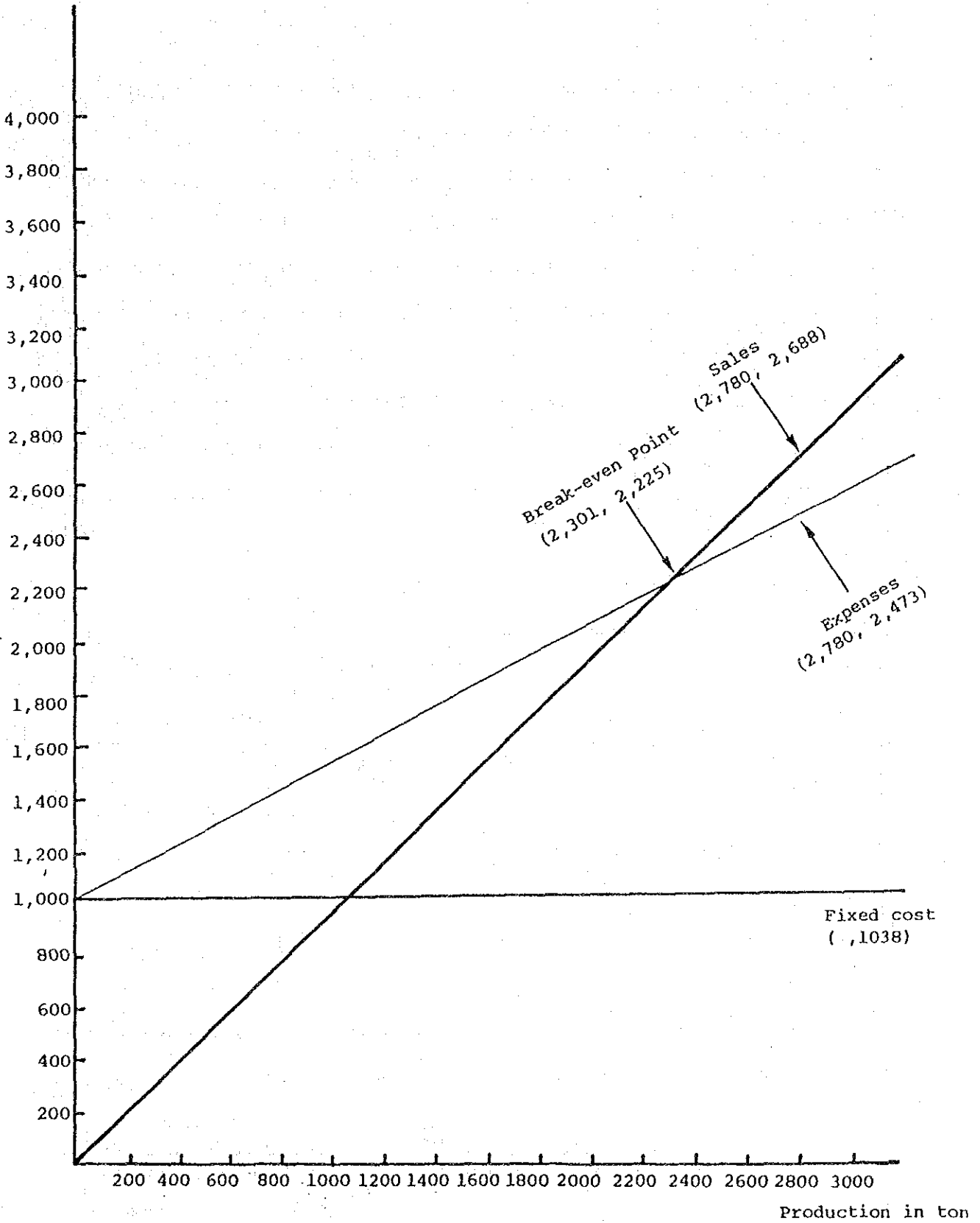


Fig. 7.6.6-2(2) Break-even Point Analysis (1993)
(JFC's renovation plan)

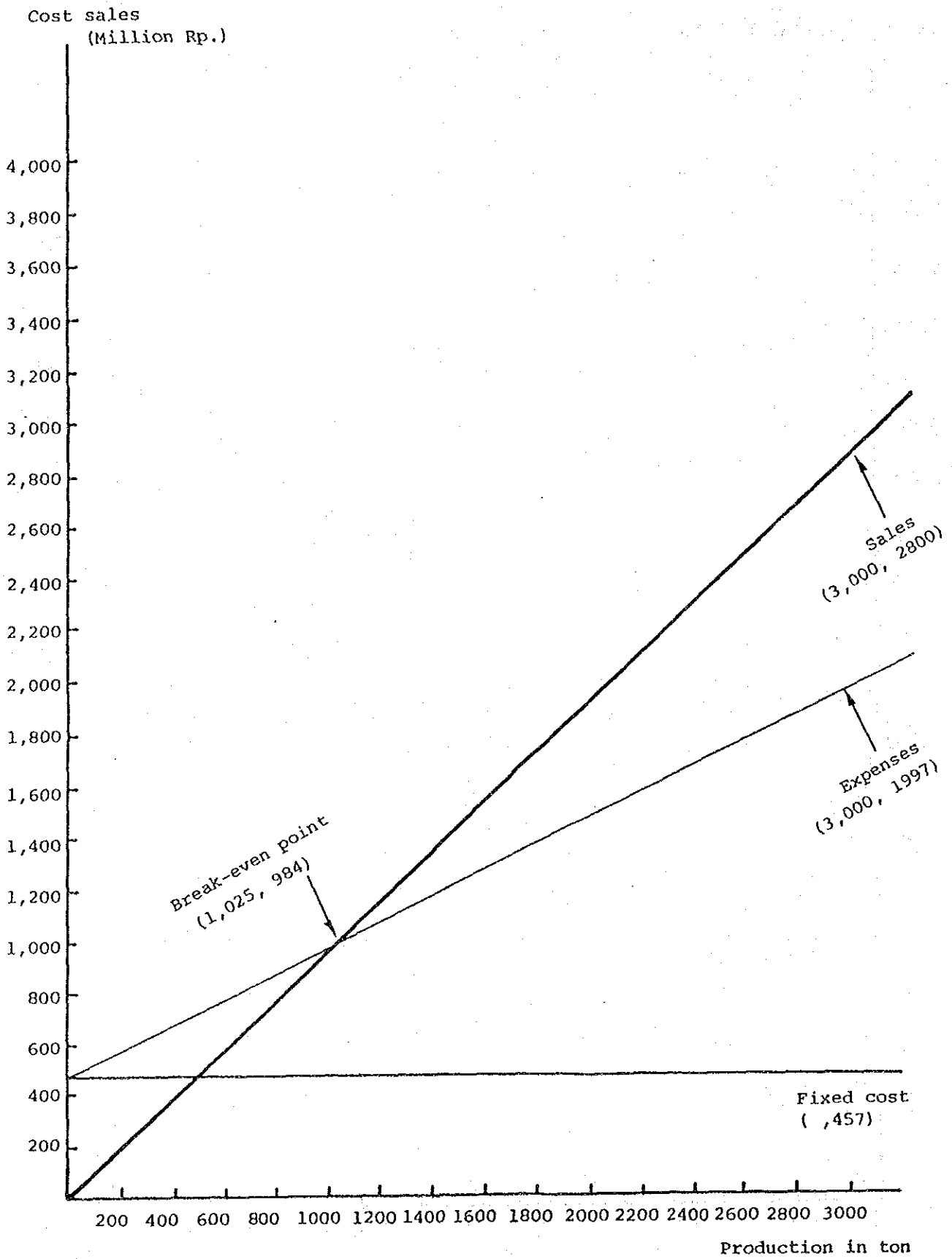


Fig.7.6.6-3 (3) Break-even Point Analysis (1996)
(JFC's renovation plan)

7.7 Conclusion

The financial internal rate of return for Case "A" is 8.9%, which is fairly close to the 10% that is generally considered the criterion for the financial feasibility of a contemplated project. The above FIRR of 8.9%, for Case "A", however, proves upon sensitivity analysis to be somewhat precarious: The FIRR will drop to around 7% upon increase of investment by 20% or upon decrease of product selling price by 5%; it will further lower by another 1% upon 10% rise of raw material cost.

While the operating profit will go into the black in 4 years from Project initiation, 6 years will pass with ordinary profit remaining in the red, on account of the heavy burden of interest on borrowed money at the rate envisaged.

This problem should be taken very seriously from the viewpoint of sound business finance.

Therefore, it is indispensable for enhancing the financial soundness of the Project and for shortening the continuous period of negative ordinary profit to do best to realize the following items.

- o To obtain financial assistance for instruction/training cost-accounting for as much as 16% of total investment-through the aid of Indonesian Government or foreign aid:
- o To procure funds for both-investment and working capital with favorable terms from Government of Indonesia or foreign country:
- o To raise the productivity by accelerating the pace of familiarization with the renovated system of operation, and by rapid mastery of foundry engineering/techniques/skills and quality control practice, combined with effective and active sales promotion for coping with very high break-even point at the outset:

It can be summarized that Case "A" adopted for financial analysis proves to be by and large feasible, and that to enhance the soundness of the Project, not only effort to raise the productivity and profitability but also to secure financial aid from government-Indonesian or foreign-should be very effective.

Similar analysis made of the renovation plan contemplated by JFC himself has yielded an FIRR of 7.9%, 1% below that of Case "A" taken up above, but still acceptably close to the 10% level. This analysis also revealed that the turning point from negative to positive would be one year later than that of Case "A". However, it should be remember that the renovation plan contemplated by JFC is infeasible from the view point of technology (Refer to Chapter 6).

In contrast to the above cases, Case "B" - assuming retention of the practice of molding with cement sand and not converting to furan sand molding - has been found to present an FIRR of 2.1% - below feasibility level.

CHAPTER 8

ECONOMIC ANALYSIS

CHAPTER 8 ECONOMIC ANALYSIS

In the previous chapter, a detailed explanation was made on the financial evaluations of the project. In this chapter, calculation was made on the economic internal rate of return and on "Modified Bruno Ratio".

8.1 Major premises for the calculation of economic internal rate of return

In financial analysis, market price is used for sales and cost. In economic analysis, accounting price is employed to compare economic benefit with cost, and calculate the internal rate of return for the evaluation of the project. In setting the economic price for the major items of benefit and cost, the following method was used.

In the case of tradable goods, it has the price fixed on the world market, which is considered to be economic value.

With regard to non-tradable goods, it theoretically should be broken down into the direct and indirect input goods for the calculations of accounting price. For this purpose, it is necessary to use the highly precise input-output data on the economy as a whole. For convenience sake, the market price was regarded here as economic value for non-tradable goods.

1) Sales price

In developed countries, JFC's product is treated as tradable goods, but because of Indonesia's economic policy, in which importance is attached to the import substitution, a large portion of the product in the renovation plan can be regarded as non-tradable goods.

Accordingly, the economic value of product was considered to be the same as the price used in the financial analysis.

2) Raw material and goods to be purchased

The raw material and goods to be bought, which are needed for the manufacturing of product under contemplation, are tradable goods. Hence, their economic value is evaluated according to the international price.

There are various kinds of raw material and goods. The price of imports includes import duties and value added tax. The price of domestic product includes value added tax.

The economic value of the raw material and goods to be purchased was treated as 90% of the market price.

3) Utility

Utility being non-tradable goods, its economic value is to be the same as the market price.

4) Personnel expenses

Labor is classified into skilled and unskilled labor.

The opportunity cost of unskilled labor is represented by the value of a marginal product, which is lost in other economic field when the unskilled labor is employed as an additional labor in the project. This is a basic idea.

However, even if the laborers to be employed for the present project are unskilled, they need to have some experience, and hence cannot be replaced by the unemployed at once.

Therefore, the wages of unskilled laborers is thought to reflect economic value, and was handled as the same as the wages used in the financial analysis. Since the salary of skilled workers including business managerial officers and technical experts is thought to have been given appropriate value, the actual personnel expenses was reckoned to be economic value.

5) Project cost

The value added tax connected with the purchase of machinery and material and a contract are transfer items in the national economy of the project cost, the economic value of equipment and building investment was regarded as 90% of the market price.

6) Other variable cost and fixed cost

The economic value of other variable cost and fixed cost was considered to be the same as the value evaluated in the market price.

7) Foreign exchange rate

In case the official foreign exchange rate does not properly reflect the value of domestic currency and international currency, the real exchange rate (shadow exchange rate) is calculated by referring to the tariff, bounty or the exchange rate at the black market, whereby the foreign currency portion of the cost and benefit is converted into local currency.

In Indonesia, the floating exchange rate system being adopted, reflecting the actual value, the official rate was reckoned to be the real exchange rate as it is.

8) Indirect benefit and cost

Some of the indirect benefit and cost cannot be calculated directly for their value. For example, the social benefit of training, and the social cost by environmental deterioration. Here, indirect benefit was supposed to be equal to indirect cost.

8.2 Economic internal rate of return and net present value

The internal rate of return, i.e. economic internal rate of return (EIRR), which was calculated with accounting price for Case "A" is 13.3%. JFC's own renovation plan shows 10.35%, and Case B 4.44%.

The result of calculation is based on the difference between the case when renovation was conducted and the case when no renovation was performed.

In Case "A", the net present value with a 10% discount rate is 602,518,000 Rps, and JFC's own renovation plan shows 83,977,000 Rps.

The EIRR of both Case "A" and JFC's own renovation plan surpasses the cut-off rate (8 - 10%), which is generally recognized as the base for judging the feasibility of a project, while Case "B" is about a half of the cut-off rate.

Fig. 8.2-1 shows the economic internal rate of return and net present value of the above three cases:

8.3 Sensitivity analysis

The sensitivity analysis of EIRR for Case "A" was calculated on the following points.

Investment cost	:	±10%
Selling price	:	±5%
Raw material cost	:	±10%

The result of sensitivity analysis is shown in Fig. 8.3-1.

The sensitivity analysis of the three cases exceeds the cut-off rate (8 - 10%).

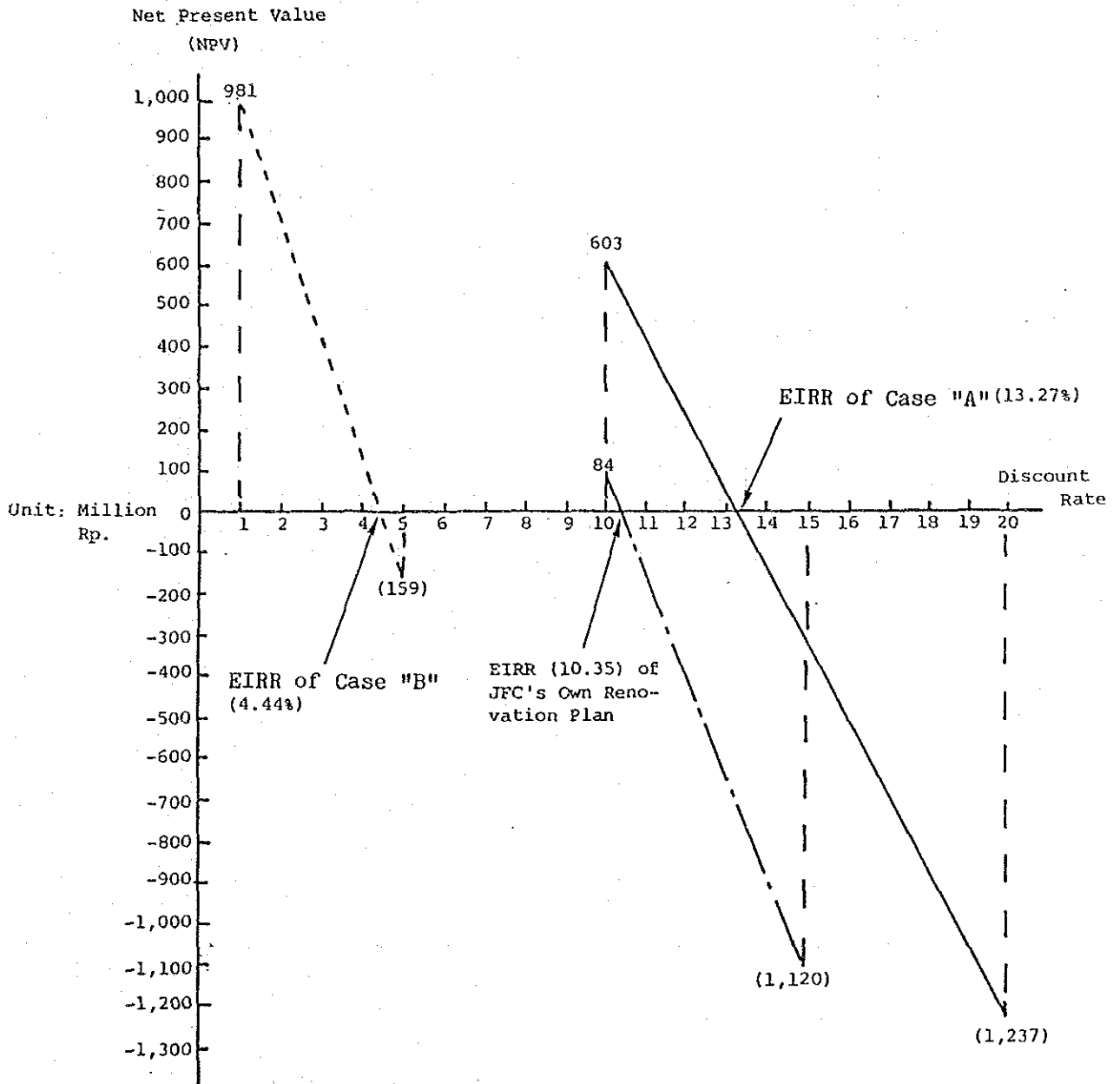


Fig. 8.2-1 Internal Rate of Return and Net Present Value

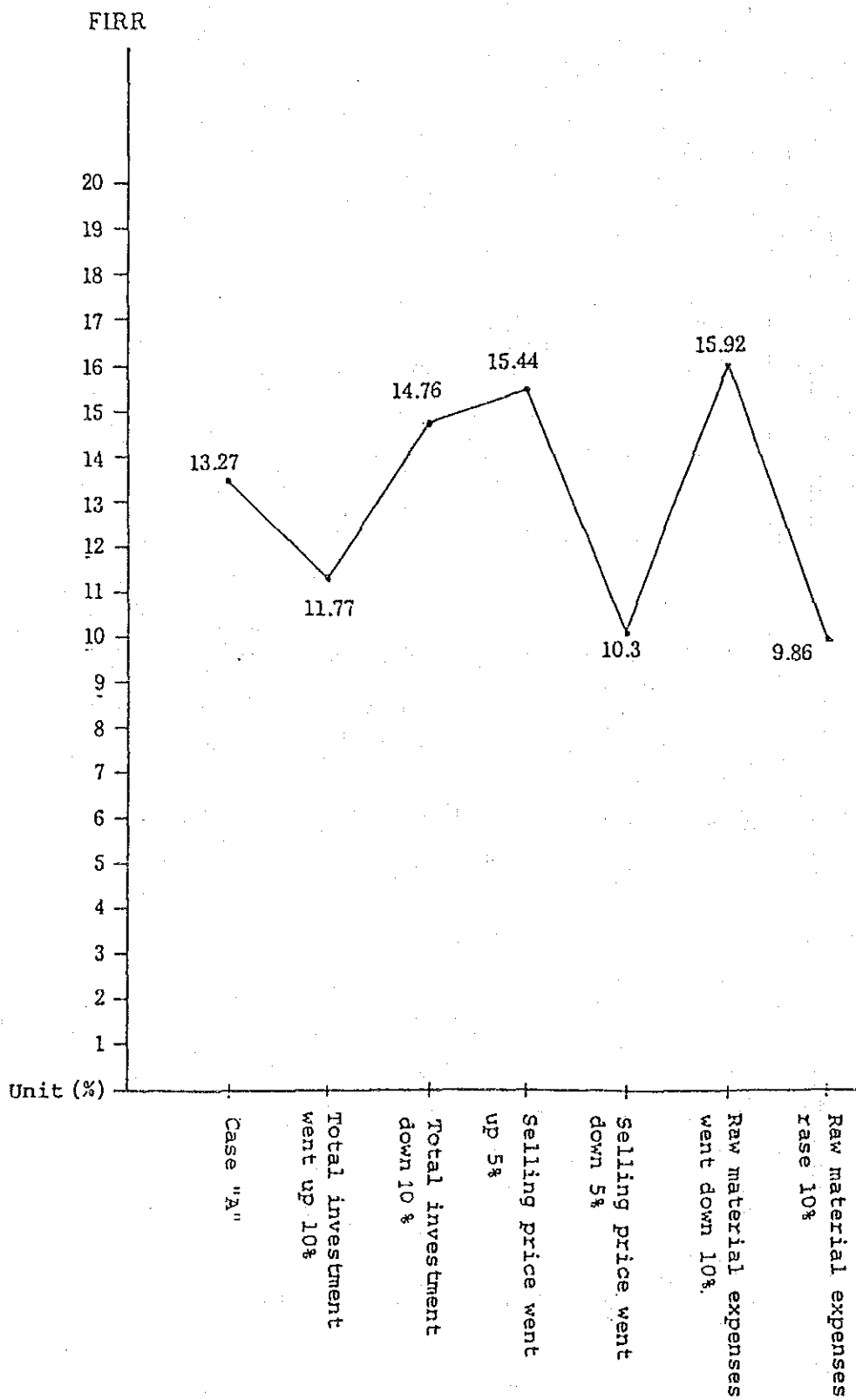


Fig. 8.3-1 Sensitivity Analysis (Case "A")

8.4 Modified Bruno Ratio (Impact of the project on foreign currency)

Modified Bruno Ratio for Case "A" was calculated on the following assumption.

- 1) Of the sales, 70% is the import substitute goods.
- 2) Of the direct material cost, 35% is import goods.
- 3) Education, training cost is all covered by foreign currency.
- 4) Other expenses are domestic cost.
- 5) Of the project investment, assumptions were made as below:
87% of machinery and equipment is a foreign currency cost. Building, civil engineering and inland transportations are all domestic cost.
Of the engineer dispatch cost, 30% is domestic cost and 70% is foreign currency cost.
- 6) Discount rate was fixed to be 10%.

The net present value of foreign currency saved during the project period is US\$7,465,000, and the domestic resource cost spent for saving the said foreign currency is 6,317,928,000 Rps. In other words, 6,317,928/7,465 being 846, the domestic resource cost of 846 Rps was used to save one dollar. This value shows less than US\$ = 1,110 Rps of the shadow exchange rate (this is the same as the official exchange rate in Indonesia). The project is quite acceptable to save foreign currency.

Modified Bruno Ratio was also calculated in the same way, supposing that the interest payment on the long-term debt was made in foreign currency. As a result, the net present value of the saved foreign currency decreases from US\$7,465,000 to 6,382,000. This means that 990 Rps is spent to save one dollar, which is less than the shadow exchange rate (US\$ = 1,110 Rps). This indicates that the project is effective in saving foreign currency.

Calculation of Modified Bruno Ratio (1)

(Unit: 1,000 Rp)

Item	Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
Sales			1,093,000	1,530,000	1,975,000	2,999,000	2,442,000	2,623,000	2,805,000	3,000,000	3,153,000	3,265,000	3,265,000	3,265,000	3,265,000	3,265,000	3,265,000	3,265,000
Equipment, building investment (After changing economic value)	2,216,463						201,818											
Technical guidance investment		328,560	168,720															
Benefit		765,100	1,085,000		1,382,500	1,609,300	1,709,400	1,836,100	1,963,500	2,100,000	2,214,100	2,285,500	2,285,500	2,285,500	2,285,500	2,285,500	2,285,500	2,285,500
Cost (direct material cost)		203,746	273,933		342,864	394,993	420,858	448,480	466,989	484,091	490,569	490,186	490,186	490,186	490,186	490,186	490,186	490,186
Cost (education, training cost)		22,049	22,049		11,025	11,025	11,025											
Cost (technical guidance investment)		229,992	118,104															
Cost (equipment)	1,196,779						142,686											
Net Earning	(1,196,779)	309,311	670,909	1,028,611	1,203,282	1,203,282	1,134,331	1,387,620	1,436,511	1,615,909	1,723,111	1,795,314	1,795,314	1,795,314	1,795,314	1,795,314	1,795,314	1,795,314
Cost (direct material cost)		378,368	508,742	636,746	733,558	733,558	781,592	832,691	867,264	899,025	911,637	910,344	910,344	910,344	910,344	910,344	910,344	910,344
Cost (other expenses)		544,038	588,184	645,602	686,415	686,415	690,773	697,938	694,768	699,398	709,323	713,403	713,403	713,403	713,403	713,403	713,403	713,403
Cost (technical guidance investment)		92,366	50,616				59,132											
Cost (equipment)	1,017,684																	
Benefit		327,900	465,000	592,500	689,700	689,700	734,600	786,900	841,500	900,000	946,900	979,500	979,500	979,500	979,500	979,500	979,500	979,500
Net Cost	1,017,684	693,094	652,542	699,848	730,273	730,273	796,697	743,929	710,552	698,423	672,260	644,247	644,247	644,247	644,247	644,247	644,247	644,247

() : Minus

Calculation of Modified Bruno Ratio (2)

Case "A" 6,317,928,000/7,465,000 = 846
 Case where interest payment to added 6,317,928,000/6,382,000 = 956

(Unit: 1,000 Rp,
 1,000 US\$)

US\$ 1 = Rp 1,110

Item	Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Foreign Net Earning (1,000 Rp)		(1,198,779)	309,311	670,909	1,028,611	1,203,282	1,134,831	1,387,620	1,496,511	1,615,909	1,723,111	1,795,314	1,795,314	1,795,314	1,795,314	1,795,314	1,795,314
Foreign Net Earning (1,000 US\$)		(1,080)	279	604	927	1,084	1,022	1,250	1,348	1,456	1,552	1,617	1,617	1,617	1,617	1,617	1,617
Discount Factor 10%			0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386	0.350	0.319	0.290	0.263	0.239
Total 7,465 (1,000 US\$)		(1,080)	254	499	696	740	625	705	692	680	658	624	566	516	469	425	386
Domestic Net Cost (1,000 Rp)		1,017,664	693,094	692,542	689,848	730,273	798,897	743,929	710,582	698,423	672,250	644,247	644,247	644,247	644,247	644,247	644,247
Discount Factor 10%			0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386	0.350	0.319	0.290	0.263	0.239
Total 6,317,928 (1,000 Rp)		1,017,664	630,022	572,040	518,076	498,776	496,115	419,576	364,513	326,164	285,038	248,579	225,486	205,515	186,832	169,437	152,575
Foreign Net Earning (1,000 Rp)		(1,198,779)	309,311	670,909	1,028,611	1,203,282	1,134,831	1,387,620	1,496,511	1,615,909	1,723,111	1,795,314	1,795,314	1,795,314	1,795,314	1,795,314	1,795,314
Interest payment on long-term debt			215,900	228,960	228,960	209,880	190,800	171,720	152,640	133,560	114,480	95,399	76,319	57,239	38,159	19,079	-
Net Earning added with interest payment		(1,198,779)	90,511	441,949	799,651	993,402	944,031	1,215,900	1,349,871	1,482,349	1,608,631	1,899,915	1,718,955	1,738,075	1,757,155	1,776,235	1,795,314
Discount Factor 10%			0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386	0.350	0.319	0.290	0.263	0.239
Total 7,084,104 (1,000 Rp)		(1,198,779)	35,001	365,060	600,538	678,494	586,242	605,768	689,406	692,257	682,060	656,167	601,648	554,446	509,575	467,150	429,080
Total converted into 6,382 (1,000 US\$)																	

() : Minus

8.5 Conclusion

The economic internal rate of return (EIRR) of Case "A" is 13.3% which exceeds 8 - 10% of the cut-off rate.

Also, the result of sensitivity analysis shows a 10% economic internal rate of return even when the premises were worsened. "Modified Bruno Ratio" also indicates that Case "A" is quite acceptable to save foreign currency.

When viewed economically, Case "A" is feasible.

On the other hand, the renovation plan, which P.T. Barata is about to push forward, has 10.35% of EIRR. Although it is 3% lower than that of JICA's plan, it is economically feasible.

However, the EIRR of Case "B" being less than 5%, a half of the cut-off rate, it is infeasible.

CHAPTER 9

CONCLUSION AND RECOMMENDATION

9. CONCLUSION AND RECOMMENDATION

9.1 Conclusion

9.1.1 Market for foundry products

The market for foundry products was estimated from:

- Review of reports from past market studies
- Analyses from global approach (global market demand/supply, future demand/supply forecast from global trends)
- Analyses from semi-individual approach (market for specific product ranges; future plans contemplated for specifically relevant branches of industry)
- Analyses from individual approach (sample survey of specific prospective customers of the Foundry Center)

The foregoing analyses indicated that demand for iron and ductile iron castings of the kinds considered adapted to manufacture at the Foundry Center would be expected to amount to:

6,505 tons/year in 1986 (first year of Renovation Project)

17,371 tons/year in 1995 (last year of Renovation Project)

hence, quite ample as market for the Foundry Center projects.

9.1.2 Management

The financial examination of JFC has revealed that the accumulated losses (1975 to 1984) amounted to 2,819,016 thousand rupiah.

To fill this deficit, the top management should improve business activities urgently on their own responsibility.

9.1.3 Technological capability of the Foundry Center

Requisite enhancement of the Foundry Center's technological capability to ensure improved product quality and operational productivity, as well as to advance into the manufacture of higher value-added products, is considered realizable through effective implementation of such measures as;

- Technical assistance obtained from highly industrialized country with assignment to the Foundry Center of instructor engineers/technicians during prescribed periods, and assignment of Foundry Center technical staff and foremen technicians to foundries abroad, for instruction/training in basic foundry engineering and practice. Training and guidance in the practical aspects should be furnished largely through on-the-job training.
- Use of furan sand molding process
- New installation of minimum equipment necessary for furan sand molding process, and for replacing delapidated equipment.

The foregoing measures are expected to raise the total production rate to:

1,000 tons/year in the 1st year of Renovation Project

1,800 tons/year in the 3rd year of Renovation Project

2,400 tons/year in the 6th year of Renovation Project

2,650 tons/year in the 10th and last year of ditto

9.1.4 Economic and financial considerations

REPELITA IV envisages a marked development of the mechanical and basic metal industries, and this could not possibly be realized without concomitant development of the link connecting these two industries - which is the foundry industry.

This promised development of the foundry industry must be led by the Jakarta Foundry Center playing a major role.

Financial analyses of the envisaged Project has yielded a financial internal rate of return of 8.9%, which is acceptable close to the generally acknowledged financial feasibility criterion of 10%.

The corresponding economic internal rate of return proves to be 13.3%, well above the generally accepted cut-off rate of 8 to 10%. The implementation of the Project is also indicated to be highly contributive to curbing foreign currency outflow.

The foregoing observations lead to the conclusion that the Project, as envisaged in this Report, is feasible.

Further, in order to improve the financial soundness of the Project by raising the FIRR, and thereby to further enhance financial feasibility, it is considered extremely effective to obtain financial support from the Indonesian Government or from abroad.

9.2 Recommendation

The recommendations presented in the relevant parts of the present Report are recapitulated below.

- (1) The current renovation plan contemplated by the Jakarta Foundry Center calls for reconsideration.
- (2) Determined efforts are required of the Foundry Center executives to enhance their capabilities for practical administration and for critical evaluation of business performance.
- (3) Those in managerial position (Department Managers and above) require taking instruction courses for acquiring the techniques and for learning the significance of management, production, quality and cost in their day-to-day functions.
- (4) The personnel organization for sales promotion requires to be strengthened, and firm production programs to be established.
- (5) Foundry techniques require to be assimilated, mastered, and further developed, with the view of improving product quality.
- (6) In-house production standards governing foundry techniques, work procedures and materials require to be established and enforced.
- (7) A Foundry Technique Training Center should be established within the Jakarta Foundry Center.
- (8) Closer ties of collaboration should be established with governmental technical and research institutions like the MIDC and ITB, with a view to exchanges of technical information including practical technique and to undertaking joint research and development projects.
- (9) The foundry equipment maintenance organization calls for re-examination.
- (10) Orderliness and tidiness of the shop floor, and the general working environment calls for improvement and maintenance in better order.

ATTACHMENT 1

**MEMBER LIST OF THE FEASIBILITY
STUDY TEAM AND COUNTER-PARTS**



ATTACHMENT-1

MEMBER LIST
OF
THE FEASIBILITY STUDY TEAM
AND
COUNTER-PART
ON THE PLANT (JAKARTA FOUNDRY CENTER)
RENOVATION PROJECT
IN
THE REPUBLIC OF INDONESIA

Feasibility study team members by JICA:

<u>NAME</u>	<u>ASSIGNMENTS</u>	<u>TITLE & COMPANY</u>
Mr. Isamu TAKI	Leader	Advisor, Ishikawajima-Harima Heavy Industries Co., Ltd.
Mr. Masayoshi TAKAHASHI	Planning	Manager, Project Division, IHI International Ishikawajima-Harima Heavy Industries Co., Ltd.
Mr. Norio OKAWA	Marketing Quality-Control	Manager, Consultant Group, IHI International, Ishikawajima-Harima Heavy Industries Co., LTD.
Mr. Yhukinori SAWAI	Utilities; Infrastructure	Manager, Consultant Group, IHI Interantional, Ishikawajima-Harima Heavy Industries Co., LTD.
Mr. Katsushi MIYAMOTO	Financial/ economic analysis; Laws and Policy; Marketing	Manager, Project Division, IHI International, Ishikawajima-Harima Heavy Industries Co., Ltd.
Mr. Tsuneo TAKEUCHI	Process and Equipment Engineering	Manager, Consultant Group, IHI International, Ishikawajima-Harima Heavy Industries Co., Ltd.

Counter Part Members

<u>NAME</u>	<u>TITLE & ORGANIZATION</u>
Ir. H.M. Toybi	Director of Basic Metal Industries, Ministry of Industry
Ir. H. Afandi Dachlan	Director of Machinery Industries, Ministry of Industry
Ir. H. A. Hutagalung	Head sub directorate of development program
Ir. Maman Abdurochman	Head sub directorate of industrial facilities
Ir. Syahbandi Hossen	Staff
Ir. Endang Dahlan	Staff
Ir. Batubara B.	Staff
Ir. Hadi Prabowo	Staff
Ir. Marthe Palebangan	Staff
Ir. Massaruddin	Staff
Ir. Arif Wigaksono	Staff
Ir. A. Prajitno	Director of P.T. BARATA INDONESIA
Ir. S. Dardjan	Executive Manager of Foundry Center Group
Ir. Z. H. Nanang	Branch Manager of Jakarta Foundry Center
Ir. Mosulich	Factory Manager of Jakarta Foundry Center

ATTACHMENT 2

**MINUTES OF MEETING
(ON THE SCOPE OF WORK
FOR THE FEASIBILITY STUDY)**

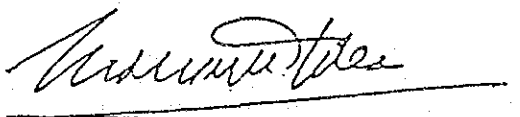
MINUTES OF MEETING

The Japanese Preliminary Survey Team sent by the Japan International Cooperation Agency (JICA) and the Directorate General of Machinery and Basic Metal Industries (DGMEMI) had a series of discussions during the period from February 14 - 20, 1985 on the "Scope of Work for the Feasibility Study on the Renovation of Jakarta Foundry Center in the Republic of Indonesia" which was signed on February 21, 1985.

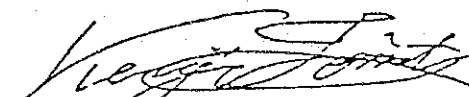
In that connection, the followings are the main subjects mutually discussed:

1. Field Work of the Feasibility Study in Indonesia will be implemented before Idul Fitri (June 20 & 21, 1985).
2. Indonesian side emphasized the importance of market survey for Jakarta Foundry Center in the Feasibility Study.
3. The prospect of market for Jakarta Foundry Center was shown from the Indonesian side as attached.

Jakarta, February 21, 1985



IR. E. M. TOYIB
Director of Basic Metal
Industry, DGMEMI



DR. KENJI TOMETA
Leader of the Preliminary
Study Team, JICA

Attached:

Prospect of Market for Jakarta Foundry Center

1. Mining(Slurry pump, ingot. mould, etc.)	400 Tons/Year
2. Agricultural Machinery(Gear Box, Fly wheel, Cylinder liner & head)	120 "
3. Machine Tool(Parts)	100 "
4. Automobile(Press dies)	100 "
5. Ship Building(Anchor)	100 "
6. Steel Making(Chill roll, coupling & spindle)	600 "
7. Railway(Shoulder)	300 "
8. Counterweight	200 "
9. Others(Man Hole Cover)	500 "

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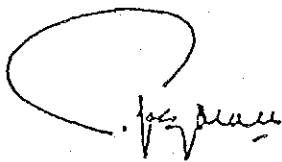
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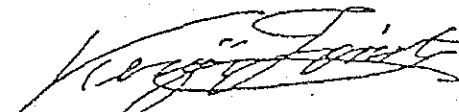
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SCOPE OF WORK
FOR
THE FEASIBILITY STUDY
ON
THE RENOVATION OF JAKARTA FOUNDRY CENTER
IN
THE REPUBLIC OF INDONESIA
AGREED UPON BETWEEN
THE DIRECTORATE GENERAL OF MACHINERY AND BASIC
METAL INDUSTRIES, MINISTRY OF INDUSTRY
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

JAKARTA, FEBRUARY 21 , 1985



IR. EMAN YOGASARA
DIRECTOR GENERAL OF MACHINERY
AND BASIC METAL INDUSTRIES,
MINISTRY OF INDUSTRY



DR. KENJI TOMITA
LEADER OF THE PRELIMINARY STUDY TEAM,
THE JAPAN INTERNATIONAL
COOPERATION AGENCY

I. INTRODUCTION

In response to the request of the Government of the Republic of Indonesia (hereinafter referred to as "GRI"), the Government of Japan decided to implement a study on the renovation of Jakarta Foundry Center (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, The Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the study, in close cooperation with the authorities of Indonesia.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVE OF THE STUDY

The objective of the Study is to diagnose the Jakarta Foundry Center (hereinafter referred to as "the Center"), and to investigate the possibility of its renovation from technical, economic, and financial points of view and prepare the report.

III. SCOPE OF THE STUDY

In order to achieve the above objective, the Study will cover the following items :

1. Present situation of and national policy on casting industry in Indonesia including the development program of the Center.
2. Diagnosis of management for the Center
 - 2-1 operation
 - 2-2 quality control

- 2-3 maintenance of machinery and equipment
- 2-4 cost control
- 2-5 administration
- 2-6 education and training
- 3. Technical diagnosis of machinery and equipment of the Center
 - 3-1 production machinery and equipment
 - 3-2 power and electricity
 - 3-3 building and structures
 - 3-4 auxiliary facilities
- 4. Study on raw materials
- 5. Survey of domestic market requirement
- 6. Formulation of renovation program

The renovation program for the Center and its formulation will be formulated on :

- 6-1 renovation plan
- 6-2 capital requirement
- 6-3 training plan
- 6-4 implementing schedule
- 7. Financial analysis
- 8. Economic evaluation
- 9. Conclusion and recommendation

IV. STEPS AND SCHEDULE OF THE STUDY

1. Steps

- Step 1 : preparatory office work in Japan
- Step 2 : Field work in Indonesia
- Step 3 : Home office work in Japan
- Step 4 : Presentation of and discussion on The Draft Final Report

2. Schedule

The tentative schedule of the Study is as shown in The Appendix.

V. REPORTS

JICA shall prepare and submit the following reports in English to GRI within the time periods indicated below :

1. Progress Reports at the end of step 2 : 10 copies
2. Draft Final Reports and its summary within 4 (four) months after commencement of the step 3 : 15 copies
3. Final Reports and its summary within 2 (two) months after the receipt of comments on the Draft Final Report by GRI : 30 copies

VI. UNDERTAKING OF THE GOVERNMENT OF INDONESIA

1. To facilitate smooth conduct of the Study, GRI shall take necessary measures :

- (1) to secure the safety of the Japanese study team,
- (2) to permit the members of the Japanese study team to enter, leave and sojourn in Indonesia for the duration of their assignment therein, and exempt them from alien registration requirements and consular fees,
- (3) to exempt the members of the Japanese study team from taxes, duties and any other charges on equipment, machinery and other materials brought into Indonesia for the conduct of the Study,
- (4) to exempt the members of the Japanese study team from income tax and charges of any kind imposed on or in connection with any emolument or allowance paid to the members of the Japanese study team for their services in connection with the implementation of the Study,
- (5) to provide necessary facilities to the Japanese study team for remittance as well as utilization of the funds introduced into Indonesia from Japan in connection with the implementation of the Study,

- (6) to secure permission for entry into private properties or restricted areas for the conduct of the Study,
 - (7) to secure permission to take all data and documents (including photographs) related to the Study out of Indonesia to Japan by the Study team,
 - (8) to provide medical services as needed. Its expenses will be chargeable on members of the Japanese study team.
2. GRI shall bear claims, if any arises against the members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese study team.
3. Ministry of Industry (hereinafter referred to as MOI) shall act as counterpart agency to the Japanese study team and also coordination body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.
4. MOI shall, at its own expense, provide the Japanese study team with the followings, in cooperation with other relevant organizations :
- (1) available data and information related to the Study,
 - (2) counterpart personnel,
 - (3) suitable office space with necessary equipment in Jakarta,
 - (4) credentials or identification cards,
 - (5) adequate number of interviewers to collect the data of firms.

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VII. UNDERTAKING OF JICA

For the implementation of the Study, JICA shall take the following measures

1. to dispatch, at its own expense, study teams to Indonesia,
2. to pursue technology transfer to the Indonesia counter part personnel in the course of the Study,

VIII. CONSULTATION

JICA and MOI shall consult with each other in respect of any matter that may arise from or in connection with the Study.

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Appendix

Tentative Schedule of the Study

Year & Month Items		1985											
		Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.			
Preparatory Office Work (Step 1)													
Field Work (Step 2)													
Home Office Work (Step 3)													
Presentation of Draft Final Report (Step 4)													
Submission of Final Report												△	

in Japan
 in Indonesia



ATTACHMENT 3

**MINUTES OF MEETING
(ON THE FIELD SURVEY
FOR THE FEASIBILITY STUDY)**

MINUTES OF MEETING

The Japanese Feasibility Survey Team (hereinafter referred to as "the Team") led by ISAMU TAKI organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") visited the Directorate General of Machinery and Basic Metal Industries (hereinafter referred to as "DGMBMI") from May 30 to June 18, 1985 in order to work out the Feasibility Study on the renovation of Jakarta Foundry Center (hereinafter referred to as "the Project") based on the Scope of Work for the Feasibility Study of the Project which was signed on February 21, 1985.

During its stay in the Republic of Indonesia, the Team exchanged views, conducted site surveys and also had a series of discussions with the Indonesian authorities concerned for the Feasibility Study of the Project.

As a result of the site surveys and discussions, the Team prepared the Minutes of Meeting for which our tentative proposal for JFC renovation plan based on site survey is specified as per attached Appendix and submitted 10 copies of Progress Report to Indonesian counterpart, DGMBMI. The Tentative proposal prepared by JICA team was approved by DGMBMI and P.T. Barata JFC.

Followings are special requests for the JFC Renovation plan by DGMBMI.

- 1) Practical training facilities including hardware and software should be included due to increasing demand for human resources in casting industries in Indonesia. Those will be utilized for retraining of JFC employee and then for practical training center of human development in casting industry in Indonesia later.

- 2) Packaged technology transfer plan including foreign expert dispatch, training in Developed country like in Japan and supply of facilities and equipments should be formulated for further development of technology in JFC.
- 3) Renovation plan has to be software oriented programme and include melting method instruction for making bigger size of molds in Gresik foundry center because JICA team strongly recommended not to make them in JFC due to various reasons.
- 4) Master plan of casting industry development in Indonesia could be included as much as possible.
- 5) Present on-going renovation plan should be reviewed and amended if necessary, in order to keep consistency between present on-going renovation plan and JICA renovation plan.

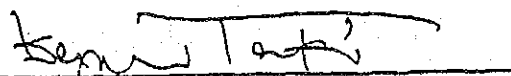
The Team promised to make their best effort to prepare the Final Report after return to Japan and expressed that the Draft Final Report will be submitted by the early of October to DGMBMI.

The Team would like to put on record their sincere appreciation for the warm hearted welcome and cooperation extended to them by the Republic of Indonesia during their stay in Indonesia, and were able to collect enough data to enable them to carry out the study on an effective and efficient manner.

Jakarta, dated June 17, 1985



Ir. H.M. TOYIB
Director of Basic Metal
Industry, DGMBMI



ISAMU TAKI
Leader of the Feasibility
Study Team, JICA

ATTACHMENT 4

**TENTATIVE PROPOSAL ON THE
RENOVATION PLAN FOR JAKARTA
FOUNDRY CENTER BASED ON THE
SITE SURVEY**

ATTACHMENT-4

APPENDIX

TENTATIVE PROPOSAL
ON
THE RENOVATION PLAN
FOR
JAKARTA FOUNDRY CENTER
BASED ON
THE SITE SURVEY

JUNE, 1985

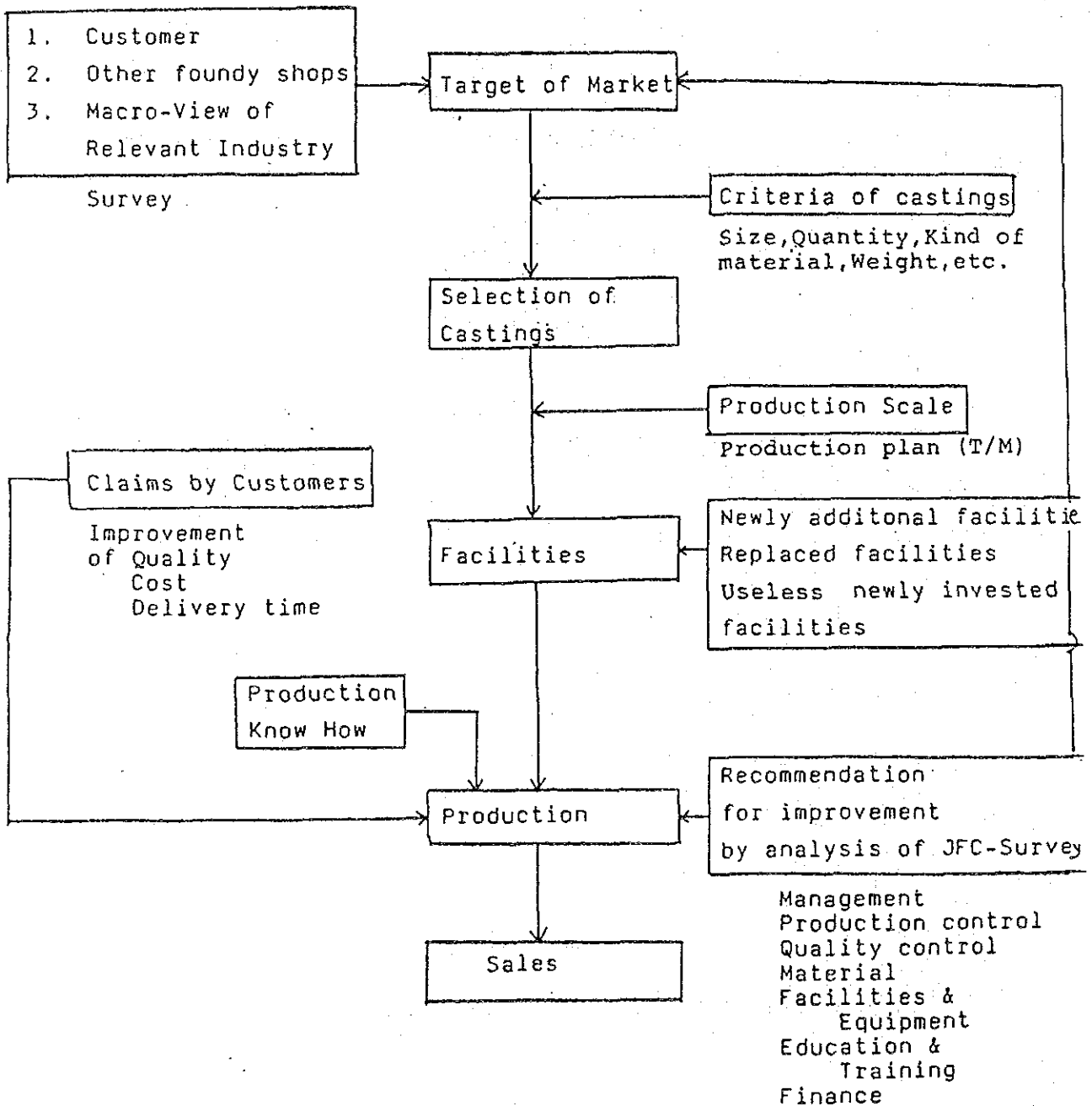
JAPAN INTERNATIONAL CORPORATION AGENCY

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1. Flow Chart for Renovation Survey



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2. Target Market

- 1) It is important to make clear the objective point of market for the production of castings in JFC.
- 2) Compromised Target Industry in the meeting at Ministry of Industry (on 1st of June, 1985) among JICA team, Ministry of Industry, P.T. BARATA and JFC.

1st priority :

- (1) Agro-based machine and equipment
- (2) Transportation
- (3) Civil and Construction
- (4) Machinery Industry
- (5) Mining & Energy

2nd priority :

- (1) Steel making
- (2) Electrical equipment

3rd priority :

- (1) Sugar
- (2) Cement
- (3) Paper mill

- 3) Enough demand could be expected in the present market through the JICA team survey, even though taking into consideration of 1st priority field.

Fore example :

- (1) Agro-based machine and equipments (Flywheel, cylinder block, etc)
- (2) Transportation
(Diesel engine parts, blocks, liner, Flywheel, cover, shoulder, brake block for rail way, etc).

- (3) Civil and Construction
(counter weight, etc.)
- (4) Machinery Industry
(Lather legs and bed, tail stock, guiar cover, etc.)
- (5) Mining & Energy
(Pump case, cover, impellor etc.)
- (6) Others
(pipe fitting, bubble cap, wheel head, christmass tree, etc.)

3. Opinions for problems by Customers for the Casting made in JFC., and the Suggestion for the Counter Measures

1) Quality :

<u>Opinion</u>	<u>Suggestion</u>
(1) Rugged surface (Rough) of Castings	1) Improvements of Workmanship 2) Improvement of molding quality i) Improvement of green sand (mix of cement sand) ii) application of Furan or pepset process
(2) Partially hard casting	1) Improvement of welding process.
(3) Dimension problems of castings	1) Improvement of pattern making 2) Improvement of molding process

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- i) Miss match
- ii) mold setting
(not correct)
- iii) Excess machining allowance (caused by shrinks, core setting etc)

(4) Porosities of castings

- 1) Improvement of pouring temperature (low)
- 2) Pouring speed (low)
- 3) Moisture of sand (high)
- 4) Core vent (not enough)
- 5) Sand strength (weak)
- 6) Ramming hardness (weak)

2) Price :

(1) JFC's sales price : 1,100 - 1,200 Rp/Kg

(2) Desirable price of customers : less than 900 Rp/Kg

Comments :

JFC's sales price seems to be 20% higher than the market price.

Reference :

Japan : 720 - 800 Rp/Kg
(for the corresponding castings)

Productivity of JFC : 70T/200 person = 0.35 Ton/person/m
: 4-5 Ton/person/m

(monthly)

(3) Delivery time

Opinion

Suggestion

- | | |
|---|--|
| 1) In case of lathe leg:
only 40% of order was
supplied during two (2)
years as good castings. | 1) It seems to have close
relation with quality
of castings

2) At first, quality of
castings should be improved
as shown in Item (I). |
|---|--|

(4) Summary of suggestions

- 1) JFC has to over-come the competition about quality, price and delivery time in all.
- 2) It is necessary for JFC to recommend soft wares such as management, production control, production technology, Know-How, at first.
- 3) Facility and equipment investment should be minimized.
- 4) Kind of casting and the size should be carefully selected in the present market.
- 5) Some castings which should be localized in near future should be selected for further effective market creation linked with Government policy.
- 6) Production control might be well organized and controlled
 - i) production plan (input) and the execution
 - ii) Out put (according to the plan)
 - iii) Quality control and feed back
 - iv) Steady improvement for claim of customers.
- 7) Size of castings might be selected, (not mix too large castings and small castings) at least

Sam



until the technology will become stable. Limit the Flask size to 1.5 m x 1.5 m and at first master the fundamental technology begin from simple castings.

8) Calculate total cost

In case of using furan sand, total cost will reduce because of improvement of productivity and quality, etc.

4. Recommendable Casting Criteria

(Basic condition for renovation plan)

	<u>Present situation</u>	<u>Proposal</u>
1) Quantity :	Many kinds of castings and small quantity.	Selected less kinds and mass production
2) Material :	SC, FC, FCD, Copper Alloy	FC, FCD
3) Size :	Not limited	1) green sand molding (FD4) 600x550 Flask (max) 2) Hand molding (Furan) 1500 x 1500 Flask (max)
4) Unit weight :	Not limited	Up to 3 Ton/piece
5) Marketing	Limited	Not Limited Study the fundamental technology for fabrication without thinking market limit

Byun

[Signature]

5. Proposal for Facilities and Equipments

The Foundry facilities and equipments in JFC are not seemed to be time-worn in general view.

Some additional facilities and equipments are recommendable as shown in below.

1) Melting :

- (1) Press machine for making scrap blocks.
- (2) Crusher for reject castings
(drop the weight and crush the casting)
- (3) Cooling tower system for compressor and induction furnaces

2) Molding :

- (1) Sand dryer
- (2) Molding plate
- (3) Existing flask maintenance & ~~bottom plate for FPA machine.~~
- (4) Improvement of band Flask (wooden flask)
(change to metal Flask)
- (5) Dust collector (bag filter type)
- (6) Compressor
- (7) Bottom plate for FD machine

3) Pattern :

- (1) Re-arrangement of Lay-out
(Seperate work shop and machine shop)
- (2) Dust collector

4) Inspection :

- (1) Surface plate (1.5 M x 2.0 M)
- (2) Dimension measurement tools
(angle plate, surface scriber, square etc.)
- (3) Dynamic balancing machine for pump, propellor, Fly wheel (B.B.I.)
(requirement by JFC)

5) Machine tools :

- (1) Machine tools for machining of flywheel, liner, slurry pump, wheel cap. etc.

6. Comment for Present Expansion Plan

Present on-going expansion plan might be reviewed in depth from the view point of utilization ratio of the facilities and equipments etc, by the team. For the time being, recommendable comments are as follows.

Recommendable exemption facilities :

1) Mould Flasks :

- (1) 3M x 3M Flasks
- (2) 2M x 2M Flasks
- (3) The relevant facilities

Reasons :

- 1) Molding and pouring space (not enough)
- 2) Turn-over of mould flask (dangerous)

7. Tentative Monthly Production Plan. (Ton/month) and the Representative Name of Castings.

1). Each molding machine and the molding line can produce at present situation as shown in below.

FD4	30 T/M
F2A	15 T/M
S. Slinger	50 T/M
Hand molding (Furan)		55 T/M
		<hr/>
		150 T/M

2) Comparison of Sales amounts (Rp)

(1) Sales plan by JFC In 1985

900 Ton/Year, Sales : 1.0 billion Rp/Year

900 T/200 person = 4.5 T/Y/P = 0.375 T/Y/P/M.

(2) Tentitive Study

150 T/M x 12 month = 1,800 T/Year

900 Rp/Kg (suppoed price) x 1,800 T/Y =

1.62 billion Rp/Year

1,800 T/Y/200p = 9 Ton/Y/person (0.75 T/M/P)

3) Expecting name of casting and the quantity (weight : Ton/M) for each molding machine.

(1) FD4 :

a) Motor cover 18 Kg x 1000 pieces = 18 Ton/Month

b) Fly whell 25 Kg x 200 pieces = 5 " / "

c) Bubble cap 3 Kg x 1000 pieces = 3 " / "

d) Showlder 1 Kg x 10.000 pieces = 10 " / "

36 Ton/Month

(2) F2A :

B.B.I cylinder 4 Kg x 4,000 pieces = 16 Ton/
Month

(3) Sand Slinger :

a) Pump Casing, Cover, Impellor.... 20 T/Month

b) Pipe fitting 20 T/Month

c) ~~Casting~~ (B.B.I) 25 Kg x 90 Unit = 2 T/Month

42 T/Month

Casing

Kaplan

(4) Hand molding :

(Furan Sand)

a) Lathe bed and leg	300 Kg x 30 Unit =	9 T/Month
b) B.B.I Fly wheel	800 Kg x 10 Unit =	8 T/Month
c) Counter weight	1,500 Kg x 80 Unit =	120 T/Month
d) Die	3,500 Kg x 3 Unit =	9 T/Month
e) B.B.I Cylinder block	300 Kg x 90 Unit =	27 T/Month
		<hr/>
		173 T/Month

Total Expected Demand :

36 Ton/Month
16 Ton/Month
42 Ton/Month
173 Ton/Month
<hr/>
267 Ton/Month

Above amounts (Ton/Month) are fully enough for the tentative target production (150 Ton/month)

8. Important Items for Renovation

1. Human training
(from the level of manager to workers)
2. Production process control
 - (1) Standardization and the execution.
for each process. (melting, sand, moulding, fettling, etc).
 - a) Facilities
 - b) Material
 - c) Method of production
 - d) Quality characteristics of casting
 - etc.
3. Maintenance control
 - (1) Control system
 - (2) Supply of spare parts (stock control)
4. Cleaning up and Arrangement of work shop and Circumstances.

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ATTACHMENT 5

CAST IRON MELTING IN ARE FURNACE

CAST IRON MELTING IN ARC FURNACE

There is no basic difference in arc furnace operation between iron and steel. Iron melting is simpler, in that there is no oxidation and refining stage. In the present instance, the furnace is envisaged to be used for both iron and steel melting, so that the furnace lining should be basic and not acid.

Combination of Melting Material

1. Combination of Melting Material

Depending on the product casting grade, the combination of the melting material is varied as given below (Table 1), with increasing proportion of steel scrap as the specified casting strength is raised.

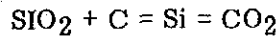
Table 1 Combination of Material by Grade

unit: %

Material Grade	Pig Iron	Return Scrap	Steel Scrap
FC 20	40	40	20
FC 25	30	35	35
FC 30	25	30	45

2. Chemical composition of Metal

The chemical composition of metal is largely determined by the grade of melting material described above in Section 1, but as already mentioned, the precise combination of melting material is subject to adjustment so as to bring the SILICON content of melt within a prescribed range. This range is 1.3 to 1.4%, whether for FC 20, 25, 30 or 35. If the Silicon content exceeds 1.4%, it will combine with oxygen to form SiO₂, whose presence will impair the fluidity of melt and accelerate its cooling. Silicon oxide will moreover react with carbon:



to undermine the purpose of recarburizer addition.

Hence, upon calculation of the aggregate silicon content of castings, if the Silicon content is found to exceed the prescribed range, the proportion of steel scrap is increased by an amount that will bring the silicon content down to the required value.

The target composition of casting for different grades are as below Table 2.

Table 2 Chemical Composition of Cast Iron by Grade

unit : %

Grade \ Element	TC	Si	Mn	Cu
FC 20	3.55 - 3.65	2.1 - 2.2	0 - 0.6	
FC 25	3.13 - 3.18	2.0 - 2.1	0.8 - 0.9	0.5
FC 30	3.13 - 3.18	1.7 - 1.8	0.9 - 1.0	0.75
FC 35	3.13 - 3.18	1.7 - 1.8	0.9 - 1.0	0.25 - 0.5

3. Melting Operations

The series of operations from power on to tapping out into ladle is charted in Fig. 1, taking as example a melt for FC30 (JIS) in 3-ton furnace. After power on the furnace, the current is turned on at relatively high power (say 160V, 6,000A for the 3-ton furnace); after melt down, current is lowered (to say 120V, 4,000A), followed by sampling, temperature measuring, slaging off, and adjustment of melt composition based on analysis of sampled melt.

During this melt adjusting phase, the melt temperature should be held in the range of 1,450 to 1,480°C. It must not be allowed to exceed 1,500°C, to prevent disappearance of graphite carbon in the melt, which will impair its fluidity, as well as waste heating power.

4. Recarburization

To ensure correct carbon content in the product casting irrespective of melting material composition, carbon is added to the melting material. In Indonesia, carbon is added in the form of the coconut charcoal. Generally the yield of carburizer will be around 50% in arc furnace melting.

5. Tapping out

5.1 Test in front of furnace

a) CE value

The CE (carbon equivalent) is measured by CE meter, to estimate the total carbon and silicon content values, as well as product casting strength. If not found within the specified range, the melt will not be used for the envisaged casting.

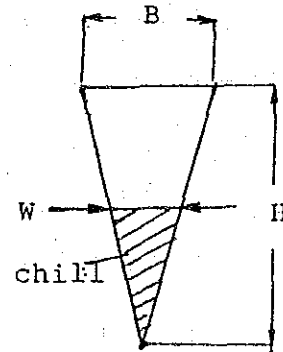
b) Chill test by wedge specimen

A wedge specimen is cast and subjected to chill test, to determine conformity of the melt. The wedge specimen is of the dimensions given below.

Table 3 Shape and Dimension of Wedge Type Specimen

unit : mm

Dimension Wedge No.	B	H	Length
W1	5.0	25.0	100.0
W2	10.0	30.0	100.0
W3	20.0	37.5	100.0
W4	25.0	45.0	100.0
W5	30.0	50.0	100.0



5.2 Inoculation

a) Inoculation

Calcium silicide or Ferrosilicon is added to the melt in ladle as inoculating agent for graphite nucleation. When putting the inoculating agent into the molten metal around 0.1 - 0.3% of it according to the grade, width of chill (T) is reduced from constitutional value on some rule.

b) Processed chill (Table 4)

After putting the inoculant into melt, processed chill of wedge specimen is obtained in less value than constitutional one, but inoculant deoxidizes molten metal and increase the strength of casting.

Specimen W4 is normally adopted as FC30 and above in arc furnace melting.

c) Sampling and tests

From the melt in ladle are taken:

1. Sample for final chemical analysis
2. Specimen for mechanical testing

d) Care of ladle

After use, the ladle lining is repaired and dried in air. Before re-use, the ladle should be preheated by fuel during 3 hours or more, which will serve also to ensure proper final drying.

Table 4 Wedge Value of Constitutional and Processed

unit : mm

Wedge Grade	Constitutional	Processed
FC 20	1.0 - 1.5	0 - 0.5
FC 25	4 - 5	1.5 - 2.0
FC 30	5 - 10	3.0 - 4.0
FC 35	12 - 18	3.0 - 4.0

Grade of Cast Iron : FC 30 (JIS)

Materials & Additives	Material : 1. pig iron 600 kg 2. ret. scrap 900 kg 3. steel scrap 1500 kg 4. recarburizer 35 kg 5. lime stone 30 kg	Recarburizer 8k/t lime stone 5 k/t CaSi 4 k/t Fesi 9.25 kg/ton FeMn 0.8k/t	control	ladle
Term	charge	melting	chemical composition	tap out
Time	8:25	10:40	11:20	
Operation	power on	melt down	temperature check slag make temp. check slag off	sampling wedge test sampling slag off
Electric power	10 min. after power on 160 V 6000 A	120 V 4000 A		
Temperature		1450°C		1500°C

Fig. 1 Arc Furnace Operation for Cast Iron Melting
(3 Ton Arc Furnace. Basic Lining)

ATTACHMENT 6

**COMMENTS ADDRESSED TO JAKARTA
FOUNDRY CENTER**

COMMENTS ADDRESSED TO THE JAKARTA FOUNDRY CENTER

1. Sales activities

The currently prevailing rather passive attitude at the Foundry Center of "waiting for orders" must be repudiated. A marketing strategy must be established and pursued that will anticipate future chances in the economic and social environment including private foundries, and will contribute actively to modifying and developing this market.

Positive and active efforts must be deployed by the Sales Department in establishing the Foundry Center's sales strategy and production scheme, in selecting the customers to be regularly served, in promoting sales and winning new customers and further initiating the development of original products and drawing customers to accept the resulting new products.

In seeking orders, priority must be given to:

- a) Products that should ensure the Foundry Center of a continuing regular work load.
- b) Products that are adapted to manufacture at the Foundry Center, in terms of available production equipment, of mastered production techniques, of practiced production methods.
- c) Products that are conducive to enhancement of the Foundry Center's technological capability, products of increasingly higher value-added in keeping with the progress of productive capability, rather than products that will swell the rate of production.

- d) Products to replace currently imported castings, to which customer attention should be attracted (for which the Foundry Center's technical capability must be duly equal to satisfying the customer who accepts the new products).

The sales department must make a point of establishing close contacts with customers - regular customers in particular - to hear their claims and complaints, and to make every effort to satisfy their demands. Satisfied customers will attract new clientele.

The sales department is, so to speak, the show window of the enterprise. The attitude of the sales representative, his response to customer, expressive of genuine solicitude for the customer's needs, should contribute immeasurably to winning the customer's reliance. Any and all complaints communicated to the representative concerning products delivered should be the subject of immediate initiative on his part in coordinating the countermeasures to be adopted and enforced by the relevant departments. The results should be reported back without delay to the customer, to indicate the serious attention accorded to his wishes.

Regular contacts with customers - even in the absence of inquiries - is essential for sounding and anticipating their intentions and plans for the future, so as to be already fully prepared when the plans mature into actual inquiries.

Market demand forecasts are no more than forecasts; Changes in the economic and social environment may at any time prove the forecasts to have been erroneous. The marketing strategy must be flexibly modified to cope without delay with such changes in circumstances.

The fundamentals of marketing strategy are as presented below.

Fundamentals of marketing strategy

The essential point of marketing is to anticipate future demands in a constantly changing environment, and to firmly grasp the basic factors for establishing and following an effective marketing strategy.

1) Choice of product mix

First determine in what products the Foundry Center excels over other foundries, and what branches of industry are served by those products.

Examine the products and their market in the sequence of:

- a) Premium products that are dominating the market
- b) Products for which the market share is showing a change
- c) Products liable to present problems in terms of circumstantial factors, such as customer demand, market industry, raw material supply
- d) Products that are enjoying a high market share, but are bringing only low profit
- e) Products of low importance to the Foundry Center.

2) Strong and weak points of the Foundry Center

The strong and the weak points of any enterprise will vary with progress of circumstances - with changes in market demand, with development of the enterprise itself. Proper grasp, and control where possible, of these factors should serve in planning the introduction of new products, and in drawing up the market strategy to be followed for these products.

The strategy should consider the possibilities of further strengthening the premium products, and turning the weak points to account.

3) Market situation

Keep track of the market situation - market stability or competition, and other characteristics:-

- The number of competing foundries producing each product
- Their shares
- Their sales strategies
- Their prices
- Substance of their technological innovations
- Changes in material used, etc.

4) General and decisive factors that can contribute to success in our competitive market

a) Pricing policy -

- Price and conditions of payment
- Constancy of price
- Rebating
- Conditions of guarantee
- Negotiability of price

b) Production scheme -

- Initial cost
- Running cost
- Product life
- Designing capability

- Renown of brand name
- Packaging
- Material quality
- Reputation on performance of product
- System of guarantee
- Maintenance service
- Installation work
- Stability of continued supply
- Supply of spare parts
- Technical services
- Research and development facilities
- Industrial rights covering the products
- Delivery period and freedom from delivery delays
- Quality control
- Efforts for lowering production cost
- Location of factory
- Limitation to production rate
- Past records of delivery
- Capability of product development

c) Sales channels

- Direct sales
- Conditions of sale
- Trading firms
- Agents
- Sole agents
- Sales organization

- Transport facilities
- d) Sales promotion
- Advertisement
 - Demonstration exhibitions
 - Demonstration courses
 - Number of sales representatives
 - Attitudes and zest of sales representatives
 - Frequency of visits to customers
 - Knowledge of products possessed by sales representatives
- e) Overall picture of enterprise
- Size of enterprise
 - Capital
 - Procurement or materials
 - Production equipment
 - Affiliated companies
 - Renown
 - Political connections
 - Technical licenses
 - Affiliated sales companies
 - Number of employees

5) Assembly of information on customers

A system must be established for regularly gathering information on what makes a specific customer buy a specific product from a specific foundry. The customer must have his reasons: Find out what they are. Determine the purchasing systems and principles of individual customers: Analyze the principles and seek to match the Foundry Center's sales campaign to these principles. Examine problems raised by customers - including complaints and solve them; report the solution to customer.

6) Assembly of information on competing foundries

Keep constant track of competing foundries and their products. Monitor changes: Trends found in the changes should well serve in forecasting future changes. Managers of frontline sales representatives must draw up and pursue a marketing strategy covering the markets for which they are in charge and the products for which they are responsible. In drawing up the strategies, the practice must be established of having the active participation in discussions by the front line sales representatives. This will serve in the interest and zeal of these front-line men, to motivate them to energetic sales activity.

The items to be discussed include:

a) The current demand and clientele

Whether the products, the market served, can be expected to persist in the future

b) Prospects of new markets into which the Foundry Center's products might be introduced to advantage

c) Whether the current sales and marketing activities leave no room for improvement

- d) What should be the essential points for enhancing competitiveness
- e) What measures could be taken to further enhance sales activities

2. Production engineering/techniques

1) The measures should be taken as soon as possible to improve managing ability of JFC's key employees.

- a) Quick acquirement of basic knowledge and technique
- b) Strengthening of the leading capacity in technical fields
- c) Establishment of the standards

2) To enhance the technical level of shop floor technicians and workers, so as to ensure production of castings of stable quality, instruction/training should be provided for the technicians/workers in:

- Pattern-making
- Molding
- Melting

To administer the training, it is advisable to obtain the assignment of expert instructions from abroad - preferably foremen supervisors well versed in modern shop floor practice.

3) To establish in-house standards for foundry practice, together with the relevant organization and system for enforcing the standards and controlling the enforcement. For this, the measures requiring to be taken are:

- Establishment of standards governing each stage of casting manufacture
- Enhancement of engineering capability for drawing up the standards.

To this end, the points to be attended to are that:

a) The standards must never degenerate into sanctimonious invocations that nobody thinks of practicing. The standards must demand practice that can be followed and which are enforceable on the shop floor, with the current level of technical capability. The severity of the standards must consequently be regularly reviewed and revised to be in keeping with the progress of technical capability as it is enhanced with the instruction/training and other activities directed to this end. The standards must, on the other hand, provide for ensuring an essential inconcessible level of product quality, and every means must be sought to eliminate beforehand all obstacles against effective enforcement of such essential provisions in the standards.

b) The requirements contained in the standards must be made known and fully understood by all concerned on the relevant shop floor, and means must be established to have the requirements effectively enforced in practice. For this, a system must be organized that unfailingly brings cases of unconformity with standards, to the immediate notice of relevant supervisors and of the Engineering Department, to permit their adoption at remedial action without delay. The problem raised must then be analyzed to distinguish between sporadic occurrence calling for symptomatic treatment, and fundamental problems requiring consideration of more basic measures such as revision of relevant standard. For this, those in supervisory position must become thoroughly conversant with shop floor conditions and practices.

The establishment and organization for enforcing the standards, as well as enhancement of the relevant engineering capability, is also advisably to be the subject of instruction/guidance obtained through assignment of foreign

instructors.

- 4) New products meeting market demands must be developed, beginning with castings already sold in the Indonesian market, and gradually extending the product range to articles of higher value-added, calling for correspondingly higher production engineering and practical technical capability.

To this end, acquisition by the relevant personnel of successively higher capability, together with equipment of pertinently high performance, must be systematically planned and realized.

The measures to be considered in this connection include:

- a) **Mastery of basic foundry techniques/skills:**
To be properly and completely acquired during the assignment of foreign expert instructors

- b) **Choice of relatively simple molding techniques:**
Cement sand molding - currently practiced - should with advantage be replaced by self-hardening furan sand, to facilitate rapid mastery of molding techniques even by novices, and which should contribute to stabilizing product quality.

- 5) Consideration of special measures for assimilating the techniques necessary for manufacturing products currently imported. Taking the example of diesel engines, a choice might be made among such special measures as:

- a) Obtaining the assignment of foreign instructor in production know-how - techniques of pattern-making, mold-designing...
- b) Obtaining technical assistance from foreign manufactures currently producing the imported castings, accompanied by purchase of drawings and production know-how

- c) Purchase of drawings and of patterns with which to proceed with the molding stage onward.

Whatever the special measure finally adopted, a considerable lead time should be required between the first trial production and final delivery of successfully manufactured product, and this makes it imperative to plan well in advance and lose no time in putting the plan into execution. The top management must take the initiative in defining and making known the principles to be followed, and in contacts with the customer to be furnished with the new products.

3. Quality control

Establishment of an effective quality control system at the Foundry Center must begin with a clear definition of the system to be introduced, set forth in a Quality Control Manual. The definition of Quality Control System should cover the means of ensuring the requisite product quality, such as:

- The personnel organization
- The necessary kinds of documentation and their formats
- The flow of work in quality control
- The quality standards to be applied to equipment, tooling, materials that affect product quality
- The system of inspection and maintenance to be applied for ensuring the foregoing quality standards in quality related equipment/tooling/materials.

Based on the principles outlined in the Quality Control Manual, the work of establishing the quality control system should proceed with:

- Collection and analysis of records on product defects due to unconformable quality, on claims and complaints from customer in reference to product quality

- Compilation of inspection standards
- Compilation of quality control standards governing individual stages of casting production.

The standards thus established must be made known and well explained to all concerned, down to the last worker on shop floor.

Any claims/complaints raised in connection with product quality should be positively taken up under the initiative of the Quality Control Group.

4. Production control

The production control organization and system must be strengthened, to ensure production in conformity with the production scheme established as described earlier.

To this end, the measures requiring to be adopted are:

- a) Work-load chart to be drawn up month before taking the work in hand for that month. This chart should be drawn in reference to the workable manhours, the current productivity level and the expected work-load.
- b) Production schedules to be drawn up individually for all principal products.
- c) Reporting without delay to those managing production control of daily work data - product designation, quantity/weight produced, manhours worked - and measures decided and put into execution without delay to counter foreseen delays in delivery, to solve problems generated in the flow of work.
- d) System for monitoring 3 times a month all deviations from established standard recorded in manhours spent and in quantity of product completed, to enhance "prime-cost-mindness" among front-line middle management, and to provide for early adoption of any requisite countermeasures/
- e) System for keeping track of current unit prime cost, to permit detection of inordinate deviations, and early adoption of requisite countermeasures.

The essential points of production control are:

- To establish a realistic schedule, based on clearly defined objectives
- To study the practical measures for maintaining the schedule thus established, to keep track of schedule maintenance
- To monitor and detect without delay any significant deviation from schedule; to seek the causes of deviation and to eliminate them.

5. Maintenance of foundry equipment

The current maintenance capability of the Foundry Center requires to be further consolidated by such measures as:

- a) Systematically performing routine and periodical inspections of production equipment/facilities, based on the maintenance manual to be enlarged and complemented with this view
- b) Regularly replenishing the stock of prescribed replacement/spare components/parts, regularly including the requisite allocation in annual budgets
- c) Firmly inculcating on machine operators the custom of daily performing routine simple checks on the machines they use.

Whether production equipment is well or poorly maintained will largely determine the productive performance of the foundry, as well as the useful life of the equipment itself. And it is the machine operator that is in a position to best know the condition of his machine, he must be taught to take pride in maintaining his machine in best condition, to facilitate his doing his job easily and well.

6. Work safety management

Foundry operations are inherently hazardous, involving high heat, loads to be handled, and of form liable to be unstably slung. Measures to ensure work safety, and inculcation of safety-mindness, are critically important factors in foundry management.

The elementary items to be enforced are:

- a) Wearing without fail the prescribed protective apparel and appliances
- b) Keeping the shop floor orderly and clean. An orderly and clean shop floor is conducive also to enhancement of productivity. Shop floor personnel should be made to understand that good products do not emerge from a disorderly and dirty jobsite.

Constant arrangement and cleaning up of the shop floor is particularly necessary at the Jakarta Foundry Center, where the premises are not spacious. Flasks and other large equipment not in use should be stored outdoors, to make the best use of the limited floor space, which should be always kept well ordered and clean, to permit effective operation.

A shop floor safety and orderliness patrol team is advised to be established, to continually make the rounds of the shop floor.

7. Personnel capability enhancement

The power of an enterprise lies in its personnel: Corporate development and prosperity is premised on the existence of capable personnel.

The enhancement of personnel capability at the Jakarta Foundry Center calls for careful planning and consistent implementation of instruction and training programs aimed at:

- a) Capability enhancement of Foundry Center personnel.
- b) Staffing Foundry Center personnel for other Indonesian foundries, in consideration of the Foundry Center's mission as national enterprise.

To this end, a Foundry Technical Training Center should be established, and operated to administer an apposite curriculum. The Training Center should be established by the Minister of Industry within the Jakarta Foundry Center, and placed under the Foundry Center's administration.

The Training Center should first concentrate in the instruction of pattern-making and molding skills. The instructors should be recruited with foreign consultant advice from among Foundry Center and other foundry personnel, and lecturers from among university professors and national research institutes such as MIDC and BTU.

8. Management

The business of an enterprise will be largely determined by the caliber and zeal of the management and middle management.

Much can be expected of the future efforts in self-enlightenment and study that should be made by Jakarta Foundry Center managers to further enhance their administrative capabilities. All managers charged with a group under them should make a point of:

- a) Setting up targets for the operations in their charge, together with plans for ensuring attainment of the targets
- b) Periodically evaluating the degree of attainment of their established targets
- c) Pinpointing problems and difficulties encountered in daily operations, and devising the means for their solution

- d) Attending seminars on management and other occasions that should contribute to self-enlightenment. Upon attending such seminars, simply hoarding the knowledge imparted to them will bring little fruit. The participants should impose assignments on themselves, to be performed by themselves. If a problem management in charge should consider it his mission, and a challenge that he should accept, to squarely face the situation and devote every effort toward solution.
- e) Managing coordination between sections. The instinctive impulsion of a section involved in a problem or difficulty to recriminate others, if left uncoordinated by management will lead nowhere. It is a duty of management in such case to bring the sections in question to consider, not how to extricate themselves from blame, but join efforts in finding a solution, and study what each section - or person - could best contribute to such end.

9. Organization and manpower

The current personnel organization at the Jakarta Foundry Center is overstaffed for clerical work. The job descriptions should be reviewed with the objective of simplifying the personnel organization, in such direction as:

- a) Broadening the scopes of responsibility covered by individual clerks, to provide for their lending a hand to others when they are overloaded with work, so that peaks and valleys in work load can be accommodated without inflating the worked force.
- b) Reviewing the cost accounting system, with a view to simplification

The direct labor force should be gradually increased, and the clerical staff reduced in keeping, to enhance the productive capability of the Foundry Center without increasing the total work force.

Also the Technical Department should with advantage be placed under the administration of the Branch Manager, to bring this Department closer to the lines of command, and activate response to problems calling for technical attention.

10. Reducing prime cost

To keep going in a competitive market, every member of an enterprise must be involved in all-out effort to reduce expenditures, and to thus strengthen the viability of the enterprise.

For this, apart from acquiring new equipment and mastering new techniques the contribution of each and every member of the personnel with improvements brought to his every-day work, will - while each improvement may be infinitesimal - accumulate and result in very significant benefit to the enterprise. Prime cost reduction can be considered to have its roots in such minute contributions to daily operation.

The contributions could take any of a wide variety of forms - enhancing efficiency, saving material or energy consumption, lowering defect rate, reducing overhead cost, etc., etc.

Considered from a different viewpoint, it is a search for wasteful, erratic or irrational factors found in products, in workpieces, in materials, in equipment, and in the action and minds of personnel.

The move for prime cost reduction must start with a clear definition and statement of the overall target, and be implemented through training courses for acquiring the techniques, and most important of all, through motivation of all members toward active participation.

The concrete measures to be adopted are:

- a) To establish a committee headed by the Branch Manager, with secretariat
- b) To determine a slogan

- c) To divide the personnel into small groups of 4 to 6 members within an organizational unit, and to designate a leader for each group
- d) To let the group leaders attend a training course
- e) To have each group set its own target, through discussions within the group, with advice, if necessary, from above
- f) To provide a forum for reporting progress made by the groups
- g) To establish a system for rewarding meritorious groups and individual members

What is important in promoting this movement is to encourage good communication between the small groups, and to have the groups consider problems from a global viewpoint rather than in the interests of the groups themselves. The members should learn that acting for self-centered motive will invariably end in opportunities lost and in increase - not decrease - of overall prime cost. Seeking solutions from a higher viewpoint and giving consideration to the interests of other groups should be the guiding principle in this small-group movement for cost reduction.

For instance, a shop floor group might adopt as target "to take care of the group's equipment by the members themselves", which should incite the members to take an interest in routinely seeing that the equipment operates in best condition, and in bringing small improvements to the equipment with checks and inspections of equipment carried out every day.

Other targets that might be adopted include, for example:

GROUP	THEME	TARGET
Melting	Reduce melt waiting time	Improve melting line operating efficiency
Molding	Reduce cycling time	Improve productivity
Sand mixing	Remove impurities in sand	Reduce defect rate
Pattern-making	Reduce spruing work	Reduce work load
Finishing	Improve lot management	Improve quality assurance system
Inspection	Improve flow of trial production inspection	Shorten delivery period

At outset, themes should not be chosen that are too high. Select subjects that are challenging but not discouraging.

Such group activities bring not only the direct benefit of enhanced productivity and lowered prime cost, but also indirect benefits such as:

- Enhanced interest of individual employees in problems faced by the foundry as a whole
- Improved communication between superiors and subordinates
- Advance toward groups that think together

To conclude, prime cost is the integrated result of technological factors, like engineering capability, production skills and equipment, and of human factors like "cost-mindedness", of the individual members, and group spirit that puts considerations for the group before personal interest, and benefit to the enterprise before small group interest.