should be walled with steel reinforced concrete or bricks so that it is protected from the high humidity and moisture during rainy seasons.

9.3.2 Cost of Cosntruction Materials

North Sumatra is not subjected to strong winds or earthquakes, so the decisive factor on the strength of building is the dynamic load of cranes to be installed. From this point of view, the weight of steel materials used for every 1 m^2 of the main plant building having the total area of 3,000 m^2 is calculated as 80 kg, while that for the auxiliary light guage building with the total area of 1,000 m^2 is based on the standard of 50 kg. It is planned that the cost of roofing and wall materials, lighting equipment and other accessories of buildings occupies more or less 50% of the cost of steel materials. Under the above concept, the cost of construction materials is calculated as follows:

1) Rp.400/kg x 3,000 m^2 x 80 kg x 1.5 (100% + 50%) = Rp.144,000,000

2) Rp.400/kg x 1,000 m^2 x 50 kg x 1.5 = Rp.30,000,000

1) + 2) = Rp.174,000,000

Furthermore, the labor cost which may be required for the construction of building is calculated as follows:

Rp.2,500/man.day x 30 men x 90 days = Rp.6,750,000

9.4 Inland Transportation and Storage of Imported Machinery and Equipment

The imported cargoes are planned to be landed at Belawan port, within the distance of 20 km to the north of the scheduled plantsite. The contents of the cargoes are to be cleared at the port customs office and to be transported to the plantsite.

9.4.1 Expenses related to the Customs Clearance and Inland Transportation

The expenses are estimated as follows based on recent data:

Unloading and warehousing:	Rp.6,500/m^3
Documents handling charge:	Rp.2,000/m^3
Customs clearnace:	Rp.1,000/m^3

Inland transportation:	Rp.4,000/m^3
Unloading at the plantsite:	Rp.1,500/m^3
Total	Rp.15,000/m^3

As the total measurement of imported cargoes is calculated as more or less 2,000 m^3, the total expenses are estimated in the following manner:

$$\text{Rp.15,000} \times 2{,}000\ m^3 = \text{Rp.30,000,000}$$

9.4.2 Storing of Machinery and Equipment at the Plantsite

It is by all means desired that the main plant building and the warehouse be completed prior to the arrival at the plantsite of the imported machinery and equipment packed in wooden cases. Delivered packages should be unpacked immediately and carried inside the roofed building so that they will not be damaged by rain. Here, the careful verification and checkup of the delivered items are to be performed by checking them with the invoice and packing lists. Valuables and those which bear the possibility of losses and thefts should be classified and stored in the locked warehouse. For storing electrical components and dried materials, it is necessary to take special measures to avoid moisture. During this storing period, the main gate of the plant and the gates of the plant buildings should be locked at night with a continuous watch by the security guards.

9.5 Erection of Machinery and Equipment

9.5.1 Acceptance of Machinery and Equipment Manufactured and/or Procured Locally

With regard to the machinery and equipment which are manufactured and/or procured by the local sub-contractors in accordance with the engineering drawings and specifications furnished by the main contractor, it is recommended to send the inspectors or supervisors from MFC to the jobsites of such sub-contractors to carry out the inspection to check if they are in conformity to the given designs and specifications as soon as the completion of sub-contracted works is reported to MFC. If any irregularity or defect is found, the inspectors give instructions for the immediate remedies. In some important cases, it may be necessary to perform midway inspections and guidance. This is quite essential for the smooth accomplishment of the subsequent erection work of the plant.

9.5.2 Erection Work

Before the start of the erection work, it is necessary to complete the power receiving substation and its supply cables from the main power source to assure the immediate availability of electricity in the plant. Water supply system should be ready at this stage for the immediate running. Machinery and equipment will be put into trial run and adjustment one after another as soon as they are erected in turns, so the lack of electric power supply at this stage will give serious influences on the total network planning of the erection work. It is necessary to utilize the experienced hands of local contractors.

It is advisable to assign the operators of the machinery and equipment as the assistants to the erection specialists during the erection work so that the operators can understand the construction and method of handling of the machinery and equipment more easily and consequently, the operators will become familiar with the operation and maintenance of the machinery and equipment to which they are assigned.

The labor cost required for the erection of machinery and equipment is roughly calculated as follows:

Rp.2,500/man.day x 25 men x 240 days = Rp.15,000,000

The numbers of the supervisors and the period of service required for the supervision and guidance of the erection work are estimated as follows:

Machinery & equipment for the foundry	1 man x 8 months
Power receiving substation	1 man x 1 month
High frequency induction furnaces	1 man x 2 months
Secondary wiring work	1 man x 1 month
General supervision	1 man x 8 months
Total	5 men 20 months

The time schedule of processes involved in this project is illustrated by Fig. 9-1.

9.6 Test Run

Machinery and equipment will be put into no load test run and adjustment one after another as soon as the installation is completed, and the operators who are assigned to each

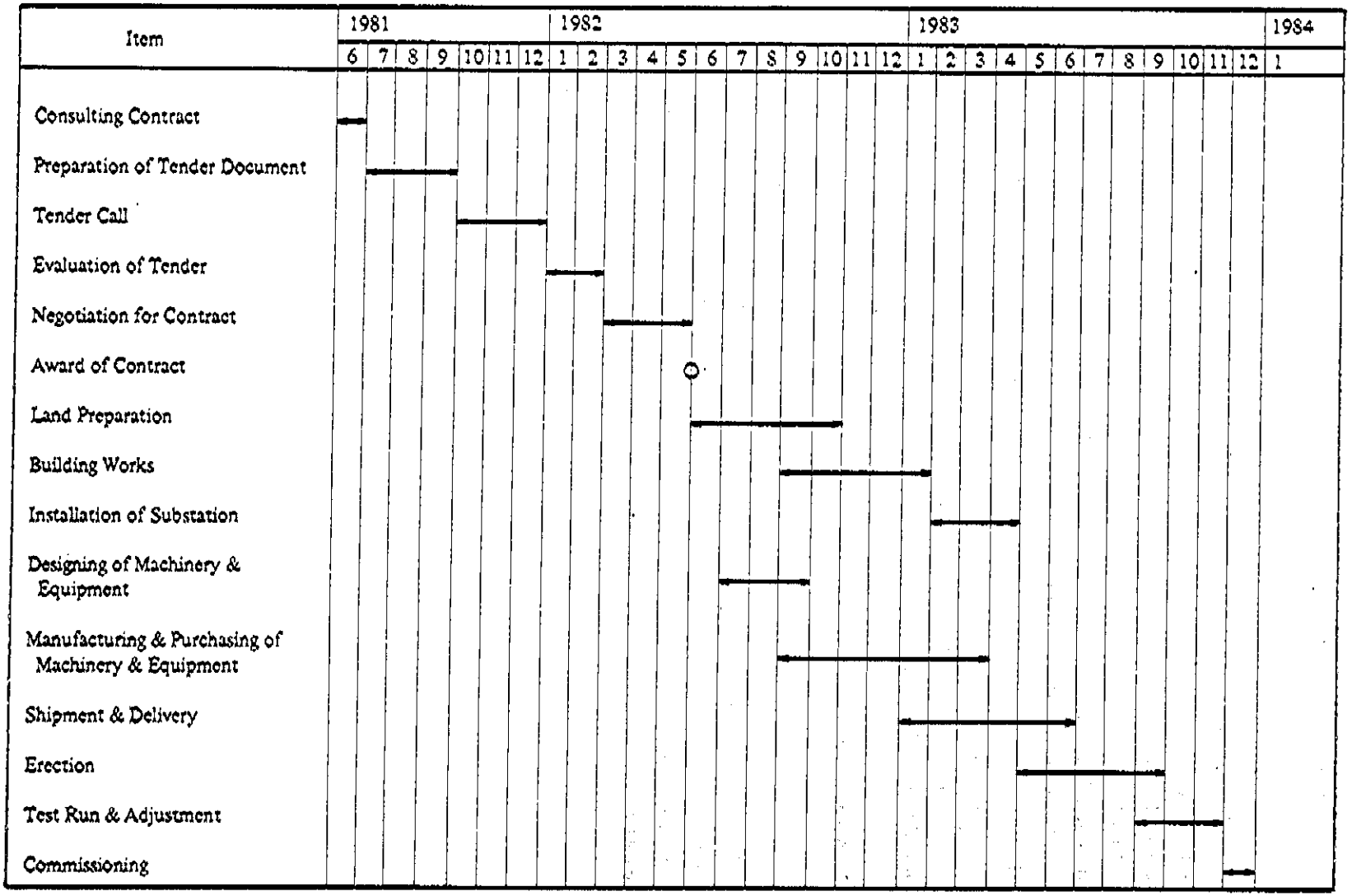
machine and equipment will attend to the test run and adjustment.

The operators should begin with the ABC of the operation because all the machinery and equipment is quite new to them. After completing no load test run of each machine and equipment, raw materials will be fed to the operation cycle for carrying out further test run with the actual load. It is necessary to prepare all raw materials, additives, tools and other accessories required for the actual operation of the plant and to have them ready to use before this stage of test run, otherwise the whole test run schedule will be interrupted. In this plan, the test run schedule spans over the period of 2 months, and this period is also utilized for the operators of each machine and equipment to become familiar with the operation of each of the machines. The actual production of castings will also be started to some extent during the test run period. The above test run with load certainly requires wood patterns for the molding station, and it is planned to include 10 sets of patterns for the popular items of products in the scope of supply.

9.2 Acceptance

After completing the scheduled test run and adjustment of the machinery and equipment successfully, and also after completing the training of the operators on the proper operation of the assigned machines, the acceptance test will be carried out. By confirming the smooth faultless performance of the whole plant, the machinery and equipment will be handed over to the owner.

Fig. 9-1. Project Schedule



Chapter 10. Sales and Production Plans and Plant Operation

Chapter 10. Sales and Production Plans and Plant Operation

10.1 Sales Plan

10.1.1 Receiving of Orders

Since a specialized foundry is essentially based on production under order, it is therefore required to deliver finished products in the designated numbers and delivery schedules as specified by the client's product drawings and specifications.

Acquiring a smooth and constant flow of orders from clients for products matched to the production scale and capacity of the foundry in order to utilize its production capacity fully at all times will be most difficult, but most vital, for securing its sound management. That is, unless an ample output level is maintained constantly through well-timed orders, it will be impossible to expect any sound management of foundry.

Persons responsible for sales must constantly maintain close contact with their clients and endeavor to understand their desires while keeping track of market conditions in general at all times. They must also have an extensive knowledge of the company's products and constantly strive to cultivate the art of negotiating with clients. In the company, they must follow production and shipping schedules in order to see that delivery dates are met, and if necessary negotiate with management on behalf of their clients.

Furthermore, in order to secure a smooth flow of orders, contacts must be maintained with clients through visits, by correspondence, telephone and other means, supported by speedy disposition of clerical work. The cultivation of sales personnel having these attributes will require not only suitable guidance by the company but also the self-consciousness of the individuals themselves.

10.1.2 Sales Plan

1) Selling Prices of Castings

The selling prices of castings will differ widely depending on the specific kind of product. In Indonesia, the prices of cast steel are higher than those of cast iron, and high manganese steel castings are transacted at specially high prices. This is because

there are numerous iron casting foundries in the country to generally meet market demands but only a few steel casting foundries, with the result that the larger portion of steel castings and high-manganese steel castings are being imported.

The prices of castings are also influenced largely by the specific shape, unit weight, thickness and number of units produced per lot. In addition, the cost of the pattern also has a large bearing on the price. The cost of the pattern naturally has to be added to the cost of newly ordered castings, although only pattern repair expenses need be added if the same product is ordered repeatedly.

According to survey findings, the prices of castings in Indonesia are generally as Table 10-1.

Table 10-1. Selling Prices of Castings

Kind of Casting	Selling Price (Rp./kg)
Thick iron castings such as rubber rolls	400 – 450
Small machine parts made of cast iron	600 – 1,000
Wheels and anchors made of cast steel	900 – 1,500
High manganese steel runners	2,000 – 2,500
Stainless steel castings	5,000

As for the selling prices of the products, the following prices have been taken from the mean prices for castings of different kinds:

Gray iron castings:	550 Rp./kg
Steel castings:	900 Rp./kg
High-Manganese steel castings:	2,000 Rp./kg

These prices are assumed by taking into account existing market prices. They also include the pattern cost since clients cannot be expected to provide patterns when placing orders.

The wooden pattern preparing cost runs up to a substantial amount and cannot be

disregarded. The cost of the wooden pattern may be higher than the cost of the casting itself if a new order is placed for only one or two units. In addition, the time required for producing the wooden pattern will be longer than that required for casting, so the product delivery date is in most cases largely influenced by the time required for producing the wooden pattern.

While estimating the pattern cost will be difficult at the present stage, it is assumed to run up to 15% of the sales price as judged from the practice of Japanese foundries engaged in the production of diversified castings in small lots.

2) Sales Amount

Assuming that MFC is operated at its rated production capacity, the basis of the sales amount will be as shown in Table 10-2.

Table 10-2. Basis of Sales Amount

Material	Unit Price (Rp./kg)	Production (Ton/Y)
Gray Iron Castings	550	600
Steel Castings	900	480
High Manganese Steel Castings	2,000	120
Total		1,200

3) Product Transportation

Finished castings are to be transported by truck. In this project plan, the use of two trucks including a 5-ton capacity truck is assumed, but if transportation capacity is insufficient, the services of transportation companies are to be sought. When transporting the products outside of Sumatra, ship loading at Belawan Port is assumed.

10.2 Production Plan

10.2.1 Annual Production and Production Yield Rate

Table 10-3 shows MFC's annual production by kind of molding process.

Table 10-3. Annual Production

(Unit: Ton/Y)

Product	V-Process	Hand Molding	Total
Gray Iron Castings	520	80	600
Steel Castings	372	108	480
Hi-Manganese Steel Castings	120	-	120
Total	1,012	188	1,200

The larger portion of production is performed by the V-process, and the hand molding process is to be adopted for products which cannot be accommodated in V-process molds or require hand molding, in which case hand molding is performed by using self-hardening sand.

The mean yield rate in product weight with respect to melting wlight is assumed to be as follows;

Gray iron castings:	70%
Steel castings:	50%
Hi-manganese steel castings:	60%

10.2.2 Molding by the V-Process

The principal conditions for molding by the V-Process are set as follows;

1) Molds

1,500 x 1,500 x 310/310 mm: 6 sets
1,000 x 2,200 x 310/310 mm: 2 sets

2) Molding speed

30 Min/mold, 2 sets/H

3) As cast weight

Average 400 kg/mold

4) Rejection

5%

The quantity of molds and annual production by kind of product, as calculated from these molding conditions, are shown in Table 10-4.

Table 10-4. Quantity of Molds & Production

Product	Quantity of Molds (molds/Yeas)	Production (Ton/Y)
Gray Iron Castings	1,958	520
Steel Castings	1,632	372
Hi-Manganese Steel Castings	489	120
Total	4,079	1,012

10.2.3 Hand Molding by Use of Self-Hardening Sand

Since the product sizes are yet unknown, there is no way of determining the sizes of the molding box to be used for hand molding. When actually receiving client orders, the molding box will have to be prepared to meet specific needs after studying the product drawings. However, since the total annual production of hand-molded products runs up to 188 tons, or less than a monthly average of 16 tons, not much investment will be required.

10.2.4 Heat Treatment

Heat treatment of steel castings and high manganese steel castings is to be performed by means of one set of multipurpose heat treatment furnaces. The capacity of the heat treatment furnace is 3 tons per batch, but assuming an average loading of 2.5 tons per change and furnace operation of once daily, it will be possible to treat 50 tons of castings in one month at an operation rate of 20 days per month, with the result that there will remain some dgree of allowance in furnace operation.

10.2.5 Wooden Pattern

Making wooden patterns is the first step in the casting process, one that is most vital in order to manufacture products of accurate dimensions within the scheduled period of time. Since no specialized wooden pattern factory is in operation in the Medan area yet, the wooden patterns will naturally have to be made by the company itslef.

The preparation of wooden patterns for use in the V-process requires a high level of skill, and cannot be made simply by providing an unskilled craftsman with drawings and materials. In Japan, for example, a period of roughly ten years is considered necessary before one can become a full-fledged wooden pattern craftsman, and so much time will be required for cultivating professionals.

The wooden patterns necessary for foundry test run are to be sent from Japan, but various kinds of wooden patterns will become necessary once production is started. In order to foster a wooden pattern manufacturing capability in the foundry by the time of its commencement of operations, the adoption of two training programs will be indispensable — one for mobilizing skilled woodworking craftsmen for retraining in specialized wooden pattern production skills, and another for making preparations for the future by employing personnel having aptitudes for becoming good wooden pattern craftsmen and sending them to the Metal Industry Development Center (MIDC) for education and training. These programs must be enforced

immediately, as soon as the Project becomes definite.

Unless this preparation is made with the greatest urgency, the trainer despatched from Japan will have to make the patterns busily by himself, and trainees will just remain as helpers without becoming professionals capable of carrying out the work on their own. The vital importance of this preparation deserves special emphasis and cannot be regarded as an overstressed precaution, for satisfactory results cannot be expected even with the soundest production plans unless good wooden patterns are made smoothly.

The wood for making patterns can be obtained from a lumber mill, but since most of it is unseasoned, it has to be dried for a long period of time after being purchased. Otherwise, it will be greatly deformed during the woodworking process, making it unfit for carving patterns. It should be kept in mind that early procurement and complete drying of wood before woodworking are vital conditions for ensuring smooth production.

10.2.6 Melting

Table 10-5 shows the melting weights of the respective products as calculated from the production amount of the products.

Table 10-5. Melting Weight

Product	Production (Ton/Y)	Yield (%)	Rejection (%)	Melting Weight (Ton/Y)
Gray Iron Castings	600	70	5	902
Steel Castings	450	50	5	1,010
Hi-Manganese Steel Castings	120	60	5	210
Total	1,200	–	–	2,122

The Total daily melting weight is calculated as 7.1 tons from the following formula:

$$2{,}122\ t/Y \times 1/12 \times 1/25 = 7.1\ t/D$$

Accoridngly, operating two sets of 1-ton capacity high-frequency induction furnaces alternately at a rate of one hour of melting time per charge will permit the furnaces to be operated at a rate of 7 charges/day. That is, the two furnaces are employed under the plan of melting cast iron and steel with the first furnace of acidic lining, and cast steel and high manganese steel by means of the second furnace of basic lining. Cast steel can be melted by the both furnaces.

10.3 Plant Operation

10.3.1 Personnel Requirement

1) Corporate Organization and Placement of Personnel

Fig. 10-1 shows the company's organization chart, and Table 10-6 the placement of laborers and office workers.
The company consists of a total of 65 personnel including the president, four managers and 60 laborers and office workers.

2) Labor Cost

The basis of labor cost is as shown in Table 10-7.

10.3.2 Plant Operation Conditions

The plant is to be operated under the following conditions:

1) Annual days of plant operation:

25 days x 12 months = 300 days

Number of shifts:	Single shift system
Daily working hours:	7 hours

From the nature of the work to be done, employees may be required to work overtime in order to complete some unfinished work, while guardsmen will be required to work under a two-shift system (day shift and night shift).

Fig. 10-1. Organization Chart

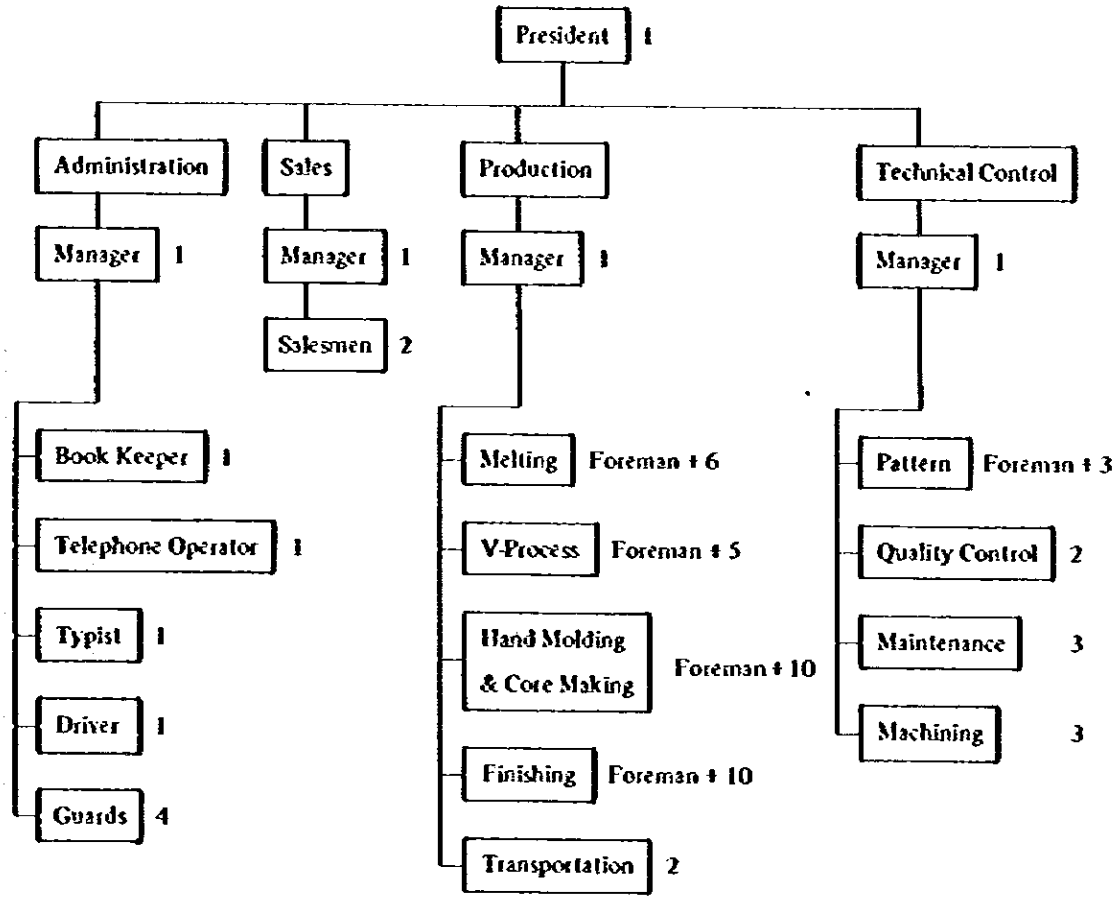


Table 10-6. Placement of Laborers and Office Workers

	Skilled	Unskilled	Total
Melting			
Furnace Operation	0	2	2
Land Preparation	1	1	2
Charge Preparation	0	2	2
Foreman	1	0	1
Molding			
V-Process	0	5	5
Hand Molding	1	4	5
Core Making	1	3	4
Sand Preparation	0	1	1
Sand Drying	0	1	1
Foremen	2	0	2
Finishing			
Shot Blast	0	1	1
Gas Cutting	1	0	1
Finishing	0	8	8
Heat Treatment	1	0	1
Foreman	1	0	1
Others			
Quality Control	1	1	2
Pattern Making	2	1	3
Machining	2	1	3
Maintenance	2	1	3
Transportation	0	2	2
Sub-total	16	34	50
Office			
Salesmen	1	1	2
Book Keeper	1	0	1
Telephone Operator	0	1	1
Typist	1	0	1
Driver	1	0	1
Guards	0	4	4
Sub-total	4	6	10
Total	20	40	60

Table 10-7. Salary and Wages in 1981

	Number	Salary & Wages (Rp./M)	Lunch & Overtime (Rp./M)	Months for Salary + Bonus (M/Y)
Manager	4	200,000	–	12 + 1
Skilled	20	75,000	20,000	12 + 1
Unskilled	36	30,000	15,000	12 + 1
Guardsmen	4	35,000	15,000	12 + 1
Total	64			

2) Plant Operation Rate

The following operation rates are assumed for plant oepration:

Ist year:	40%
2nd year:	60%
3rd year:	80%
4th year:	90%
5th year and beyond:	100%

The foundry cannot be put to full operation immediately after completion of equipment installation and test run. Since various manual operations are involved in the respective processes, plant operation at its full capacity will be possible only through the consistent efforts of skilled workers to perform their work infallibly, incessant endeavor of the managerial staff to constantly improve production techniques and exhaustive compliance with operation control by all concerned. In order to attain this situation, the plant operation rate is set at a low level initially with the aim of performing both training and production at the same time, gradually upgrading the level in concert with proficiency.

10.3.3 Raw Materials, Subsidiary Materials and Utilities Requirements

1) Table 10-8 indicates the requirement of raw materials and subsidiary materials.

Table 10-8. Requirement of Raw Materials and Subsidiary Materials

Item	Supply	Unit Price* (Rp./kg)	Requirement (Ton/Y)
Pig Iron		150	172
Steel Scrap	Local	60	950
Cast Iron Scrap	Local	115	85
Carburizer		300	11
Ferro Silicon		600	11
Ferro Manganese		460	26
Inoculator		900	5
Aluminum	Local	1,500	1
Silica Lining		289	7
Magnesia Lining		1,125	20
Fine Silica Sand	Local	40	166
Silica Sand	Local	40	102
Olivine Sand		120	77
EVA Film		60,000 Rp./Roll	155 Rolls
PE Film		12,000 Rp./Roll	148 Rolls
Graphite Coating		400 Rp./ℓ	2,500 ℓ
Zircon Coating		1,000 Rp./ℓ	3,640 ℓ
Methanol	Local	700 Rp./ℓ	4,320 ℓ
Water Glass	Local	150	19
Di-Calcium Silicate		180	6
Fire Clay	Local	40	61
Carbon Powder		300	1.2
Steel Shot		900	10
Grinder Wheel		3,000	2.4
Oxygen Gas (20 kg/Cylinder)	Local	5,200 Rp./Cylinder	300 Cylinder
LPG (60 kg/Cylinder)	Local	12,500 Rp./Cylinder	10 Cylinder
Welding Rod	Local	520	0.6
Miscellaneous	Local		

Remarks: * ; Unit purchasing price in January 1981.

2) Table 10-9 indicates the requirement of utilities.

Table 10-9. Requirement of Utilities

Item	Requirement
Power	2,735,000 (kWh/Y)
Water	12,360 (m^3/Y)
Fuel Oil	245,000 (l/Y)

10.4 Anti-Pollution Measures

Foundries are generally regarded as a rather notable source of pollution in industrially advanced countries, and in these countries strenuous efforts are being made to devise anti-pollution measures. However, the concrete contents of related regulations differ widely depending on the country and region, with the result that anti-pollution measures are enforced by indefinite methods and in varying degrees.

In Indonesia, where it is known that environmental disruption by foundries has sometimes been the subject of discussion, the study team found that the foundries visited were rather unconcerned about anti-pollution facilities and that there were no concrete records or data related to pollution control. Especially with small-scale foundries which comprise the backbone of the domestic casting industry, it appears that no anti-pollution measures whatsoever are being adopted.

However, when designing the MFC foundry, measures conforming partly to Japanese environmental preservation regulations were adopted, and the foundry was designed in conformance with international anti-pollution standards.

Table 10-10 indicates the various kidns of environmental disruption generated by foundries in general, and their principal sources of generation, while Table 10-11 indicates the extent of environmental disruption conceivably generated by MFC's prodction facilities.

Table 10-10. Environmental Disruption by Foundries in General

Kind of Disruption	Principal Sources and Pollutants Generated
Vibration	Jolt type molding machine
Noise	Jolt type molding machine
Dust	Melting furnace, sand treatment and after-treatment equipment, mold releasing, conveyance of sand and mold
Air pollution	Melting furnace, heating furance
Water contamination	Machinery waste oil
Offensive odor	Organic binding agents
Wastes	Waste sand, slag

Table 10-11. Extent of Environmental Disruption by MFC Production Equipment

Process	Equipment	Extent of Environmental Disruption
Melting	High-frequency induction furnace	Least generation of vibration, noise and dust among various types of melting furnaces.
Molding	V-process and Di-Cal self-hardening sand molding process	The V-process and Di-Cal self-hardening sand molding process do not generate vibration or noise since they do not involve jolting like types of molding processes in general. An extremely small quantity of dust is generated by mold releasing in comparison with other processes. Since the molding sand contains only a small quantity of additives, hardly any dust is generated during conveyance of sand and mold. Also, additives generating offensive odors are not used.
Sand treatment Finishing Heat treatment		It is difficult to adopt totally enclosed systems for these processes, but generation of dust is prevented by providing individual machines with dust collectors.

In the MFC Project, the high-frequency induction furnace is adopted in the melting process and the V-process in the molding process, by which the generation of noise, vibration, dust, offensive odors and air pollution, normally associated with foundries in general, is suppressed almost entirely.

In addition, the generation of industrial wastes such as slag and waste sand is also minimized, with the result that the extent of environmental disruption is definitely far less compared with other types of equipment and processes. The extent of water contamination is also suppressed to about the same extent with machinery plants in general.

Since the MFC Project is designed with the basic concept of a so-called "clean foundry", systems and equipment of minimum environmental disruption are selected. The scale of the foundry being comparatively small in its entirety, the realization of a completely "clean foundry" is economically difficult, but the foundry has been designed with the greatest consideration given to prevention of environmental disruption.

Chapter 11. Guidance in Management and Techniques

Chapter 11. Guidance in Management and Techniques

11.1 Necessity of Guidance

Even if a foundry having the most sophisticated production facilities was constructed, it will be unable to operate at a high efficiency if there are problems in the foundry's management and techniques. It will then become impossible to manufacture products of high quality, and the foundry will eventually be forced into bankruptcy. Accordingly, when constructing a foundry in a developing country, it will be necessary for foundry personnel to receive sufficient training in aspects of both corporate management and manufacturing techniques.

With a jobbing foundry like MFC, the situation surrounding activities for acquisition of client orders will most greatly influence the foundry's management. In order to obtain as many product orders as possible from among the indefinite mass of users, it will be necessary for sales personnel to patiently pay visits to the industrial plants of various industries in operation all about in the region and to select and determine, from among the demands placed by these users, the kinds of products which MFC will be capable of supplying.

If the activities of sales personnel were insufficient and improper and the amount of orders inadequate compared with the foundry's production capacity, the management will soon become bankrupt.

Meanwhile, in response to orders received, the foundry will have to supply products of high quality satisfying the requirements of users, for which production personnel will have to possess adequate technical capabilities for producing quality products within tolerable dimensions. Otherwise, if the needs of these clients cannot be met, their reliance on the foundry will be lost and it will become impossible to receive repeat orders thence forth.

Other requirements which users place on the foundry are strict observance of delivery schedules and moderate product prices, and in order to comply with these requirements foundry personnel will be required to possess adequate aptitudes in aspects of plant management. For this, guidance will have to be received in all aspects of plant management — procurement of raw materials, stock, inventory, control, labor and financial management.

In order for the foundry to be managed soundly, it will be necessary for activities concerning the aforementioned sales, production and management to be performed adequately

in a sophisticated mix, because an inadequacy in any of these aspects will cause difficulties in financial aspect.

Owing to the reasons outlined above, foundry personnel will have to receive guidance related to product sales, plant management and production techniques. A description of the contents of these guidance programs is offered hereunder.

11.2 Overseas Guidance

In the present Project, the plan is to install production facilities of relatively high technical level. However, since MFC is a jobbing foundry required to produce diversified products in small lots, there will be various processes demanding workers to use their judgement and perform manual labor. Accurate judgement with respect to reactions and appropriate disposition will be required, for which a high level of knowledge and experience will necessary.

Overseas guidance primarily involves technical training. Engineers having acquired some experience in the manufacture of castings in Indonesia as well as skilled workers hired by the foundry will have to receive overseas guidance for acquisition of most modern techniques.

In order to offer training in a short period of time and most efficiently, the manufacturing processes are to be broken down into detailed parts in order to have the trainees receive guidance by specific processes and acquire skills in specialized techniques.

Accoridngly, training is to be offered by processes, such as melting, preparation of wooden patterns, mold making, finishing, testing and inspection, and quality control.

Although it would be desirable to offer guidance to as many trainees as possible and for a long period, the following training plan has been drafted for this project in consideration of the expenses and time involved:

Melting:	2 trainees
Molding:	2 trainees
Wooden pattern preparation:	1 trainee
Finishing:	1 trainee

The trainees to be dispatched for overseas technical training are MFC engineers or skilled workers selected from among the personnel to be appointed to managers or sub-managers of the respective processes.

An overseas training period of at least four months is regarded necessary. Training is to be completed before the construction of the foundry is started, in order to permit trainees after returning to Indonesia to help the construction work, through which they can acquire knowledge relating to plant equipment, which knowledge is usable in the future for maintenance work.

11.3 Domestic Training

Staff members and workers who are not dispatched overseas for training will have to receive suitable training in the country before commencement of foundry operation.

Domestic training is to be offered at the plant site, at some appropriate time while the foundry is under construction. Dispatching staff members to MIDC for training is certain to provide highly satisfactory results.

11.4 Guidance after Commencement of Foundry Operation

In order to ensure sound foundry management, it will be necessary for foundry personnel to acquire sufficient knowledge and techniques in such aspects as product sales (including acquisition of orders), manufacturing and plant management, as described earlier.

That is, in carrying out this project and in order to attain these objectives, it will be necessary to receive integrated training over all phases of foundry operation and management from overseas consultants after commencement of foundry operation.

Receiving of guidance from overseas consultants is to be generally performed in the following manner:

1) Guidance on Marketing

Guidance on marketing is to be offered through practical taining, or with sales personnel accompanying the consultant in visits to various users of castings, through which practical order-taking methods are taught concretely.

2) Guidance in Foundry Management

Theoretical and practical guidance is to be offered in connection with procurement of raw materials, stock inventory, labor and financial management.

3) Guidance in Manufacturing Techniques

Training is to be offered by kind of process, or in connection with melting, preparation of wooden patterns, molding, finishing, testing and inspection, and quality control of product.

4) Preparation of Guidebook

While most of the above-mentioned guidance is offered orally, the consultants are to prepare detailed guidebooks by which guidance can be given to a multiple number of trainees. This method is adopted since it not only helps to improve the guidance efficiency but also has the effect of easing the influence when a worker having received guidance inadvertently leaves the foundry for some personal reason.

5) Period of Guidance and Required Number of Consultants

Guidance will have to be offered over a long period of time, and when impelementing this project, a guidance period of at least two years will be necessary, for which the following number of consultants will be required:

Marketing Management	)	Total of 2 consultants (24 man-month)
Manufacturing		Total of 2 consultants (48 man-month)

11.5 Cost of Guidance and Training

The cost for the guidance and training services described above, based on prices as of January, 1981, is as follows:

Training in Indonesia

Residential expenses:

¥600,000/man-month x 24 man-month = ¥14,400,000

Airfare expenses:

Rp.1,200,000 x 6 = Rp.7,200,000

Guidance after commencement of foundry operation

Consultant expenses:

Total: ¥120,000,000

(Calculated on the basis of ¥20,000,000/consultant/Y)

Chapter 12. Required Investment and Financing Plan

Chapter 12. Required Investment and Financing Plan

An estimate of the investment necessary for implementing this project, as well as the plan for procurement of necessary funds, are described hereunder.

12.1 Basic Conditions

The basic conditions for estimating the project cost are as follows:

1) Currency exchange rate

US$1 = ¥205 = Rp.625

2) Method of procurement of plant equipment

By competitive bids

3) Type of contract for procurement of plant equipment

CIF plus supervisor, lump sum contract

4) Time of cost estimation

Prices as of January, 1981

5) Price escalation (annual rate)

Foreign currency	8%
Domestic currency	15%

12.2 Estimation of Project Cost (As of January, 1981)

The estimation was made, based on prices as of January, 1981, when site survey was conducted.

1) Land

A strip of land 12,000 m^2, necessary for this project, is to be leased from Industrial Estate Medan under the following conditions:

Term of lease	30 years
Method of payment of rent	Prepayment in full
Unit rent (Rp./m^2)	Rp.9,350

2) Cost of Machinery and Equipment

The cost of imported machinery and equipment (FOB) necessary for the project, or for power receiving, melting, molding and sand treatment, including engineering fees, is estimated at ¥527,096,000, and that of machinery and equipment procurable in Indonesia, at Rp.164,024,000.

3) Ocean Freight and Insurance

The costs for these items are equivalent to 6.2% of paint machinery and equipment costs (FOB).

4) Inland Transportation and Cargo Handling Costs

The volume of imported machinery and equipment is calculated at 2,000 m^3, and the inland transportation cost from Belawan Port to plant site at Rp.15,000/m^3.

5) Civil Engineering Works

The cost for civil engineering works, including landfilling, piling and other operations, is calculated at Rp.77,900,000.

6) Building Works

The costs of materials for the construction of buildings and their foundations, as well as the labor cost of an aggregate of 5,400 man-days, are calculated at Rp.236,000,000.

7) Erection Works

The cost for erection of plant machinery and equipment, including an aggregate of 6,000 man-days of labor cost, is calculated at Rp.15,000,000.

8) Cost for Supervision

The cost for supervisors for erection of machinery and equipment, running up to 25 man-months (6 supervisors), is calculated at Rp.33,976,000.

9) Miscellaneous Costs

Miscellaneous costs for the procurement of automobiles and other fixed assets, other than for machinery and equipment and buildings, are calculated at Rp.60,976,000.

10) Pre-Oepration Capital Expenditures

(a) Dispatch of Trainees

Prior to commencement of operation of MFC, six employees are to be dispatched to Japan to receive practical training at foundries in melting, molding, sand treatment, wooden pattern preparation and other techniques, for which a cost of ¥14,400,000 in foreign currency and Rp.7,200,000 in local currency is estimated.

(b) Consulting Fee

In order to implement the MFC project, consultants will have to be hired for such services as preparation of tender specifications, evaluation of tenders, approval of documents and diagrams, monitoring erection of plant equipment and approval of plant delivery, for which a consulting fee of ¥50,000,000 is calculated for a total of 30 man-months of servies.

(c) Management Guidance

After commencement of operation of MFC, a total of four foreign consultants including two experts on casting, one expert on wooden pattern preparation and one advisor on foundry management including sales, are to be employed in order to ensure transfer of technology and smooth management of foundry, for which a cost

of ¥120,000,000 is estimated.

(d) Others

(i) Rp.81,000,000 is estimated as connection charge for receiving power from PLN.

(ii) Rp.57,000,000 is estimated as MFC establishment.

(iii) Rp.17,493,000 is estimated as the costs for foundry test run including raw materials, utilities and labor costs for 15 day's production.

11) Contingency

With respect to the cost items 1)–9) in paragraph 12.2, a contingency consisting of 5% of the foreign currency portion and 10% of the local currency portion is calculated. Table 12-1 shows all the estimated project costs described above.

Table 12-1. Estimate of Project Cost (Jan., 1981)

Item	Foreign Portion		Local Portion (Rp.1,000)	Total (Rp.1,000)
	(¥1,000)	(Rp.1,000)		
1. Land			112,200	112,200
2. Machinery & Equipment (FOB)	527,096	1,607,000	164,024	1,771,024
3. Ocean Freight & Insurance	32,697	99,686		99,686
4. Inland Transportation, etc.			30,000	30,000
5. Civil Engineering Works			77,900	77,900
6. Building Works			236,000	236,000
7. Erection Works			15,000	15,000
8. Supervision	33,650	102,591		102,591
9. Miscellaneous			60,976	60,976
10. Pre-Operation Capital Expenditures	184,400	562,195	162,693	724,888
11. Contingency	29,672	90,463	69,610	160,073
Total	807,515	2,461,935	928,403	3,370,338

12.3 Initial Working Capital

Table 12-2 indicates the initial working capital required in the initial year of foundry operation.

Table 12-2. Initial Working Capital

Inventory	Day	Value (Rp.1,000)
Imported Raw Materials	90	24,326
Domestic Raw Materials	30	17,440
Goods, Goods in Process, etc.	15	24,076
Total		65,842

Price in Jan., 1984, Production level 65%.

12.4 Total Project Cost

The total project cost is obtained by drawing up the capital disbursement plan in conformance with the project schedule and for each project cost item included in Table 12-1, estimated by prices as of January, 1981, and calculating these cost items at time of their disbursment under condition of price escalation of 8% for the foreign currency portion and 15% for the local currency portion.

Table 12-3 shows the price escalation and disbursement plan, and Table 12-4 the total project cost on the disbursement basis.

Table 12-3. Price Escalation, Disbursement Plan

(Unit: Rp.1,000)

Item	1981		1982		1983		1984		1985	
	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local
1. Land		112,200								
2. Machinery & Equipment (FOB)			520,668	56,588	1,316,133	151,558				
3. Ocean Freight & Insurance			32,298		81,643					
4. Inland Transportation & Handling				10,350		27,720				
5. Civil Engineering Works				89,585						
6. Building Works				217,120		62,304				
7. Erection Works						19,800				
8. Supervision					120,031					
9. Miscellaneous						80,488				
10. Pre-Operation Capital Expenditure	30,488	7,775	65,854	17,882	122,706	182,887	230,488		248,780	
11. Contingency					105,842	91,885				
Project Cost	30,488	119,975	618,820	391,525	1,746,355	616,642	230,488		248,780	
12. Initial Working Capital								65,842		
Total Project Cost	30,488	119,975	618,820	391,525	1,746,355	616,642	230,488	65,842	248,780	
	150,463		1,010,345		2,362,997		296,330		248,780	

Table 12-4. Total Project Cost Required

Item	Foreign Portion		Local Portion (Rp.1,000)	Total (Rp.1,000)
	(¥1,000)	(Rp.1,000)		
1. Land			112,200	112,200
2. Machinery & Equipment (FOB)	602,471	1,836,801	208,146	2,044,947
3. Ocean Freight & Insurance	37,373	113,941		113,941
4. Inland Transportation, etc.			38,070	38,070
5. Civil Engineering Works			89,585	89,585
6. Building Works			279,424	279,424
7. Erection Works			19,800	19,800
8. Supervision	39,370	120,031		120,031
9. Miscellaneous			80,488	80,488
10. Pre-Operation Capital Expenditure	229,018	698,316	208,544	906,860
11. Contingency	34,716	105,842	91,885	197,727
Project Cost	942,978	2,874,931	1,128,142	4,003,073
12. Initial Working Capital			65,842	65,842
Total Project Cost	942,978	2,874,931	1,193,984	4,068,915
13. Interest during Construction*			217,890	217,890
Financing Required	942,978	2,874,931	1,411,874	4,286,805

* Refer to Item 12.5 3)

12.5 Financing Plan

1) Policy for Procurement of Funds

(a) The total project cost (including interest incurred during foundry construction) is to be financed by means of equity capital and long-term loan.

(b) Based on a decision of the Indonesian Government, the Government is to invest in Rupiah, equivalent to ¥570,000,000.

(c) Investments are also to be made by the Government of North Sumatra and private foundry companies.

2) Capital Structure

Based on information acquired through local surveys, the capital structure for the MFC project will be as shown in Table 12-5.

Table 12-5. Capital Structure

(Unit: Rp.1,000)

Equity Capital:		2,672,805
Indonesian Government:	1,737,805	
North Sumatra Government:	860,000	
Private Foundry Company:	75,000	
Debt:		1,614,000
Long Term Loan:	1,614,000	
Total:		4,286,805

Note: Total Project Cost including Interest during Construction; Rp. 4,286,805.

3) Long-Term Loan and Interest During Construction

The long-term loan is to be borrowed at the beginning of 1983 under the following terms and conditions:

Terms and Conditions:

Grace Period	3 years
Repayment Period	12 years
Annual Interest Rate	13.5%

The interest payable during MFC construction in the initial year of loan under the terms and conditions described above will be:

Rp.1,614,000,000 x 13.5% = Rp.217,890,000

(Included in Table 12-4.)

Chapter 13. Financial Analysis

Chapter 13. Financial Analysis

Production cost calculation and financial analysis are made in this Chapter.

13.1 General Conditions

1) MFC is assumed to commence plant operation from January, 1984.

2) The project life of the foundry is assumed to be 15 years after commencement of operations.

3) The prices for calculating production cost and profit and loss are based on prices as of January, 1984. These prices were obtained from the prices of January, 1981, with annual escalation rate of 8% for the foreign currency portion and 15% for the local currency portion in principle. It is assumed that these prices will remain unchanged for the following 15 years.

13.2 Conditions Assumed in Financial Analysis for the Standard Case of Case A (Base Case)

1) Standard Production Capacity

MFC's standard production capacity is as shown in Table 13-1.

Table 13-1. Production Capacity

(Unit: Ton)

Product	FC	SC	SC Mn H
Production	600	480	120

Note: FC: Gray Iron Castings
SC: Carbon Steel and/or Low Alloy Steel Castings
SC Mn H: High Manganese Steel Castings

2) Production Level

The production level during this financial analysis is assumed to be as shown in Table 13-2.

Table 13-2. Production Level

Year	1984	1985	1986	1987	1988–1998
Production Level	40%	60%	80%	90%	100%

3) Unit Selling Price

In Indonesia, the unit selling prices of castings are largely influenced by the prices of imported products. As the castings produced in this Project are mostly substitute for imported castings, unit selling price of the produced castings will increase with escalation rate applicable to those castings in international market. Therefore, the unit selling prices of castings as of January, 1984 are calculated on the basis of prices as of January, 1981, adjusted with price escalations of 8% annually, and are shown in Table 13-3.

Table 13-3. Unit Selling Price

(Unit: Rp.1,000/Ton)

Product	FC	SC	SC Mn H
Unit Price	693	1,134	2,520

4) Costs

The bases of calculation of the following cost items are described hereunder.

a) Cost of Raw Materials

Table 13-4 indicates the unit consumption and cost of principal raw materials and supplies necessary for melting, molding, heat treatment and finishing in order to manufacture castings.

b) Utilities Cost

Electricity, fuel oil and water are regarded as utilities, and divided into direct variable utilities and indirect fixed utilities. Table 13-5 shows the variable utilities cost and Table 13-6 the fixed utilities cost.

c) Manpower Cost (Fixed Cost)

The manpower cost is divided into that incurred for the workshop and that incurred for the sales and administration departments and is shown in Table 13-7.

d) Maintenance Cost (Fixed Cost)

The maintenance cost is assumed to run up to 0.5% of the machinery and equipment cost in the initial year of foundry operation, and 1% in subsequent years.

e) Insurance (Fixed Cost)

Machinery and equipment as well as buildings are to be insured, for which an insurance cost equivalent to 0.5% of the cost of machinery and equipment as well as buildings will be incurred.

Table 13-4. Unit Consumption of Raw Materials

Item	(A) Unit price (Rp./kg)	FC		SC		SC Mn H	
		(B) Unit consumption	(A)x(B) Value (Rp./t)	(C) Unit consumption	(A)x(C) Value (Rp./t)	(D) Unit consumption	(A)x(D) Value (Rp./t)
Pig Iron	189	285.7	53,997				
Steel Scrap	91	571.4	51,997	1,000.0	91,000	883.3	80,380
Cast Iron Scrap	175	142.8	24,990				
Ferro-Manganese	580	2.9	1,682	10.0	5,800	166.7	96,686
Ferro-Silicon	756	8.6	6,502	8.0	6,048	6.7	5,065
Silica Sand	61	150.2	9,162	369.0	22,509		
Olivine Sand	151					629.3	95,024
Clay	61	43.3	2,641	72.9	4,447		
Film			11,642		11,642		14,364
Other Materials, etc.			168,148		337,528		539,280
			330,761		478,974		830,799

Note: (B) (C) (D) Unit consumption: kg/t of product.

Table 13-5. Variable Utilities Cost

Item	(A) Unit price	FC		SC		SC Mn H	
		(B) Unit consumption	(A)x(B) Amount (Rp./t)	(C) Unit consumption	(A)x(C) Amount (Rp./t)	(D) Unit consumption	(A)x(D) Amount (Rp./t)
Electric Power	30 (Rp./kWh)	1,700.0 (kWh/t)	51,000	2,500.0 (kWh/t)	75,000	2,200.0 (kWh/t)	66,000
Fuel Oil	76 (Rp./ℓ)	14.3 (ℓ/t)	1,087	40.4 (ℓ/t)	3,070	33.7 (ℓ/t)	2,561
Water	380 (Rp./m^3)	5.8 (m^3/t)	2,204	6.8 (m^3/t)	2,584	16.7 (m^3/t)	6,346
			54,291		80,654		74,907

Table 13-6. Fixed Utilities Cost

Item	Unit Price	Annual Consumption	Value per Year (Rp.1,000)
Electric Power	2,432 (Rp./kVA per M)	24,000 (kVA/Y)	53,368
Electric Power	30 (Rp./kWh)	90,000 (kWh/Y)	2,700
Water	380 (Rp./m^3)	3,600 (m^3/Y)	1,368
Total			62,436

Table 13-7. Manpower Cost

	Classification	Number	Annual Rate (Rp.1,000)	Amount (Rp.1,000)
Work Shop	Manager	2	3,952	7,904
	Skilled	15	1,877	28,155
	Unskilled	36	889	39,004
	Total	53		68,063
Administration & Sales	Director	1	5,928	5,928
	Manager	2	3,952	7,904
	Senior	5	1,877	9,385
	Junior	4	889	3,556
	Total	12		26,773
Grand Total		65		94,836

f) Depreciation Cost (Fixed Cost)

Tangible fixed assets and intangible fixed assets are to be depreciated by the fixed amount method, over the following periods:

Machinery & Equipment	15 years
Building	25 years
Vehicle	5 years
Intangible Assets	5 years

g) Sales and Administration Cost (Variable Cost)

Sales and general administration cost equivalent to 2% of sales revenue is assumed.

h) Interest on Loan (Fixed Cost)

The conditions of long-term loan is assumed to be as follows:

Grace Period	3 years
Repayment Period	12 years
Annual Interest Rate	13.5%

Table 13-8 indicates the principal and interest payable annually on long-term loan.

5) Corporate Tax

Payment of corporate income tax is exempted for the first 4 years after commencement of foundry operation, and 45% annually from the fifth year.

13.3 Production Cost

The production cost is divided into direct variable cost and indirect fixed cost, and will differ with each year. The production cost described hereunder is for 1990, based on prices as of 1984.

Table 13-8. Long Term Loan Interest

(Unit: Rp.1,000)

Year	Principal Balance	Repayment	Interest	Debt Service
1983	1,614,000		217,890	217,890
1984	1,614,000		217,890	217,890
1985	1,614,000		217,890	217,890
1986	1,479,500	134,500	199,733	334,233
1987	1,345,000	134,500	181,575	316,075
1988	1,210,500	134,500	163,418	297,918
1989	1,076,000	134,500	145,260	279,760
1990	941,500	134,500	127,103	261,603
1991	807,000	134,500	108,945	243,445
1992	672,500	134,500	90,788	225,288
1993	538,000	134,500	72,630	207,103
1994	403,500	134,500	54,473	188,973
1995	269,000	134,500	36,315	170,815
1996	134,500	134,500	18,315	152,658
1997		134,500		134,500

Note: Principal Balance is at the beginning of the year.

1) Direct Variable Cost

The costs shown below are direct variable costs which can be elucidated for each product.

Raw material cost	(Table 13-4)
Utilities cost	(Table 13-5)

2) Indirect Fixed Cost

The costs shown below cannot be elucidated for each product, and therefore regarded as indirect fixed costs.

Utilities cost	(Table 13-6)
Manpower cost	(Table 13-7)
Maintenance cost	
Insurance	
Depreciation cost	
Interest	

3) Distribution of Indirect Cost

Roughly 80% of indirect costs are related directly to plant costs, so indirect costs are assumed to be distributed in proportion to their degree of involvement in product manufacturing. Distribution of indirect cost is shown in Table 13-9.

4) Production Cost

Based on the preconditions described above, the production costs were calculated on the basis of 1984 prices as are shown in Tables 13-10 and 13-11.

13.4 Analysis of Break-Even Point

The break-even point is analyzed under the following conditions:

1) The ratio of manufacture of products is constant, at FC 50%, SC 40% and SCMnII 20%.

2) Break-even point analysis is made based on production cost and, profit and loss estimated for the year 1990.

3) The variable cost ratios are as follows:

FC	57.6%
SC	51.4%
SCMnII	38.0%
General	50.0%

Table 13-9. Distribution of Indirect Cost

Products	FC	SC	SC Mn H
Ratio (%)	40	48	12

Table 13-10. Manufacturing Cost (1990)

(Unit: Rp.1,000)

	FC	SC	SC Mn H	Indirect Cost
Raw Material	198,457	229,908	99,696	
Utilities	32,575	38,714	8,989	
Direct Cost	231,032	268,622	108,685	
Utilities				62,436
Manpower				68,063
Maintenance				25,345
Insurance				15,079
Depreciation				188,216
Interest				127,103
Indirect Cost Absorbed	194,497	233,396	58,349	486,242
Total Manufacturing Cost	425,529	502,018	167,034	

Table 13-11. Unit Product Cost

(Unit: Rp./Ton)

Year	FC	SC	SC Mn H
1984	1,366,728	2,032,172	2,311,584
1990	709,215	1,045,871	1,325,283
1998	624,479	918,764	1,198,180

Price in 1984

4) Prices are based on those as of 1984.

5) The break-even point is indicated in operation rate.

Break-even point for each kind of product and for all products are shown in Table 13-12, and that for all products is illustrated in Fig. 13-1.

Table 13-12. Break-even Point (1990)

(Unit: Rp.1,000)

		FC	SC	SC Mn H	All Products of the Project
I.	Sales Revenue	415,800	544,320	302,400	1,262,520
	Variable Cost	239,348	279,508	114,773	633,629
	Fixed Cost	205,206	246,247	61,362	513,015
II.	Total Cost	444,554	525,755	176,335	1,146,644
I-II	Net Profit	-28,754	18,565	126,065	115,876
	Break-even Point (%)	116.4	93.1	32.8	81.3
	Variable Cost	239,348	279,508	114,773	633,629
	Fixed Cash Expense	129,920	155,903	38,976	324,799
III.	Total Cash Expense	369,268	435,411	153,749	958,428
I-III	Cash In (Out)	46,539	108,909	148,651	304,092
	Cash Break Even Point (%)	73.7	58.9	20.79	51.5

Price in 1984

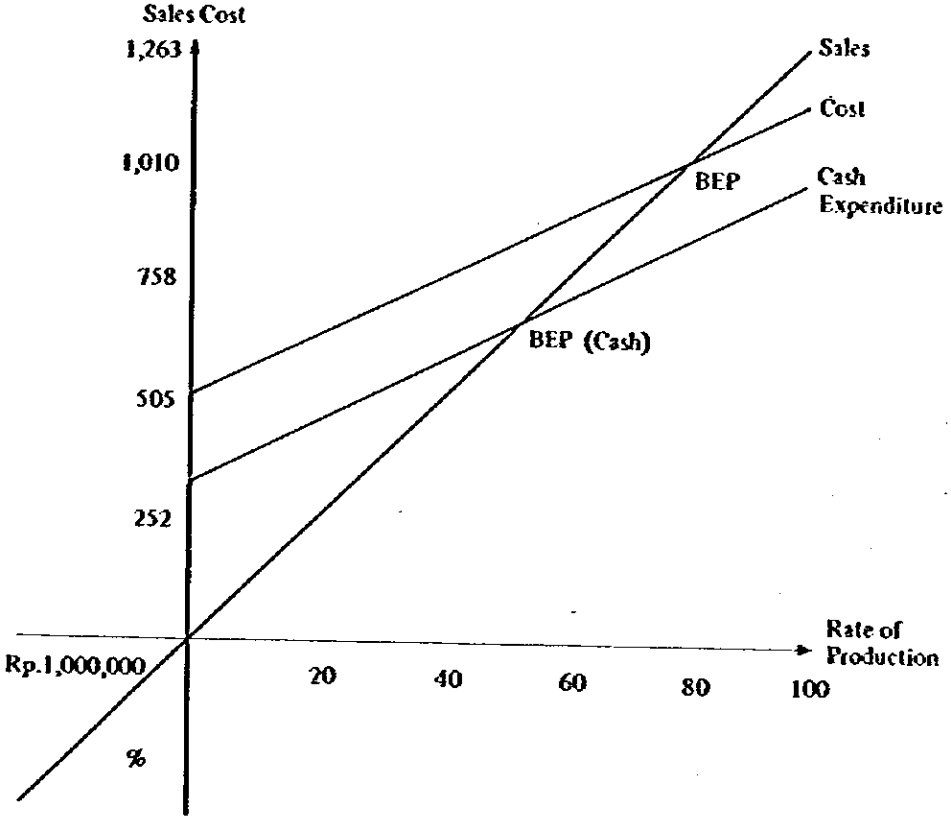
From the results shown in those tables the following conclusions are drawn:

1) Regarding the manufacture of FC, MFC will fall into deficit operation.

2) The break-even point in the manufacture of SC being 93.1%, there is fear of deficit operation even with a slight aggravation in aspects of sales revenues or manufacturing costs.

3) The break-even point in the manufacture of SCMnH being 32.8%, the manufacture of this product will largely contribute to the profitability of the Project as a whole.

Fig. 13-1. Break-even Point (1990)



4) It is undesirable that the business performance of MFC will be influenced largely by the situation surrounding the sales of SCMnH whose product ratio comprises only 10% of the entire product volume.

5) It must constantly be kept in mind in this Project that the manufacturing and sales of both SC and SCMnH, which are the underpinnings of MFC's business performance, involve a number of unstable factors.
Break-even point in each year of operation is shown in Table 13-13.

Table 13-13. Break-even Point

Year	1984	1986	1988	1990	1992	1994	1996	1998
BEP (%)	117	125	119	82	76	70	64	61

13.5 Internal Rate of Return (IRR)

13.5.1 Internal Rate of Return of the Project

The internal rate of return obtained on the basis of the conditions (Standard Case of Base Case) described in paragraph 13.2 of this Cahpter is as follows:

IRR (Before tax)	4.304%
IRR (After tax)	1.537%

As these figures indicate, the profitability of this project is extremely low.

13.5.2 Sensitivity Analysis

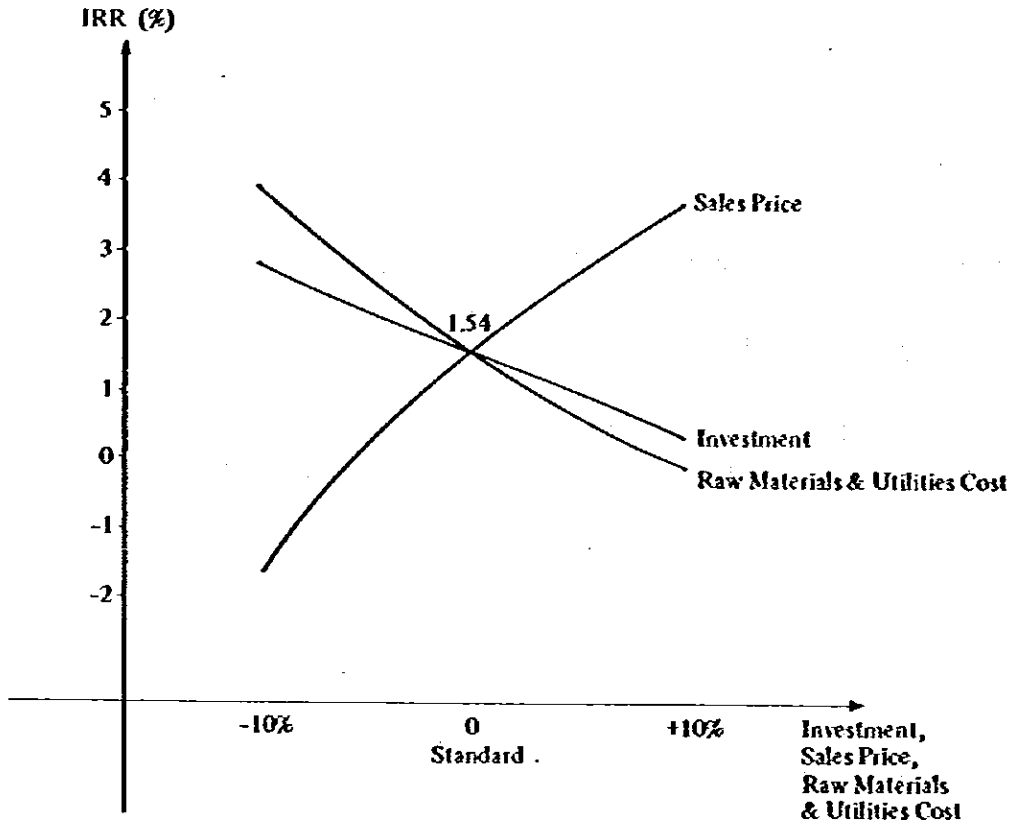
The changes that would be brought about in the internal rate of return were studied for the cases when an increase or decrease of 10% occurs in the investment cost, sales revenue as well as raw materials and utilities costs with respect to the standard case of Base Case, described in paragraph 13.2 of this chapter.

Results are shown in Table 13-4 and Fig. 13-2.

Table 13-14. IRR, Sensitivity Analysis (Base Case)

	10% Increase	Standard	10% Decrease
Investment	0.410%	1.535%	2.821%
Sales Price	4.280	1.535	-1.648
Raw Material & Utilities Cost	-0.029	1.535	3.099

Fig. 13-2. Sensitivity Analysis (Base Case)



13.5.3 Internal Rate of Return for Case B

According to the Implementation Program of 1975 prepared by the Department of Industry of Indonesia, the foundry operation rates are set as follows:

1st year of operation	65%
2nd year	75%
3rd year	85%
4th and subsequent years	100%

When the foundry operation rates assumed in the Base Case are changed to the conditions described above, the internal rates of return before and after tax will be 4.962% and 2.556% respectively.

That is, even if conditions are improved to some extent as described above, the internal rate of return of this Project will be extremely low and the MFC Project cannot be regarded as a fascinating project promising a high level of profitability.

13.6 Income Statement

As indicated by the income statement prepared on the basis of the standard case of Base Case (Table 13-16, Pro Forma Income Statement), this Project will incur a deficit every year during th five years after commencement of operation, and in 1988 the aggregate deficit will run up to Rp.1,507,962,000. Moreover, the aggregate deficit cannot be liquidated during the project life of 15 years.

The tables from 13-15 to 13-18 which are attached at the end of this Chapter are for the following cases.

Table 13-15 Case A (Base Case)	Without Taxation
Table 13-16 Case A (Base Case)	With Taxation
Table 13-17 Case B	Without Taxation
Table 13-18 Case B	With Taxation

13.7 Fund Flow Statement

According to Fund Flow Statement for Base Case, this project shows that cash deficiency will be faced for a period of four years during its economic life of 15 years.

13.8 Financial Assessment

As observed from the financial analysis, the following conclusion is reached with respect to this project:

1) The profitability of this project is very low.

2) Product-Wise profitability

a) The manufacture of cast iron contributes largely to maintaining the foundry's operation rate but does not display profitability.

b) Meanwhile, the manufacture of cast steel will not contribute to profit-making unless

the operation rate is maintained at a high level exceeding 90%, as judged from the results of analysis of the break-even point by kind of product.

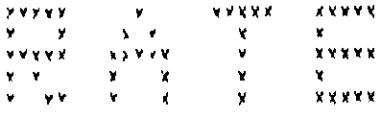
c) The manufacture of high manganese cast steel displays a high level of profitability, but since its production volume is very low, or only 120 t/Y even with full production, the corporate destiny itself will be jeopardized if there is any notable slump in client orders to this product.

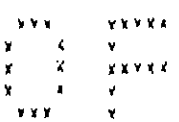
3) Fund Flow

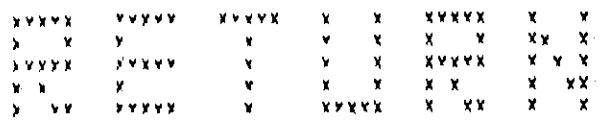
Cash shortage will be encountered over a period of four years in the standard case of Base Case. In order to avoid such a situation it is indispensable to get additional governmental financial aid or some new loan.

Accordingly, it is concluded that this project is infeasible as observed from its financial analysis.

Table 13-15







Year	3	4	5	6	7-17
Production Level	40%	60%	80%	90%	100%

Tax 0% (before Tax)

S A L E S R E V E N U E

(YEAR)	0	1	2	3	4	5	6	7	8
(1) F C									
RATE OF OPERATION				60.00	80.00	95.00	95.00	100.00	100.00
LOCALLY									
QUANTITY (TON)				240	320	480	560	800	800
UNIT PRICE ($)				4935000	4935000	4935000	4935000	4935000	4935000
REVENUE (1000$)				1184520	2369040	3552480	3749220	4155800	4155800
(2) S C									
RATE OF OPERATION				40.00	60.00	80.00	90.00	100.00	100.00
LOCALLY									
QUANTITY (TON)				192	288	384	432	480	480
UNIT PRICE ($)				11540000	11540000	11540000	11540000	11540000	11540000
REVENUE (1000$)				2217728	3326592	4435456	4989888	5544320	5544320
(3) SCMNM									
RATE OF OPERATION				60.00	80.00	80.00	90.00	100.00	100.00
LOCALLY									
QUANTITY (TON)				48	72	96	108	120	120
UNIT PRICE ($)				25200000	25200000	25200000	25200000	25200000	25200000
REVENUE (1000$)				1209600	1814400	2419200	2721600	3024000	3024000
REVENUE FROM PRODUCT (1000$)				5059328	7597312	10126016	11342848	12632520	12632520
REVENUE (LOCAL) (1000$)				5059328	7597312	10126016	11342848	12632520	12632520
REVENUE (EXPORT) (1000$)									
TOTAL REVENUE (1000$)				5059328	7597312	10126016	11342848	12632520	12632520

S A L E S R E V E N U E

	(YEAR)	9	10	11	12	13	14	15	16	17
(1) P C										
RATE OF OPERATION		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOCALLY										
QUANTITY	(TON)	400	400	400	400	400	400	400	400	400
UNIT PRICE	(RP)	493000	493000	493000	493000	493000	493000	493000	493000	493000
REVENUE	(1000RP)	415800	415800	415800	415800	415800	415800	415800	415800	415800
(2) S C										
RATE OF OPERATION		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOCALLY										
QUANTITY	(TON)	480	480	480	480	480	480	480	480	480
UNIT PRICE	(RP)	1134000	1134000	1134000	1134000	1134000	1134000	1134000	1134000	1134000
REVENUE	(1000RP)	544320	544320	544320	544320	544320	544320	544320	544320	544320
(3) SEMEN										
RATE OF OPERATION		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOCALLY										
QUANTITY	(TON)	120	120	120	120	120	120	120	120	120
UNIT PRICE	(RP)	2520000	2520000	2520000	2520000	2520000	2520000	2520000	2520000	2520000
REVENUE	(1000RP)	302400	302400	302400	302400	302400	302400	302400	302400	302400
REVENUE FROM PRODUCT	(1000RP)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520
REVENUE (LOCAL)	(1000RP)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520
REVENUE (EXPORT)	(1000RP)									
TOTAL REVENUE	(1000RP)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520

P R O F O R M A I N C O M E S T A T E M E N T

	(YEAR)	0	1	2	3	4	5	6	7	8
****REVENUE****										
TOTAL REVENUE	(1000RP)				505008	757512	1010016	1136268	1262520	1262520
****COST****										
(1) RAW MATERIALS										
PIG IRON										
REQUIREMENT	(1KG)				68568	102852	137136	154278	171420	171420
UNIT PRICE	(1RP)				180	180	180	180	180	180
VALUE	(1000RP)				12859	19289	25719	28934	32150	32150
STEEL SCRAP										
REQUIREMENT	(1KG)				371536	557303	743070	835952	928836	928836
UNIT PRICE	(1RP)				91	91	91	91	91	91
VALUE	(1000RP)				33810	50714	67619	76072	84524	84524
CAST IRON SCRAP										
REQUIREMENT	(1KG)				54272	81408	108544	122112	135680	135680
UNIT PRICE	(1RP)				175	175	175	175	175	175
VALUE	(1000RP)				9498	14246	18995	21369	23744	23744
FERRO MANGANESE										
REQUIREMENT	(1KG)				10822	16232	21643	24348	27054	27054
UNIT PRICE	(1RP)				580	580	580	580	580	580
VALUE	(1000RP)				6276	9414	12552	14121	15691	15691
FERRO SILICON										
REQUIREMENT	(1KG)				5032	7548	10063	11321	12579	12579
UNIT PRICE	(1RP)				756	756	756	756	756	756
VALUE	(1000RP)				3805	5707	7610	8561	9512	9512
SILLICA SAND										
REQUIREMENT	(1KG)				108408	162612	216816	243918	271020	271020
UNIT PRICE	(1RP)				61	61	61	61	61	61
VALUE	(1000RP)				6615	9923	13231	14885	16539	16539
OLIVINE SAND										
REQUIREMENT	(1KG)				50208	75312	100416	112968	125520	125520
UNIT PRICE	(1RP)				151	151	151	151	151	151
VALUE	(1000RP)				7581	11372	15162	17057	18953	18953
CLAY										
REQUIREMENT	(1KG)				26340	39510	52680	59265	65850	65850
UNIT PRICE	(1RP)				61	61	61	61	61	61
VALUE	(1000RP)				1608	2412	3216	3618	4020	4020
FILM										
VALUE	(1000RP)				5719	8578	11438	12867	14297	14297
OTHER MATERIALS ETC										
VALUE	(1000RP)				151164	226746	302328	340119	377910	377910
(2) UTILITIES										
ELECTRIC POWER										
REQUIREMENT	(1KWH)				993600	1490400	1987200	2235600	2484000	2484000
UNIT PRICE	(1RP)				30	30	30	30	30	30
VALUE	(1000RP)				29808	44712	59616	67068	74520	74520

PRO FORMA INCOME STATEMENT

	(YEAR)	0	1	2	3	4	5	6	7	8
HEAVY OIL										
REQUIREMENT	(1E 6)				12970	10210	21413	24816	32018	32018
UNIT PRICE	(1$/B)				24	24	24	24	24	24
VALUE	(1E6$)				473	4469	9047	21100	26433	26433
WATER 1										
REQUIREMENT	(1E6 B)				8600	8260	6018	7425	8768	8768
UNIT PRICE	(1$/B)				380	380	380	380	380	380
VALUE	(1E6$)				3268	3205	2469	2822	3329	3329
ELECTRIC POWER 2										
VALUE	(1E6$)				41048	41048	41048	41048	41048	41048
WATER 2										
VALUE	(1E6$)				1348	1348	1348	1348	1348	1348
(3) OPERATING LABOUR	(1E6$)				9485A	9485A	9485A	9485A	9485A	9485A
(4) MAINTENANCE	(1E6$)				12825	25565	25565	25565	25565	25565
(5) INSURANCE	(1E6$)				15079	15079	15079	15079	15079	15079
(A) SALES AND ADMINISTRATION	(1E6$)				10100	15150	20200	22725	25250	25250
(7) DEPRECIATION										
	(1E6$)				355650	355484	355484	355484	355484	257077
	(1E6$)									
TOTAL OPERATING COST	(1E6$)				776707	943559	1097254	1153617	1214075	1064261
NET OPERATING INCOME	(1E6$)				-208344	-208927	-81240	-17540	65545	193259
INTEREST	(1E6$)				217470	217800	196213	181575	163618	145200
SPECIAL ITEMS	(1E6$)									
NET INCOME BEFORE TAX	(1E6$)				-442275	-426917	-277073	-199024	-117875	47999
INCOME TAX	(1E6$)									
NET INCOME AFTER INT. & TAX	(1E6$)				-442275	-426917	-277073	-199024	-117875	47999

P & L PROFORMA INCOME STATEMENT

	(YEAR)	0	10	11	12	13	14	15	16	17
NET INCOME AFTER INT. & TAX										
TOTAL REVENUE	(1000RM)	1242520	1242520	1242520	1242520	1242520	1242520	1242520	1242520	1242520
****COST****										
(1) RAW MATERIALS										
PIG IRON										
REQUIREMENT	(1KG)	171420	171420	171420	171420	171420	171420	171420	171420	171420
UNIT PRICE	(1DM)	180	180	180	180	180	180	180	180	180
VALUE	(1000DM)	32398	32398	32398	32398	32398	32398	32398	32398	32398
STEEL SCRAP										
REQUIREMENT	(1KG)	92XX3A	92XX3A	92XX3A	92XX3A	92XX3A	92XX3A	92XX3A	92XX3A	92XX3A
UNIT PRICE	(1DM)	91	91	91	91	91	91	91	91	91
VALUE	(1000DM)	X4524	X4524	X4524	X4524	X4524	X4524	X4524	X4524	X4524
CAST IRON SCRAP										
REQUIREMENT	(1KG)	X5AX0	X5AX0	X5AX0	X5AX0	X5AX0	X5AX0	X5AX0	X5AX0	X5AX0
UNIT PRICE	(1DM)	175	175	175	175	175	175	175	175	175
VALUE	(1000DM)	14004	14004	14004	14004	14004	14004	14004	14004	14004
FERRO MANGANESE										
REQUIREMENT	(1KG)	24554	24554	24554	24554	24554	24554	24554	24554	24554
UNIT PRICE	(1DM)	580	580	580	580	580	580	580	580	580
VALUE	(1000DM)	15401	15401	15401	15401	15401	15401	15401	15401	15401
FERRO SILICON										
REQUIREMENT	(1KG)	9804	9804	9804	9804	9804	9804	9804	9804	9804
UNIT PRICE	(1DM)	756	756	756	756	756	756	756	756	756
VALUE	(1000DM)	7412	7412	7412	7412	7412	7412	7412	7412	7412
SILICA SAND										
REQUIREMENT	(1KG)	267240	267240	267240	267240	267240	267240	267240	267240	267240
UNIT PRICE	(1DM)	61	61	61	61	61	61	61	61	61
VALUE	(1000DM)	16302	16302	16302	16302	16302	16302	16302	16302	16302
OLIVINE SAND										
REQUIREMENT	(1KG)	75514	75514	75514	75514	75514	75514	75514	75514	75514
UNIT PRICE	(1DM)	151	151	151	151	151	151	151	151	151
VALUE	(1000DM)	11403	11403	11403	11403	11403	11403	11403	11403	11403
CLAY										
REQUIREMENT	(1KG)	40972	40972	40972	40972	40972	40972	40972	40972	40972
UNIT PRICE	(1DM)	61	61	61	61	61	61	61	61	61
VALUE	(1000DM)	2710	2710	2710	2710	2710	2710	2710	2710	2710
FILM										
VALUE	(1000DM)	14297	14297	14297	14297	14297	14297	14297	14297	14297
OTHER MATERIALS ETC										
VALUE	(1000DM)	327414	327414	327414	327414	327414	327414	327414	327414	327414
(2) UTILITIES										
ELECTRIC POWER 1										
REQUIREMENT	(1KWH)	2484000	2484000	2484000	2484000	2484000	2484000	2484000	2484000	2484000
UNIT PRICE	(1DM)	30	30	30	30	30	30	30	30	30
VALUE	(1000DM)	74520	74520	74520	74520	74520	74520	74520	74520	74520

PRO FORMA INCOME STATEMENT

	(YEAR)	9	10	11	12	13	14	15	16	17
HEAVY OIL										
REQUIREMENT	(TL)	32016	32016	32016	32016	32016	32016	32016	32016	32016
UNIT PRICE	(1MD)	7A	7A	7A	7A	7A	7A	7A	7A	7A
VALUE	(1000MD)	2433	2433	2433	2433	2433	2433	2433	2433	2433
WATER 1										
REQUIREMENT	(1TGV)	8764	8764	8764	8764	8764	8764	8764	8764	8764
UNIT PRICE	(1MD)	3A0	4A0	5A0	6A0	3A0	4A0	5A0	3A0	4A0
VALUE	(1000MD)	5326	5326	5326	5326	5326	5326	5326	5326	5326
ELECTRIC POWER 2										
VALUE	(1000MD)	A10AA	A10AA	A10AA	A10AA	A10AA	A10AA	A10AA	A10AA	A10AA
WATER 2										
VALUE	(1000MD)	13AA	13AA	13AA	13AA	13AA	13AA	13AA	13AA	13AA
(3) OPERATING LABOUR	(1000MD)	96A3A	96A3A	96A3A	96A3A	96A3A	96A3A	96A3A	96A3A	96A3A
(4) MAINTENANCE	(1000MD)	25365	25365	25365	25365	25365	25365	25365	25365	25365
(5) INSURANCE	(1000MD)	15079	15079	15079	15079	15079	15079	15079	15079	15079
(A) SALES AND ADMINISTRATIO	(1000MD)	25250	25250	25250	25250	25250	25250	25250	25250	25250
(7) DEPRECIATION										
	(1000MD)	1A421A	1A421A	1A421A	1A421A	1A421A	1A421A	1A421A	1A421A	1A421A
	(1000MD)									
TOTAL OPERATING COST	(1000MD)	1019505	1019505	1019505	1019505	1019505	1019505	1019505	1019505	1019505
NET OPERATING INCOME	(1000MD)	243015	243015	243015	243015	243015	243015	243015	243015	243015
INTEREST	(1000MD)	127105	104965	80298	72A50	64673	5A316	14159		
SPECIAL ITEMS	(1000MD)									
NET INCOME BEFORE TAX	(1000MD)	115912	138050	162722	170325	178542	20A721	228857	243015	243015
INCOME TAX	(1000MD)									
NET INCOME AFTER INT. & TAX	(1000MD)	115912	138050	162722	170325	178542	20A721	228857	243015	243015

INTERNAL RATE OF RETURN (FINANCIAL)

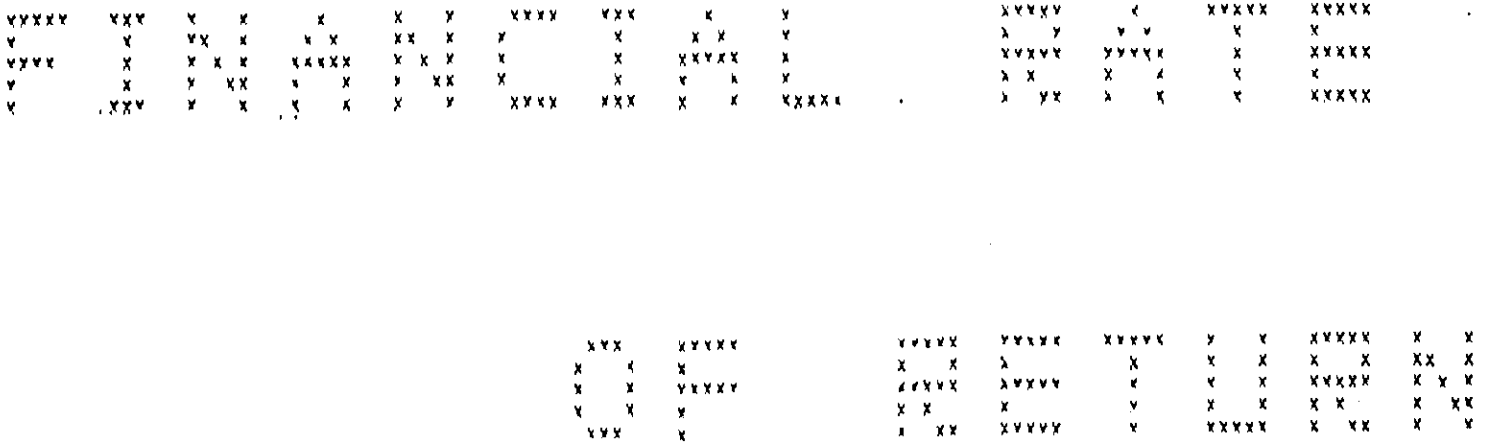
(UNITS 1000$)

YEAR	INVESTMENT	NET OPERATING INCOME	SPECIAL ITEMS	INCOME TAX AT 100% EQUITY	DEPRE-CIATION	SALVAGE VALUE	DEPLETED WORKING CAPITAL	NET CASH INFLOW	DISCOUNT FACTOR	PRESENT VALUE OF NET CASH INFLOW
0	150645	0	0	0	0			-150645	1.00000	-150645
1	1010345	0	0	0	0			-1010345	0.90179	-911241
2	2342997	0	0	0	0			-2342997	0.92304	-2163872
3	204330	-269345	0	0	333930			-339245	0.88949	-206430
4	269789	-206027	0	0	345884			-40121	0.85571	-59147
5	0	-40241	0	0	345884			338464	0.82300	251584
6	0	-17542	0	0	345884			368327	0.79154	291641
7	0	45565	0	0	345884			411231	0.76131	328307
8	0	193259	0	0	257972			411231	0.73232	315759
9	0	245015	0	0	166221A			411231	0.70454	303494
10	0	245015	0	0	166221A			411231	0.67794	292001
11	0	245015	0	0	166221A			411231	0.65144	280930
12	0	245015	0	0	166221A			411231	0.62656	270196
13	0	245015	0	0	166221A			411231	0.60242	259472
14	0	245015	0	0	166221A			411231	0.57961	249965
15	0	245015	0	0	166221A			411231	0.55765	240503
16	0	245015	0	0	166221A			411231	0.53619	231208
17	0	245015	0	0	166221A		45562	437793	0.51547	256324

TOTAL=0

INTERNAL RATE OF RETURN = 7.272 %

Table 13-16



Year	3	4	5	6	7-17
Production Level	40%	60%	80%	90%	100%

Tax 45%

S A L E S R E V E N U E

	(YEAR) 0 1 >	3	4	5	6	7	8
(1) F C							
RATE OF OPERATION		60.00	80.00	90.00	90.00	100.00	100.00
LOCALLY							
QUANTITY	(1TON)	240	320	480	540	600	600
UNIT PRICE	(RP)	693000	693000	693000	693000	693000	693000
REVENUE	(1000RP)	166320	221760	332640	374220	415800	415800
(2) S C							
RATE OF OPERATION		60.00	80.00	90.00	90.00	100.00	100.00
LOCALLY							
QUANTITY	(1TON)	132	288	396	432	480	480
UNIT PRICE	(RP)	1134000	1134000	1134000	1134000	1134000	1134000
REVENUE	(1000RP)	217728	326592	435456	489888	544320	544320
(3) SCMNW							
RATE OF OPERATION		60.00	80.00	90.00	90.00	100.00	100.00
LOCALLY							
QUANTITY	(1TON)	48	72	96	108	120	120
UNIT PRICE	(RP)	2520000	2520000	2520000	2520000	2520000	2520000
REVENUE	(1000RP)	120960	181440	241920	272160	302400	302400
REVENUE FROM PRODUCT	(1000RP)	505008	757512	1010016	1135848	1262520	1262520
REVENUE (LOCAL)	(1000RP)	505008	757512	1010016	1135848	1262520	1262520
REVENUE (EXPORT)	(1000RP)						
TOTAL REVENUE	(1000RP)	505008	757512	1010016	1135848	1262520	1262520

SALES REVENUE

			9	10	11	12	13	14	15	16	17
(1) E C											
RATE OF OPERATION			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
--LOCALLY--											
QUANTITY	(	TON)	400	400	400	400	400	400	400	400	400
UNIT PRICE	(	RP)	693000	693000	693000	693000	693000	693000	693000	693000	693000
REVENUE	(	1000RP)	415800	415800	415800	415800	415800	415800	415800	415800	415800
(2) S C											
RATE OF OPERATION			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
--LOCALLY--											
QUANTITY	(	TON)	480	480	480	480	480	480	480	480	480
UNIT PRICE	(	RP)	1134000	1134000	1134000	1134000	1134000	1134000	1134000	1134000	1134000
REVENUE	(	1000RP)	544320	544320	544320	544320	544320	544320	544320	544320	544320
(3) SCMNM											
RATE OF OPERATION			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
--LOCALLY--											
QUANTITY	(	TON)	120	120	120	120	120	120	120	120	120
UNIT PRICE	(	RP)	2520000	2520000	2520000	2520000	2520000	2520000	2520000	2520000	2520000
REVENUE	(	1000RP)	302400	302400	302400	302400	302400	302400	302400	302400	302400
REVENUE FROM PRODUCT	(	1000RP)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520
REVENUE (LOCAL)	(	1000RP)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520
REVENUE (EXPORT)	(	1000RP)									
TOTAL REVENUE	(	1000RP)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520

P R O F O R M A I N C O M E S T A T E M E N T

		(YEAR)	0	1	2	3	4	5	6	7	8
****REVENUE****											
TOTAL REVENUE	(	1000RP)				505008	757512	1010016	1136268	1262520	1262520
****COST****											
(1) RAW MATERIALS											
PIG IRON											
REQUIREMENT	(	1KG)				85568	102852	137136	154278	171420	171420
UNIT PRICE	(	1RP)				180	180	180	180	180	180
VALUE	(	1000RP)				12959	18450	25219	29150	32398	32398
STEEL SCRAP											
REQUIREMENT	(	1KG)				371534	447102	743069	835952	928836	928836
UNIT PRICE	(	1RP)				91	91	91	91	91	91
VALUE	(	1000RP)				33810	50714	67619	76072	84524	84524
CAST IRON SCRAP											
REQUIREMENT	(	1KG)				34272	51409	68544	77112	85680	85680
UNIT PRICE	(	1RP)				175	175	175	175	175	175
VALUE	(	1000RP)				5998	8998	11995	13495	14994	14994
FERRO MANGANESE											
REQUIREMENT	(	1KG)				10622	15932	21243	23899	26554	26554
UNIT PRICE	(	1RP)				580	580	580	580	580	580
VALUE	(	1000RP)				6161	9241	12321	13861	15401	15401
FERRO SILICON											
REQUIREMENT	(	1KG)				3922	5882	7843	8824	9804	9804
UNIT PRICE	(	1RP)				756	756	756	756	756	756
VALUE	(	1000RP)				2965	4447	5929	6671	7412	7412
SILICA SAND											
REQUIREMENT	(	1KG)				104896	140744	213792	240516	267240	267240
UNIT PRICE	(	1RP)				61	61	61	61	61	61
VALUE	(	1000RP)				6521	8781	13041	14671	16302	16302
OLIVINE SAND											
REQUIREMENT	(	1KG)				30206	45310	60413	67964	75516	75516
UNIT PRICE	(	1RP)				151	151	151	151	151	151
VALUE	(	1000RP)				4561	6842	9122	10263	11403	11403
CLAY											
REQUIREMENT	(	1KG)				24349	36523	48698	54785	60872	60872
UNIT PRICE	(	1RP)				61	61	61	61	61	61
VALUE	(	1000RP)				1488	2232	2975	3347	3719	3719
FILM											
VALUE	(	1000RP)				5719	8579	11438	12867	14297	14297
OTHER MATERIALS ETC											
VALUE	(	1000RP)				131046	196570	262093	294854	327616	327616
(2) UTILITIES											
ELECTRIC POWER 1											
REQUIREMENT	(	1KWH)				993600	1490400	1987200	2235600	2484000	2484000
UNIT PRICE	(	1RP)				30	30	30	30	30	30
VALUE	(	1000RP)				29808	44712	59616	67068	74520	74520

PRO FORMA INCOME STATEMENT

		(YEAR)	0	1	2	3	4	5	6	7	8
HEAVY OIL											
REQUIREMENT	(	1L)				12404	10210	25413	28414	32016	32016
UNIT PRICE	(	1RP)				24	24	24	24	24	24
VALUE	(	1000RP)				975	1440	1967	2290	2633	2633
WATER 1											
REQUIREMENT	(	1TON)				7400	5260	6928	7825	8768	8768
UNIT PRICE	(	1RP)				380	380	380	380	380	380
VALUE	(	1000RP)				1330	1995	2459	2902	3324	3324
ELECTRIC POWER 2											
VALUE	(	1000RP)				41068	41068	41068	41068	41068	41068
WATER 2											
VALUE	(	1000RP)				1368	1368	1368	1368	1368	1368
(3) OPERATING LABOUR	(	1000RP)				96838	96838	96838	96838	96838	96838
(4) MAINTENANCE	(	1000RP)				17473	25345	25345	25345	25345	25345
(5) INSURANCE	(	1000RP)				15079	15079	15079	15079	15079	15079
(6) SALES AND ADMINISTRATION	(	1000RP)				18100	23150	24200	22725	25250	25250
(7) DEPRECIATION											
	(	1000RP)				135930	195488	183486	345488	285686	237072
	(	1000RP)									
TOTAL OPERATING COST	(	1000RP)				776503	943330	1009254	1153417	1214075	1040261
NET OPERATING INCOME	(	1000RP)				-209385	-204027	-82240	-17349	65565	103250
INTEREST	(	1000RP)				217890	217890	166733	181475	163418	145260
SPECIAL ITEMS	(	1000RP)									
NET INCOME BEFORE TAX	(	1000RP)				-427275	-421917	-248973	-198824	-117875	47990
INCOME TAX	(	1000RP)									21600
NET INCOME AFTER INT. & TAX	(	1000RP)				-427275	-421917	-248973	-198824	-117875	26390

P R O F O R M A I N C O M E S T A T E M E N T

		(YEAR)	9	10	11	12	13	14	15	16	17
NET INCOME AFTER INT. & TAX											
TOTAL REVENUE	(	1000MM)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520
****COST****											
(1) RAW MATERIALS											
PIG IRON											
REQUIREMENT	(	1KG)	171420	171420	171420	171420	171420	171420	171420	171420	171420
UNIT PRICE	(	1PP)	180	180	180	180	180	180	180	180	180
VALUE	(	1000PP)	32598	32598	32598	32598	32598	32598	32598	32598	32598
STEEL SCRAP											
REQUIREMENT	(	1KG)	92*836	92*836	92*836	92*836	92*836	92*836	92*836	92*836	92*836
UNIT PRICE	(	1PP)	91	91	91	91	91	91	91	91	91
VALUE	(	1000PP)	84524	84524	84524	84524	84524	84524	84524	84524	84524
CAST IRON SCRAP											
REQUIREMENT	(	1KG)	45680	45680	45680	45680	45680	45680	45680	45680	45680
UNIT PRICE	(	1PP)	175	175	175	175	175	175	175	175	175
VALUE	(	1000PP)	14994	14994	14994	14994	14994	14994	14994	14994	14994
FERRO MANGANESE											
REQUIREMENT	(	1KG)	26554	26554	26554	26554	26554	26554	26554	26554	26554
UNIT PRICE	(	1PP)	580	580	580	580	580	580	580	580	580
VALUE	(	1000PP)	15401	15401	15401	15401	15401	15401	15401	15401	15401
FERRO SILICON											
REQUIREMENT	(	1KG)	9804	9804	9804	9804	9804	9804	9804	9804	9804
UNIT PRICE	(	1PP)	756	756	756	756	756	756	756	756	756
VALUE	(	1000PP)	7412	7412	7412	7412	7412	7412	7412	7412	7412
SILICA SAND											
REQUIREMENT	(	1KG)	267240	267240	267240	267240	267240	267240	267240	267240	267240
UNIT PRICE	(	1PP)	61	61	61	61	61	61	61	61	61
VALUE	(	1000PP)	16302	16302	16302	16302	16302	16302	16302	16302	16302
OLIVINE SAND											
REQUIREMENT	(	1KG)	75516	75516	75516	75516	75516	75516	75516	75516	75516
UNIT PRICE	(	1PP)	151	151	151	151	151	151	151	151	151
VALUE	(	1000PP)	11403	11403	11403	11403	11403	11403	11403	11403	11403
CLAY											
REQUIREMENT	(	1KG)	60972	60972	60972	60972	60972	60972	60972	60972	60972
UNIT PRICE	(	1PP)	61	61	61	61	61	61	61	61	61
VALUE	(	1000PP)	3719	3719	3719	3719	3719	3719	3719	3719	3719
FILM											
VALUE	(	1000PP)	14297	14297	14297	14297	14297	14297	14297	14297	14297
OTHER MATERIALS ETC											
VALUE	(	1000PP)	327616	327616	327616	327616	327616	327616	327616	327616	327616
(2) UTILITIES											
ELECTRIC POWER 1											
REQUIREMENT	(	1KWH)	24*4000	24*4000	24*4000	24*4000	24*4000	24*4000	24*4000	24*4000	24*4000
UNIT PRICE	(	1PP)	30	30	30	30	30	30	30	30	30
VALUE	(	1000PP)	76520	76520	76520	76520	76520	76520	76520	76520	76520

PRO FORMA INCOME STATEMENT

		(YEAR)	9	10	11	12	13	14	15	16	17
HEAVY OIL											
REQUIREMENT	(	1L)	32016	32016	32016	32016	32016	32016	32016	32016	32016
UNIT PRICE	(	1BP)	76	76	76	76	76	76	76	76	76
VALUE	(	1000BP)	2433	2433	2433	2433	2433	2433	2433	2433	2433
WATER ?											
REQUIREMENT	(	1TON)	8768	8768	8768	8768	8768	8768	8768	8768	8768
UNIT PRICE	(	1BP)	380	380	380	380	380	380	380	380	380
VALUE	(	1000BP)	3326	3326	3326	3326	3326	3326	3326	3326	3326
ELECTRIC POWER ?											
VALUE	(	1000BP)	61068	61068	61068	61068	61068	61068	61068	61068	61068
WATER ?											
VALUE	(	1000BP)	1368	1368	1368	1368	1368	1368	1368	1368	1368
(3) OPERATING LABOUR	(	1000BP)	94836	94836	94836	94836	94836	94836	94836	94836	94836
(4) MAINTENANCE	(	1000BP)	25365	25365	25365	25365	25365	25365	25365	25365	25365
(5) INSURANCE	(	1000BP)	15079	15079	15079	15079	15079	15079	15079	15079	15079
(6) SALES AND ADMINISTRATION	(	1000BP)	25250	25250	25250	25250	25250	25250	25250	25250	25250
(7) DEPRECIATION											
	(	1000BP)	188216	188216	188216	188216	188216	188216	188216	188216	188216
	(	1000BP)									
TOTAL OPERATING COST	(	1000BP)	1010505	1010505	1010505	1010505	1010505	1010505	1010505	1010505	1010505
NET OPERATING INCOME	(	1000BP)	243015	243015	243015	243015	243015	243015	243015	243015	243015
INTEREST	(	1000BP)	127103	118065	90788	72630	56473	38315	19158		
SPECIAL ITEMS	(	1000BP)									
NET INCOME BEFORE TAX	(	1000BP)	115912	124950	152227	170385	186542	204700	224857	243015	243015
INCOME TAX	(	1000BP)	52160	56227	68502	76673	83944	92115	101186	109357	109357
NET INCOME AFTER INT. & TAX	(	1000BP)	63752	68723	83725	93712	102598	112585	123671	133658	133658

Fund Flow Statement (Base Case)

(Unit: Rp. 1,000)

Year	0	1	2	3	4	5	6	7	8
Balance Brought Forward		116,817	175,594	545,110	97,435	△ 189,576	△ 218,363	△ 166,101	△ 32,788
Stock Capital	267,280	1,069,122	1,336,403						
Loan			1,614,000						
Sales Revenue				505,008	757,512	1,010,016	1,136,268	1,262,520	1,262,520
Cash Inflow	267,280	1,069,122	2,950,403	505,008	757,512	1,010,016	1,136,268	1,262,520	1,262,520
Project Cost	150,463	1,010,345	2,362,997	296,330	248,780				
Cash Operating Cost				438,463	577,853	704,570	767,931	831,289	831,289
Interest			217,890	217,890	217,890	199,733	181,575	163,418	145,260
Tax									21,600
Principal Repayment						134,500	134,500	134,500	134,500
Cash Outflow	150,463	1,010,345	2,580,887	952,683	1,044,523	1,038,803	1,084,006	1,129,207	1,132,649
Cash Balance	116,817	58,777	369,516	△ 447,675	△ 287,011	△ 28,787	52,262	133,313	129,871
Balance Carried Forward		175,594	545,110	97,435	△ 189,576	△ 218,363	△ 166,101	△ 32,788	97,083

Note: Cash Operating Cost = Total Operating Cost – Depreciation

Fund Flow Statement (Base Case) (Cont'd)

(Unit: Rp. 1,000)

Year	9	10	11	12	13	14	15	16	17
Balance Brought Forward	97,083	214,551	342,005	479,446	626,874	784,288	952,689	1,130,076	1,317,450
Stock Capital									
Loan									
Sales Revenue	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520
Cash in Flow	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520
Project Cost									
Cash Operating Cost	831,289	831,289	831,289	831,289	831,289	831,289	831,289	831,289	831,289
Interest	127,103	108,945	90,788	72,630	54,473	36,315	18,158		
Tax	52,160	60,332	68,502	76,673	84,844	93,015	101,186	109,357	109,357
Principal Repayment	134,500	134,500	134,500	134,500	134,500	134,500	134,500	134,500	
Cash Outflow	1,145,052	1,135,066	1,125,079	1,115,092	1,105,106	1,095,119	1,085,133	1,075,146	940,646
Cash Balance	117,468	127,454	137,441	147,428	157,414	167,401	177,387	187,374	321,874
Balance Carried Forward	214,551	342,005	479,446	626,874	784,288	952,689	1,130,076	1,317,450	1,639,324

INTERNAL RATE OF RETURN (FINANCIAL)

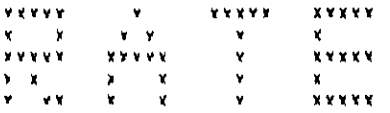
(UNITS 1000$)

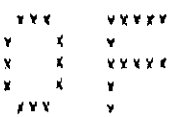
YEAR	INVESTMENT	NET OPERATING INCOME	SPECIAL ITEMS	INCOME TAX AT 100% EQUITY	DEPRECIATION	SALVAGE VALUE	RECLAIMED WORKING CAPITAL	NET CASH INFLOW	DISCOUNT FACTOR	PRESENT VALUE OF NET CASH INFLOW
0	150643	0	0	0	0			-150643	1.00000	-150643
1	1010545	0	0	0	0			-1010545	0.99494	-995069
2	2362907	0	0	0	0			-2362907	0.98998	-2339081
3	294330	-269385	0	0	336930			-226785	0.95532	-216510
4	248780	-206027	0	0	345644			-48121	0.96087	-46234
5	0	-10240	0	0	345644			505446	0.92645	283062
6	0	-17349	0	0	345644			544337	0.91246	331160
7	0	45545	0	20605	385644			411724	0.89884	369187
8	0	145250	0	48947	237972			344244	0.88525	304760
9	0	245015	0	109357	148214			321974	0.87194	280631
10	0	245015	0	109357	148214			321974	0.85864	276388
11	0	245015	0	109357	148214			321974	0.84570	272209
12	0	245015	0	109357	148214			321974	0.83291	268093
13	0	245015	0	109357	148214			321974	0.82052	264060
14	0	245015	0	109357	148214			321974	0.80791	260048
15	0	245015	0	109357	148214			321974	0.79570	256114
16	0	245015	0	109357	148214			321974	0.78347	252245
17	0	245015	0	109357	148214		45843	367714	0.77192	283768

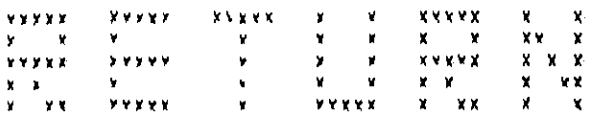
TOTALS

INTERNAL RATE OF RETURN = 1.555 %

Table 13-17







Year	3	4	5	6-17
Production Level	65%	75%	85%	100%
Tax 0% (before Tax)				

SALES REVENUE

	(YEAR)	0	1	2	3	4	5	6	7	8
(1) F C										
RATE OF OPERATION					45.00	75.00	95.00	100.00	100.00	100.00
LOCALLY										
QUANTITY	(1TON)				300	450	510	600	600	600
UNIT PRICE	($)				493000	493000	493000	493000	493000	493000
REVENUE	(1000$)				220220	311850	351450	415800	415800	415800
(2) S C										
RATE OF OPERATION					65.00	75.00	95.00	100.00	100.00	100.00
LOCALLY										
QUANTITY	(1TON)				312	360	456	480	480	480
UNIT PRICE	($)				1134000	1134000	1134000	1134000	1134000	1134000
REVENUE	(1000$)				353808	408240	482472	544320	544320	544320
(3) SCMIN										
RATE OF OPERATION					45.00	75.00	95.00	100.00	100.00	100.00
LOCALLY										
QUANTITY	(1TON)				78	90	102	120	120	120
UNIT PRICE	($)				2520000	2520000	2520000	2520000	2520000	2520000
REVENUE	(1000$)				196560	226800	257040	302400	302400	302400
REVENUE FROM PRODUCT	(1000$)				820478	964890	1077162	1262520	1262520	1262520
REVENUE (LOCAL)	(1000$)				820478	964890	1077162	1262520	1262520	1262520
REVENUE (EXPORT)	(1000$)									
TOTAL REVENUE	(1000$)				820478	964890	1077162	1262520	1262520	1262520

SALES REVENUE

		(YEAR)	9	10	11	12	13	14	15	16	17
(1) P C											
RATE OF OPERATION			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOCALLY											
QUANTITY	(	TON)	400	400	400	400	400	400	400	400	400
UNIT PRICE	(	RP)	693000	693000	693000	693000	693000	693000	693000	693000	693000
REVENUE	(	1000RP)	415800	415800	415800	415800	415800	415800	415800	415800	415800
(2) S C											
RATE OF OPERATION			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOCALLY											
QUANTITY	(	TON)	480	480	480	480	480	480	480	480	480
UNIT PRICE	(	RP)	1134000	1134000	1134000	1134000	1134000	1134000	1134000	1134000	1134000
REVENUE	(	1000RP)	544320	544320	544320	544320	544320	544320	544320	544320	544320
(3) SEMEN											
RATE OF OPERATION			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOCALLY											
QUANTITY	(	TON)	120	120	120	120	120	120	120	120	120
UNIT PRICE	(	RP)	2520000	2520000	2520000	2520000	2520000	2520000	2520000	2520000	2520000
REVENUE	(	1000RP)	302400	302400	302400	302400	302400	302400	302400	302400	302400
REVENUE FROM PRODUCT	(	1000RP)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520
REVENUE (LOCAL)	(	1000RP)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520
REVENUE (EXPORT)	(	1000RP)									
TOTAL REVENUE	(	1000RP)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520

PRO FORMA INCOME STATEMENT

		(YEAR)	0	1	2	3	4	5	6	7	8
****REVENUE****											
TOTAL REVENUE	(	1000RP)				820438	944890	1073142	1242520	1242520	1242520
****COST****											
(1) RAW MATERIALS											
PIG IRON											
REQUIREMENT	(	1KG)				111423	128545	145707	171420	171420	171420
UNIT PRICE	(	1RP)				189	189	189	189	189	189
VALUE	(	1000RP)				21059	24299	27539	32398	32398	32398
STEEL SCRAP											
REQUIREMENT	(	1KG)				805743	896427	780511	928836	928836	928836
UNIT PRICE	(	1RP)				91	91	91	91	91	91
VALUE	(	1000RP)				74041	83305	71186	84524	84524	84524
CAST IRON SCRAP											
REQUIREMENT	(	1KG)				55422	66260	77098	85680	85680	85680
UNIT PRICE	(	1RP)				175	175	175	175	175	175
VALUE	(	1000RP)				9744	11742	13745	14994	14994	14994
FERRO MANGANESE											
REQUIREMENT	(	1KG)				17240	19914	22571	26556	26556	26556
UNIT PRICE	(	1RP)				580	580	580	580	580	580
VALUE	(	1000RP)				10011	11551	13091	15401	15401	15401
FERRO SILICON											
REQUIREMENT	(	1KG)				8373	7333	8333	9804	9804	9804
UNIT PRICE	(	1RP)				756	756	756	756	756	756
VALUE	(	1000RP)				6814	5550	6300	7412	7412	7412
SILLICA SAND											
REQUIREMENT	(	1KG)				173706	200430	227154	267240	267240	267240
UNIT PRICE	(	1RP)				61	61	61	61	61	61
VALUE	(	1000RP)				10596	12228	13856	16302	16302	16302
OLIVINE SAND											
REQUIREMENT	(	1KG)				40085	50437	64189	75516	75516	75516
UNIT PRICE	(	1RP)				151	151	151	151	151	151
VALUE	(	1000RP)				7412	8552	9693	11405	11405	11405
CLAY											
REQUIREMENT	(	1KG)				39632	45720	51826	60972	60972	60972
UNIT PRICE	(	1RP)				61	61	61	61	61	61
VALUE	(	1000RP)				2418	2790	3161	3719	3719	3719
FILM											
VALUE	(	1000RP)				9293	10723	12152	14297	14297	14297
OTHER MATERIALS ETC											
VALUE	(	1000RP)				212050	245712	278423	327616	327616	327616
(2) UTILITIES											
ELECTRIC POWER +											
REQUIREMENT	(	1KWH)				1612600	1868000	2111400	2486000	2486000	2486000
UNIT PRICE	(	1RP)				30	30	30	30	30	30
VALUE	(	1000RP)				48438	55900	63342	74520	74520	74520

PRO FORMA INCOME STATEMENT

	(YEAR)	0	1	2	3	4	5	6	7	8
HEAVY OIL										
REQUIREMENT	(1L)				20810	24012	27214	32016	32016	32016
UNIT PRICE	(1$/)				74	74	74	74	74	74
VALUE	(1000$)				1542	1825	2044	2433	2433	2433
WATER 1										
REQUIREMENT	(1TON)				5484	6541	7434	8748	8748	8748
UNIT PRICE	(1$/)				540	580	580	580	580	580
VALUE	(1000$)				2161	2495	2834	3324	3324	3324
ELECTRIC POWER 2										
VALUE	(1000$)				41068	41068	41068	41068	41068	41068
WATER 2										
VALUE	(1000$)				1368	1368	1368	1368	1368	1368
(3) OPERATING LABOUR	(1000$)				96836	96836	96836	96836	96836	96836
(4) MAINTENANCE	(1000$)				12423	25345	25345	25345	25345	25345
(5) INSURANCE	(1000$)				15079	15079	15079	15079	15079	15079
(6) SALES AND ADMINISTRATION	(1000$)				14613	18038	21464	25250	25250	25250
(7) DEPRECIATION										
	(1000$)				334030	595484	585474	595484	585480	252922
	(1000$)									
TOTAL OPERATING COST	(1000$)				952792	1058574	1121037	1214075	1214075	1060261
NET OPERATING INCOME	(1000$)				-112154	-111446	-64795	45545	45545	193259
INTEREST	(1000$)				217890	217890	199233	181575	163918	145260
SPECIAL ITEMS	(1000$)									
NET INCOME BEFORE TAX	(1000$)				-330044	-329336	-264028	-136030	-118373	47999
INCOME TAX	(1000$)									
NET INCOME AFTER INT. & TAX	(1000$)				-330044	-329336	-264028	-136030	-118373	47999

P & O F O R M A I N C O M E S T A T E M E N T

	(YEAR)	0	10	11	12	13	14	15	16	17
NET INCOME AFTER INT. & TAX										
TOTAL REVENUE	(1000RP)	1242520	1242520	1242520	1242520	1242520	1242520	1242520	1242520	1242520
**********										
(1) RAW MATERIALS										
PIG IRON										
REQUIREMENT	(1KG)	171420	171420	171420	171420	171420	171420	171420	171420	171420
UNIT PRICE	(1RP)	180	180	180	180	180	180	180	180	180
VALUE	(1000RP)	32398	32398	32398	32398	32398	32398	32398	32398	32398
STEEL SCRAP										
REQUIREMENT	(1KG)	928836	928836	928836	928836	928836	928836	928836	928836	928836
UNIT PRICE	(1RP)	91	91	91	91	91	91	91	91	91
VALUE	(1000RP)	84524	84524	84524	84524	84524	84524	84524	84524	84524
CAST IRON SCRAP										
REQUIREMENT	(1KG)	85680	85680	85680	85680	85680	85680	85680	85680	85680
UNIT PRICE	(1RP)	175	175	175	175	175	175	175	175	175
VALUE	(1000RP)	14994	14994	14994	14994	14994	14994	14994	14994	14994
FERRO MANGANESE										
REQUIREMENT	(1KG)	26554	26554	26554	26554	26554	26554	26554	26554	26554
UNIT PRICE	(1RP)	580	580	580	580	580	580	580	580	580
VALUE	(1000RP)	15401	15401	15401	15401	15401	15401	15401	15401	15401
FERRO SILICON										
REQUIREMENT	(1KG)	9804	9804	9804	9804	9804	9804	9804	9804	9804
UNIT PRICE	(1RP)	756	756	756	756	756	756	756	756	756
VALUE	(1000RP)	7412	7412	7412	7412	7412	7412	7412	7412	7412
SILLICA SAND										
REQUIREMENT	(1KG)	267240	267240	267240	267240	267240	267240	267240	267240	267240
UNIT PRICE	(1RP)	61	61	61	61	61	61	61	61	61
VALUE	(1000RP)	16302	16302	16302	16302	16302	16302	16302	16302	16302
OLIVINE SAND										
REQUIREMENT	(1KG)	75516	75516	75516	75516	75516	75516	75516	75516	75516
UNIT PRICE	(1RP)	151	151	151	151	151	151	151	151	151
VALUE	(1000RP)	11403	11403	11403	11403	11403	11403	11403	11403	11403
CLAY										
REQUIREMENT	(1KG)	60972	60972	60972	60972	60972	60972	60972	60972	60972
UNIT PRICE	(1RP)	61	61	61	61	61	61	61	61	61
VALUE	(1000RP)	3719	3719	3719	3719	3719	3719	3719	3719	3719
FILM										
VALUE	(1000RP)	14297	14297	14297	14297	14297	14297	14297	14297	14297
OTHER MATERIALS ETC										
VALUE	(1000RP)	327616	327616	327616	327616	327616	327616	327616	327616	327616
(2) UTILITIES										
ELECTRIC POWER 1										
REQUIREMENT	(1KWH)	2484000	2484000	2484000	2484000	2484000	2484000	2484000	2484000	2484000
UNIT PRICE	(1RP)	30	30	30	30	30	30	30	30	30
VALUE	(1000RP)	74520	74520	74520	74520	74520	74520	74520	74520	74520

PRO FORMA INCOME STATEMENT

		(YEAR)	9	10	11	12	13	14	15	16	17
HEAVY OIL											
REQUIREMENT	(	1L)	52016	52016	52016	52016	52016	52016	52016	52016	52016
UNIT PRICE	(	1BP)	76	76	76	76	76	76	76	76	76
VALUE	(	1000BP)	2633	2633	2633	2633	2633	2633	2633	2633	2633
WATER 1											
REQUIREMENT	(	1TON)	8768	8768	8768	8768	8768	8768	8768	8768	8768
UNIT PRICE	(	1BP)	380	380	380	380	380	380	380	380	380
VALUE	(	1000BP)	3324	3324	3324	3324	3324	3324	3324	3324	3324
ELECTRIC POWER 2											
VALUE	(	1000BP)	61068	61068	61068	61068	61068	61068	61068	61068	61068
WATER 2											
VALUE	(	1000BP)	1368	1368	1368	1368	1368	1368	1368	1368	1368
(3) OPERATING LABOUR	(	1000BP)	96838	96838	96838	96838	96838	96838	96838	96838	96838
(4) MAINTENANCE	(	1000BP)	25345	25345	25345	25345	25345	25345	25345	25345	25345
(5) INSURANCE	(	1000BP)	15079	15079	15079	15079	15079	15079	15079	15079	15079
(6) SALES AND ADMINISTRATION	(	1000BP)	25250	25250	25250	25250	25250	25250	25250	25250	25250
(7) DEPRECIATION											
	(	1000BP)	188218	188218	188218	188218	188218	188218	188218	188218	188218
	(	1000BP)									
TOTAL OPERATING COST	(	1000BP)	1010505	1010505	1010505	1010505	1010505	1010505	1010505	1010505	1010505
NET OPERATING INCOME	(	1000BP)	243015	243015	243015	243015	243015	243015	243015	243015	243015
INTEREST	(	1000BP)	127103	108945	90788	72630	54473	36315	18158		
SPECIAL ITEMS	(	1000BP)									
NET INCOME BEFORE TAX	(	1000BP)	115912	134070	152227	170385	188542	206700	224857	243015	243015
INCOME TAX	(	1000BP)									
NET INCOME AFTER INT. & TAX	(	1000BP)	115912	134070	152227	170385	188542	206700	224857	243015	243015

INTERNAL RATE OF RETURN (FINANCIAL)

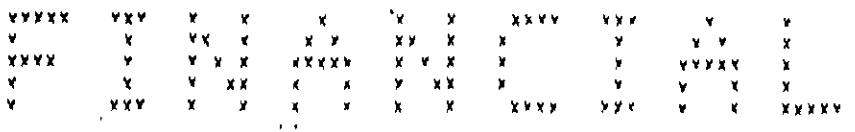
(UNIT= 1000$)

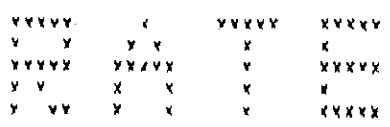
YEAR	INVESTMENT	NET OPERATING INCOME	SPECIAL ITEMS	INCOME TAX AT 100% EQUITY	DEPRE-CIATION	SALVAGE VALUE	RECLAIMED WORKING CAPITAL	NET CASH INFLOW	DISCOUNT FACTOR	PRESENT VALUE OF NET CASH INFLOW
0	150445	0	0	0	0			-150445	1.00000	-150445
1	1010345	0	0	0	0			-1010345	0.95272	-962580
2	2342997	0	0	0	0			-2342997	0.90744	-2126851
3	296350	-112154	0	0	133970			-22534	0.86477	-19485
4	244780	-111484	0	0	385484			25222	0.82398	20780
5	0	-48705	0	0	385484			336901	0.78503	264478
6	0	45545	0	0	385484			431231	0.74792	322487
7	0	45545	0	0	385484			431231	0.71247	307241
8	0	193259	0	0	237972			431231	0.67870	292715
9	0	245015	0	0	186216			431231	0.64649	278877
10	0	245015	0	0	186216			431231	0.61582	265697
11	0	245015	0	0	186216			431231	0.58659	253132
12	0	245015	0	0	186216			431231	0.55924	241164
13	0	245015	0	0	186216			431231	0.53280	229763
14	0	245015	0	0	186216			431231	0.50741	218901
15	0	245015	0	0	186216			431231	0.48341	208552
16	0	245015	0	0	186216			431231	0.46075	198692
17	0	245015	0	0	186216		45962	497773	0.43907	218202

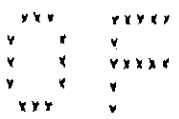
TOTAL=0

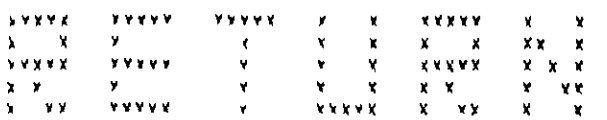
INTERNAL RATE OF RETURN = 4.242 %

Table 13-18









Year	3	4	5	6-17
Production Level	65%	75%	85%	100%

Tax 45%

SALES REVENUE

(YEAR)	0	1	2	3	4	5	6	7	8
(1) A C									
RATE OF OPERATION				65.00	75.00	85.00	100.00	100.00	100.00
LOCALLY									
QUANTITY (1TON)				340	450	510	600	600	600
UNIT PRICE (RP)				680000	680000	680000	680000	680000	680000
REVENUE (1000RP)				231200	306000	346800	408000	408000	408000
(2) S C									
RATE OF OPERATION				65.00	75.00	85.00	100.00	100.00	100.00
LOCALLY									
QUANTITY (1TON)				272	360	408	480	480	480
UNIT PRICE (RP)				1134000	1134000	1134000	1134000	1134000	1134000
REVENUE (1000RP)				308448	408240	462672	544320	544320	544320
(3) SEMEN									
RATE OF OPERATION				65.00	75.00	85.00	100.00	100.00	100.00
LOCALLY									
QUANTITY (1TON)				78	90	102	120	120	120
UNIT PRICE (RP)				2520000	2520000	2520000	2520000	2520000	2520000
REVENUE (1000RP)				196560	226800	257040	302400	302400	302400
REVENUE FROM PRODUCT (1000RP)				736538	946980	1073142	1262520	1262520	1262520
REVENUE (LOCAL) (1000RP)				736538	946980	1073142	1262520	1262520	1262520
REVENUE (EXPORT) (1000RP)									
TOTAL REVENUE (1000RP)				736538	946980	1073142	1262520	1262520	1262520

S A L E S   R E V E N U E

		(YEAR)	9	10	11	12	13	14	15	16	17
(1) C											
RATE OF OPERATION			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOCALLY											
QUANTITY	(	1TON)	600	600	600	600	600	600	600	600	600
UNIT PRICE	(	W)	693000	693000	693000	693000	693000	693000	693000	693000	693000
REVENUE	(	1000W)	415800	415800	415800	415800	415800	415800	415800	415800	415800
(2) C											
RATE OF OPERATION			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOCALLY											
QUANTITY	(	1TON)	480	480	480	480	480	480	480	480	480
UNIT PRICE	(	W)	1134000	1134000	1134000	1134000	1134000	1134000	1134000	1134000	1134000
REVENUE	(	1000W)	544320	544320	544320	544320	544320	544320	544320	544320	544320
(3) S											
RATE OF OPERATION			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
LOCALLY											
QUANTITY	(	1TON)	120	120	120	120	120	120	120	120	120
UNIT PRICE	(	W)	2520000	2520000	2520000	2520000	2520000	2520000	2520000	2520000	2520000
REVENUE	(	1000W)	302400	302400	302400	302400	302400	302400	302400	302400	302400
REVENUE FROM PRODUCT	(	1000W)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520
REVENUE (LOCAL)	(	1000W)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520
REVENUE (EXPORT)	(	1000W)									
TOTAL REVENUE	(	1000W)	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520	1262520

PRO FORMA INCOME STATEMENT

	(YEAR)	0	1	2	3	4	5	6	7	8
****REVENUE****										
TOTAL REVENUE	(1000RM)				420434	964490	1075162	1262520	1262520	1262520
****COST****										
(1) RAW MATERIALS										
PIG IRON										
REQUIREMENT	(1KG)				111423	125545	145727	171420	171420	171420
UNIT PRICE	(1RM)				180	180	180	180	180	180
VALUE	(1000RM)				20056	24299	27530	32308	32308	32308
STEEL SCRAP										
REQUIREMENT	(1KG)				403743	404427	780511	928836	928836	928836
UNIT PRICE	(1RM)				91	91	91	91	91	91
VALUE	(1000RM)				36941	43393	71186	84524	84524	84524
CAST IRON SCRAP										
REQUIREMENT	(1KG)				55432	66240	72828	85480	85480	85480
UNIT PRICE	(1RM)				175	175	175	175	175	175
VALUE	(1000RM)				9704	11242	12745	14994	14994	14994
FERRO MANGANESE										
REQUIREMENT	(1KG)				17240	19014	22571	26554	26554	26554
UNIT PRICE	(1RM)				580	580	591	580	580	580
VALUE	(1000RM)				10011	11551	13091	15401	15401	15401
FERRO SILICON										
REQUIREMENT	(1KG)				8373	7353	8335	9804	9804	9804
UNIT PRICE	(1RM)				754	754	754	754	754	754
VALUE	(1000RM)				6318	5550	6290	7412	7412	7412
SILLICA SAND										
REQUIREMENT	(1KG)				173704	200630	227154	267240	267240	267240
UNIT PRICE	(1RM)				61	61	61	61	61	61
VALUE	(1000RM)				10594	12234	13856	16302	16302	16302
OLIVINE SAND										
REQUIREMENT	(1KG)				60085	54437	64189	75516	75516	75516
UNIT PRICE	(1RM)				151	151	151	151	151	151
VALUE	(1000RM)				7417	8552	9695	11403	11403	11403
CLAY										
REQUIREMENT	(1KG)				39432	45729	51836	60972	60972	60972
UNIT PRICE	(1RM)				61	61	61	61	61	61
VALUE	(1000RM)				2418	2780	3151	3719	3719	3719
FILM										
VALUE	(1000RM)				9203	10722	12152	14297	14297	14297
OTHER MATERIALS ETC										
VALUE	(1000RM)				212750	245712	279475	327414	327414	327414
(2) UTILITIES										
ELECTRIC POWER 1										
REQUIREMENT	(1KWH)				1414400	1643000	2111400	2484000	2484000	2484000
UNIT PRICE	(1RM)				30	30	30	30	30	30
VALUE	(1000RM)				44428	55490	63342	74520	74520	74520

PRO FORMA INCOME STATEMENT

	(YEAR)	0	1	2	3	4	5	6	7	8
HEAVY OIL										
REQUIREMENT	(1L)				20310	24912	27214	32016	32016	32016
UNIT PRICE	(1MB)				76	76	76	76	76	76
VALUE	(100000)				1542	1925	2061	2433	2433	2433
WATER 1										
REQUIREMENT	(1TON)				3650	4561	7436	8760	8760	8760
UNIT PRICE	(1DD)				590	590	590	590	590	590
VALUE	(100000)				2161	2693	2826	3324	3324	3324
ELECTRIC POWER 2										
VALUE	(100000)				61049	61049	61049	61049	61049	61049
WATER 2										
VALUE	(100000)				1368	1368	1368	1368	1368	1368
(3) OPERATING LABOUR	(100000)				64858	64858	64858	64858	64858	64858
(4) MAINTENANCE	(100000)				12673	25345	25345	25345	25345	25345
(5) INSURANCE	(100000)				15079	15079	15079	15079	15079	15079
(6) SALES AND ADMINISTRATION	(100000)				10613	14858	21465	25250	25250	25250
(7) DEPRECIATION	(100000)				335950	585686	585686	585686	585686	237972
	(100000)									
TOTAL OPERATING COST	(100000)				932792	1058674	1121957	1214075	1214075	1049761
NET OPERATING INCOME	(100000)				-1112154	-1117484	-487795	45545	45545	193259
INTEREST	(100000)				217800	217800	199755	183479	163618	145760
SPECIAL ITEMS	(100000)									
NET INCOME BEFORE TAX	(100000)				-1329944	-1335274	-687550	-137934	-117873	47499
INCOME TAX	(100000)									23600
NET INCOME AFTER INT. & TAX	(100000)				-1329944	-1335274	-687550	-137934	-117873	23899

PRO FORMA INCOME STATEMENT

(YEAR)	0	10	11	12	13	14	15	16	17
NET INCOME AFTER INT. & TAX									
TOTAL REVENUE (1000RM)	1242520	1242520	1242520	1242520	1242520	1242520	1242520	1242520	1242520
****COST****									
(1) RAW MATERIALS									
PIG IRON									
REQUIREMENT (1KG)	171420	171420	171420	171420	171420	171420	171420	171420	171420
UNIT PRICE (1RM)	180	180	180	180	180	180	180	180	180
VALUE (1000RM)	32308	32308	32308	32308	32308	32308	32308	32308	32308
STEEL SCRAP									
REQUIREMENT (1KG)	928836	928836	928836	928836	928836	928836	928836	928836	928836
UNIT PRICE (1RM)	01	01	01	01	01	01	01	01	01
VALUE (1000RM)	84524	84524	84524	84524	84524	84524	84524	84524	84524
CAST IRON SCRAP									
REQUIREMENT (1KG)	85480	85480	85480	85480	85480	85480	85480	85480	85480
UNIT PRICE (1RM)	175	175	175	175	175	175	175	175	175
VALUE (1000RM)	14994	14994	14994	14994	14994	14994	14994	14994	14994
FERRO MANGANESE									
REQUIREMENT (1KG)	26554	26554	26554	26554	26554	26554	26554	26554	26554
UNIT PRICE (1RM)	580	580	580	580	580	580	580	580	580
VALUE (1000RM)	15401	15401	15401	15401	15401	15401	15401	15401	15401
FERRO SILICON									
REQUIREMENT (1KG)	9806	9806	9806	9806	9806	9806	9806	9806	9806
UNIT PRICE (1RM)	754	754	754	754	754	754	754	754	754
VALUE (1000RM)	7412	7412	7412	7412	7412	7412	7412	7412	7412
SILLICA SAND									
REQUIREMENT (1KG)	247240	247240	247240	247240	247240	247240	247240	247240	247240
UNIT PRICE (1RM)	01	01	01	01	01	01	01	01	01
VALUE (1000RM)	16302	16302	16302	16302	16302	16302	16302	16302	16302
OLIVINE SAND									
REQUIREMENT (1KG)	75516	75516	75516	75516	75516	75516	75516	75516	75516
UNIT PRICE (1RM)	151	151	151	151	151	151	151	151	151
VALUE (1000RM)	11403	11403	11403	11403	11403	11403	11403	11403	11403
CLAY									
REQUIREMENT (1KG)	60972	60972	60972	60972	60972	60972	60972	60972	60972
UNIT PRICE (1RM)	01	01	01	01	01	01	01	01	01
VALUE (1000RM)	3719	3719	3719	3719	3719	3719	3719	3719	3719
FILM									
VALUE (1000RM)	14297	14297	14297	14297	14297	14297	14297	14297	14297
OTHER MATERIALS ETC									
VALUE (1000RM)	327616	327616	327616	327616	327616	327616	327616	327616	327616
(2) UTILITIES									
ELECTRIC POWER 1									
REQUIREMENT (1KWH)	24840000	24840000	24840000	24840000	24840000	24840000	24840000	24840000	24840000
UNIT PRICE (1RM)	30	30	30	30	30	30	30	30	30
VALUE (1000RM)	74520	74520	74520	74520	74520	74520	74520	74520	74520

PRO FORMA INCOME STATEMENT

	(YEAR)	9	10	11	12	13	14	15	16	17
HEAVY OIL										
REQUIREMENT	(1K)	32016	32016	32016	32016	32016	32016	32016	32016	32016
UNIT PRICE	(1BD)	7A	7A	7A	7A	7A	7A	7A	7A	7A
VALUE	(100000)	2433	2433	2433	2433	2433	2433	2433	2433	2433
WATER 1										
REQUIREMENT	(1TON)	8748	8748	8748	8748	8748	8748	8748	8748	8748
UNIT PRICE	(1AD)	380	380	380	380	380	380	380	380	380
VALUE	(10000D)	3324	3324	3324	3324	3324	3324	3324	3324	3324
ELECTRIC POWER 2										
VALUE	(100000)	61068	61068	61068	61068	61068	61068	61068	61068	61068
WATER 2										
VALUE	(100000)	1368	1368	1368	1368	1368	1368	1368	1368	1368
(3) OPERATING LABOUR	(100000)	94834	94834	94834	94834	94834	94834	94834	94834	94834
(4) MAINTENANCE	(10000D)	25345	25345	25345	25345	25345	25345	25345	25345	25345
(5) INSURANCE	(10000D)	15070	15070	15070	15070	15070	15070	15070	15070	15070
(6) SALES AND ADMINISTRATION	(10000D)	25250	25250	25250	25250	25250	25250	25250	25250	25250
(7) DEPRECIATION	(100000)	188216	188216	188216	188216	188216	188216	188216	188216	188216
	(100000)									
TOTAL OPERATING COST	(100000)	1019505	1019505	1019505	1019505	1019505	1019505	1019505	1019505	1019505
NET OPERATING INCOME	(100000)	243015	243015	243015	243015	243015	243015	243015	243015	243015
INTEREST	(100000)	127104	118945	107888	92430	66427	38415	18458		
SPECIAL ITEMS	(100000)									
NET INCOME BEFORE TAX	(100000)	115912	124070	135127	150585	176588	204600	224557	243015	243015
INCOME TAX	(100000)	52160	60352	65502	76073	86444	93015	101180	109357	109358
NET INCOME AFTER INT. & TAX	(100000)	63752	63718	69625	74512	90144	111585	123471	133658	133658

Fund Flow Statement

(Unit: Rp. 1,000)

Year	0	1	2	3	4	5	6	7	8
Balance Brought Forward		116,817	175,594	545,110	627,744	833,962	1,235,980	1,751,194	2,284,565
Stock Capital	267,280	1,069,122	1,336,403						
Loan			1,614,000						
Sales Revenue				820,638	946,890	1,073,142	1,262,520	1,262,520	1,262,520
Cash Inflow	267,280	1,069,122	2,950,403	820,630	946,890	1,073,142	1,262,520	1,262,520	1,262,520
Project Cost	150,463	1,010,345	2,362,997	296,330	248,780				
Cash Operating Cost				223,776	274,002	336,891	431,231	431,231	431,231
Interest			217,890	217,890	217,890	199,733	181,575	163,418	145,260
Tax									21,600
Principal Repayment						134,500	134,500	134,500	134,500
Cash Outflow	150,463	1,010,345	2,580,887	737,996	740,672	671,124	747,306	729,149	732,591
Cash Balance	116,817	58,777	369,516	82,634	206,218	402,018	515,214	533,371	529,929
Balance Carried Forward		175,594	545,110	627,744	833,962	1,235,980	1,751,194	2,284,565	2,814,494

Note: Cash Operating Cost = Total Operating Cost - Depreciation

Fund Flow Statement (Cont'd)

(Unit: Rp. 1,000)

Year	9	10	11	12	13	14	15	16	17
Balance Brought Forward	2,814,494	3,332,020	3,859,542	4,397,041	4,944,527	5,501,999	6,069,458	6,646,903	7,234,335
Stock Capital									
Loan									
Sales Revenue	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520
Cash Inflow	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520	1,262,520
Project Cost									
Cash Operating Cost	431,231	431,231	431,231	431,231	431,231	431,231	431,231	431,231	431,231
Interest	127,103	108,945	90,788	72,630	54,473	36,315	18,158		
Tax	52,160	60,322	68,502	76,673	84,844	93,015	101,186	109,357	109,357
Principal Repayment	134,500	134,500	134,500	134,500	134,500	134,500	134,500	134,500	
Cash Outflow	744,994	734,998	725,021	715,034	705,048	695,061	685,075	675,088	540,588
Cash Balance	517,526	527,522	537,499	547,486	557,472	567,459	577,445	587,432	721,932
Balance Carried Forward	3,332,020	3,859,542	4,397,041	4,944,527	5,501,999	6,069,458	6,646,903	7,234,335	7,956,257

Chapter 14. Economic Effects of MFC Project

Chapter 14. Economic Effects of MFC Project

14.1 Economic Significance of Project

The Government of Indonesia has in the past implemented the First Five-Year Plan (1969/70–1973/74) and the Second Five-Year Plan (1974/75–1978/79), through which the country has achieved steady economic growth. However, as indicated by Table 14-1, the growth rates have not been uniform for all sectors of industry.

Table 14-1. Trend of GNP in Indonesia by Industrial Sectors

(Unit: bn Rp.)

Industry	1971	1972	1973	1974	1975
1. Agriculture, Forestry and Fisheries	2,441	2,479	2,710	2,811	2,836
a) Farm Products	1,436	1,415	1,573	1,681	1,694
b) Others	1,005	1,064	1,137	1,130	1,142
2. Mining and Quarrying	551	674	831	859	828
3. Manufacturing	490	554	650	755	849
4. Electricity, Gas and Water	24.7	26.2	30.4	37.0	41.0
5. Construction	171	222	262	320	357
6. Broadcasting and Telecommunications	210	229	257	288	303
7. Trade, Financing and Other Services	1,712	1,873	2,013	2,171	2,406
Gross National Product	5,599.7	6,057.2	6,753.4	7,241.0	7,620.0

Source: Central Bureau of Statistics of Indonesia, 1978

The Third Five-Year Plan (1979/80–1983/84) presently in progress aims at achieving a balanced growth among every sector rather than on the economic growth itself, and with the metal and machinery industry which comprises important sector of the manufacturing industry, the domestic consumption and production are anticipated as shown in Table 14-2:

Table 14-2. Domestic Consumption and Production

(Unit: bn Rp.)

	1978	1979	1984	1989
Domestic consumption	1,257	1,427	2,721	5,142
Domestic production	733	845	1,801	4,050

In order to attain these targets, the Government of Indonesia is striving to encourage private corporations to participate actively in this sector of industry by offering various aids in investments. By adopting such measures it plans to promote the growth of principal industries and to stimulate peripheral small-scale industries, through which it aims to contribute to the economic growth of industry as a whole.

The government is placing emphasis on the development of the following sectors of industry, among which it is presently giving priority to the program for developing the industry of industrial machinery and processing equipment:

1) Steel Industry
2) Non-ferrous
3) Automotive
4) Shipbuilding
5) Rolling Stock
6) Engine
7) Suspension, steering & power transmission
8) Agricultural tractors
9) Heavy construction equipment
10) Heavy electrical machines & equipment
11) Electronics & telecommunication
12) Industrial machinery & processing equipment

13) Motor vehicles
14) Aircraft
15) Machine tools

The casting industry plays a vital role in the development of the industrial machinery and processing equipment industry, and in this respect the establishment of MFC is a project of major significance.

The Jakarta Foundry Center and Surabaya Foundry Center which have already been constructed, invariably comply with the government's policies, and when the economic effects exerted by these foundry centers on the eastern and western regions of Java are taken into consideration, it can be said that each of these foundry centers will display its raison d'etre.

In this respect, MFC is also considered to contribute to the economic development of North Sumatra, and as observed from the aspects of its economic effects, the significance of its existence is fully recognized.

14.2 Economic Benefits Emanating from MFC Project

14.2.1 Tangible Benefits

The establishment of MFC will lead to the manufacture of 480 tons, 720 tons, 960 tons, 1,080 tons and 1,200 tons of castings, respectively, in the initial, second, third, fourth and fifth years after commencement of foundry operations.

The castings to be manufactured by MFC are presently being imported by expending valuable foreign currency, so by producing these castings domestically there will be a great economic benefit.

14.2.2 Indirect Benefits

1) Foreign Currency Saving by Curbing Imports

The quality castings (FC, SC and SCMnH) to be manufactured by MFC are presently being imported in the North Sumatra region, so after production is started by MFC, these products can be used in place of their imported castings, resulting in substantial savings in foreign currencies.

Table 14-3 indicates the foreign currency saving achieved by the project.

2) Creation of Job Opportunities

While only 65 employees are necessary for the operation of MFC, the foundry will indirectly require distribution organizations to employ a considerable number of employees for the domestic procurement of raw materials, so the implementation of this project is certain to create new job opportunities.

3) Other Indirect Benefits

It will become easier for other private industries and corporations to establish themselves in the industrial center, with the result that the functions of the industrial center itself will be promoted for the economic development of the region as a whole.

In addition, the establishment of MFC will have the added effect of upgrading the technical level of the local casting industry.

Table 14-3. *Foreign Currency Saving by the Project*

1) Foreign Exchange Outflow

(Unit: US$1,000)

Year	Yen Credit	Other Outflow	Total	Discount Factor (8%)	Present Value
0	0		0	1.000	0
1	1		1	0.926	1
2	31		31	0.857	27
3	115		115	0.794	91
4	124	56	180	0.735	132
5	124	398	522	0.681	355
6	124		124	0.630	78
7	127		127	0.583	74
8	182		182	0.540	98
9	336		336	0.500	168
10	347		347	0.463	161
11	340		340	0.429	146
12	333		333	0.397	132
13	325		325	0.368	120
14	319		319	0.340	108
15	312		312	0.315	98
16	305		305	0.292	89
17	298		298	0.270	80
18	291		291	0.250	73
19	284		284	0.232	66
20	277		277	0.215	60
21	271		271	0.199	54
22	264		264	0.184	49
23	257		257	0.170	44
24	250		250	0.138	40
25	240		240	0.146	35
26	178		178	0.135	24
27	18		18	0.125	2
Total	6,073		6,527		2,405

2) Foreign Currency Saved by the Production

(Unit: US$1,000)

Year	Sales Revenue (Foreign Currency Saving)	Imported Raw Material (Foreign Currency Out)	Net Saving	Discount Factor (8%)	Present Value
0			0	1.000	0
1			0	0.926	0
2			0	0.857	0
3	808*	100	708	0.794	562
4	1,212	151	1,061	0.794	842
5	1,616	201	1,415	0.794	1,124
6	1,818	226	1,592	0.794	1,264
7	2,020	251	1,769	0.794	1,405
8	2,020	251	1,769	0.794	1,405
9	2,020	251	1,769	0.794	1,405
10	2,020	251	1,769	0.794	1,405
11	2,020	251	1,769	0.794	1,405
12	2,020	251	1,769	0.794	1,405
13	2,020	251	1,769	0.794	1,405
14	2,020	251	1,769	0.794	1,405
15	2,020	251	1,769	0.794	1,405
16	2,020	251	1,769	0.794	1,405
17	2,020	251	1,769	0.794	1,405
Total			24,235		19,247

* Year 3–17, Price in 1984.

3) Net Foreign Currency Saved by the Project

Total Amount Saved: US$19,247,000 – US$2,405,000 = US$16,842,000 (Price in 1981)

Chapter 15. Conclusion, Recommendation and Comments

Chapter 15. Conclusion, Recommendation and Comments

Conclusion and Recommendation

As indicated by the results of financial analysis of the Case A (Base Case), the internal rate of return (after tax) of this MFC project is exceedingly low, or only 1.54%, and great difficulty will be encountered also in fund flow. Therefore, it is concluded that the project is not feasible.

Even if the foundry operation rates adopted in the Implementation Program were assumed as in Case B (operation rates in the initial year, 2nd year, 3rd year and 4th and subsequent years respectively 65%, 75%, 85% and 100%), the internal rate of return (after tax) will be still very low at 2.56%. Under this condition, although calculation shows that the project is just saved from a shortage of funds, if there is even a slight aggravation of conditions, not only a reduction in internal return rate will arise, but a shortage of funds will also take place and consequently the project will fail. Since there is a great possibility of such a situation being encountered, the implementation of the MFC Project harbors an extremely great potential of risk.

The survey team recommends that a feasibility study is made on a project of establishing a foundry in the Medan area, based on new concepts, after various industrial plants are constructed in the area and the market for castings is fully expanded.

Comments

1) Medan, together with Jakarta and Surabaya, constitute the centers of the principal industrial zones of Indonesia. Accordingly, in order to attain further progress of industries in the Medan area today and in the future, it will be imperative to upgrade the present technical standards, product quality and output levels of the casting industry there. In this sense no one can deny that the plan to establish MFC is highly significant.

   However, it will not be an easy task to operate and maintain MFC as a profitable enterprise.

The matter of whether the MFC establishment plan is feasible or not will have to be examined from a purely techno-economic viewpoint, aside of the significance of establishing the foundry center in the Medan area.

2) In general, the casting industry, differing essentially from industries such as the oil refining and petrochemical industries, demands operations sustained by hard manual labor. The castings themselves hardly become finished end products possessing high added value as they are, and are normally sold as components or general-purpose products of relatively low price. In addition, castings are most diversified and multifarious in aspects of their shape, size and quality.

In this sense, the casting industry is essentially different from other industries such as the oil refining industry or nitrogen fertilizer industry which produce products of uniform quality by facilities themselves. Moreover, castings can be imported being combined in complete machine.

Because of these reasons, it will be most difficult to protect domestically produced castings from imported products by import barriers, and they will constantly be faced with competition from their foreign competitors, making the management of foundries quite difficult.

Moreover, since the Indonesian casting industry relies for the larger portion of its raw materials on imports, it lacks such advantages as possessed by the aforementioned industries which use raw materials available domestically at low prices.

These factors undermine the foundation sustaining the casting industry, and even in the case where the foundry appears viable, there is always the fear that management may become faced with deficits even with slight aggravation in operating conditions.

3) In order to secure viability under such stringent conditions, one method of approach is for the foundry to tie up with some specific manufacturer consuming large quantities of castings and to mass-produce products meeting the specific needs of the manufacturer, or to become a captive foundry.

On the other hand, a method available for a foundry to secure viability as a jobbing foundry is a) to mass-produce general-purpose products such as pipe fittings, or b) to selectively manufacture products providing as bigger profits as possible.

With case a), a large market will have to exist for the specific types of castings to be produced, and the foundry will have to be operated at a high operation rate as under a two-shift or three-shift system. Meanwhile, with case b), a large market for castings must exist to permit selection of advantageous products.

In this respect, the Medan area has not an environment permitting the establishment of a captive foundry at the present stage, and neither does the environment permit adoption of methods a) or b).

4) In consideration of the existing environment in the Medan area, the study team recommends that a feasibility study on putting up a foundry in the Medan area is carried out under a new concept in the future when a substantial numbers of fairly large consumers of castings are introduced to the Medan area and the market of castings in the area is fully expanded.

Appendixes

Appendix 1. Members of Survey Team

1.	Dr. Shigeo Ueki	Team Leader (Director, Japan Consulting Institute)
2.	Mr. Sumio Kikuta	Sub-leader of Team (Japan General Foundry Center)
3.	Mr. Shigeo Ienaka	Consultant (Japan General Foundry Center)
4.	Mr. Soohei Ono	Consultant (Japan General Foundry Center)
5.	Mr. Yasuji Noda	Consultant (Japan Consulting Institute)
6.	Mr. Kenji Kawabi	Advisor (Overseas Economic Cooperation Fund)
7.	Mr. Hideo Yasuki	Advisor (Japan International Cooperation Agency)
8.	Mr. Takahiko Kasama	Coordinator (Japan International Cooperation Agency)

Appendix 2. Members of the Indonesian Counterpart Team

1.	Ir. Eman Yogasara	Director for Programming, DOI
2.	Ir. Noegardjito	Head, Division for Machinery Matter, DOI
3.	Drs. Sofari	Head, Division for Metal, DOI
4.	Ir. Sulaiman Said	Institution for Standardization, DOI
5.	Mr. Syahbandi Hossen	Staff for Directorate for Planning, DOI
6.	Mr. Tambunan	Leader of DOI, North Sumatra
7.	Mr. Sidabutar	Staff of DOI, North Sumatra
8.	Mr. Sembiring	Ditto
9.	Mr. Sihombing	Ditto

Appendix 3. Itinerary

Jan.	4 (Sun.)	Left Tokyo and arrived at Jakarta.
Jan.	5 (Mon.)	Visited the Japan International Cooperation Agency and the Overseas Economic Cooperation Fund in Jakarta. Visited Directorate General of Basic Metal Industries of DOI to have a kick off meeting. Left Jakarta and arrived at Medan.
Jan.	6 (Tue.)	Visited KPSU and BAPPEDA to have talk about the MFC Project. Visited Medan Industrial Estate to investigate the plant site. Courtesy call to Consulate General of Japan in Medan. Visited P.T. Sumatra Raya Sari Engineering to collect information and data.
Jan.	7 (Wed.)	Visited PLN, PAM, P.T. Growth Sumatra, Bengkel Gelugur, Tenaga Baru, P.T. Super Andalas Steel and P.T. Hari Subur & Son to collect information and data.
Jan.	8 (Thu.)	Visited BKPM, Bureau of Statistic of North Sumatra. P.J.K.A. Medan and P.T. Atmindo to collect information and data.
Jan.	9 (Fri.)	Visited P.T.S. Palindo.
Jan,	10 (Sat.)	Left Medan to visit P.T. ADEI Crumb Rubber Factory, rubber and oil palm estates. Arrived at Prapat.
Jan.	11 (Sun.)	Left Prapat and arrived at Medan.
Jan.	12 (Mon.)	Visited KPSU to have talks about the Project.

Jan.	13	(Tue.) A group Left Medan and arrived at Surabaya. Mr. S. Ono Visited Perkerjaan Umum Depot and KPSU to collect information and data.
Jan.	14	(Wed.) A group Visited Foundry Gresik and P.T. Sri Riken to collect information and data. Mr. S. Ono Visited P.T. Indonesia Asahan Aluminium and P.T. Gunury Jahapi to collect information and data.
Jan.	15	(Thu.) A group Left Surabaya and arrived at Jakarta. Mr. S. Ono Left Medan and arrived at Jakarta.
Jan.	16	(Fri.) Visited JICA Jakarta to report on the Study. Courtesy call to Ambassador of Japan to Indonesia and gave a report on the study.
Jan.	17	(Sat.) Visited DOI to have the second meeting about the Project.
Jan.	18	(Sun.)
Jan.	19	(Mon.) Visited Foundry Jakarta and P.T. Bakrie Tubumaker.
Jan.	20	(Tue.) Inner discussion about the interim report to be submitted to DOI.
Jan.	21	(Wed.) Meeting about the Project with the Minister of DOI. Visited BAPPENAS and BAPINDO to collect information and data.
Jan.	22	(Thu.) Visited MIDC in Bandung to collect information and data.

Jan. 23 (Fri.)	Visited Directorate General of Basic Metal Industries of DOI to submit the Interim Report. Visited JICA Jakarta and Embassy of Japan to extend the copy of Interim Report. A group Left Jakarta directly for Tokyo. B group Left Jakarta and arrived at Singapore.
Jan. 24 (Sat.)	A group Arrived at Tokyo. B group Visited IHI Singapore and Hitachi Metal Singapore to collect information and data.
Jan. 25 (Sun.)	B group Visited Mihatsu Industries to collect information and data.
Jan. 26 (Mon.)	B group Visited Jurong Alloy, PTE Ltd., and Matsushita Singapore to collect information and data.
Jan. 27 (Tue.)	B group Departed Singapore and arrived at Japan.

Appendix 4

INTERIM REPORT

ON

EVALUATION STUDY

ON

THE ESTABLISHMENT PROGRAM OF THE MEDAN FOUNDRY CENTER

IN THE REPUBLIC OF INDONESIA

JANUARY, 1981

JAPANESE EVALUATION STUDY TEAM
JAPAN INTERNATIONAL COOPERATION AGENCY

C O N T E N T S

I. INTRODUCTION

1. In accordance with the agreement made between the Indonesian Government and the Japanese Government, Japan International Cooperation Agency (JICA) has undertaken an evaluation study on the Establishment Program of The Medan Foundry Center (MFC), North Sumatra.

2. The evaluation study has the following purposes :

   1) In connection with the establishment program of a foundry center in Medan, North Sumatra, the results of past surveys will be reviewed.

   2) Comprehensive evaluation will be made from technical and economic points of view in orde to confirm the feasibility of establishing t foundry center.

3. The scope of the evaluation study is as follows :

   1) Present condition of allied industries

   2) Present condition of casting industry

   3) Market

   4) Kinds of products to be selected

   5) Production scale

   6) Plant site

   7) Availability of raw materials, utilities, infrastructure, etc.

   8) Production process

   9) Plans for production facilities

   10) Plant layout

   11) Plant construction

   12) Production and sales plans

   13) Method of guidance for management and production

   14) Investment required

   15) Fund plan

16) Financial analysis

17) Economic analysis

18) Problems for materialization of the project.

4. The work performed during the stay of the Study Team in Indonesia, from January 4th to 23rd, mainly consists of :

   1) Discussions with The Department of Industry (Counterparts) and other authorities concerned with respect to major elements of the Project for clarification of the evaluation study.

   2) Visits to the selected plant site for the Project for site investigation.

   3) Visits to and interviews with the existing foundries, users of castings (factories which are using castings).

   4) Collection of data and information which are required for the evaluation study.

5. Based on findings, data and information obtained through the foregoing activities, the Study Team will accomplish the evaluation study with precise examinations and analyses performed subsequently after its return to Japan.

6. For the evaluation study about three months will be required after return of the Study Team to Japan. The results of the study will be compiled in a report written in English (Draft) and discussions on the content will be made in Jakarta.

7. This Interim Report is to present a summary of the Study Team's findings or observation in respect of major elements to be confirmed as a basis for its subsequent evaluation study.

8. With the full assistance and cooperation extended by The Counterparts and other authorities concerned, the Study Team has successfully performed its duties. The Study Team acknowledges and takes this opportunity to express its appreciation for such assistance and cooperation of the Counterparts and other authorities.

II. MARKET ASPECT

1. Existing Production of Castings in North Sumatra. According to the various surveys and studies which were carried out in the past (the first feasibility study by Japan Consulting Institute (JCI) in August, 1971; the survey by Overseas Economic Cooperation Fund (OECF) in February, 1972; the supplementary study by JCI in May, 1973; the market survey by JCI in January, 1976.) and also to the informations obtained from Dinas Perindustrial Propinsi Sumatera Utara (DOI, North Sumatra), there are more or less 20 foundries operating in the city of Medan and its suburban districts. However, the production scale of these foundries is small, and the average output is believed to be somewhere about 15 metric tons per month. These foundries are using primitive coke-fired cupola (small induction furnace in C.V. Logam is the only exception) producing low grade (or rather gradeless) iron castings. It may safely be said that the total supply capacity of the existing foundries is more or less 400 tons per month.

   The majority of the products is sold to crumb rubber processing factories (rolls, frames, helical gears and pinions, clutches, etc.).

   To reconfirm the above mentioned capacity of supply, the Study Team paid visits to the following foundries (Listed in the order of visit)

   P.T. Sumatera Raya Sari Engineering.
   P.T. Hari Subur & Sons.
   P.T. Super Andalas Steel.
   P.T. Tenaga Baru.
   P.T. Bengkel Gelugur.
   P.T. Growth Sumatra.

   These 6 factories are quite representative in Medan area, and especially, the first 2 foundries are participating in the Medan Foundry Center (MFC) as the shareholders. P.T. Super Andalas Steel closed their foundry due to the severe competition with the small, so-called backyard foundries scattered around the outskirts of Medan city, and also due to the active operations in their steel fabrication shop to which the labour and capital concentration was essentially required. In the same way, P.T. Growth Sumatra is putting more energy into their steel bar rolling mill, and their foundry only produces spare parts for the rolling mill equipment.

Judging from these situations, it is possible to give a conclusion that the production of castings in North Sumatra is maintaining the almost same level in the past 10 years, and the market is limited to the surrounding plantations.

2. Potential Demand

The result of survey of UNIDO in 1975 indicates that the potential demand of castings in North Sumatra (including the provinces of Aceh, North Sumatra, Riau, West Sumatra and Jambi) is approximately 1,000 metric tons per month. It is consisted of various pumps, rubber and palm oil processing machinery, construction equipment, pipes and fittings, various valves, manhole covers and frames, wear parts for cement plant, sewing machines. Diesel engine components, winches and anchors, valves and fittings for petroleum and natural gas, utensils of daily life, auto repair parts, wheels etc., and the majority is imported.

Apart from the arguments whether this presumption of potential demand given by UNIDO is reasonable or not, most of those imported items such as pumps, valves, rubber and palm oil machinery, construction equipment, etc. are by themselves the functioning units requiring a high production engineering standard.

Eliminating these difficult parts, and still paying considerations to the basic casting requirements in Medan area, the team hereby made the following recommendations of the products assortment to be produced in MFC.

3. Recommendable Products Assortment

3-1 Cast Iron Family.
Rolls and gears for rubber mills.
Sand pump casings for tin mines.
Soil pipe joints and flanges.
Brake drums as repair parts & knock down parts.
Fly wheels as knock down parts.
Mill rolls for rolling mills.
Alloy cast iron parts for palm oil factories.
Counter weights.

3-2 Cast Steel Family.
Sprocket wheels and shoes for heavy equipment.
Truck bogie wheels.
Cement mill liners.
Gears.
Crushers jaws & hammers.

Teeth & adapters for earth moving equipment.
Electrode holder for aluminium smelting.
Piling heads.
Anchors & winches.
Parts for palm oil factories.
For the purpose of grasping the propriety of the above recommendation more concretely, the team made visits to the following organizations.
P.T. Atmindo (Palm oil processing equipment)
P.J.K.A. (Railway)
P.T. Sawit Malinda (Palm oil refinery)
P.T. Adei Crumb Rubber Factory (Rubber)
Pekerjaan Umum (Public Works)
P.T. Indonesia Asahan Aluminium
Gunung Gahapi (Rolling mill)
P.T. Barata Foundry Gresik
P.T. Barata Foundry Jakarta
P.T. Bakrie-Tubemakers

4. Potential Market Assumption & Recommendable Production Scale.

Judging from the informations and facts obtained from the above interviews, the items listed in the above items 3-1 and 3-2 are considered to be appropriate in terms of the basic product-mix for MFC, and it is almost certain that the potential demand at the present moment will be approximately 100 tons per month for the castings listed in the above item 3-1 and approximately 70 tons for the item 3-2.

To avoid any repetition of the difficulties experienced in Jakarta and Surabaya Foundry Centers, the initial production scale should be kept to the minimum level as far as it is economically feasible.

From this point of view, the production capacity of the plant should be designed as 50 tons per month of cast iron group and also 50 tons per month of cast steel group.

5. Marketing Supervision

During the construction period of the plant, it is recommended to carry out an intensive marketing effort preferably with the assistance of a marketing expert, which will preferably include the preparation of the wooden patterns of some of the representative, large lot castings as much as possible before the trial run of the plant.

III. TECHNICAL ASPECT

1. Basic Design Concept

1) It is essential to maintain the operation rate of the plant high. For this purpose, the following points must be considered seriously.

   a) the production capacity of the plant should be designed to suit to the demand conservatively estimated maintaining the minimum economical level.

   b) Sufficient supervision should be rendered in the field of plant administration, marketing and production technology.

2) Selection of the Products

As being reported in the previous chapter, the plant should aim at the production of high quality castings equivalent to the international standard to meet the demand of the local consumers and to substitute gradually for the imported castings.

3) Selection of the Production Process

Careful considerations were given for selecting the most appropriate moulding process for the proposed product-mix. Reviewing from the merit comparison, it is recommended to adopt such a versatile process as, for instance, the vacuum sealed moulding process (which is now becoming as one of the most reasonable moulding methods).

In addition to the above-mentioned process, the adoption of chemical bonded sand system will assist the above process for the production of large sized castings.

For the melting process, it is planned to use a pair of high frequency coreless induction furnaces which are commonly used for melting both iron and steel.

4) Suppression of Capital Investment.

To reduce the burden of interest, the capital cost of the plant equipment has to be suppressed as far as possible.

2. Production Planning

As being reported also in the previous chapter, the production planning is based on the comparatively

sure items selected from the conservative demand assumption.

Cast Iron	600 metric tons/year
Cast Steel	480 metric tons/year
High Manganese Steel	120 metric tons/year
Total	1.200 metric tons/year

3. Plant Equipment.

As being briefed in the above item 3), it is planned to use 2 units of 1 ton/batch capacity high frequency coreless induction furnace with alternate melting-holding power sources. Approximately 80% of the total production will be made out of the new moulding process quoted in the above item 3), while the remaining 20% will be produced by the chemical bonded sand process.

Note: Vacuum sealed moulding process is a Japanese invention in 1973, and now it is expanding explosively over the world's ambitious foundries.

In this process, dry sand in the special moulding box is sealed by plastic film of a high plasticity and the sand mould is kept under a reduced pressure during pouring and cooling processes.

4. Plantsite

It is recommended to use a lot in the Industrial Estate Medan located at about 10 km point on Medan-Belawan road.

It is conveniently located and the land levelling has been almost completed. Soil bearing condition is generally acceptable with the minimum filling and elevating requirement. Connecting works to the electric power inlet of Perusahaan Umum Listrik Negara (PLN) and the water inlet of Perusahaan Air Minum (PAM) are both convenient and no difficulty is expected.

5. Land Area

Total land area required will be about 15.000 m2, and the building area for the main factory and auxiliary facility will be about 4.000 m2. Houses for the employeees are excluded from the Project scope.

6. Utility

The availability of electric power from PLN and water from PAM is confirmed.

7. Manpower Requirement

Total manpower to operate the plant normally is planned to be 60.

8. Technical Training and Operation Supervision

Under the present local circumstances in Medan, it is not very easy to get experienced engineers, technicians and skilled labours. Therefore, a sufficient training and supervision service will be essentially required.

It is planned to carry out the job training of 6 expected foremen or technicians of key job functions in a foundry of the similar nature for the period of 4 months.

In addition, it is considered to be necessary to assign 4 foreign foundry experts for the period of 2 years from the start up of the plant for the purpose of the thorough technical and managerial guidance as well as technology transfer.

9. Construction Period

It is expected that the construction period will be about 18 months from the effectuation of contract upto the commissioning of the plant.

IV. ECONOMIC ASPECT

1. The work performed by the Study Team with regard to financial and economic aspects mainly consists of :

   1) Clarification of cost factors and major assumptions used for the production cost estimate and financial analysis.

   2) Setting-up of assumptions to be applied to the financial and economic evaluation.

2. Based on the financial plan projected by the Study Team, the Study Team will prepare financial statements (i.e. income statement and cash flow). On the basis of the projected financial statements, the Study Team will conduct the following analyses:

   - Internal Rate of Return (IRR) before tax
   - Internal Rate of Return (IRR) after tax
   - Rate of Return on Equity

   These analyses will be made by employing the Discounted Cash-Flow Method and also with sensitivity analysis of these rates affected by changes in major factors such as sales price, capital cost, etc.

3. Taking into account economic cost and benefit of the Project, the Study Team will assess the economic return of the Project in terms of Internal Rate of Return. The Team will also assess the economic effect of the Project on the national economy of Indonesia.

4. Major assumptions to be taken for financial and economic analyses will be as follows:

   1) Capital Structure

      (a) Most of Yen creditportion will be converted to equity of MFC by Government. Approval No. B7243/D/H/VII.4/11/76.

      (b) Terms and condition of Rupiah Loan

Repayment period	12 years
Annual interest rate	13.5 %

2) Depreciation and Amortization

(a)	Depreciation period	
	Machinery and equipment	15 years
	Building	25 years
	Others	5 years
(b)	Amortization period	
	Preoperation cost	5 years

3) Taxes

Income tax of machinery & equipment	exempted
Income tax	45%
Tax holiday	4 ~ 3 years

4) Utility Cost

(a)	Electricity	
	Connection charge	Rp.40,000/KVA
	Power charge	according to basic tariff of PLN
(b)	Water	
	Connection charge	unknown
	Consumption charge	according to basic tariff of PAM

5) Project Life

Project life for IRR calculation	15 years

ANNEX

MINUTES OF MEETING
ON
EVALUATION STUDY
ON
THE ESTABLISHMENT PROGRAM
OF MEDAN FOUNDRY CENTER
IN
THE REPUBLIC OF INDONESIA

JANUARY 22, 1981 JAKARTA

Shigeo Ueki

DR. SHIGEO UEKI
Leader of the
JICA Study Team

IR. EMAN YOGASARA
Director for Programming
Department of Industry

MINUTES OF MEETING (No. 1)

Subject	:	Medan Foundry Center (MFC) Project
Date, Time	:	5th January, 1981 11:00 AM to 1:00 PM
Place	:	Department of Industry (DOI)
Personnels Attended	:	Ir. Eman Yogasara - Director for Programming Ir. Sulaiman Said - Institute for Industrial Research and Development Ir. Noegardjito - Head Sub Directorate for Machinery and Equipment Drs. Sofari - Head Sub Directorate for Metal Industry Mr. Syahbandi Hossen - Staff of Directorate for Programming Dr. S. Ueki - Leader and 6 members of JICA Study Team Mr. K. Hada - JICA, Jakarta Mr. K. Goto - OECF, Jakarta

Contents:

1. Welcome greetings by Ir. Eman Yogasara.

2. Replying speech and explanation by Dr. Ueki of the contents of "Talking Paper" which is attached as Appendix I.

   1) The purpose of this Study Team:

      - to review the existing survey reports prepared in the past regarding MFC.

      - to confirm whether this Project is feasible or not.

   2) The scope of this Study was also explained by Dr. Ueki.

      The contents of the "Talking Paper" were agreed by Ir. Yogasara and his staff with the following comments.

      In this project, the Indonesian Government will act a double role - as the promotor of the Project and as the shareholder of MFC.
      Therefore, the Government should be very careful especially with the experience in Jakarta and Surabaya Foundry Centers.
      In this sense, the Government would like to request the Study Team to add the following point to its scope of Study:

To Item 2 Give attention to the capacity, quality and price of the existing production.

To Item 3 There are a lot of castings imported from the overseas with higher quality and a lower price. Why? Is there any incentive policy of the government of the exporting country?

To Item 17 Economic analysis should include the report on the economic effect of the MFC Project on the whole economy of Indonesia.

The Study Team replied that due considerations would be paid to these comments.

3. Ir. Yogasara expressed the opinion of the Department of Industry (DOI) on the implementation of MFC as follows:

The Indonesian Government is still considering the materialization of MFC as a very important project within the framework of its conception of so-called machine building industry. The Government desires to manufacture machinery and equipment which are essential to the development of machine industry in Indonesia.

Any new project will be required to use machinery and equipment which are already made and available in Indonesia.

Frankly speaking, DOI is being requested by National Planning Authority to establish firmly such machine industry by the year 1985 as one of 17 key projects. Machine Industry includes:

1) Motor Vehicles - Engine Manufacturing Program (Engine plant of Government basis & private - by Mitsubishi, Yanmar, Kubota & BBI)
2) Machine Tools
3) Agricultural Equipment
4) Machinery for Sugar Mills, Cement Mills, Oil and Petrochemical Industries
5) Others

The Study Team is kindly requested to put the above fact into its mind during this study work.

4. The Study Team questioned if it is possible to expect the supply of laborers with a considerable skill from the existing member foundries of MFC.

Ir. Yogasara replied that this kind of cooperation is one of the original concepts of the implementation of MFC and is not changed. However, the word "skilled" has always a "comparative" sense.

5. Another question by the Study Team was whether it is possible to bind the laborers and technicians who were trained in Japan for MFC.

   - Ir. Yogasara personally replied that it may be possible to bind them under contract basis, but it will all depend upon the financial condition of the new foundry.

     If such workers ask MFC favour to cancel the contract because of their low salary paid by MFC, MFC cannot reject it emotionally.

6. Ir. Yogasara sounded if it is possible for the Study Team to submit a rough budget factor to DOI before leaving Indonesia because DOI is requested by the Planning Authority (BAPPENAS) to present this data before April 1981.

   The Study Team replied that it will study in this respect.

7. Itinerary of the Study Team was finalized after discussion between the both parties and the meeting was closed.

MINUTES OF MEETING (No. 2)

Subject	:	Medan Foundry Center (MFC) Project
Date, Time	:	17th January 1981 10:00 - 12:00 AM
Place	:	Department of Industry (DOI)
Personnels Attended	:	Ir. Eman Yogasara - Director for Programming Ir. Noegardjito - Head Sub Directorate for Machinery and Equipment Industry Drs. Sofari - Head Sub Directorate for Metal Industry Mr. Syahbandi Hossen - Staff of Directorate for Programming Ir. Martin Palebangan - ditto Dr. S. Ueki - Leader and 6 members of JICA Study Team Mr. K. Hada - JICA, Jakarta

Contents:

Following to the first meeting held at the same place on 5th January 1981 the second meeting was held immediately after the mission's return from the survey trip around Medan and Surabaya.

1. Ir. Eman Yogasara expressed his appreciation for the survey effort of the Study Team in the Medan and Surabaya regions.

2. He explained the Basic Guideline for National Development Plan.
The main points were as follows:

   - The First 5-Year Development Plan (REPELITA I) started from 1969 and ended in 1974, then the Second was from 1974 upto 1979. During the First and the Second 5-Year Plans, the priority was given to National Economic Growth.

   - Now, we are in the middle of the Third 5-Year Plan (1979-1984) and during this period, the priority is given to Equal Distribution changing the place with Economic Growth which comes to the second priority.

   - Then, the following figures were given to show the past achievement and the future development program in the metal and engineering industries in Indonesia.

Metal & Engineering Industry (Rp Billion: Constant Price as 1973)

	1974	76	78	79	84	89
Domestic Consumption	883	1,126	1,257	1,427	2,721	5,142
Domestic Production	473	585	733	845	1,801	4,050

To attain the target in 1989, the Indonesian Government will offer various incentive and positive participation of investment.
The positive attitude of the Government of this nature will promote the induction of the leading industries, and they will stimulate the surrounding small scale industries to lead the total economic growth.
The Government (DOI) expects MFC as one of the leading industries to stimulate the surrounding small scale industries in North Sumatra.

Besides the above mentioned positive assistance of the Government such as incentives and investment DOI declared 15 Key Programs during "REPELITA 3 and 4" These are as follows:

1) Steel Industry (Pellet, Slab, Hot Strip, Cold Sheet Tin Plate and Seamless Pipe)
2) Non-Perrous (Alumina, Aluminium, Smelter, Al sheet and Foil etc.)
3) Automotive (Commercial Vehicles)
4) Shipbuilding (3000 G/T)
5) Railway Carriage
6) Engine (Diesel and Petrol)
7) Suspension, Steering and Power Transmission
8) Agricultural Tractors
9) Heavy Construction Equipment
10) Heavy Electrical Machines and Equipment
11) Electronics and Telecommunication
12) Industrial Machinery and Processing Equipment (Cement, Paper, Petro chemicals, Agriculture, Textile, Mining etc.)
13) Motor Vehicles (Motor Cycles)
14) Aircraft
15) Machine Tools

Such being the case, the implementation of MFC has a deeper significance if it is considered in connection with the materialization of the above 15 Key Projects.
Especially, DOI is giving the first priority to establishment of the production of item 12, Industrial Machinery and Processing Equipment within the time limit of about 3 years.

3. The explanation by Ir. Yogasara was continued to show an example of the conception of DOI in relation to the implementation of these Key Projects.
The case of Commercial Vehicle was taken up and shown referring to a diagram.

4. Dr. Ueki summarised the results of survey.
Upto this moment of the discussion nearly 20 factories in Medan area and 2 in Surabaya were visited and inspected.
To sum up, the JICA mission observed and recognized that MFC will play a very important role in the development of national economy of Indonesia.
However, the mission had to pay a serious attention to the present difficulties in Jakarta Foundry Center and Surabaya Foundry Center.
To judge whether MFC can survive or not was the main interest throughout the survey. It was observed that all the foundries in Medan area were small and primitive. Surabaya Foundry Center was well mechanized but its operating efficiency was low, while P.T. Sri Riken was small and not so well equipped but they were running well on 3 shift basis.
The level of the facility of MFC should stand in the middle of Surabaya Foundry Center and P.T. Sri Riken.

Dr. Ueki explained the following basis on which the designing of MFC would be made.

1) To maintain a high operation rate.
In other words, the production capacity should not be designed to be so high. Also, the products in MFC should be those which are not being produced in Medan area.
The Study Team has a strong feeling that MFC should concentrate in the production of cast steel and high quality iron castings. By doing so, MFC and the existing foundries in Medan area can cooperate each other.

2) Substantial managerial and technical guidance will be most important, and a considerable amount of fund is to be allocated to this field.

3) Such a process as the vacuum sealed molding process which requires few skilled worker and is getting world-wide reputation will be adopted.

4) The plan should be conservative.
Production capacity will be about 1,200 tons/year in 7 hours/day single shift (1500 tons/year in 9 hours/day operation).

The Study Team asked Ir. Yogasara his opinion on the plan of the production capacity and Ir. Yogasara supported the plan.

5) Ir. Yogasara explained the following point to the Study Team.

In the case of MFC, the Department of Finance has issued the announcement that most of Yen credit portion can be converted to the equity of MFC.

6) The Study Team questioned who will be the nucleus of this Project. Ir. Yogasara replied that the DOI will act as the nucleus and the sponsor because the Indonesian Government will take the majority of the share, however, the person in the center of management has not yet been decided.

7) The Study Team further asked if this Project will take the shape of full turn-key job project.
Ir. Yogasara replied that the most popular contract form in Indonesia is so called Semi-Turkey.

8) Schedule for next Monday was finalized and the meeting was closed.

Appendix 5

MINUTES OF MEETING

on

Presentation of

Evaluation Study Report (Draft)

on

the Establishment Program of the Medan Foundry Center

in the Republic of Indonesia

May 1, 1981 Jakarta

Shigeo Ueki

Dr. Shigeo Ueki

Leader of the
JICA Study Team

Ir. Moh. Toyib

Acting Director of
Programming
Department of Industry

S.U.

Minutes of Meetings

Jakarta, May 1, 1981

The Japanese Study Team for evaluating the establishment program of the Medan Foundry Center (hereinafter referred to as "The JICA Team") sent by the Japan International Cooperation Agency (hereinafter referred to as "JICA"), an official agency responsible for the Government of Japan, presented to the Indonesian counterpart, the Department of Industry (hereinafter referred to as "DOI") the report entitled "Evaluation Study Report on the Establishment Program of the Medan Foundry Center in the Republic of Indonesia (Draft)".

The following is a summary of main subjects discussed and agreed mutually during the meetings.

1. Schedule of Meetings and Contents of Discussions

   The schedule of meetings and contents of discussions are attached in Annex.

2. Presentation of the Draft Report

   2.1. The Japanese Team presented The Draft Report which has been prepared based on the objectives, the scope of work and information described in the Minutes of Meeting dated January 22, 1981. The presentation was made by highlighting the features of the study and results.

   2.2. DOI and The JICA exchanged views on The Draft Report.

   (1) DOI appreciated the contents and grade of The Draft Report.

(2) Ir. Eman Yogasara, Director General, expressed his regret on the conclusion of the Draft Report presented by The JICA Team. The Director General, however, emphasized the important role expected for the foundry industry in the Medan area to support the basic development plan of metal and engineering industry which is currently promoted in the north Sumatra by the Government of Indonesia. The JICA Team expressed their full understanding for the intention of the Government of Indonesia.

(3) DOI and The JICA Team agreed to modify a part of the Chapter of Summary and Conclusion as stated below.

"31. The promotion and development of industries in Medan area is one of the most important themes for the balanced growth of the national economy. For achieving this theme, it is necessary to reorganize and establish the foundry industry in the area to give efficient support to other industries. Under this consideration, various studies on the establishment of MFC have been carried out in the past decade.

According to the result of The Evaluation Study by The JICA Team, it is concluded unfortunately that the immediate implementation of the establishment of MFC is financially not feasible.

However, The JICA Team also recommend DOI to carry out a feasibility study on putting up a foundry in Medan area under a new concept in the future when a substantial numbers of fairly large consumers of castings are introduced to Medan area and the market of castings in the area is fully expanded."

3. Final Report

The Draft Report will be considered as final after making the above mentioned modification and corrections of possible mis-spellings. The Final Report will be submitted to the Indonesian authorities by June 20, 1981.

Both parties agreed and accepted the above.

Records of the 1st Meeting

Date, Time: April 28, 1981 (Tues) 09:30 - 11.00

Personnels Attended:

DOI: Ir. Moh. Toyib, Acting Director
Ir. Noegardjito, Head Sub-Directorate for Machinery and Plant Equipment.

The JICA Team: Dr. S. Ueki and 4 members

JICA Jakarta : Mr. K. Hada

OECF Jakarta : Mr. K. Goto

Place: DOI

Main subjects discussed:

1. Ir. Toyib, Acting Director welcomed The JICA Team.
He explained as follows:
MFC project has a long history of over 10 years, and a lot of efforts have been taken for the materialization of this plan in the past decade.
From this point of view alone, DOI wishes to reach a certain favourable conclusion during the stay of the JICA Team.

2. Dr. Ueki, on behalf of The JICA Team, returned the greetings.
The JICA Team presented to DOI the separate sheet entitled "Presentation of Evaluation Study Report (draft)" in which the outlines of the voluminous Draft Report was abstracted. The JICA Team explained the key points of the contents and reported that the MFC project was evaluated as not feasible.

3. The JICA Team further explained that the Draft Report was composed of 15 chapters and the whole contents of chapters 13, 14 and 15 - the most important portion of The Draft Report were explained to DOI by Dr. Ueki.

S.U.

4. Acting Director explained to The JICA Team as follows:
When DOI started the plan of MFC in 1969, the main aim of DOI was to upgrade the quality of castings produced in Medan area.
The quality of castings available in Medan today has not been improved.
If the MFC project is not feasible, is there any alternative plan to improve the quality of castings in that area? By supporting some of the existing foundries, for example?

5. The JICA Team commented as follows:
Supporting the existing foundries is not so simple.
There will be a difficulty in the organization and control.
If such a support is carried out in a small scale basis, it will be impossible to expect any remarkable improvement.

6. DOI wished to have some more time to read The Draft Report more carefully.

7. The JICA Team agreed.

S. Li.

Records of 2nd Meeting

Date, Time: 29th April 1981, 12: 15

Personnels Attended: DOI - Ir. Eman Yogasara, Director General
Ir. M. Toyib, Acting Director of Programming
Ir. Noegardjito, Head Sub Directorate for Machinery & Plant Equipment
Mr. Syahbandi Hossen, Staff
Dr. S. Ueki & 4 members of the JICA Team
Mr. K. Hada, JICA Jakarta

Place: DOI

Main subjects discussed:

1. Ir. Eman Yogasara, Director General welcomed The JICA Team and appreciated the laborious work of preparing The Draft Report of this grade in such a short time, but Director General was not entirely satisfactory on the conclusion of The Draft Report.

2. Dr. Ueki explained the summary of the Report.
He further recommended that DOI should consider a foundry project under a totally new concept when a substantial number of machine industries as consumers of castings are intorudced to Medan area.

3. Director General understood that the recommendation made by The JICA Team was that DOI was to wait for some years, and he wished that the waiting might not be so long.
DOI noticed the following points in the contents of The Draft Report:

a) Production tonnage is reduced to 1,200 tons/year.
b) Still the investment becomes higher.
c) Selling prices of castings are not much improved, and The JICA Team was asked to explain the reason.

4. The JICA Team explained that the above contradiction was mainly caused by the 1st and 2nd Oil crises and also by the big change of the exchange rate of Yen currency.

5. DOI further pointed out that the equipment cost appears very high.

6. The JICA Team explained that the equipment cost as of today (January 1981) is shown in the page 12-4 which is not very high.

7. DOI requested The JICA Team to breakdown the Pre-operation Cost.

8. The JICA Team explained the contents of the Preoperation Cost and DOI agreed.

9. Director General emphasized that the various industries such as sugar, cement, fertilizer, aluminium, LNG, etc. will be developed and established within 2 to 3 years of time and DOI will try its best to promote these industries as the basic market of castings.

10. The JICA Team expressed its slight doubt if it is a good form of such a narrow margin industry as foundry to be run by the participation of the Government.

11. Director General replied that it is necessary for the Government to participate because the foundry is one of the essential industries. He further explained that the Government should put up with the low profit nature of foundry industry for the purpose of establishing the metal and engineering industries in the North Sumatra region.

12. Director General again emphasized his hope that the waiting should not be too long.
In any case, the Government is essentially in need of the foundry to support the machine industry in the North Sumatra which is currently planned by the Government as the first priority to increase the local contents.

13. Director General asked The JICA Team what will happen if the production capacity of MFC is trebled.

14. The JICA Team replied that IRR will be improved if the production is trebled, but the market is the problem.

15. Director General added that the small foundry town Ceper in the Central Java alone is currently producing 10,000 tons a year.
The demand of castings for water works made Ceper town so busy.
The production of castings in the whole Indonesia is now reaching the level of 60,000 to 70,000 tons a year.

16. Director General expressed his appreciation for the eager cooperation of JICA in this evaluation study, and the meeting was continued by the leadership of Ir. M. Toyib, Acting Director.

17. Acting Director told to The JICA Team that the interest of DOI is how to make the conclusion as feasible.
He asked The JICA Team if it is possible to consider the following alternatives.

a) Under the assumption that the market is capable to accept, is this plant possible to produce 3,600 tons per year in 3-shift basis?

b) Or is it possible to reduce the capacity of the plant to 600 tons per year for the production of 1,200 tons in 2-shift basis?

18. The JICA Team replied the above alternatives are both technically possible. However, plan a) contains the problem of market and plan b) will not contribute so much for the savings of equipment cost.

19. Acting Director also expressed that the sugar mill project in Medan area will be completed in 1982. Considering this fact alone, the market estimate and the setting of production volume by The JICA Team is too low.

20. Dr. Ueki explained that The JICA Team could not be optimistic in the assumption of market with the sad experiences in Jakarta and Surabaya foundry centers. It is not recommendable to rely too much on the future demand. The JICA Team decided that 1,200 tons/year was most appropriate at this moment. Certainly, the plant can accept the future increase of production and it will improve IRR value. However, we cannot say when such time will come.

21. Acting Director emphasized that DOI is not trying to change the contents of this Draft Report. DOI simply wishes to find out what is the bottleneck in this planning which makes this project not feasible.
It is now clear that the problems in this project are summarized as follows:

1) Production volume is too low.
2) Selling price is low.
3) Equipment cost is high.

22. Dr. Ueki repeated that foundry is not a quick money making business. The JICA Team still often wonder if it is recommendable for the Government to participate.

23. Acting Director confirmed that DOI is well aware that this project is not an easy one. Profit is very small. However, that is why the Government is joining. The Government is very eager to push through this project.

24. Ir. Noegardjito asked The JICA Team if it is possible to reduce the equipment cost.

25. The JICA Team replied that it is possible to a certain extent with the sacrifice of some of the functions of the plant but it will be not so much.

26. DOI asked The JICA Team if there is any alternative process.

27. The JICA Team presented the data entitled " A Comparison of Production Between the Proposed Plan in JICA Report and Possible Alternative Plan".

28. Acting Director explained that there is only one way to improve IRR. That is to increase the output.
In this case, the problem of how to sell is considered separately.
DOI's report to the Minister may be related to this point of view. Certainly, it is only the matter of calculation.

29. Acting Director further asked the opinion of The JICA Team regarding some good products for changing the character of MFC from purely jobbing to the production foundry and for making this project feasible.

30. The JICA Team suggested the production of iron and steel valves with the condition that DOI can enter into a certain agreement with a leading valve manufacturer to secure the supply of know-how, parts and assembling technology.

31. DOI asked if it is possible for The JICA Team to make several trial calculations for improving IRR rate by changing the various input factors.

32. Dr. Ueki replied that this Draft Report was made by concentrating the knowledges and various studies and experiences of many experts and it is not possible for us to change the contents and figures at this stage. As all the necessary conditions and basic figures are already given in The Draft Report it is entirely upto your discretion to make any free trial calculations.

33. DOI agreed. Acting Director Toyib also emphasized that the basic guideline during the 3rd Development Plan is the equal distribution of development, and to support the metal and engineering industry in the North Sumatra and it is essentially necessary to establish MFC. Under this concept, DOI must make this project feasible. Certainly, there are many ways to make it feasible, and frankly it is a bit embarrassing for DOI if The Draft Report clearly and simply affirms that this project is not feasible.

34. Acting Director Toyib was puzzled why MFC was branded as not-feasible while such foundries as P.T. Bakrie, P.T. Sri Riken, etc. are making profit even though the profit is small.

35. The JICA Team explained that these foundries stated above are operating in production basis and also their constitutions are the profit seeking private companies operated by single owners.

36. Director Toyib mentioned to The JICA Team to consider the cases of Jakarta and Surabaya foundry centers separately. They are the special cases and DOI knows where are the roots of problems and difficulties of these foundry centers. It is therefore, not very practical to refer these cases in the study by The JICA Team.

Records of the 3rd Meeting

Date, Time: April 30, 1981 (Thur.), 11:00 - 14:00

Personnels Participated:

DOI : Ir. Moh. Toyib, Acting Director
Ir. Noegardjito, Head Sub-Directorate for Machinery and Plant Equipment

The JICA Team: Dr. S. Ueki & 4 members

Place: DOI

Main subjects discussed:

1. The JICA Team asked if it is necessary to explain The Draft Report to the Minister of Industry.

2. Acting Director Toyib replied that the meeting with the Minister at this stage will not be necessary because the Report is still in its draft form, and moreover, the contents of the Draft Report will be briefed and reported to the Minister by Director General Eman Yogasara and Acting Director Toyib even after the departure of The JICA Team from Jakarta.

3. The JICA Team explained about the modification of the expression on conclusion. The expression of item 31 on page 11 was softened (cf. Minutes of Meetings) and item 32 was deleted.

4. DOI further requested The JICA Team to agree with adding the word "financially" before the words "not feasible" in the modified expression.

5. The JICA Team agreed to change the text of the Draft Report to read as "financially not feasible".

6. DOI asked why The JICA Team reduced the volume of production from 2,557 tons (total of iron and steel castings given in item 7 page 3 as potential for MFC) to 1,200 tons.

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7. The JICA Team explained the reason by quoting the descriptions in the Draft Report (Chapter 4-1) and DOI agreed.

8. DOI further asked The JICA Team as follows:
Is it possible to produce more than 1,200 tons per year if more orders are secured by the very good performance of the management?

9. The JICA Team replied as follows:
Theoretically, it is possible to produce more or less 2,200 tons of as-cast on 7 hours per day 300 days per year 1-shift basis. Maximum volume of molten metal for 1 tap out will be 2.2 tons. For increasing the production volume, it is better to adopt overtime or double shift operation than putting heavy duty on the furnace.
It is necessary to pay attention to the fact that the capacity of machining in Medan area.

10. DOI explained as follows:
World Bank is currently cooperating with the Government of Indonesia for upgrading and reinforcing some 200 machine shops in Indonesia.
These machine shops in Medan area are also included in the above plan and will be improved greatly. DOI is always paying attention to the importance of the balance between foundries and machine shops.

11. DOI questioned about the contents of the machinery and equipment.

12. The JICA Team explained that the most obvious difference from the previous planning was the application of V-Process

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13. DOI asked The JICA Team the reason why such a new technology as V-Process was selected for MFC.

14. The JICA Team explained as follows:
The initial investment may be a little bit higher than other conventional processes such as Furan self-setting, but V-Process can offer many remarkable advantages. Out of them, the following merits are evaluated as most suitable for the operations in Indonesia by many foundry professionals.

No moulding skill is required.
No heavy work.
Defects by human reasons are minimized.
Eminent savings in fettling.
Sand conditioning and reclamation are unnecessary.
Accurate dimensions and smooth finish.
Cheaper running cost.

Here again, the separate sheet of Comparison of Production between V-Process and Furan and Sodium Silicate Processes was referred, and DOI understood the intention of The JICA Team.

15. DOI requested The JICA Team to attach the above Comparison to this records of meeting, and The JICA Team agreed to do so.

16. DOI further explained about the national development plan of industries laid out in the near future.
It includes 13 additional cement plants to increase the existing output of 12 million tons to 17 million tons, 6 sugar mills, 7 fertilizer plants and 9 pulp and paper mills.
Out of the above, those related to Medan area are as follows:

1) Cement

Indarung III[b]	600,000	tons	(near Padang)
Indarung IV	1,200,000	"	(")
Andalas	1,000,000	"	(near Medan)
Bohorok	500,000	"	(")

2) Sugar Mill

Cinta Manis	4,000,000	TCD	(tons of cane input per day)

For these projects, the finance has been allocated.

17. The JICA Team joined DOI to expect a sharp increase of demand of castings in Medan area along with the implementation of the above projects.

18. The draft of the "Minutes of Meetings" was explained by The JICA Team to DOI and DOI agreed with the draft. The both parties agreed to meet again at 4 p.m. tomorrow, May 1, 1981 at DOI to exchange the signatures.

19. DOI asked JICA Team the possibility of the establishment of the MFC by using step-by-step-system to make it possible to be implemented. With this sytem, DOI feels the MFC project will be feasible.

The JICA Team answered that the JICA Team cannot answer because this question is out of the objective and scope of the Evaluation Study.

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A ~~Trial~~ Comparison of Production Between
The ~~Original~~ Proposed Plan in JICA Report and
Possible Alternative Plan.

1. Moulding Process

There are three representative moulding processes currently applied in the international foundry industries, ie. Green Sand Process, Furan Self-Setting Process and Sodium Silicate Self-Setting Process.

1-1. In case of Green Sand Process, it is necessary to give outer forces to harden moulds, and mechanical compacting (moulding) machines are used today in the most green sand foundries. In the ~~Medan foundry~~ pursuit Project, the majority of castings aimed to produce is rather large in size, and even the smallest moulding box will have the inner dimensions of 800 mm square.

These castings scheduled for V-Process will require the boxes having dimensions of 1,500 mm square which require quite heavy moulding machines.

Green sand also requires a full-scale sand conditioning plant which is quite expensive.

For the type of operations scheduled ~~in Medan~~ for the Project, Green Sand System is not recommendable and is out of the question from the view points of initial investment and casting technology.

1-2. Then the trial calculations of production cost have been done on Furan Sodium Silicate Self-Setting methods and the results have

been compared with that of the ~~original~~ plan proposed in The ~~recommended by~~ JICA Report.

These comparisons proved that the cost of materials for making moulds out of Furan and Sodium Silicate methods was much higher than the ~~original~~ proposed JICA plan and that it was not possible to expect and economical production of castings.

1-3. The cost of equipment for making moulds and cores by Furan and Sodium Silicate methods is lower than the ~~original~~ proposed JICA plan, but it is still far away from compensating the expensive material cost.

(Table 1. COST OF EQUIPMENT & DEPRECIATION)

	~~Original~~ Proposed JICA Plan	Alternative Plan
Initial Equipment Cost (Yen)	93,000,000.-	50,000,000.-
Annual Depreciation 5 Years (Yen/Year)	18,600,000.-	10,000,000.-
Depreciation per Ton of Castings (Yen/Ton)	1,550.-	834.-
(Rp./Ton)	4,725.-	2,543.-

(Table 2. COMPARISON OF MATERIALS FOR MAKING MOULDS AND CORES.

Based on the production of 1,200 tons/year) Unit : Rp. 1,000.-/year

	~~Original~~ Proposed Plan (Mainly V-Process)	Furan Self-Setting	Sodium Silicate Self-Setting
New Silica Sand	10,720	46,160	46,160
Olivine Sand	9,240	26,640	26,640
EVA Film	9,300	——	——
PE Film	1,730	——	——
Sodium Silicate	2,850	——	45,150

Hardening Agent (Di-cal)	1,080	——	21,240
Collapsing Agent (Carbon Powder)	360	——	17,100
Clay	2,440	——	——
Urea Furan Resin		64,260	
Furfural Resin		46,800	
Catalyst		25,490	
CO_2 Gas	3,060	——	3,060
Total :	40,830	209,350	159,350
Rp./T	34,025	174,458	132,792

Life of patterns and moulding boxes will augment the above difference.

2. Melting Equipment

In the scope of this planning, the only alternative for induction melting is cupola.

The following trials have been done on the assumption that grey iron is to be melted by 1 set of cupola and steel and alloy steel by 1 set of high frequency induction furnace.

2-1. The capacity of cupola will necessarily be 2-ton/hr. because the cupola smaller than this is difficult to control.

Capacity-wise, 2-ton/hr. is [redacted] too much to obtain only 600 tons of iron castings per year. Therefore, the cupola will be operated every other day and one melt will produce 7.4 tons of hot metal (about 4 hours running).

In this case, the pouring will be carried out in the afternoon of the second day, and the molding operation will be continued for almost 2 days. This style of operation will unavoidably require more or less double of the normal requirement of molding boxes.

2-2. Due to the elimination of one of the furnace bodies it is necessary to force the high frequency furnace to carry out such a tough work as 5 heats a day to melt carbon steel and high manganese steel.

~~And moreover, it is impossible to melt steel during the furnace being repaired or relined.~~

2-3. Having two furnace bodies can offer a higher flexibility. It is possible to melt steel by either one of the two furnaces unless otherwise the both furnaces are simultaneously repaired or relined.

2-4. Having separate melting shops for induction furnace and cupola is difficult to control. Each shop will require its own specialized operators.

2-5. For cupola melting, the charging ratio of scrap steel is inevitably restricted to a certain extent, and the cost of materials will be increased, by about Rp 30,000 per ton in comparison with the case of two induction furnaces. ~~And the cost of the combination of one cupola and one induction furnace will be about Rp 20,000 per ton.~~

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2-6. The initial investment for the equipment will be increased for about Yen 9,000,000.- from the original plan.
The main changes are shown here below.

Eliminations of 250 KW Power Pack	- ¥3,000,000.-
Reducing 250 KVA from Sub-Station	- ¥3,000,000.-
Elimination of 1-ton Induction Furnace	-¥10,000,000.-
Addition of 2-ton/hr. Cupola	+¥25,000,000.-
Balance :	¥9,000,000.-

2-7. To have a combined setup of one cupola and one induction furnace is disadvantageous in all respects in comparison with the case of having two induction furnaces.

(Table 3. Comparison of Melting Cost of Grey Iron.)

(Per ton of molten metal)

	Unit Price (Rp./kg)	Cupola (2 ton/hr)		High Frequency Induction Furnace (1-ton)	
		Consumption (1kg)	Amount (Rp/ton)	Consumption (~~ton/year~~ kg/ton)	Amount (Rp/ton)
Electricity	Rp. 40/KWH	20 KWH	800	700 KWH	28,000
Coke	225	200	45,000	—	
Linestone	25	30	750	—	
Pig Iron	150	300	45,000	200	30,000
Iron Scrap	115	200	23,000	100	11,500
Scrap Steel	60	200	12,000	400	24,000
Ferro-Silicon	600	2		2	920

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Carburizer	250	——		10	2,500
Inoculant	900	5	4,500	5	4,500
Sub-Total Materials			131,450		77,020
Lining Material			8,000		2,370
Equipment Cost		Cupola + Induction	6,983	Induc-tion x 2	6,314
Total			147,233		113,704
Difference			+33,529	(÷ 30%)	

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