

**THE FEASIBILITY STUDY**  
**ON**  
**THE RENOVATION OF JAKARTA FOUNDRY CENTER**  
**IN**  
**THE REPUBLIC OF INDONESIA**

**SUMMARY**

JICA LIBRARY



1034455[4]

**DECEMBER, 1985**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

国際協力事業団	
受入 月日 '86. 2. 26	108
	66.6
登録No. 12459	MPI

## Contents

### Summary

	<u>Page</u>
1. Roles and functions of the Jakarta Foundry Center .....	1
2. Demand forecast .....	2
3. Envisaged product mix .....	4
4. Production quantities .....	4
5. Productivity .....	5
6. Manner of implementing the Renovation Project .....	6
7. Personnel organization .....	10
8. Estimated cost of Project implementation .....	13
9. Financial analysis .....	13
10. Economic analysis .....	15
11. Conclusion and recommendation .....	15
11.1 Conclusion .....	15
11.2 Recommendation .....	18

### Appendix :

Basical Condition for the Renovation Plan .....	19
---	----



## SUMMARY

The Jakarta Foundry Center of P.T. Barata Indonesia was established and constructed in 1971 with Yen credit accorded by the Government of Japan. Since establishment, the Center continued production of castings, but at a rate far below the level originally envisaged. Today, the Foundry Center's equipment has in part deteriorated, and to improve the situation, the Government of Indonesia requested the Japanese Government for assistance in renovating this Foundry Center. The request was answered by the dispatch of a survey mission to assemble information and data, based on which to undertake a feasibility study. The present Report covers the results of this study.

### 1. Roles and functions of the Jakarta Foundry Center

The aims of JFC, judging from the results in the past and its present roles, are summarized as follows:

#### A. Roles in the Indonesian society as national enterprise

- a. To acquire, assimilate, improve, disseminate advanced foreign foundry technology.
- b. To contribute to realization of national policy (cf. promoting the utilization of domestically manufactured products.)
- c. To serve as model foundry and leading enterprise in foundry industry to inspire and coordinate the activities of private foundries in the country.
- d. To furnish private foundries with capable managers and engineers, and skilled workers, through transfer to these foundries of personnel trained in the Center.

- B. Sound business administration as an enterprise
- C. To share the market with private enterprise in cooperative participation, with view to fostering fair and healthy competition.

## 2. Demand forecast

For forecasting the future demand for foundry products, reports from market surveys conducted in the past were reviewed, and the data were analyzed through three approaches; global, semiindividual and individual. Harmonization with plans for the Foundry Center held by the Indonesian Government also was considered in drawing up the principles of business strategy envisaged for the reformed Foundry Center, outlined below.

### A. Scheme of production

- a. To produce castings in large (or medium) lots in small variety
- b. To limit the casting materials to cast iron and ductile iron
- c. To limit the size of castings to fit 600 x 560 mm flask in the case of machine molding, and 1,500 mm x 1,500 mm flask in the case of hand molding
- d. To limit the maximum unit weight of castings to 3 tons.
- e. Not to hesitate securing orders in fair competition with private industry, to ensure a sound rate of production.

**B. Envisaged market**

In consideration of the foregoing scheme of production, and taking into account the relevant discussions held with those in charge in Government and at Barata, the market to be envisaged for the renovated Foundry Center was determined to be, in first place, the industries of:

- Agriculture-oriented machinery and equipment
- Transportation equipment
- Civil engineering and construction
- Machine tools
- Mining and energy
- Public works

**C. Demand forecast**

The branches of industry envisaged above are expected to present a market for foundry products totaling the amounts given below, and should provide ample scope for the renovated Foundry Center to secure sufficient orders for stable and sound rate of production.

	1st year (1986)	After 10 years (1995)
FC (including FCD)	6,505 Ton/Y	17,371 Ton/Y

### 3. Envisaged product mix

The envisaged product mix for the renovated Foundry Center was determined by selecting products considered adapted to manufacture at the Center from among castings demanded by the envisaged market, particularly those already marketed by the Center or by other foundries, and others expected to be encouraged production in line with the current policy for adoption of domestically manufactured products. The resulting envisaged product mix is as follows.

- For agriculture-oriented machinery/equipment:

Diesel engine flywheels and cylinder blocks

- For transportation equipment:

Railroad equipment : Rail shoulders

Automobile presses : Press dies

Diesel engines : Flywheels, cylinder blocks/liners/covers,  
pistons

- For civil engineering/  
construction : Counterweights

- For machine tools : Lathe/milling machine components

- For mining/energy production : Pump components, bubble caps

- For public works : Pipe fittings

### 4. Production quantities

The quantities of castings to be produced are envisaged to be successively raised in 3 phases during the 10 years of the Renovation Project. The 3 phases are characterized as follows:



- Initial phase (Short term) : Assimilation of basic foundry technology  
Target production 1,000 tons
- Intermediate phase (Medium term) : Acquisition of new production techniques
- Final phase (Long term) : Mastery of further advanced techniques.

TERM	ACHIEVEMENT OBJECTIVE	TARGET ANN. PRODUCT. (tons/yr)	
		INITIAL	END
SHORT TERM	Assimilation of basic foundry technology	1,000 (1st year)	1,800 (3rd year)
MEDIUM TERM	Acquisition of new production techniques	2,100 (4th year)	2,400 (6th year)
LONG TERM	Mastery of further advanced foundry techniques	2,500 (7th year)	2,650 (10th year)

In consideration of the mission defined above of the Foundry Center, the aim should be upheld of striving toward production of higher value-added castings requiring advanced techniques, rather than toward larger quantities produced.

#### 5. Productivity

The current level of productivity, amounting to barely 4.47 tons/Y.Man in 1984, is envisaged to attain: (compared with 1984)

9.42 tons/Y.Man (2.1-fold improvement) in 3 years

12.57 tons/Y.Man (2.8-fold improvement) in 6 years

13.87 tons/Y.Man (3.1-fold improvement) in 10 years

## 6. Manner of implementing the Renovation Project

The present survey has indicated that the current low performance of the Jakarta Foundry Center is mainly attributable not to shortage of market demand but rather to inadequate technical capability of the Center itself, which has alienated customers, and has led to the current level of orders stagnating below expectation. The low level of product quality and delays in delivery are obstructing orders for products, and the resulting low rate of production raises production cost, to constitute a vicious cycle.

This situation will not be remedied by enhancing the scale of operations and widening the range and variety of products: This will risk impairing the proper functioning of technical management and equipment maintenance to result in confusion of the management function. The present Renovation Project has been drawn up with emphasis placed in enhancing the Foundry Center's capabilities in business management and production technology, renovation of foundry facilities and equipment has been limited to the range and extent indispensable for making effective use of the renovated facilities/equipment, and to replacement of equipment that has become dilapidated.

### 6.1 Management/technology renovation

The Jakarta Foundry Center's business performance has been very far from satisfactory, having not once recorded operating profit ever since its establishment. To break away from this deplorable situation, it is essential for the Foundry's executives to make determined efforts to enhance their capability for administration and leadership, exercising strict and equitable control over the plans and operations, as well as critical examination of results obtained, in the different operating units.

In respect of production technology, repeated technical assistance has been obtained in the past by the Foundry Center for expert guidance in foundry techniques and for training abroad of Foundry Center personnel. The fruits of such technical assistance, while fairly well utilized in some instances, when considered globally, not effectively applied in daily practice. This applies particularly to operator skills.

There is urgent need of establishing a system that will ensure the nurturing of capable foundrymen, not only to staff the Center and contribute to its sound development, but also to be transferred to private industry to serve in furthering the development of Indonesian Foundries. The instruction and training requiring to be administered include:

- (1) Enhanced instruction and training in basic notions and techniques for the engineers, strengthened technical direction of shop floor operations
- (2) Training of technicians in basic skills
- (3) Nurturing of qualified technicians through assignment to courses at the Foundry Training Center.

To this end, technical assistance should be necessary, with assignments from abroad of expert instructors during the first 1 or 2 years of the Renovation Project.

## 6.2 Facilities/equipment renovation

Renovation in the aspects of foundry facilities and equipment covers new installations.

The "hardware" renovation covers new equipment indispensable for implementing the envisaged production scheme, and for replacing dilapidated existing equipment, accompanied by improvement of the production line in the existing foundry, and attendant renovation of pattern-making shop and office rooms.

The equipment and buildings envisaged to be additionally acquired or extended are as listed respectively in Tables 6-1 and -2, and its layout is shown in Figs. 6-1 and 6-2.

For constructing the building and installing the equipment, it is advisable to commission a qualified construction consultant for design and work supervision, with overall direction undertaking by a group charged with this work at the Foundry Center. The construction is envisaged to take 12 months from contract to completion of test operation.

Table 6-1 Equipment to be Newly Acquired

<u>EQUIPMENT</u>	<u>QUANTITY</u>
Pattern-making -	
- Woodworking lathe	1
- Bobbin sander	1
- Dust collecting system	1
- Spare parts =	
= Band-saw blades	6 sets
= Universal milling machine cutters	1 set
Sand preparation -	
- Sand drying equipment	1
- Dust collecting system for green sand	1
- Rubber belt for conveyor	1
- Continuous sand mixer (10 t/h)	1
- Continuous sand mixer (3 t/h)	1
- Sand reclaiming unit for self-hardening sand	1
Molding -	
- FD-4 molding machines (after 5 years)/accessories	2
- Hoists for ditto (accessories 500 kg)	2
- Roller conveyor for F-2A molding machine line	1
- Molding flasks (for F-2A machines)	15 sets
- Molding flasks (for FD-4 machines)	60 sets

- Molding flasks (for hand molding)	15 sets
- Shell molding machines	2
- Overhead traveling crane (hoist 3t)	1
- Green sand hardness testers	3
- Traverser	1
<b>Melting -</b>	
- Monorail (2t)	1
- Ladle (1t)	2
- Ladle (300 kg)	2
- Ladle (500 kg)	2
- Ladle (1t), (tea pot type)	2
- Hydraulic press	1
- Cooling tower	1
- Circulating pump for cooling tower	2
- Spare parts/components =	
= Coil for 2-t furnace	1
= Coil for 5-t furnace	1
= Vacuum switches	3 sets for each furnace
= Contactors	5
<b>Finishing -</b>	
- Overhead traveling crane (5-t)	1
- Jib crane (2-t)	1
- Hand push car	1
- Swing grinders	1
- Double head grinder	3
- Cyclone dust collector	1
- Compressor	1
- Cooling tower	1
<b>Inspection -</b>	
- Metallurgical microscope, camera	1 set
- Digital hardness tester (Brinell)	1
- Vickers hardness tester	1
- Desk drilling machine	1
- Inspection surface plate	1
- Inspection instruments	1 set

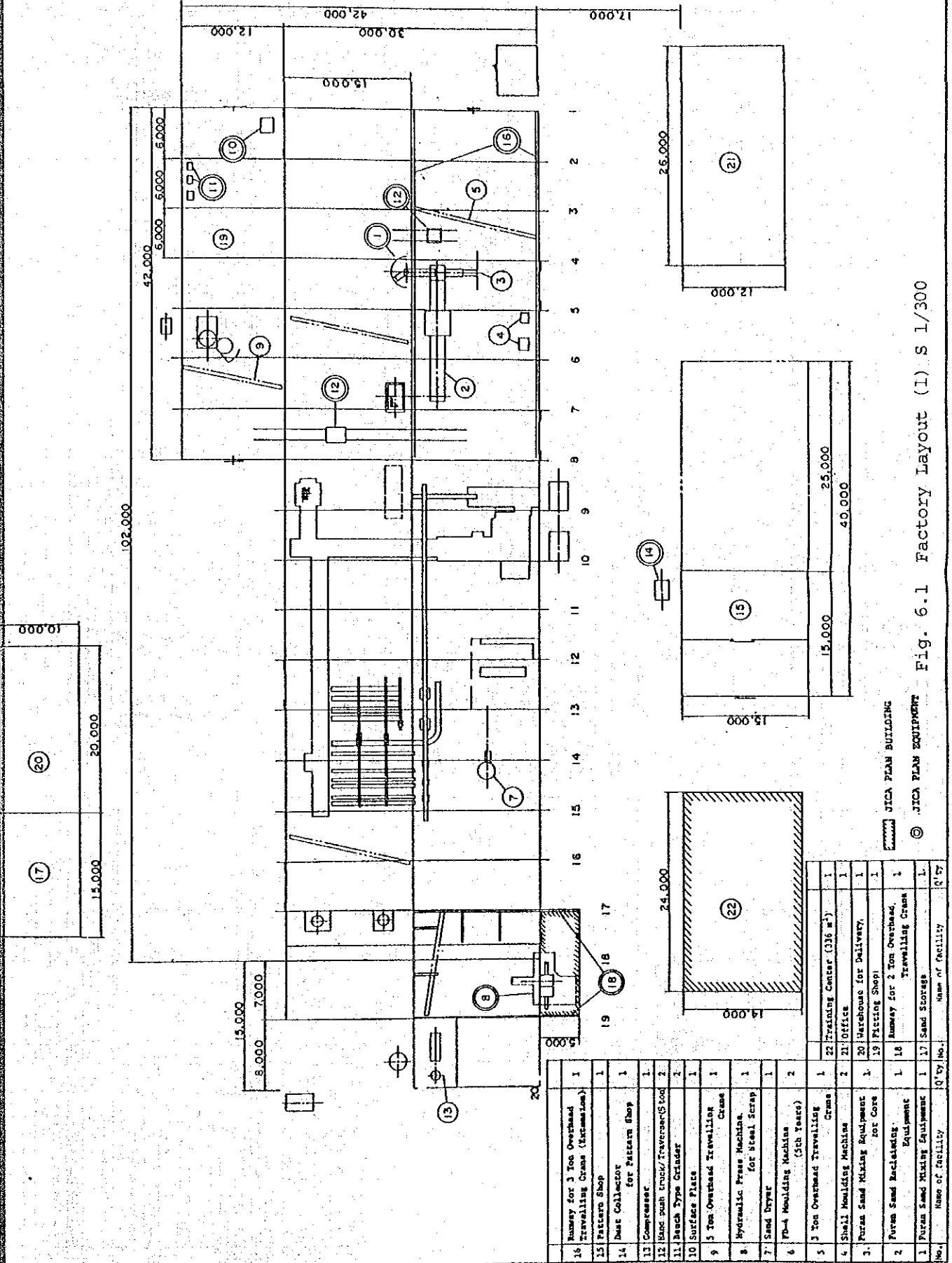
Table 6-2 Buildings to be Newly Constructed or Extended

<u>BUILDING</u>	<u>FLOORAGE (m<sup>2</sup>)</u>
Pattern-making shop	225
Office building	312
Steel scrap press shop	65
Finishing shop (Relocation)	504
Product depository	200
Sand depository	150

7. Personnel organization

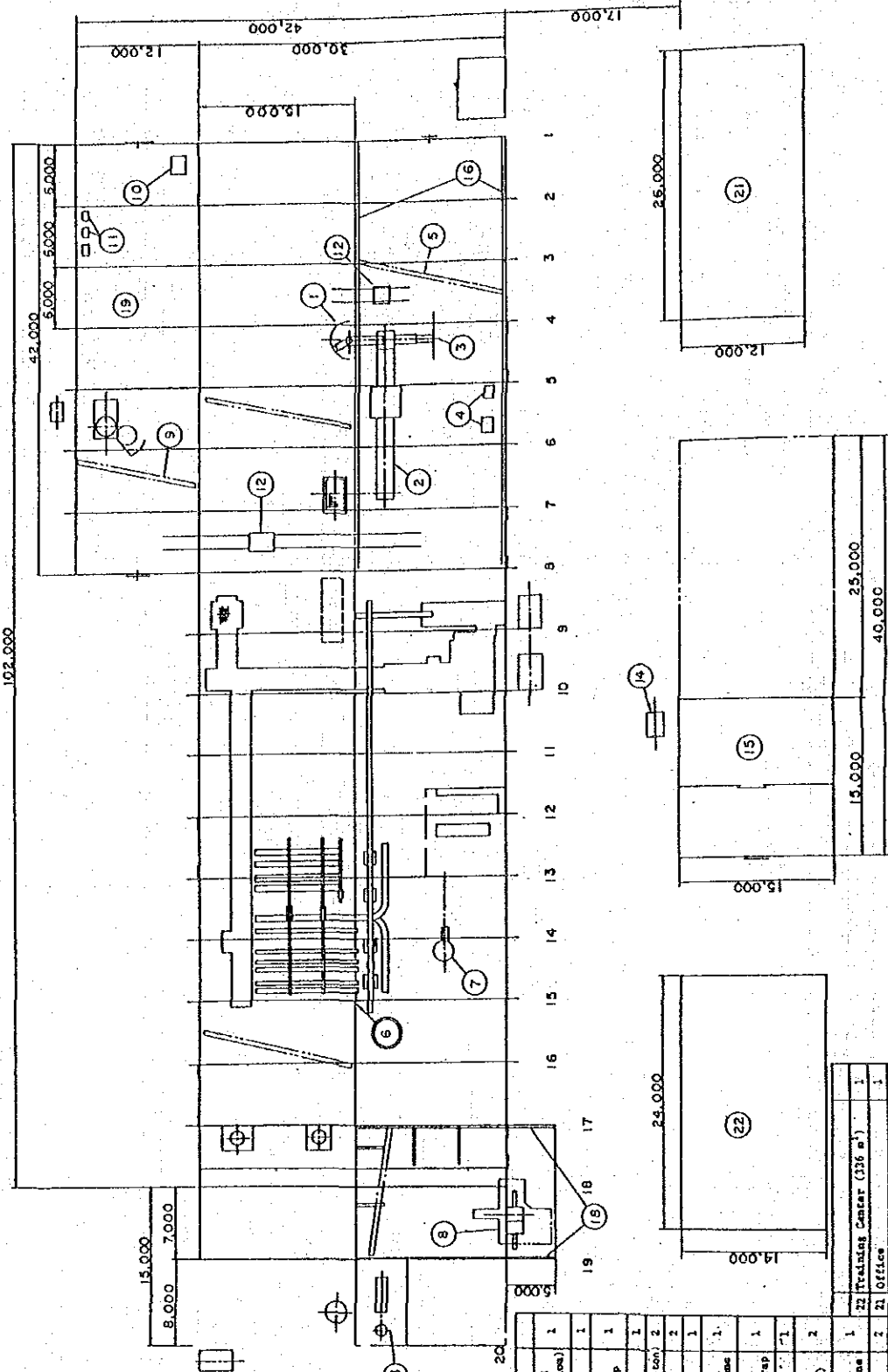
The only modification envisaged to affect the Jakarta Foundry Center is to place the Technical Department under the administration of the Factory Manager.

The total personnel of 191 is envisaged to remain unchanged throughout the 10 years of the Renovation Project.



JICA PLAN BUILDING © JICA PLAN EQUIPMENT Fig. 6.1 Factory Layout (I) S 1/300

17	15,000	20,000	10,000
----	--------	--------	--------



14	Rumley for 3 Ton Overhead Travelling Cranes (Extension)	1
15	Pattern Shop	1
14	Dust Collector for Pattern Shop	1
13	Compressor	1
12	Hand pump truck/Traverser(5 ton)	2
11	Besch Type Grinder	2
10	Surface Plate	1
9	5 Ton Overhead Travelling Crane	1
8	Hydraulic Press Machine for Steel Scrap	1
7	Sand Dryer	1
6	FD-4 Moulding Machine (5th Year)	2
5	3 Ton Overhead Travelling Crane	1
4	Shell Moulding Machine	2
3	Puran Sand Mixing Equipment for Cars	1
2	Puran Sand Moulding Equipment	1

22	Training Center (326 m <sup>2</sup> )	1
21	Office	1
20	Warehouse for Delivery	1
19	Fitting Shop	1
18	Rumley for 2 Ton Overhead Travelling Crane	1



8. Estimated cost of Project implementation

Estimated project costs in case of the Case "A" (Furan process is adopted) are showed in the following table.

(Unit: Rp 1,000)

CURRENCY	FOREIGN	LOCAL	TOTAL
1. Machinery & Equipment (CIF)	966,384	144,402	1,110,786
2. Inland Transportation		44,431	44,431
3. Civil & Erection		239,932	239,932
4. Construction Expenses		71,091	71,091
5. Engineering Fee	177,727		177,727
6. Building		548,340	548,340
7. Others	156,399	39,100	195,499
Base Project Cost	1,300,510	1,087,296	2,387,806
8. Contingencies	89,071	70,882	159,953
Project Cost	1,389,581	1,158,178	2,547,759
9. Tax		254,773	254,773
Total Project Cost	1,389,581	1,412,951	2,802,532
10. Engineer Cost (Dispatched)	348,096	149,184	497,280
Grand Total of Project Cost (Case "A")	1,737,677	1,562,135	3,299,812

NOTE: The above cost estimates are based on the plan drawn up by JICA Team.

9. Financial analysis

The financial internal rate of return for the Case "A" (Furan process is adopted) is 8.9%, which is fairly close to the 10% that is generally considered the criterion for the financial feasibility of a contemplated project. The above FIRR of 8.9%, for the Case "A", however, proves upon sensitivity analysis to be somewhat precarious: The FIRR will drop to around 7% upon decrease of product selling price by 5% or increase of investment by 20%; it will lower to around 6% upon 10% rise of raw material cost.

The operating profit will go into the black in 4 years from Project initiation, but recurring profit will remain in the red on account of the heavy burden of interest on borrowed money. This will present a somewhat serious problem from the point of financial soundness.

In order to shorten the red period of recurring profit by increasing FIRR, and thus to make this Renovation Plan financially feasible, it is very important to take the following measures;

- \* To obtain financial assistance for instruction/training - accounting for as much as 16% of the total investment - from the Indonesian or foreign governments.
- \* To procure funds for both investment and working capital at low interest and favorable conditions from the Indonesian and foreign governments.
- \* To strengthen sales activities and increase productivity as soon as possible by thorough quality control, production control and rapid mastery of foundry engineering, once the renovation is completed. This measure is needed especially because the break - even point will be very high at the onset on account of heavy burden of interest and depreciation.

It can be summarized that Case "A" adopted for financial analyses proves to be by and large feasible, and that to enhance the soundness of the Project, it is indispensable for JFC to make great effort for increasing productivity and profit. Also, the aid from the Indonesian or foreign governments should be very effective.

As seen in Chapter 6, the Renovation Plan of JFC is technically difficult to realize. However, the analyses based upon certain presumptions has yielded a FIRR of 7.9%, which is close to the 10% level of feasibility but 1% that of Case "A". In addition, since the investment for equipment is large, and depreciation and interest push up the cost, recurring profit will remain in the red for 7 years - 1 year longer than in Case "A".

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

## 10. Economic analysis

The economic internal rate of return for Case "A" proves to be 13.3%, well above the generally accepted cut-of rate of 8 to 10%. Moreover, sensitivity analysis has indicated that, even with the postulated factors worsened to some extent, the EIRR still remained at a level of 10%. The modified Bruno ratio also indicated the basic case (Case "A"), to be highly contributive to curbing foreign currency outflow.

It can thus be concluded that Case "A" is feasible in terms of EIRR.

Similar analysis of the Barata plan has yielded 10.35% for EIRR, which is quite acceptable, although 3% below that of the above Case "A".

Case "B" presents an EIRR not attaining 5%, roughly half of the cut-off rate, and is not feasible.

## 11. Conclusion and recommendation

### 11.1. Conclusion

#### 11.1.1 Market for foundry products

The market for foundry products was estimated from:

- Review of reports from past market studies
- Analyses from global approach (global market demand/supply, future demand/supply forecast from global trends)

- Analyses from semi-individual approach (market for specific product ranges; future plans contemplated for specifically relevant branches of industry)
- Analyses from individual approach (sample survey of specific prospective customers of the Foundry Center)

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

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

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

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

#### 11.1.2 Management

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

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

#### 11.1.3 Technological capability of the Foundry Center

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

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

- Use of furan sand molding process
- New installation of minimum equipment necessary for furan sand molding process, and for replacing delapidated equipment.

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

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

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

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

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

#### 11.1.4 Economic and financial considerations

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

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

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

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

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

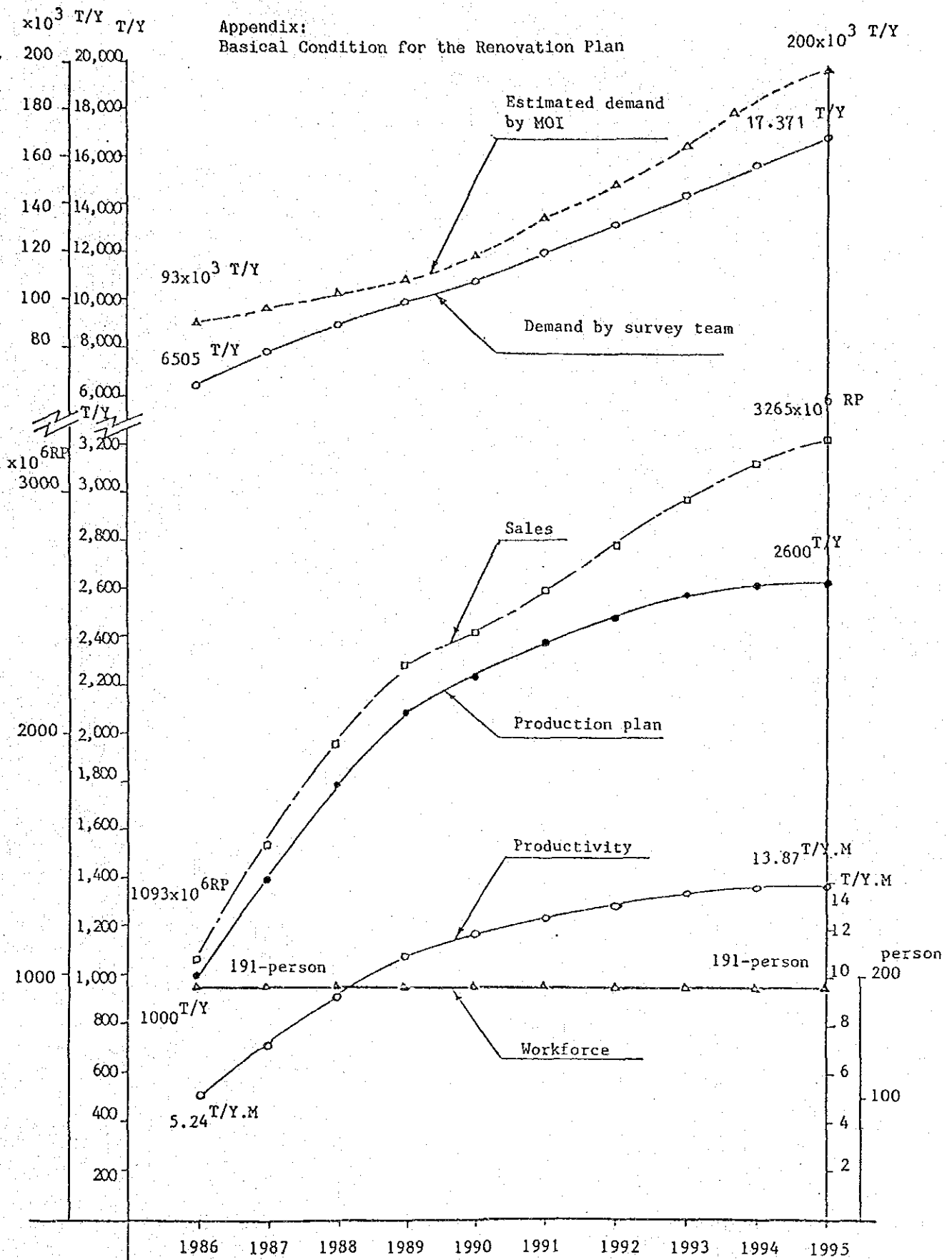
Further, in order to improve the financial soundness of the Project by raising the FIRR, and thereby to further enhance financial feasibility, it is considered extremely effective to obtain financial support from the Indonesian Government or from abroad.

## 11.2 Recommendation

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

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

Appendix:  
 Basical Condition for the Renovation Plan



JICA