THE FEASIBILITY STUDY REPORT
ON
THE DEVELOPMENT OF PLANT PROCESSING EQUIPMENT INDUSTRY
IN
THE REPUBLIC OF INDONESIA
(SUMMARY)

FEBRUARY, 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

CONTENTS (SUMMARY)

LIST OF TABLE (SUMMARY)

VII Technical Conclusion and Recommendation

LIST OF FIGURE (SUMMARY)

Boma Bisma Indra, Wahana

Boma Stork, Pasuruan

GENERAL

OBJECTIVES AND SCOPE OF STUDIES

General

Objectives and Scope of Studies

(1) Historical background

A number of constructions of plant etc. have so far been made in developing countries, most of which being situated in Asia, under economical cooperation of Japan, but owing to the aging of the equipment or insufficient maintenance, the rate of operation or operation efficiency has decreased. As such a case has increased in number, the rise of production cost is worried about.

In Indonesia too, the most of the machine tools to manufacture plant processing equipment now working comprises such machine as was used before 1940's. Besides, the new machine investment and the engineering transfer so far made are very much limited and the rate of factory operation as well as the quality of products still remain in a low level.

On the other hand, in the Second 5-Year Plan that started in 1974, emphasis was put on the volume increase of massive necessaries as well as the increase of employment opportunity, and at the same time, strategical investment in the basic material sector of the First 5-year Plan continued, as a result of which, the investment in the basic material sector was rewarded with good fruits, evidenced by such a rapid production increase of urea fertilizer as from 103,000 tons in 1971 to 990,000 tons in 1978 and that of cement as from 515,000 tons in 1971 to 3,649,000 tons in 1978.

In the Third 5-Year Plan that started in 1979 on the basis of such an outcome as abovementioned, the upbringing of such large-scaled assembly industry as airplane, ship, locomotive, passenger as well as goods wagon in addition to automobile and motorcycle was started. This was based on the strategy to bring up such an up-stream industry as basic materials etc. in the first place, then bring up such a down-stream industry as the assembly of final materials and for the third step, to strengthen those industries that fasten the above two.

In the Fourth 5-Year Plan that started in April, 1984, the upbringing of those industries that fill up the gap between the both of them was taken up as the most important item to be achieved for the third step.

This idea can be regarded as a development strategy that meets the flow of the times, if we understand the present status that while the basic materials sector has so far progressed comparatively smoothly, the various machinery manufacturing sector is the problem awaiting solution in future.

Under such circumstances, the renovation as well as reactivation of plant processing equipment manufacturing plants are a matter requiring immediate attention and the Indonesian government has requested Japan to cooperate with them accordingly. Above all, much importance is attached to the promotion of plant equipment manufacturing industry from the view-point of foreign currency saving as well as basic engineering advancement, to which the top priority is given in the Fourth 5-Year Plan.

The Japan International Cooperation Agency has agreed to execute a full-scale survey, by way of sending a preparatory investigation committee in February, 1984 and a preliminary investigation committee in May, 1984 as requested by the Indonesian government. Those plants that become the objectives of the renovation this time are as follows:

- o P.T. BARATA:
  - o JAKARTA Plant (except the foundry center)
  - o SURABAYA Plant (except the foundry as well as construction equipment workshops)
  - o GRESIK Plant (added to the Scope as a result of the discussion with MOI)
  - o TEGAL Plant
- o P.T. BOMA-BISMA-INDRA (P.T. BBI):
  - o SURABAYA Plant - INDRA Unit (including WAHANA sub-unit, but excluding the foundry)
- o P.T. BOMA STORK:
  - o PASURUAN Plant

Agreement has also been made with the Ministry of Industry to put the equipment plan of the 3 corporations taken as the objects (BABIBO) into practice under the assumption to produce the following main items.

- o P.T. BARATA:
  Mechanical equipment for (1) sugar plant and (2) cement plant

- o P.T. BBI:
  Processing equipment for (1) fertilizer plant and (2) pulp and paper plant

- o P.T. BOMA STORK:
  Mechanical and processing equipment for (1) sugar plant and (2) palm oil plant

(2) Objectives of study

The objectives of this study are to make up a renovation plan to achieve the target of increasing productive capacity as well as productive efficiency, while improving product quality after making a general investigation from the market, technical, financial as well as economical points of view, with reference to the possibility of effecting a renovation, through the diagnosis of each plant of BABIBO, taking the kind of plant equipment and demand volume into full account. As to the renovation plan, we have not limited the matter to the aspect of equipment alone, but have also made a diagnosis on the present status of management, control, educational training, maintenance system, safety control of these plants and finally proposed a renovation plan.

The main objective of the study lies in the manufacture of plant equipment for the designated 5 plants, but since the manufacture of other items will also be available by virtue of this renovation, we have also taken up these items for our dynamic study and have made comments on them.

(3) Scope of work

1) Diagnosis of the present status of the plants concerned.

Diagnosis has been made on each individual workshop of facilities, engineering technique and management.

2) **Market survey**

After effecting a market survey putting weight on plant equipment for the designated 5 plants, we have finally made up the BABIBO PRODUCT MIX.

3) **Material survey**

4) **Making-up of a renovation plan**

We have made up a renovation program in consideration of economical efficiency as well as technical environment.

① Establishment of a renovation plan which looks reasonable from the viewpoints of facilities, engineering technique and management.

② Calculation of the required capital cost.

③ Establishment of an educational training plan.

5) **Financial analysis as well as assessment of this project.**

6) **Economical evaluation of this project.**

7) **Conclusion and recommendation.**

I

CONCLUSION AND RECOMMENDATION

I Conclusion and Recommendation

(1) Market Aspects

1) The significant amount of plant processing equipment demand can be expected in Indonesia as far as the industrial development policy as stated in PELITA IV is realized.

2) The potential demand of plant processing equipment to be domestically manufactured is calculated to be approximately 180 thousand tons p.a. It includes the equipment demand of the five designated plants and that which BABIBO presently manufactures and will be able to manufacture.

3) In addition to the above demand, there is other promising demand which was not studied in this report. Considering these demand, the potential demand will increase further.

4) Therfore, the establishment of plant processing equipment manufacturing industry can be justified in Indonesia.

5) On the other hand, the final production capacity of BABIBO will reach 85 thousand tons p.a. In view of the potential demand and the capacity, it can be said that the renovation plan is reasonable.

6) However, BABIBO's production capacity after renovation will increase to more than four times as much as the present capacity. The marketing force to deal with such large volume of products has to be reformed and reinforced to great extent.

7) In line with the reform of marketing force, it is advised to carry out the education and training of sales personnel by experienced instructor(s) who has a thorough knowledge in this field so that their capabilities can be improved.

8) The education and training should be performed in accordance with the long-term, not short-term, training program in which the actual marketing activities are incorporated.

(2) **Technical fields**

1) While the basic material industry and the assembling industry have grown remarkably in Indonesia, the equipment machineries of these industrial fields depend chiefly on imports even now. So the present development plan of the plant processing equipment manufacturing industry is most opportune for planning.

2) Judging from the results of the market study, the market for the manufacturing industry of localized machineries is promissing.

3) At present the technical level of each factory is not necessarily high. They, however, have been making effort to elevate their technical level, and are very enthusiastic for the future development.

4) Factory spaces for the production of 85,000 T/Y are already available.

5) Together with the introduction of new equipment machineries, systemization of quality control, clarification of managerial organization and execution of training for engineers and workers are strictly advisable.

6) For the purpose of smooth transportation of large-sized and/or heavy products, roads and harbor facilities are to be improved and reinforced.

(3) **Financial and economic aspects**

1) The development of plant processing equipment manufacturing industry is significantly important in view of the industrialization of Indonesia and ripple effects on other industries.

2) The one of indicators which shows the profitability of project, Financial Internal Rate of Return after tax of the designated projects, indicates higher than 10% as listed below.

BARATA	BBI	BOMA STORK
10.6%	10.2%	25.1%

3) As the results of financial analysis, the financial position of each company will be improved after the development of existing factories.

4) The economic indicator, Economic Internal Rate of Return of projects, shows 23.8% which is higher than cut-off rate (8 - 10%) of project which is normally adopted to select projects.

5) Accordingly, the designated project is feasible in case that the premise of the financial and economic evaluation is not adversely changed.

(4) The further modifications and/or re-investments to the selected production facilities

1) The selection of the production facilities in this feasibility study report were planned on the basis of the following pre-conditions:

① The capacity of the machine-tools were designed in accordance with the specifications (material/dimension/weight) of the components for the plants, of which category and sizing (capacity) were also defined from the market research and in the product mix plan.
For example, the facing lathe machine for P.T. Barata indonesia Gresik factory has been designed to have a capacity of machining the raw mill flange for 1,000,000 Ton/Year Cement Plant, and also the floor type boring/milling machine for P.T. Barata Indonesia Surabaya machine shop is to be equipped with a capacity to machine the mill cheek for 4,000 Ton/Day Sugar Plant.

② The specifications of the machine-tools including cutter tools and accessories were selected referring to the current production technology and considering the present situation of each individual factory of P.T. Barata Indonesia, P.T. Boma-Bisma-Indra and P.T. Boma Stork respectively.

For example:

Ⓐ The floor type boring/milling machine for P.T. Barata Indonesia Surabaya machine shop is to be equipped with MDI-NC devices

together with the various accessories instead of the C.A.M. system, because the C.A.M. system would be really effective only when operated in combination with the C.A.D. system which P.T. Barata has not yet applied.

Ⓑ The CNC drilling center machines for P.T. Barata Indonesia Gresik factory and P.T. Boma-Bisma-Indra Wahana unit are designed for high efficiency in drilling tube plates of heat exchangers.

Ⓒ Semi-automatic welding machines are to be equipped respectively in P.T. Barata Indonesia Gresik/Jakarta factories and P.T. Boma-Bisma-Indra Wahana/Indra units with IC control devices for automatic control of the welding current and voltage.

Ⓓ The exclusive-use lathes specialized for high efficiency in machining of cane rolls are selected for P.T. Barata Indonesia Tegal workshop, because exclusive-use machines are deemed more efficient than NC machines or copying machines especially in case that the machined objects are in the similar shapes with various different sizes.

Ⓔ The automatic welding equipment combined with exclusive type manipulators and turning rolls are selected for P.T. Boma Stork, because the weld-beams in the boiler drums/pressure vessels require decfectless quality and P.T. Boma Stork is expecting constant and repeated orders of those items as their main products.

③ The quantity of the similar category of the production facility in each factory was settled respectively based on the production load plans that were estimated/calculated in accordance with the expected share of each factory in the total market demand forecast.
However, careful consideration to avoid an overlapping investment and/or extremely low loading factor was paid to the final investment plan.

For example:

Ⓐ The large type hobbing machine and/or the high frequency induction

hardening equipment are to be introduced only to P.T. Barata Surabaya machine shop and it is recommended to avoid further investment of the same or similar facility to other factories.

Ⓑ Although the end plate is the essential component of the boilers/pressure vessels which are the main products of P.T. Boma Stork, no flanging machine is to be installed in P.T. Boma Stork.
The reason is that formed end plates are obtainable from outside like P.T. Boma-Bisma-Indra Wahana unit closely located and belonging to the same group of the company, and moreover the utmost utilization of narrow working floor in Pasuruan workshop is also important for P.T. Boma Stork to increase the production capacity.

④ Some of the production facilities are to be introduced from viewpoints of the skill training and the future proficiency, which is somewhat irrespective of the present production plan and/or production loading factors.

For example:

Ⓐ Each one of the floor type boring/milling machine with MDI-NC device is to be introduced to P.T. Barata Indonesia Tegal workshop and P.T. Boma Stork respectively in consideration of the practical training plan thereabout.

Ⓑ Three units of radio controlled overhead travelling cranes are to be introduced to P.T. Barata Indonesia Tegal workshop for the urgent enhancement of the productivity especially in the material handling.

2) Regarding future modifications and/or re-investments for each factory, following points are recommended to be considered carefully on the abovementioned selection basis of the production facilities.

① As far as future technology/license transfers do not exceed the capacity and/or category of the plant equipment defined in this report, no further investments and/or modifications of machine tools shall be required.

② Even When new machining technology should be developed drastically in the future, the adoption of such new technology would have to be carefully decided considering the actual situation of products, workers' skill and production control system.

③ When the situation surrounding the factories' production activity should be remarkably deviated from the planned condition, minimum modification with minimum re-investment would be recommended for suitable machine-tools and relating facilities.

For example:

Ⓐ When P.T. Barata Indonesia completes and thoroughly masters the C.A.D. system in the engineering center, only the MDI-NC devices of the floor boring/milling machines and the vertical lathe shall be raplaced with C.A.M. system together with the rewiring of the telelphone system whose P.A.B.X. has already been applicable to computerized control system.

Ⓑ When P.T. Barata Indonesia Surabaya machine shop is required to assemble a product over 50 Ton, the co-work of 50 Ton crane plus 25 Ton crane shall be adopted at first, then another 50 Ton crane shall be considered to be additionally invested in.
Such a short circuit idea to build a new bay equipped with a 100 Ton crane shall not be recommended.

④ If the product mix plan should be extremely deviated from the original plan and/or load balance among categorized machine tools should be remarkably changed, the following steps shall be applied prior to the decision making of re-investments:

Ⓐ To reinvestigate and reconfirm whether such unbalanced load is a temporay phenomenon or long term tendency.

Ⓑ To consider how to utilize the existing machine tools with combination of jigs and/or special accessories/adaptors.

Ⓒ To check the availability of utilizing subcontractors and/or maintenance facilities of other industrial fields, such as steel mills, shipyards and cement factories, etc.

⑤ Continued study and forecast on the tendency of technology and market are strongly recommended as well as constant improvement of production technique and routine maintenance of the facilities.
This sort of routine maintenance and jig manufacturing costs after the renovation are covered in this report.

II

RESULTS OF PLANT DIAGNOSIS

II Result of Plant Diagnosis

II-1 Barata Surabaya Machine Shop

(1) Main products of plant

Surabaya-Machine Shop has two functional aspects: the machining center of P.T. Barata Indonesia, and the processing division of Surabaya-Foundry. It has the following average production record during the 5 years from 1979 through 1983.

Spare roll for sugar cane mill	504 tons
Other equipments for sugar plant	710 〃
Small-sized water-mill and others	718 〃
Total	1,932 tons

Being imagined from the background of this workshop, it is natural that the major portion of the production are covered with the work directly relating to the maintenance of sugar plants.

(2) Conditions of plant location and layout

This workshop has repeatedly expanded until there is no room left for additional installation of machine tools. Since P.T. Barata Indonesia has decided to move the present steel construction branch in Surabaya to the new factory in Gresik, the open space previously occupied by a steel construction branch must be utilized to accommodate installation of additional facilities for the Machine shop.

With regard to the layout of machine tools, the process flow of products has become extremely complicated as a result of the several additional installations. This, coupled with the lack of conveying equipment, is responsible for the low productivity.

(3) Facilities

The production facilities have aged so much that their accuracy and efficiency has considerably dropped, although efforts have been made to maintain the machinery

equipment at the machine tool rehabilitation center installed in the Surabaya Plant. There are only a small number of machines that can meet the requirements of finishing accuracy and machining speed; most of the machines require some repair or modification.

Concerning utility facilities, the substation has nearly reached its capacity. Further, it has a problem in terms of specifications.

The communication facilities are based on old-type switchboards and interphones, which is a large barrier in communication.

(4) Production control system

As for the production engineering, almost effort is concentrated to the maintenance of detoriorated facilities, therefore the study and introduction of the newest machining technique has not yet actually realized. Moreover the functional group in charge of the research and improvement of the production technique seems to be not clearly organized.

The concept/understanding amongst the engineers and workers concerning the quality control seems to be also relatively passive manner especially against the quality of materials.
However P.T. Barata Indonesia has been promoting the in company training and education in wide range and the individual skill-level are consequently deemed to be a reasonable degree.

II-2 Barata Gresik

In July and August, 1984, we diagnosed the P.T. Barata Surabaya factory and the district of Gresik. This chapter describes the diagnostic results of technical matters and recommended countermeasures.

(1) Current production status

1) Annual output at fabrication division

The annual output of steel structures and plate works at the Surabaya factory is about 5,000 tons.

2) Maximum production weight and sales amount in percentage

HEAT EXCHANGERS	45 TON/MONTH	2.5%
VESSELS	15	6.0
TANKS	120	12.5
PIPINGS	250	7.5
STEEL STRUCTURES	500	29.0
PLATE WORKS	350	37.5
PARTS/MACHINING	75	2.5
OTHERS	25	2.5

3) In the stage of investigation, there were not very clearly defined relations with the applicable industries: cement, sugar, fertilizer, paper/pulp and palm oil. Based on this study, the product mix is prepared for GRESIK Factory.

(2) Production facilities and production technology

1) Present production facilities

① The items investigated are as follows: cutting equipment, forming machine, welding equipment, drying oven of welding rods, heat treating furnace, surface preparation, testing and examination equipment, and utilities.

② The floor space of buildings for steel structures and plate works is 15,220 m^2, covering six bays. The fabrication area for steel structures and piping is 8,500 m^2.

2) Production technology

① Experienced codes and standards

JIS, ASME, BS, API and Indonesia Standard

② Experienced material

Carbon steel, C-Mo steel, Cr-Mo steel, ferritic stainless steel, austenitic stainless steel, aluminum and stainless clad steel.

③ The normally required production periods after order placement on an ex-work basis are as follows:

Heat exchanger	ϕ 1.5M × L4.5M	6 weeks
Vessels	ϕ 4.5M × L9M	8 weeks
Tanks	ϕ 3.5M × L11M	8 weeks

3) Recommendations based on investigation results

① Measures should be taken to put the production facilities, floor space layout and floor in good condition. Also, it appears that the present floor space may become too small when changes in the production

capacity and product mix are attempted in the future.

② To fabricate the highest quality of product, it seems necessary to enhance the current level of production technology.

(3) Management/control system and personnel makeup

The Gresik factory is independent of the Surabaya factory, but at present, it has a site only. Under the circumstances, considerations have been made based on the fabrication division of the Surabaya factory.

1) Management system and personnel

① Recommendations about management system

Although the present system is functionally well organized in terms of block diagram, it has departments and sections mixed with one another, with relatively unclear distinction between them. We recommend to clearly define the business function and managerial function by taking the opportunity of constructing the new building.

② Personnel

The pressing point of issue is to grasp the employees' technical level and improve their level for the preparation of higher product quality and larger output. To realize this, it is desirable to train the employees for higher technical level without greatly increasing the number of employees.

2) Production control system

① The basic function of production control is to achieve a system that provides better quality, higher technology and less cost. With this function, the production control system is designed to manage each step of production so that products are completed as planned and scheduled.

② The investigation results give the impression of a lack of close connection between the Production Control and Planning Section and the Technological Section-the two sections responsible for production control.

③ There is also a need for good measures against delay in delivery.

④ Design-related matters

The investigation conducted so far suggests the necessity of improving the ability to designing & drawings for the independent machines manufactured at the factory. The reason for this is that the basis for higher quality control, better production control and greater capacity are good designing & drawings and the ability to make products exactly as shown in the drawings. The designing ability should be improved through good communication and quick response between shop workers and designers.

3) Quality control system and inspection

① It seems that the management of QC and working has been penetrating the employees. The QC manual prepared by the Surabaya factory personnel themselves is a piece of evidence.

② There still is a need for a control system where the manual is publicized, and thoroughly understood and checked. The first step toward this is to conduct inhouse the nondestructive test of welds, test of critical members and other jobs which are currently farmed out.

③ Furthermore, failures and claims should be more exactly identified by collecting their data. In the future when products are manufactured with higher quality and in larger volume, measures against recurrence of failures and claims should be one of the determining factors of quality control.

4) Maintenance system

It is recommended that the new Gresik factory have a maintenance section just as the Surabaya factory does. Because the Gresik factory purchases many new machines, it is necessary to collect data and establish control points.

II-3 Barata Jakarta

In July and August, 1984, we diagnosed the P.T. Barata Jakarta factory. This chapter describes the diagnostic results of technical matters and recommended countermeasures.

(1) Current production status

1) Annual output at fabrication division

- The annual output of steel structure and plate works at the Jakarta factory is about 2,000 tons.

2) Maximum production weight and sales amount in percentage

VESSELS	10	TON/MONTH	5%
TANKS	70		10
PIPINGS	25		5
STEEL STRUCTURES	100		50
PLATE WORKS	60		10
PARTS/MACHINING	20		5
OTHERS	-		15

In the stage of investigation, there were not very clearly defined relations with the applicable industries: cement, sugar, fertilizer, paper/pulp and palm oil. Based on this study, the product mix is prepared for Jakarta factory.

(2) Production facilities and production technology

1) Present productions facilities

① The items investigated are as follows: cutting equipment, forming machine, welding equipment, drying oven of welding rods, heat treating furnace, surface preparation, testing and examination equipment, and utilities.

② The floor space of buildings for steel structure and Plate works is 5,238 m^2, covering six bays. In the outdoor work area, steel structures and piping are prefabricated and assembled.

2) Production technology

① Experienced codes and standards

JIS, ASME, BS, API and Indonesian Standard

② Experienced materials

Carbon steel, C-Mo steel, Cr-Mo steel, ferritic stainless steel, austenitic stainless steel, and others.

③ The normally required production periods after order placement on an exwork basis are as follows:

Vessels	ϕ 1.8M x 4.5M	8 weeks
Tanks	ϕ 3.0M x L4M	8 weeks

3) Recommendations based on investigation results

① The production facilities, building layout, and floor require better straightening and improved maintenance status. The floor space of the existing buildings is considered to be inadequate to accommodate the increase in output or changes in production machines.

② To fabricate the highest quality of product, it seems necessary to enhance the current level of production technology.

(3) Management/control system and personnel makeup

The Jakarta factory is planning to change the present equipment makeup to expand the capacity centering on plate works. We studied the captioned subject in terms of preparation for increases in product range and output, by looking at the present situation as a refering.

1) Management system and personnel

① Recommendations about management system

Although the present system is functionally well organized in terms of block diagram, it has departments and sections mixed with one another, with relatively unclear distinction between them. We recommend to clearly define the business function and managerial function by taking the opportunity of constructing the new building.

② Personnel

The pressing point of issue is to grasp the employees technical level and improve their level for the preparation of higher product quality and larger output. To realize this, it is desirable to train the employees for higher technical level without greatly increasing the number or employees.

2) Production control system

① The basic function of production control is to achieve a system that provides better quality, higher technology, and less cost. With this function, the production control system is designed to manage each step of production so that products are completed as planned and scheduled.

② The investigation results give the impression of a lack of close connection between the Production Control and Planning Section and the Technological Section—the two sections responsible for production control.

③ There is also a need for good measures against delay in delivery.

④ Design-related matters

The investigation conducted so far suggests the necessity of improving the ability to make designing and drawings for the

independent machines manufactured at the factory. The reason for this is that the basis for higher quality control, better production control and greater capacity are good designing and drawings and the ability to make products exactly as shown in the drawings. The designing ability should be improved through good communication and quick response between shop workers and designers.

3) Quality control system and inspection

① Preparations are under way for penetrating the management of QC and working among the employees. The QC manual prepared by the Jakarta factory personnel themselves is a piece of evidence.

② There still is a need for a control system where the manual is publicized more thoroughly and checked. The first step toward this is to conduct inhouse the nondestructive test of welds, test of critical members and other jobs which are currently farmed out.

③ Furthermore, failures and claims should be more exactly identified by collecting their data. In the future when products are manufactured with higher quality and in larger volume, measures against recurrence of failures and claims should be one of the determining factors of quality control.

4) Maintenance system

The Jakarta factory has a maintenance section. Because the factory will purchase many new machines at the implementation of renovation, it is necessary to collect data and establish control points.

(4) Layout, floor structure and transportation facility

1) Present floor space structure will be able to be used in the future.

2) Overhead traveling crane is deteriorated especially in its driving system: it might not be used long.

3) The site is large and has still much space: extension is possible.

(5) Utilities

1) Power supply equipment, especially transformers, is used in common with foundry equipment. Further capacity increase is possible.

2) Water is from factory own well.

II-4 Barata Tegal Workshop

(1) Main products of plant

As P.T. Barata Indonesia Tegal Work Shop was established as a maintenance shop of the neighbouring sugar plants, they are mainly engaged in the manufacture of spare parts supplies for sugar plant, above all cane mill roll. They are also manufacturing irrigation equipment for agricultural purpose in this district. The average production record in this workshop during the last 5 years (inclusive of the figure planned for 1984) is as follows:-

Machinery processing spare parts for Sugar plant (mainly comprising maintenance spare parts)	198tons
Plate work (mainly comprising equipments for irrigation and spare parts for sugar plant)	486tons
Steel structure (mainly comprising the manufacture at Erection Field)	87tons
Total	771tons

As to the position of Tegal Work shop in P.T. Barata Indonesia, it belongs to the business group of machinery and foundry, similar to Surabaya Machine Shop, and it is given the following task.

1) To play the part of a maintenance service shop for sugar plants in the central districts of Java.

2) A general service shop of P.T. Barata Indonesia in the central district of Java.

(2) Conditions of plant location and layout.

Tegal plant is situated in the urban area of Tegal city in the central part of Java Island. Their plant site is already surrounded by other companies' structures as well

as roads and there can be found no more room for plant extension. The plant site has also been mostly occupied by the plant and office and there is no more room for enlargement of a building.

As to the layout inside the plant, it is so arranged that machinery plant stands in the central part, plate work shop, on the northern side, while there are material warehouses for plate work and shrinkage fitting area for cane mill roll on the southern side. Consequently, manufacturing process of products runs quite unreasonable. Moreover, at a corner of the plant building, a parking place is provided for employees, which is one of the doubtful points in the layout.

(3) Many of the equipments for machinery processing are old fashioned, but they are somehow good for use, from the view-point of the work object. It can not, however, be left as it is, from the view-point of productive efficiency. As to equipments for plate work, it can rather be said that they have almost no equipment at all. It goes without saying that most of their works are carried out by means of worker's experience and skill.

Further, with regard to conveying equipments, they have only a unit of overhead travelling crane in each working bay and that is all they have at present. Consequently, wait-for-handling loss at work is very great.

Their substation is the equipment they are renting from PLN, whose capacity as well as specification are not enough. Thus, an enlargement of their substation equipments must be the very first thing to do when an equipment renovation or reinforcement is made in future.

(4) Production control system

They are making the maintenance service of their equipments by their own members, but are entrusting large-scaled repair or rebuilding to the Machine Tool Rehabilitation Center in Surabaya. Periodic diagnosis of the equipments is also made by a supervisor sent from the Machine Tool Rehabilitation Center.

Regarding production engineering, it is utterly impossible to discuss a renovation of processing technique this way and that with the presently owned equipments alone as described above. The matter of fact is that they are compelled to

secure accuracy as well as quality, depending on each worker's skill, under the present circumstances. Paradoxically speaking, it can be said that the engineering level of the workers of this plant has reached such a level enough to meet the requirements of the present production circumstance.

Concerning quality control, too, only three inspection workers including a manager control everything, at present, so it goes without saying that quality of materials or that of works entirely depends on reliability of the materials suppliers or workers respectively.

II-5 Boma Bisma Indra, Indra

In July and August, 1984, we diagnosed the Indra Unit of P.T. Boma Bisma Indra. This chapter describes the diagnostic results of technical matters and recommended countermeasures.

(1) Current production status

1) The annual outputs at the Indra Unit are as follows:

STEEL STRUCTURE	2,700 T/Y
STEEL PLATE WORK	2,300 T/Y
MACHINERY	800 T/Y
TOTAL	5,800 T/Y

2) Product percentage in sales amount

VESSELS	2%
TANKS	20%
PIPINGS	15%
STEEL STRUCTURES	25%
PLATE WORKS	20%
PARTS/MACHINE	15%
OTHERS	3%

3) In the stage of investigation, there were not very clearly defined relations with the applicable industries: cement, sugar, fertilizer, paper/pulp and palm oil. Also, the investigation found a relatively few number of products heavier than 5 tons. The relationships between the outputs and applicable industries with regard to the parts/machine and steel structures produced at Indra Unit were investigated. Based on this study, the product mix for Indra Unit is prepared.

(2) Production facilities and production technology

1) Present production facilities

① The items investigated are as follows: cutting equipment, forming machine, welding equipment, drying oven of welding rods, heat treating furnace, surface preparation, testing and examination equipment, and utilities.

② The floor space of buildings for steel structures and plate works is 6,129 m^2, covering four bays. The fabrication area is estimated at about 4,000 m^2 and the machine tools and fitting area is about 4,240 m^2.

2) Production Technology

① Experienced codes and standards

JIS, ASME, API and Indonesian Standards

② Experienced materials

Carbon steel, C-Mo steel, austenitic stainless steel, etc. (Non-ferrous).

③ For the normally required production periods after order placement on an ex-work basis, detail data could not be obtained.

④ The procedures practiced at the Indra Unit include collection of production cost figures loading curves for large construction works, and operation cards.

3) Recommendation based on investigation results

① The production facilities, building layout, and floor require better straightening and improved maintenance status. The floor space of

the existing buildings is considered to be inadequate to accommodate the increase in output or changes in production machines.

② To fabricate the highest quality of product, it seems necessary to enhance the current level of production technology.

(3) Management/control system and personnel makeup

The Indra Unit is planning to transfer plate works to Wahana Unit and to expand the capacity centering on parts/machine and steel structures. Under the circumstances, considerations have been made based on the existing unit.

1) Management system and personnel

① Recommendations about management system

Although the present system is functionally well organized in terms of block diagram, it has departments and sections mixed with one another, with relatively unclear distinction between them. We recommend to clearly define the business function and managerial by taking the opportunity of constructing the new building.

② Personnel

The pressing point of issue is to grasp the employees' technical level and improve their level in the preparation of higher product quality and larger output. To realize this, it is desirable to train the employees for higher technical level without greatly increasing the number of employees.

2) Production control system

① The basis function of production control is to achieve a system that provides better quality, higher technology, and less cost. with this function, the production control system is designed to manage each step of production so that products are completed as planned and scheduled.

② The investigation results give the impression of a lack of close connection between the Production Control and Planning Section and the Technological Section—the two sections responsible for production control.

③ There is also a need for good measures against delay in delivery.

④ Design-related matters

The investigation conducted so far suggests the necessity of improving the ability to make designing & drawings for the independent machines manufactured at the Unit. The reason for this is that the bases for higher quality control, better production control and greater capacity are good designing & drawings and the ability to make products exactly as shown in the drawings. The designing ability should be improved through good communication and quick response between shop workers and designers.

3) Quality control system and inspection

① It could not fine a QC manual or non-destructive examination equipment, which form basis of management for quality control.

② There should be an established control system which prepares a QC manual, publicizes the importance of quality and checks quality. The first step toward this is to conduct inhouse the nondestructive test of welds, test of critical members and other jobs which are currently farmed out.

③ Furthermore, failures and claims should be more exactly identified by collecting their data. In the future when products are manufactured with higher quality and in larger volume, measures against recurrence of failures and claims should be one of the determining factors of quality control.

4) **Maintenance system**

The Indra Unit has a maintenance section. Because the Unit purchases many new machines at the implementation of renovation, it is necessary to collect data and establish control points.

(4) Layout, building structure and handling equipment

1) The buildings are so structured as to endure further use.

2) Overhead traveling cranes are serviceable subject to adequate maintenance and service, although they are of old type, their drive system in particular.

3) Machining Department shares a building with Foundry Shop. Working environment must be improved by means of dust-proofing, etc.

II-6 Boma Bisma Indra, Wahana

In July and August, 1984, we diagnosed Wahana Subunit of P.T. Boma Bisma Indra. This chapter describes the diagnostic results of technical matters and recommended countermeasures.

(1) Current production

1) The annual outputs at the Wahana Subunit are as follows:

ASSEMBLAGE OF WAGON CARRIAGE	3,960 T/Y
WATER GATES	180 T/Y
TOTAL	4,140 T/Y

2) In the stage of investigation, there were not find with the applicable industries: cement, sugar, fertilizer, paper/pulp and palm oil.

(2) Production facilities and production technology

1) Present production facilities

① Present fabrication works of wagon carriage and water gates are continued as existing facilities condition.

② The buildings for wagon carriages assembly is 1,864 m^2, covering four bays, and building for water gates fabrication works is 300 m^2 with one bay.

2) Production technology

① Experienced codes and standards

JIS, ASME, API and Indonesian Standard

② Experienced materials

Carbon steel

③ For the normally required production periods after order placement on an ex-work basis, detail data could not be obtained.

④ Summation of production cost, detailed table for works for large construction works and operation cards for construction works are available.

3) Recommendations based on investigation results

① Present production facilities and buildings for wagon carriages is not improved. But, the building for water gates manufacturing is removed out.

② To fabricate the highest quality of product, it seems necessary to enhance the current level of production technology.

(3) Management/control system and personnel makeup

The Wahana Unit when completed, will become an independent unit from Indra Unit, but at present it is only a site with small factory. The existing Wahana Subunit is under control of Indra Unit. Its control organization is the same as of the Indra Unit which is described in the Item on Indra Unit (II-5-(3)).

II-7 Boma Stork Pasuruan

(1) Main products of plant

The production record (including the planned figures for 1984) during the past 5 years of P.T. Boma-Stork Pasuruan Plant shows an year-to-year increase tendency and its average figures are as follows:

Equipment for sugar plant (mainly downstream equipment)	462	tons
Boiler and pressure vessel (including boiler for sugar plant)	1,294.8	"
Others	347.6	
Total	2,104.5	tons

As shown, the main products of this plant are boiler and pressure vessel. Concerning the sugar plant, it can be said that the main products are rather downstream equipment. However, P.T. Boma-Stork is concentrating their effort in engineering development including technical tie-up and self-development; therefore they are also manufacturing such products under their own brand name (including some made under license) as water treatment equipment, in addition to the above-described boiler and downstream equipments for sugar plant. Such products as water treatment equipment occupy a very large percentage in their production, in comparison with other competitors in the same business.

(2) Conditions of plant location and layout

This plant is situated in the urban area of Pasuruan City about 60 km away from Surabaya. It is surrounded by roads and private houses, so there is no room for an enlargement of the site. In addition, as much plant extension as possible has already been made inside the plant site. So, scrap-and-build is imperative to accelerate equipment reinforcement; the foundry has already been abolished and its site is used as a steel cutting area.

Such being the circumstances, the flow of product processing is very complicated in layout. The handling in the plant is also very much inefficient.

Moreover, there is a case that the plant is requested to store finished products temporarily if the customer's reception has not been ready yet. In such a case, the plant is compelled to put the products at a corner of a road for temporary storage, by way of paying rent.

(3) Equipment

Although additional machines were installed and existing machines were repaired in 1974, the production equipment include many aged and old-fashioned machines, with low productivity.

The crane capacity has already dropped below the weight of assembled products. This forces assembling operations to extremely low efficiency.

What's more, although its main products are boiler and pressure vessel, the plant does not possess the radiographic examination device and stress relieving furnace — essential items in the production processes — but depends for these items on subcontractors.

(4) Production control system

As may be seen from the fact that the P.T. Boma-Stork Pasuruan Plant owns its own brand of products, this plant seems to have solid control systems for design work, drawings and production, with adequate personnel for plant operation. Its production engineering system is also favorable: engineers responsible for production control are despatched overseas for training, and efforts are made to provide suitable maintenance of facilities (although aged) and to ensure required machining accuracies.

Quality control, as compared to the production control system, is regarded as a relatively weak field. One reason may be the lack of some examination equipment referred to before. As far as pressure vessels are concerned, however, the basic level of quality control is not very low; the plant has experienced A.S.M.E. operation.

III

MARKET STUDY

III Market Study

III-1 Outline of Plant Processing Equipment Manufacturing Industry and Five Designated Industries

(1) Outline of plant processing equipment manufacturing industries

At present, there are about 40 plant processing equipment manufacturers in Indonesia which consist of government-owned as well as private enterprises. Their capabilities are mostly concentrated on producing spare parts, components of machineries and plant processing equipment, especially for sugar mills, palm oil factories and hydro power plants. The production in 1982 was around 60,000 tons p.a. None of these companies is able to manufacture a complete plant.

The 1982 demand for the plant processing equipment was around 200,000 tons but the domestic production capability is only 60,000 tons p.a. which means 30% of total demand.

Among the plant processing equipment manufacturers in Indonesia, P.T. Barata, P.T. Boma Bisma Indra (BBI) and P.T. Boma Stork are in a leading position in this industry. The outline of these companies are described in the Technical Study.

Their main production experience is as follows:

- Equipment for sugar mills, palm oil factories, cement plants, etc.
- Equipment for mini-hydro power station such as turbine, penstock and watergate.
- Power transmission towers.
- Industrial boiler, packaged boiler.
- Storage tanks.
- Components such as gear, spindle, shaft, metal bearing, etc.
- Structures such as bridge.

(2) Outline of five designated plants

All of five designated plants studied are important to Indonesia's development and therefore hold out great prospects for future new plant construction. Table III-1 summarizes the latest production capacity for each industry.

Table III-1 Production Capacity in 5 Designated Plants

Plants	Production Capacity (1,000 T/Y)	Year (as of)
Cement	11,720	1983
Sugar	1,554*	1983
Fertilizer		
Ammonia	2,661	1984
Urea	3,326	1984
ZA	150	1983
Phosphoric Acid	200 (P_2O_5)	1984
TSP	1,000	1983
Pulp & Paper	437	1982
Palm Oil	1,031	1982

* : Production

III-2 Method of Market Study

Market study has been made on the plant processing equipment for the following five designated plants and the study flow is shown in Fig. III-1.

- Cement plant
- Sugar plant
- Fertilizer plant
- Pulp and paper plant
- Palm oil plant

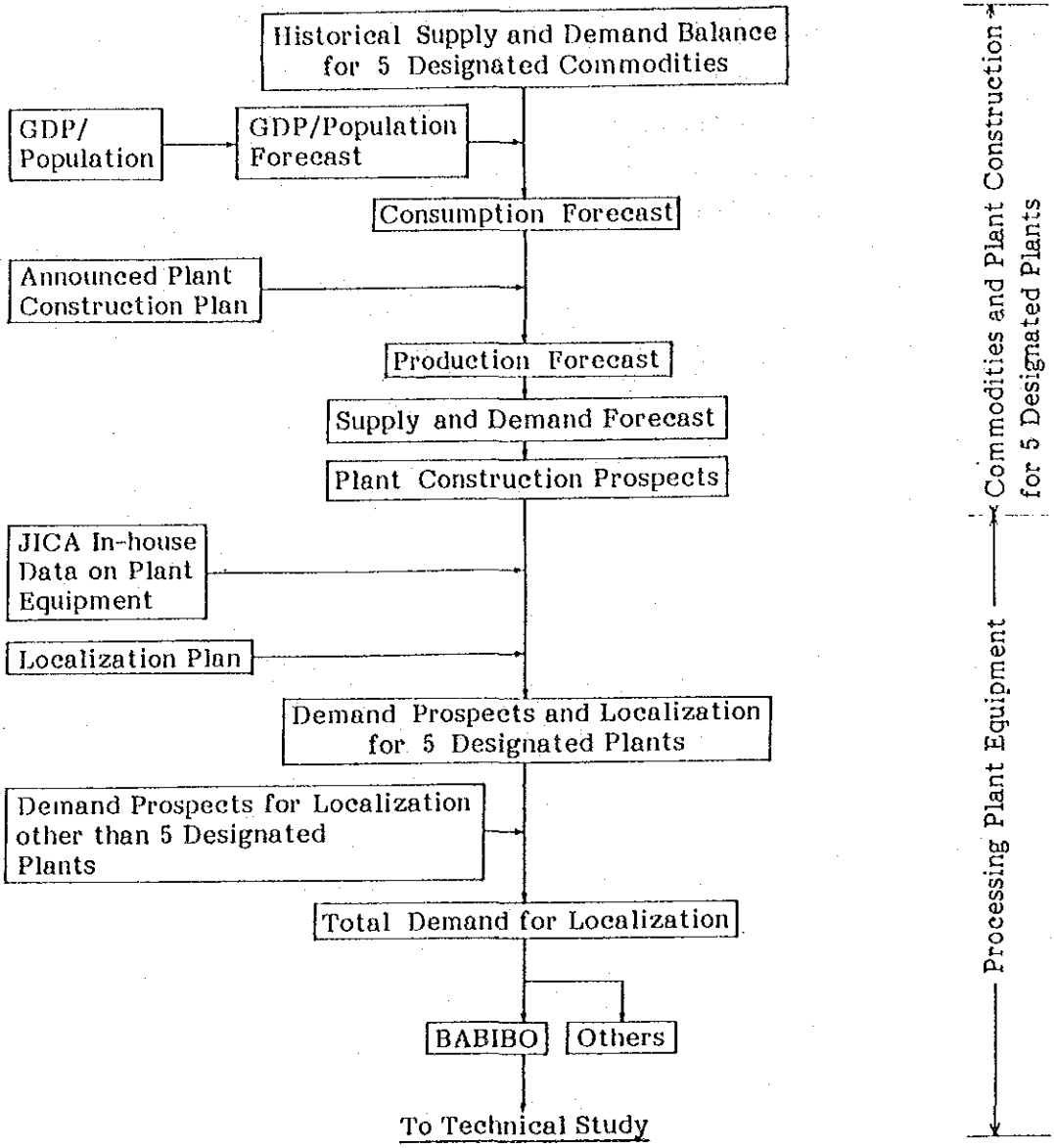


Fig. III-1 Market Study Flow

The forecast for commodities consumption was made using correlation between the consumption and GDP in principle, taking into account the per capita consumption level of each commodity. Concerning the GDP and population projection, they were made by reviewing figures in PELITA IV and published data.

As for the production forecast, it was given by using the consumption forecast together with the announced plant construction plan. The supply and demand pattern of each commodity (self-sufficiency or export-oriented) was also considered.

The supply and demand balance forecast was then prepared by combining the consumption and production forecasts.

The plant construction prospects were prepared for the five designated plants based on the production forecast of each commodity.

The plant processing equipment for the five designated plants was classified into the Category and Function levels in accordance with the Engineering Advancement Association (ENAA) classification using the JICA in-house data. They are further divided into the imported equipment and local one to obtain the localization rate. In line with this, the plant processing equipment was classified according to the kinds of work consisting of the structure work, plate work and machine work.

The latter result was combined with the plant construction prospects to obtain the demand of the plant processing equipment and the local contents.

Furthermore, the demand for some plant processing equipment which BABIBO presently manufactures and those which BABIBO will be able to manufacture was forecasted. The result was combined with the demand of plant processing equipment for the five designated plants to calculate the potential demand for plant processing equipment to be manufactured in Indonesia.

The amount of orders to be received by BABIBO companies and factories were planned on the basis of the potential demand for the plant processing equipment to be domestically manufactured. The result is used as the basis for product mix calculation in the technical study.

III-3 Market Study Results

(1) Projection of population and gross domestic products (GDP)

The projection of population and GDP are shown in Tables III-2 and III-3, respectively. The average annual growth rate of population is set at 2.0% for PELITA IV/V and 1.9% for PELITA VI. As for GDP, the average annual growth rate is set at 5.0% for PELITA IV, 4.6% for PELITA V and 4.2% for PELITA VI.

Table III-2 Projection of Population

PELITA	Year	Population (Million)	Av. Annual Growth Rate for PELITA (%)
	1973	127.6	
	74	130.5	
	75	133.5	
II	76	135.2	2.1 (actual)
	77	138.3	
	78	141.6	
	79	144.1	
	80	147.5	
III	81	151.3	2.2 (actual)
	82	154.7	
	83	158.1	
	84	161.6	
	85	165.2	
IV	86	168.7	2.0
	87	172.2	
	88	175.6	
	89	179.1	
	90	182.7	
V	91	186.3	2.0
	92	190.1	
	93	193.9	
	94	197.6	
	95	201.3	
VI	96	205.1	1.9
	97	209.0	
	98	213.0	

Table III-3 GDP Projection (At Constant 1973 Market Price)

PELITA	Year	GDP (Rp Billion)	Annual Growth Rate (%) Annual	Av. for PELITA
	1973	6,753.4	-	
	74	7,269.0	7.6	
	75	7,630.8	5.0	
II	76	8,156.3	6.9	6.9% (actual)
	77	8,870.9	8.8	
	78	9,566.5 (9,471.2)	7.8	
	79	10,164.9	6.3	
	80	11,169.2	9.9	
III	81	12,055	7.9	6.0% (actual)
	82	12,325	2.25	
	83	12,707*	3.1*	
	84	13,342	5.0	
	85	14,009	5.0	
IV	86	14,710	5.0	5.0%
	87	15,445	5.0	
	88	16,218	5.0	
	89	16,964	4.6	
	90	17,744	4.6	
V	91	18,560	4.6	4.6%
	92	19,414	4.6	
	93	20,307	4.6	
	94	21,160	4.2	
	95	22,049	4.2	4.2%
VI	96	22,975	4.2	
	97	23,940	4.2	
	98	24,945	4.2	

1) *: Provisional

2) Figure in parenthesis indicates GDP for PELITA III planning

(2) Supply and demand balance forecast for five designated commodities

Tables shown below summarize the supply and demand balance forecast for the five designated commodities.

Table No.	Title
III-4	Supply and Demand Balance of Cement
5	Supply and Demand Balance of Sugar
6	Supply and Demand Balance of Urea
7	Supply and Demand Balance of ZA
8	Supply and Demand Balance of TSP
9	Supply and Demand Balance of Paper
10	Supply and Demand Balance of Palm Oil

Table III-4 Supply and Demand Balance of Cement

PELITA	Year	Production Capacity (1,000 T/Y)	Production (1,000T)	Consumption (1,000T)	Balance (1,000T)
	1983	11,720	8,500	8,993	-493
	84	15,610	10,840	9,383	1,457
	85	17,910	12,540	10,404	2,136
IV	86	17,910	13,430	11,477	1,953
	87	17,910	14,330	12,603	1,727
	88	19,410	15,230	13,786	1,444
	89	20,910	16,280	14,928	1,352
	90	22,410	17,480	16,123	1,357
V	91	23,910	18,680	17,372	1,308
	92	23,910	18,980	18,679	301
	93	23,910	19,130	20,047	-917
	94	25,410	20,030	21,353	-1,323
	95	26,910	21,080	22,714	-1,634
VI	96	28,410	22,280	24,132	-1,852
	97	29,910	23,480	25,609	-2,129
	98	31,410	24,680	27,148	-2,468

Table III-5 Supply and Demand Balance of Sugar

PELITA	Year	Production (1,000T)	Consumption (1,000T)	Balance (1,000T)
III	1983	1,630	2,014	-384
	84	1,721	2,222	-501
	85	1,818	2,346	-528
IV	86	1,919	2,477	-558
	87	2,027	2,614	-587
	88	2,141	2,758	-617
	89	2,261	2,896	-635
	90	2,388	3,042	-654
V	91	2,521	3,193	-672
	92	2,662	3,352	-690
	93	2,811	3,519	-708
	94	2,969	3,677	-708
	95	3,135	3,843	-708
IV	96	3,311	4,015	-704
	97	3,496	4,195	-699
	98	3,692	4,382	-690

Table III-6 Supply and Demand Balance of Urea

PELITA	Year	Production Capacity (1,000T/Y)	Production (1,000T)	Consumption (1,000T)	Balance (1,000T)
III	1983	2,729	2,255	2,348	-93
	84	3,299	2,768	2,388	380
	85	4,429	3,756	2,605	1,151
IV	86	4,429	3,982	2,833	1,149
	87	4,429	4,095	3,072	1,023
	88	4,999	4,494	3,324	1,170
	89	4,999	4,551	3,567	984
	90	5,569	5,007	3,821	1,186
V	91	5,569	5,064	4,086	978
	92	5,569	5,121	4,364	757
	93	6,139	5,520	4,655	865
	94	6,139	5,577	4,933	644
	95	6,139	5,634	5,223	411
VI	96	6,709	6,033	5,523	510
	97	6,709	6,090	5,837	253
	98	6,709	6,147	6,165	-18

Table III-7 Supply and Demand Balance of Ammonium Sulfate

PELITA	Year	Production Capacity (1,000T/Y)	Production (1,000T)	Consumption (1,000T)	Balance (1,000T)
III	1983	150	208	353	-145
	84	150	210	391	-181
	85	400	350	431	- 81
IV	86	400	370	473	-103
	87	400	390	517	-127
	88	400	390	563	-173
	89	600	530	608	- 78
	90	600	550	654	-104
V	91	600	570	703	-133
	92	600	570	754	-184
	93	800	710	808	- 98
	94	800	730	859	-129
	95	800	750	912	-162
VI	96	800	750	967	-217
	97	1,000	890	1,025	-135
	98	1,000	910	1,085	-175

Table III-8 Supply and Demand Balance of TSP

PELITA	Year	Production Capacity (1,000T/Y)	Production (1,000T)	Consumption (1,000T)	Balance (1,000T)
III	1983	1,000	783	965	-182
	84	1,000	900	1,049	-149
	85	1,000	900	1,210	-310
IV	86	1,000	900	1,376	-476
	87	1,000	900	1,492	-592
	88	1,500	1,250	1,614	-364
	89	1,500	1,300	1,733	-433
	90	2,000	1,700	1,856	-156
V	91	2,000	1,750	1,985	-235
	92	2,000	1,800	2,120	-320
	93	2,500	2,150	2,261	-111
	94	2,500	2,200	2,397	-197
	95	2,500	2,250	2,538	-288
VI	96	3,000	2,600	2,683	- 83
	97	3,000	2,650	2,835	-185
	98	3,000	2,700	2,995	-295

Table III-9 Supply and Demand Balance of Paper

PELITA	Year	Production Capacity (1,000T/Y)	Production (1,000T)	Consumption (1,000T)	Balance (1,000T)
III	1983	537.2	404.8	539	-134.2
	84	743.8	529	570	-41
	85	886.2	635	601	34
IV	86	886.2	670	634	36
	87	886.2	709	668	41
	88	976.2	763	704	59
	89	976.2	772	739	33
	90	1,066.2	835	776	59
V	91	1,066.2	844	814	30
	92	1,156.2	907	854	53
	93	1,156.2	916	896	20
	94	1,246.2	979	936	43
	95	1,246.2	988	977	11
VI	96	1,336.2	1,051	1,021	30
	97	1,336.2	1,060	1,066	-6
	98	1,426.2	1,123	1,113	10

Table III-10 Supply and Demand Balance of Palm Oil

PELITA	Year	Production (1,000T)	Consumption (1,000T)	Balance (1,000T)
III	1983	907	525	382
	84	1,092	621	471
	85	1,180	641	539
IV	86	1,221	661	560
	87	1,521	681	840
	88	1,743	701	1,042
	89	1,965	736	1,229
	90	2,187	773	1,414
V	91	2,409	811	1,598
	92	2,631	852	1,779
	93	2,779	895	1,884
	94	2,927	931	1,996
	95	3,075	968	2,107
VI	96	3,223	1,007	2,216
	97	3,371	1,047	2,324
	98	3,519	1,089	2,430

(3) Plant construction prospects for five designated plants

Table III-11 shows the plant construction prospects for each plant based on the production forecast of the corresponding commodities.

Table III-11 Summary of Plant Construction Prospects

Plant	PELITA IV					PELITA V					PELITA VI				
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Cement Plant (1 Million T/Y)	1.5	1.5	1.5	1.5			1.5	1.5	1.5	1.5	1.5		1.5		1.5
Sugar Plant (4,000 TCD)	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5
Fertilizer Plant															
-Ammonia Plant (1,000 T/D)	1		1		1	1			1			1			1
-Urea Plant (1,700 T/D)	1		1		1	1			1			1			1
-Ammonium			1				1				1				1
Sulphate Plant (200,000 T/Y)					1										
-Phosphoric Acid			1				1						1		
Plant ($625TP_2O_5$/D)															
-TSP Plant (500,000 T/Y)		1		1			1			1			1		
Pulp & Paper Plant (90,000 T/Y)		1		1		1		1		1		1		1	
Palm Oil Plant (30 TFFB/H)	11	11	11	11	11	8	8	8	8	8	8	8	8	8	8

(4) Selection standards for localization of plant processing equipment

The selection standards for localization of plant processing equipment for the five designated plants were established, taking the following items into consideration.

- Negative list (Daftar Barang Modal yang Dikeluarkan dari Daftar Induk Barang Impor)
- Those helpful for technological development of Indonesia
- Those which can be manufactured after five years from now when the renovation is completed and the plant commenced its operation.
- Those which do not need any special material
- Those which require much freight cost because of the weight and size

Following describes the localization of plant processing equipment for the five designated plants using these selection standards.

(5) Plant processing equipment configuration and localization rate of five designated plants

The plant processing equipment configuration and localization rate were prepared for each plant using JICA in-hose data.

1) ENAA's Category classification

Each plant processing equipment is summarized according to the ENAA's Category classification as shown in Table III-12. The localization rate for each plant is shown below.

Plant	Localization Rate (%)
- Cement Plant	52.4
- Sugar Plant	70.7
- Fertilizer Plant	65.6
- Pulp & Paper Plant	67.2
- Palm Oil Plant	96.3

Table III-12 Summary of Localization Plan by ENAA Classification

(1/3)

(Unit: T)

Classification of ENAA	Cement Plant			Sugar Plant			Ammonia Plant			Urea Plant		
	Local	Import	Total	Local	Import	Total	Local	Import	Total	Local	Import	Total
Equipment	767	1,939	2,706	2,224	171	2,395	1,658	1,509	3,167	993	812	1,805
Rotating Machines	11	283	294	96	384	480	38	497	535	17	329	346
Miscellaneous Equipment	2,414	6,589	9,003	870	434	1,304	-	5	5	16	59	75
Package Units				545	1,156	1,701	62	195	257	35	168	203
Piping	697	945	1,642	537	158	695	2,500	452	2,952	1,050	224	1,274
Instrumentation							-	300	300	-	200	200
Electrical	880	767	1,647	191	190	381	400	1,200	1,600	250	700	950
Civil & Architecture	7,606	188	7,794	2,047	38	2,085	3,200	100	3,300	1,200	60	1,260
Others				1	161	162	370	40	410	200	20	220
Items not Classified by NEAA	27	542	569				1,780	2,230	4,010			
Total	12,402 (52.4%)	11,253 (47.6%)	23,655 (100%)	6,511 (70.7%)	2,692 (29.3%)	9,203 (100%)	10,008 (60.5%)	6,528 (39.5%)	16,536 (100%)	3,761 (59.4%)	2,572 (40.6%)	6,333 (100%)

Notes) 1) Cement Plant: 1.5 million T/Y
2) Sugar Plant: 4,000 TCD
3) Ammonia Plant: 1,000 T/D
4) Urea Plant: 1,725 T/D
5) ZA Plant: 200,000 T/Y
6) Phosphoric Acid Plant: 625 TP_2O_5/D
7) TSP Plant: 500,000 T/Y
8) Pulp & Paper Plant: 90,000 T/Y
9) Palm Oil Plant: 30 TFFB/H

(Unit: T)

Classification of ENAA	ZA Plant			Phosphoric Acid Plant			TSP Plant			Fertilizer Total		
	Local	Import	Total	Local	Import	Total	Local	Import	Total	Local	Import	Total
Equipment	1,563	-	1,563	452	-	452	460	34	494	5,126	2,355	7,481
Rotating Machines	64	312	376	5	56	61	44	17	61	168	1,211	1,379
Miscellaneous Equipment	83	1,177	1,260	23	8	31	144	312	456	266	1,561	1,827
Package Units	70	-	70	50	-	50	90	-	90	307	363	670
Piping	410	107	517	168	33	201	487	63	550	4,615	879	5,494
Instrumentation	-	110	110	-	70	70	-	130	130	-	810	810
Electrical	120	400	520	80	220	300	100	250	350	950	2,770	3,720
Civil & Architecture	1,900	90	1,990	1,600	80	1,680	2,000	100	2,100	9,900	430	10,330
Others	160	20	180	240	30	270	180	20	200	1,150	130	1,280
Items not Classified by ENAA												
Total	4,370 (66.4%)	2,216 (33.6%)	6,586 (100%)	2,618 (84.0%)	497 (16.0%)	3,115 (100%)	3,505 (79.1%)	926 (20.9%)	4,431 (100%)	24,262 (65.6%)	12,739 (34.4%)	37,001 (100%)

(3/3)

(Unit: T)

Classification of ENAA	Pulp & Paper Plant			Palm Oil Plant		
	Local	Import	Total	Local	Import	Total
Equipment	1,890	306	2,196	92	-	92
Rotating Machines	-	346	346	3	5	8
Miscellaneous Equipment	732	1,090	1,822	137	2	139
Package Units	89	-	89	40	-	40
Piping	1,433	251	1,684	16	1	17
Instrumentation	-	308	308			
Electrical	500	1,179	1,679	-	4	4
Civil & Architecture	2,621	71	2,692			
Others	23	-	23			
Items not Classified by ENAA						
Total	7,288 (67.2%)	3,551 (32.8%)	10,839 (100%)	288 (96.3%)	11 (3.7%)	299 (100%)

2) Classification by kinds of work

Table III-13 shows each plant processing equipment classified and summarized according to the kinds of work consisting of the structure work, plate work and machine work. The localization rates for the total five designated plants are 94.5% for steel structure, 52.4% for plate work products, 24.1% for machine work products and 63.1% in total.

Table III-13 Summary of Localization Plan by Kind of Works

(Unit: T)

Plant	Structure Work			Plate Work			Machine Work			Total			Remarks
	Local	Import	Sub-total	Local	Import	Sub-total	Local	Import	Sub-total	Local	Import	Total	
Cement	7,606 (100%)	- (0%)	7,606 (100%)	2,123 (32.5%)	4,412 (67.5%)	6,535 (100%)	1,793 (23.3%)	5,886 (76.7%)	7,679 (100%)	11,522 (52.8%)	10,298 (47.2%)	21,820 (100%)	excl. electrical and instrumentation
Sugar	2,408 (98.4%)	38 (1.6%)	2,446 (100%)	3,267 (68.3%)	1,518 (31.7%)	4,785 (100%)	644 (40.5%)	945 (59.5%)	1,589 (100%)	6,319 (71.6%)	2,501 (28.4%)	8,820 (100%)	excl. electrical and instrumentation
Fertilizer													
Ammonia	4,280 (88.8%)	540 11.2%)	4,820 (100%)	5,690 (50.9%)	5,491 (49.1%)	11,181 (100%)	38 (7.1%)	497 (92.9%)	535 (100%)	10,008 (60.5%)	6,528 (39.5%)	16,536 (100%)	
Urea	1,660 (86%)	270 (14%)	1,930 (100%)	2,083 (51.4%)	1,972 (48.6%)	4,055 (100%)	17 (4.9%)	329 (95.1%)	346 (100%)	3,760 (59.4%)	2,571 (40.6%)	6,331 (100%)	
ZA	2,220 (91.7%)	200 (8.3%)	2,420 (100%)	2,086 (55%)	1,704 (45%)	3,790 (100%)	64 (17%)	312 (83%)	376 (100%)	4,370 (66.4%)	2,216 (33.6%)	6,586 (100%)	
Phosphoric Acid	1,900 (93.6%)	130 (6.4%)	2,030 (100%)	713 (69.6%)	311 (30.4%)	1,024 (100%)	5 (8.2%)	56 (91.8%)	61 (100%)	2,618 (84%)	497 (16%)	3,115 (100%)	
TSP	2,410 (93.8%)	160 (6.2%)	2,570 (100%)	1,051 (58.4%)	749 (41.6%)	1,800 (100%)	44 (72.1%)	17 (27.9%)	61 (100%)	3,505 (79.1%)	926 (20.9%)	4,431 (100%)	
Sub-total	12,610 (90.7%)	1,300 (9.3%)	13,910 (100%)	11,623 (53.2%)	10,227 (46.8%)	21,850 (100%)	168 (12.2%)	1,211 (87.8%)	1,379 (100%)	24,261 (65.6%)	12,738 (34.4%)	36,999 (100%)	
Pulp & Paper	3,358 (94.9%)	181 (5.1%)	3,539 (100%)	3,930 (56.5%)	3,023 (43.5%)	6,953 (100%)	- (0%)	346 (100%)	346 (100%)	7,288 (67.2%)	3,550 (32.8%)	10,838 (100%)	
Palm Oil	80 (98.8%)	1 (1.2%)	81 (100%)	147 (94.8%)	8 (5.2%)	155 (100%)	61 (96.8%)	2 (3.2%)	63 (100%)	288 (96.3%)	11 (3.7%)	299 (100%)	
Total	26,062 (94.5%)	1,520 (5.5%)	27,582 (100%)	21,090 (52.4%)	19,188 (47.6%)	40,278 (100%)	2,666 (24.1%)	8,390 (75.9%)	11,056 (100%)	49,678 (63.1%)	29,098 (36.9%)	78,776 ((100%)	

(6) Total demand forecast of plant processing equipment to be manufactured in indonesia

Using the above output and the data shown in Table III-11, the demand for the plant processing equipment to be domestically manufactured was calculated for the five designated plants. The corresponding demand for plants other than the five designated ones was also estimated. Totaling these two results, the potential demand for plant processing equipment to be manufactured domestically was forecasted as shown in Table III-14.

Table III-14 suggests that the expected demand is approximately 160,000-18,000 tons per year during the period of PELITA IV-VI. This demand should be the basis of the sales plan of BABIBO.

Table III-14 Potential Demand for Localization

(Unit: 1,000 T/Y)

PELITA	5 Designated Plants				Other than 5 Designated Plants*				Total			
	S	P	M	Sub-total	S	P	M	Sub-total	S	P	M	Total
PELITA IV (1984-88)	19.4	19.0	4.1	42.5	95.1	20.4	5.1	120.6	114.5	39.4	9.2	163.1
PELITA V (1989-93)	22.2	22.8	4.6	49.6	98.0	22.7	6.2	126.9	120.2	45.5	10.8	176.5
PELITA VI (1994-98)	22.5	24.9	4.8	52.2	98.9	24.0	7.1	130.0	121.4	48.9	11.9	182.2

*: including

1) equipment of refinery and petrochemical plants
2) equipment of power plants and transmission tower
3) boilers
4) water gate and bridge
5) rehabilitation of sugar plant and reshelling of mill rolls

(7) Receiving order plan of each BABIBO company

The products allocation for plant processing equipment for the five designated plants is as follows.

- BARATA: Cement plant and sugar plant
- BBI: Fertilizer plant, and pulp and paper plant
- BOMA STORK: Sugar plant and palm oil plant

Table III-15 shows the work allocation with further classification into kinds of work in each factory. The receiving order quantity for each BABIBO company was determined by establishing the reasonable share to the potential demand in Table III-14, and the result was evolved to the product mix which is described in the technical part. Table III-16 summarizes the demand prospects and the product mix.

The quantity of received order as viewed from the product mix shall be about 85 thousand tons every year after PELITA VI. To maintain this level of order, market development of the plant processing equipment not described herein is necessary in addition to organizing the powerful marketing force. The fields for market development should be as follows:

- Iron/steel making plants
- Coal/ore mining development projects
- Nonferrous metal plants
- Petroleum/gas development projects
- Plywood related plants
- Agriculture related plants
- Construction projects

Table III-15 Work Allocation Summary

Company	Works	Cement Plant			Sugar Plant			Fertilizer Plant			Pulp & Paper Plant			Palm Oil Plant		
		S	P	M	S	P	M	S	P	M	S	P	M	S	P	M
BARATA	Surabaya			○			○									
	Gresik	○△	○△		○△	○△										
	Tegal		○	○	○	○	○									
	Jakarta				○△	○△										
BBI	Indra							○△		○	○△					
	Wahana							○	○△		○	○△				
BOMA STORK	Pasuruan				○△	○△	○△							○	○	○

Note) ○ : Shop Work
△ : Site Work
S : Structure Work
P : Plate Work
M : Machining

Table III-16 Demand Prospects and Product Mix

(Unit: 1,000 T/Y)

		PELITA V				PELITA VI				PELITA VII			
		S	P	M	Total	S	P	M	Total	S	P	M	Total
Demand Prospects (Yearly Average)	5 Designated Plants												
	Cement Plant	6.1	1.7	1.4	9.2	4.6	1.3	1.1	7.0				
	Sugar Plant	9.6	13.1	2.6	25.3	12.0	16.3	3.2	31.5				
	Fertilizer Plant	4.3	4.1	0.1	8.5	4.2	4.3	0	8.5				
	Pulp & Paper Plant	1.6	2.7	0	4.3	1.1	1.8	0	2.9				
	Palm Oil Plant	0.6	1.2	0.5	2.3	0.6	1.2	0.5	2.3				
	Sub-Total	22.2	22.8	4.6	49.6	22.5	24.9	4.8	52.2				
	Others	98.0	22.7	6.2	126.9	98.9	24.0	7.1	130.0				
	Total	120.2	45.5	10.8	176.5	121.4	48.9	11.9	182.2				
Product Mix	Year	1989				1994				1999			
	BARATA												
	Surabaya	0	0.1	3.3	3.4	0	0.2	5.0	5.2	0	0.2	6.1	6.3
	Gresik	7.1	8.3	0	15.4	9.4	11.1	0	20.5	9.4	11.1	0	20.5
	Tegal	1.4	1.5	1.1	4.0	1.5	1.6	1.7	4.8	1.7	1.9	1.9	5.5
	Jakarta	5.3	5.6	0	10.9	7.0	7.4	0	14.4	7.0	7.4	0	14.4
	Sub-total	13.8	15.5	4.4	33.7	17.9	20.3	6.7	44.9	18.1	20.6	8.0	46.7
	BBI												
	Indra	8.4	0.8	1.5	10.7	11.3	1.0	2.0	14.3	11.3	1.0	2.0	14.3
	Wahana	0.1	9.4	0	9.5	0.1	12.6	0	12.7	0.1	12.6	0	12.7
	Sub-total	8.5	10.2	1.5	20.2	11.4	13.6	2.0	27.0	11.4	13.6	2.0	27.0
	Boma Stork	3.1	6.2	0.7	10.0	3.1	7.4	0.7	11.2	3.1	7.4	0.7	11.2
	Total	25.4	31.9	6.6	63.9	32.4	41.3	9.4	83.1	32.6	41.6	10.7	84.9

IV

PREREQUISITE CONDITIONS OF THE RENOVATION PROGRAM AND STUDY ON THE RELATED TECHNICAL SUBJECTS

IV Prerequisite Conditions of the Renovation Program and Study on the Related Technical Subjects

IV-1 Barata Surabaya Machine Shop

(1) Product mix and production plan

In establishing the production plan, the product mix is planned as follows:

1) Machined spare parts in the cement plant, of which the localization is possible in consideration of material procurement, special treatment in processing, special engineering technique, etc. As to the products mainly related to plate works, Barata's Steel Construction Shop carries out up to machining.

2) For the sugar plant, cane mill assembling and all of the machining items except the plate work items of which machining are to be carried by P.T. Barata Indonesia Gresik Steel construction branch.

3) For the small sized water turbines having been manufactured under the license, the machining and assembling of all parts including the plate welded casings.

4) In addition to the above 1) to 3), machining of the cast iron produced in Surabaya foundry and the parts manufacturing/machining required by Steel mills and other various industries.

The production plan made on the basis of the foregoing and as a result of the market research, and the load plan based on the above production plan, are detailed as follows:

		1989	1994	1999
PRODUCTION PLAN	Equipment for sugar & cement plants	2,517	4,022	4,997
	Water turbine & others	850	1,101	1,261
	TOTAL (A)	3,367	5,123	6,258
LOADING PLAN	Equipment for sugar & cement plants	123,900	143,470	149,680
	Water turbine & others	72,570	80,260	105,550
	TOTAL (B)	196,470	223,730	255,230
Total man.machine hours / Total production weight (B/A)		58.4	43.7	40.8

Unit : Production Plan = Weight (ton)
Load Plan = Man/machine Hours (H)
B/A = H/TON

Remark : Year-to-Year fluctuation of B/A partly depends on each year's product mix but basically, the skill proficiency effect after renovation (1989 → 1994 → 1999) is thought to be great.

(2) Basic policy of the facility plan

1) Workshop layout

① The site that will be available after the move of the present steel construction shop in Surabaya Plant will be used as a machinery plant. One of the bays on this site will be rebuilt so that it may be used for machining and assembling large-sized machines, where a 50-ton overhead travelling crane will be installed.

② The plate-work bay necessary for manufacturing a small-sized

water-mill will be placed on the site presently occupied by the steel construction shop. Here, necessary equipments will be installed and an exclusive assembly area will be allocated.

③ In order to improve the manufacturing-process flow of the main products in the production plan of the existing machinery as well as those to be installed anew will be rearranged for streamlining purposes. At the same time, the conveying equipment will be increased in capacity.

④ The machine tool rehabilitation center will not be changed in the layout plan.

2) Facility

① With reference to the facility plan for the purpose of achieving both production plan and load plan, our basic idea is as follows:

i) Since the cane mill roll is the key product, the roll machining equipment will be strengthened above other sugar processing machines. An attempt will be made to use this equipment for roll machining only and to streamline the processing flow.

ii) Gear manufacturing equipment, including hardening machines, will be installed anew. These are aimed primarily at the gears of the machines for sugar plant.

iii) Existing machines will be tried for continued use if they can be repaired or modified for better efficiency and if they are subject to large load fluctuations.

iv) Minimal equipment for plate work required for manufacturing small-size water mills will be installed.

② Quality control will be strengthened by providing better inspection

and test equipment and tools such as supersonic examiner.

③ To keep pace with the strengthening of equipment and the transition to NC design of some machines, renovation will be made of substation equipment, as well as the transformer and switchboard system.

(3) Production control system and training plan

Followings are the key points for the intensification of production control system as well as the scope and methods of training, while the details thereof are described in Chapter 4 para.4.1.5 of the Report.

1) Measures for strengthening production control system

① The overall coordination function, covering sales activities and procurement function, will be strengthened. This should be accomplished through extending the function of the production control department and by providing a direct link to branch managers.

② Clear distinctions will be established between the departments responsible for production engineering-particularly the departments which promote more efficient and improved equipment, and the introduction and research of new machining technologies. To serve as the driving force for higher productivity, these departments will be under direct control of the factory manager.

③ By strengthening the quality control department, an attempt is made at transition to integrated quality assurance system covering material up to shipment.

④ The loading plan has been prepared from considerations of the effect of the new and efficient facilities to be introduced, as well as the subsequent effect of the workers' skills trained on such new equipment. The personnel plan based on this loading plan assumes an

attendance rate of 94%, as compared to the present rate of 90 to 95%.

2) **Training plan**

① Training will be given to as many persons as possible without lowering production. To achieve this objective, the OJT (on-the-job training) will be used where three instructors are despatched to the Surabaya Machine Shop on a yearly basis by the training consultant.

② Training in production control is given to engineers and formen of the departments of production control, quality assurance and plant engineering. This is carried out on a task force basis aimed primarily at higher productivity. The training is expected both to provide education and to improve practical work through advices and instructions from the instructors.

③ The proficiency level will be raised by two means: the instructions in practical skills given by the erection and commissioning supervisors despatched from equipment suppliers, and the instructions in applications given by the above-mentioned instructors.

2) **Personnel plan**

Table IV-1-1 shows the personnel plan for engineers and indirect workers. This plan has been set up in consideration of the man power plan and the measures for strengthened production control system, which are based on the loading plan and equipment plan. The table does not include the personnel of the machine tool rehabilitation center.

(4) Implementation schedule plan

The renovation implementation schedule is to be planned under the preconditions described below.

1) The implementation should be completed within fiscal 1988 (ending in

March, 1989). To meet this target, it is assumed that the D/D (detailed design) consultant and the equipment machinery supplier are to be nominated in June, 1985 and May, 1986, respectively, and that the contract with the supplier is to become effect by July 1, 1986.

2) The detailed foundation design can be only commenced after the presentation of loading data and anchor plan from the facilities supplier. Accordingly, in the detailed plan for approval of renovation implementation, it should be understood beforehand that the foundation still has some allowances.

3) The renovation implementation schedule assumes that the new Gresik Plant building, decided by P.T. Barata Indonesia himself, is completed on schedule within fiscal 1985. That is, the Surabaya Steel Construction Shop must have moved from the present site by the time the reconstruction of large machining and assembly bay to be built on this site is initially commenced.

4) Production activities will unavoidably be lowered by the effects of the reconstruction, the foundation work for machines and equipment, and the relocation of facilities. To minimize the reduction of output during this period, the following matters are taken into consideration.

   ① To reduce the construction period to a minimum, the D/D consultant prepares the detailed construction plan and construction procedures, nominates (Indonesian) constructors at an early time (soon after completion of D/D), and makes the constructors carry out prior study and preparation thoroughly. The D/D consultant carefully and properly control the construction work.

   ② To avoid the influences on production activities due to replacement of the substation facilities, both the substation and secondary transformer are changed to new equipment. The existing substation and secondary transformer facilicites will be removed when the new equipment has received power.

③ Machine tools will first be installed on the site now occupied by the steel construction shop because then there is less influence on the present machining work; when production activity has started if only partially on this side, machine tools will be moved in the present machine shop area. To assure this, the D/D consultant is required to prudently decide the order of equipment foundation work, installation, and move.

Table IV-1-1 Personnel Program

Barata Surabaya Machine Shop

ORGANI-ZATION	MAIN FUNCTION	PERSONNEL PLAN							
		1984		1989		1994		1999	
		MANAGER, ENGINEER & STAFF	WORKER	MANAGER, ENGINEER & STAFF	WORKER	MANAGER, ENGINEER & STAFF	WORKER	MANAGER, ENGINEER & STAFF	WORKER
Branch manager		1		1		1		1	
Production control	1) production scheduling & control 2) coordination with other groups 3) packing and dispatching 4) material & subcontract control	34		5	35	7	40	8	40
Quality control	1) material & work inspection 2) product inspection 3) calibration of inspection tool	10		10	22	10	25	10	25
Factory manager		1		1		1		1	
Technical	1) production engneering & technique 2) preparation of jig & tool 3) workers training	(Included in work groups)		10	10	12	10	12	10
Maintenance	1) preventive maintenance 2) repair and contorol of tool	46		2	34	2	22	2	16
Machining	1) machining work 2) hardening	127			118		129		132
Assembling	1) assembling and fitting 2) plate work & painting				58		58		71
Handling	1) material & tool handling	(Included in work groups)			27		30		33
TOTAL				29	304	33	314	34	327
		288		333		347		361	

NOTE : Members for Contract Sect. and Administrative Sect. are not included in the above figures
This Table is only of Surabaya machine shop, then excludes of Machine-tool rehabilitation center.

IV-2 Barata Gresik

(1) Plant location

1) The renovation plan of the P.T. Barata-Indonesia Surabaya factory is accomplished at the new factory in Gresik by providing a new product mix and increasing the output.

2) The land with an adequate area and stable soil for the construction of plant facilities should be prepared. The lower cost for land preparation is one of key factors to decrease of heavy burden on factory operation.

3) The soil survey has proves that the factory site is not very poor. But it indicates the necessity of soil replacement, as well as a one-meter banking for the prevention of flooding in the rainy season. Also, a large number of concrete piles are required.

4) Judging from the above conditions, the current plan should be carried forward to more advantage in terms of time schedule and cost than looking for an alternative site.

5) To prepare the land, an approval for use of the Gresik site must first be granted from the Indonesian government.

(2) Criteria for selection of production facilities

The major items to be produced at the Gresik factory are process equipment for cement plant and sugar plant, as well as the kinds of equipment which have been produced. Therefore, the production facilities are selected according to the criteria and guidelines mentioned below.

1) The Facilities are at such technical level which can be handled by the factory's current employees at their improved technical skills and provide adequate machining accuracy and capabilities.

2) Because repeated and/or mass produced products are not covered in this renovation plan, manufacturing facilities do not have higher numerically controlled systems such as CAD/CAM machines.

3) The auxiliary facilities of stress relief furnace, pickling equipment and painting equipment are installed. Plating equipment, however, is not installed but is left to a specialized manufacturer.

4) Inspection facilities are based principally on non-destructive examination, which should be utilized for thoroughgoing implementation of the idea of quality assurance.

(3) Limitations on transportation

1) The ports nearest to the factory are Cemen Gresik and Petrokimen. These ports are accessible but do not have the port facilities and cargo handling facilities which are specifically suited for the products concerned. Under the circumstances, the next nearest port, Tanjung Perak in Surabaya, is used.

2) Tanjung Perak port, Surabaya, is about 36 km from the Gresik factory.

3) The weight limitation on the route from Gresik to Surabaya is 8 tons as required by the Police of Surabaya-a low level.

4) A minimum of 30 tons of product must safely be transported, which requires amendment of applicable regulations, as well as the improvement of roads, bridges, etc.

IV-3 Barata Jakarta

(1) Plant location

1) The renovation plan of the P.T. Barata-Indonesia Jakarta factory is accomplished by adding bays on both sides of the factory, and providing there a new product mix and increasing the output.

2) The land with an adequate area and stable soil for the construction of plant facilities should be prepared. The lower cost for land preparation is one of key factors to decrease of heavy burden on factory operation.

3) The site scheduled for additional bays does not have a particular problem of soil.

(2) Criteria for selection of production facilities

The major items to be produced at the Jakarta factory are process equipment for cement plant and sugar plant, as well as the kinds of equipment which have been produced. Therefore, the production facilities are selected according to the critiera and guidelines stated below.

1) The facilities are at such technical level which can be handled by the factory's current employees at their improved technical skills and provide adequate machining accuracy and capabilities.

2) Because repeated and/or mass produced products are not covered in this renovation plan, manufacturing facilities do not have higher numerically controlled systems, such as CAD/CAM machines.

3) The auxiliary facilities of stress relief furnace, pickling equipment and painting equipment are installed. Plating equipment, however, will not be installed but will be left to a specialized manufacturer.

4) Inspection facilities will be based principally on non-destructive examination, which should be utilized for thoroughgoing implementation

of the idea of quality assurance.

(3) Limitations on transportation

1) The port nearest to the factory is Tanjung Priok at a distance of about 15 km.

2) Since the weight limitation on the road to Tanjung Priok port is 30 tons and no requirement is imposed by the Police of Surabaya, there is no major problem about product transportation limitation.

IV-4 Barata Tegal Workshop

(1) Product mix and production plan

The following are the product mix as a base for the production plan.

1) To take charge of the components for the comparatively light middle gauge plates for the cement plant.

2) To take charge of the following ranges for the sugar plant.

   1 To supply the sugar plant in the middle district of Java with spare parts.

   2 To take charge of the necessary components for a new plant or for the plant renovation. The responsibility shall be shared with Surabaya Machine Shop. To take charge of the plate work partially as well.

3) To take charge of the manufacture of the structures and components for the irrigation.

4) To act as a Java middle district general service shop at P.T. Barata Indonesia and to manufacture the consignments ordered from other business groups. To take orders from Gresik Foundry or Jakarta Foundry for the manufacture of the vehicle axles, pump casings used to alleviate the seasonal load fluctuation of the sugar plant facilities.

The production plan based on the above and through the market research, and the load plan, to be a base for the facility plan, which is evaluated from the production plan are as follows. The items for production described in the above articles 1), 2), 3) need to/can be manufactured at the erection field or at a small-sized workshop. So the facility plan excludes the load for the site fabrication at the erection field and the subcontractors.

			1989	1994	1999
PRODUCTION PLAN	Equipment for sugar & Palm oil plant		3,255	3,790	4,280
	Irrigation & others		779	1,084	1,193
	TOTAL (A)		4,034	4,874	5,473
LOADING PLAN	Equipment for sugar & cement plants	In house	176,800	184,020	205,640
		Subcontract or site fabrication	150,410	144,660	142,130
	Irrigation & others	In house	71,970	83,590	77,940
		Subcontract or site fabrication	28,800	32,400	28,800
	TOTAL	In house	248,770	267,610	283,580
		Subcontract or site fabrication	179,210	177,060	170,930
		TOTAL (B)	427,980	444,670	454,510
Total man.machine hours / Total production weight (B/A)			96.3	91.2	83.0

Unit : Production Plan = Weight base (ton)

Load Plan = Man hour base (Man/machine hour)

Note : (1) The yearly fluctuation of B/A depends on the product mix of each year, though basically attributed to following factor

1989 1994 1999 skill proficiency effect after the renovation.

(2) B in B/A refers to the total of the in-shop, subcontract and site fabrications.

(2) Basic policy of the facility plan

The following is a summary and the details shall be referred to Chapter 4 para. 4.4.3 & 4.4.4 of the Report.

1) Workshop layout

① At first the study was made to rationalize the production process flow in each area for machining/assembling and plate work. The reinforcement/modification of the buildings were subsequently planned together with the provision of additional overhead cranes.

② In addition to the above the present small-size forging facility shall be transferred to the south-end bay (out of use at present) to avail the site for a new parking area.

2) Facility

① Facility plan in support of the production plan and the load plan is as follows.

i) With the cane mill roll as the main product, the facilities for the production shall be reinforced including some exclusive use of facilities. At the same time the manufacturing procedure flow shall be rationalized.

ii) As a general workshop located in the middle of Java, the production capacity for the medium size products must be enhanced. So the floor-type boring machine and the vertical lathe (numerically controlled) are to be newly installed.

iii) Installation of a special machine for the Bevel gear of the gate winder used in the irrigation which operates constantly and yields high productivity is recommended to be introduced.

iv) The plate work for the production of middle gauges shall be

equipped with new machines for cutting, forming, and welding to reinforce the production capacity and to enhance the productivity.

② Inspection facility are properly provided considering the inspection range and accuracy required for each product.

③ As for the handling facilities, the self-propelling dolly for interbays transportation and the forklift trucks for the handling between bay and outdoor storage are also provided in addition to the aforesaid overhead cranes.

④ In order to satisfy the increase of power demand and the stability in voltage for the N.C. equipment, the new substation equipment with the specification of secondary voltage adjustable type (220 V to 380 V/440 V) of which incoming voltage is 20 kV in accordance with the P.L.N. guidance are to be newly installed.

(3) Production control system and training plan

Followings are the key points for the intensification of production control system as well as the scope and methods of training, while the details thereof are described in Chapter 4 para. 4.4.5 of the Report.

1) Production control system

① The present system of the production control shall be improved in accordance with the increasing number of workers for the increasing production rate. And the guidance and expediting system for purchase of the material and the fabrication by the subcontractors shall be intensified.

② A quality control system covering all through the production steps such as the materials, fabrication process, finished products need to be established. And the relevant quality control manual to support the Q. C. system must be prepared.

③ Considering the future status of this workshop that may turn to the own brand manufacturer in lieu of the present character as the sugar plant maintenance shop, such organization as to research and introduce a new technique and modernized facilities are to be seriously studied and intensified in terms of the enhancement of productivity and the quality assurance. Thus the numerical controlled machines and automatic welding equipment as described in preceding paragraph are introduced for the earlier training and proficiency.

④ Man power plan is figured out considering the modernization of the facilities after the renovation and the skill improvement as a result of the training program. Attendance rate 94% (at present 90 to 95%) is applied here.

⑤ The man power plan based on the above is shown in Table IV-4-1.

2) Training plan

① For the purpose of the effective training of the large numbers of trainees without hindering the production activity, On the Job Training system by the instructors/trainers invited from abroad is recommended to adopt instead of the overseas training only for limited trainees.

② The practical achievement of the quality control and production techniques by the task force team organized within the assigned members of Tegal workshop under the instruction and guidance by the invited instructors brings the effective results both on the actual improvement of the systems and the level up of individual members having participated to this training.

③ Since the workers of this workshop have considerably high level of the skill, usage of the newly installed machineries and the application methods shall be instructed by the above mentioned training consultant and the erection & commissioning supervisor dispatched by

the machineries supplier for the related technical training.

(4) Implementation schedule

The following requirements must be taken into consideration for the implementation plan.

1) The implementation should be completed within fiscal 1988 (ending in March, 1989). To meet this target, it is assumed that the D/D (detailed design) consultant and the facilities supplier are to be nominated in June 1985 and May, 1986 respectively and that the contract with the facilities supplier is to become effect by July 1, 1986.

2) The detailed foundation design for machine equipment can be only commenced after the presentation of loading data and anchor plan from the facilities supplier. Accordingly in the detailed plan for approval of renovation implementation, it should be understood that the foundation plan still has some allowance.

3) In duration of the execution of renovation for the buildings, machines foundation and machines relocation, the influence thereof to the production activities will be unavoidable, but following points are to be taken into consideration to minimize the reduction of output in this period.

   ① The D/D consultant shall provide with the detailed renovation network plan together with the practical execution procedure and make the assigned contractors (Indonesian) thoroughly study in advance.
   The D/D consultant shall properly supervise the execution throughout the implementation period.

   ② To avoid the influence of the change of the power receiving facility on the production activity, the old power receiving facility shall be removed only after the new power receiving station and the power receiving facility are set and switched on.

4) With a view to set the production after the renovation on its path within 1988, the installation or transfer of the machineries shall be accomplished during the cane off season at the sugar plant in relation to the equipment delivery schedule. From the viewpoint of the sales activity as well, the advanced production shall be encouraged to minimize or to prevent any drop or confusion in production and sales activities.

Table IV-4-1 Personnel Program

Barata Tegal Work Shop

ORGANI-ZATION	MAIN FUNCTION	PERSONNEL PLAN							
		1984		1989		1994		1999	
		MANAGER, ENGINEER & STAFF	WORKER	MANAGER, ENGINEER & STAFF	WORKER	MANAGER, ENGINEER & STAFF	WORKER	MANAGER, ENGINEER & STAFF	WORKER
Branch manager		1		1		1		1	
Quality control	1) material inspection 2) work & product inspection 3) calibration of inspection tool	3		3	7	5	8	5	10
Factory manager		1		1		1		1	
Production preparation	1) preparation of material/subcontract 2) preparation of work instruction 3) production scheduling	9		4	6	5	7	6	9
Production handling	1) time keeping 2) expedition and follow up 3) material handling 4) despatching and delivery	6		7	17	10	17	10	19
Machinery	1) technique for machining 2) preparation of jig & tool 3) machining & assembling	49		6	52	6	62	6	67
Construction	1) technique for plate work 2) plate work 3) site fabrication & erection	55		10	70	10	69	10	74
Maintenance	1) preventive maintenance 2) repair & store of tool 3) maintenance of facilities	8		2	13	2	15	2	15
TOTAL		132		34	165	40	178	41	194
				199		218		235	

NOTE : Commercial Dep't, Finance & General affair Dep't are excluded from above figures

IV-5 Boma Bisma Indra, Indra

(1) Plant location

1) The renovation plan of the P.T. B.B.I., Indra Unit is accomplished by transferring the plate work division to the Wahana Sub-unit, and by providing a new product mix and increasing the output through effective use of the area previously occupied by the plate work division.

2) Because the plan does not include land preparation or rebuilding, there is no major problem within the framework or present limitation on product mix.

(2) Criteria for selection of production facilities

The major items to be produced at the Indra Unit are process equipment for fertilizer plant and pulp/paper plant, as well as the kinds of equipment which have been produced. Therefore, the production facilities are selected according to the criteria and guidelines stated below.

1) The facilities are at such technical level which can be handled by the factory's current employees at their improved technical skills and provide adequate machining accuracy and capabilities. The facilities are planned with JIS.

2) Because repeated and/or mass produced products are not covered in this renovation plan, manufacturing facilities do not have higher numerically controlled systems, such as CAD/CAM machines.

3) The auxiliary facilities of painting equipment are installed.

(3) Limitations on transportation

1) The port nearest to the Indra Unit is Tanjung Perak (in Surabaya) at a distance of about 15 km.

2) The weight limitation on the route to Tanjung Perak port is 12 tons as required by the Police of Surabaya-a low level.

3) A minimum of 30 tons of product must safely be transported, which requires amendment of applicable regulations, as well as the improvement of roads, bridges, etc.

IV-6 Boma Bisma Indra, Wahana

(1) Plant location

1) The renovation plan of the P.T. B.B.I., Wahana Sub-unit is accomplished by transferring the fabrication division of the Indra Unit to the Wahana Unit, and by providing a new product mix and increasing the output at the new unit.

2) The land with an adequate area and stable soil for the construction of plant facilities should the prepared. The lower cost for land preparation is one of key factors to decrease of heavy burden of factory operation.

3) The soil survey has proved that the factory site is not very poor. But it indicates the necessity of soil replacement, as well as a 0.7 m banking for the prevention of flooding in the rainy season.

(2) Criteria for selection of production facilities

The major items to be produced at the Wahana Unit are process equipment for fertilizer plant and pulp/paper plant as well as the kinds of equipment which have been produced. Therefore, the production facilities are selected according to the criteria and guidelines stated below.

1) The facilities are at such technical level which can be handled by the factory's current employees at their improved technical skills and provide adequate machining accuracy and capabilities. The facilities are planned with JIS.

2) Because repeated and/or mass produced products are not covered in this renovation plan, manufacturing facilities do not have higher numerically controlled systems such as CAD/CAM machines.

3) The auxiliary facilities of stress relief furnace, pickling equipment and painting equipment are installed. Plating equipment, however, is not installed but will be left to a specialized manufacturer.

4) Inspection facilities is based principally on non-destructive examination, which is utilized for thoroughgoing implementation of the idea of quality assurance.

(3) Limitations on transportation

1) The port nearest to the Wahana Unit is Tanjung Perak at a distance of about 60 km. This distance is 115 km for a product higher than 2.4 m because the product must then be transported via a by-pass road.

2) The weight limitation on the route to Tanjung Perak is 12 tons as required by the Police of Surabaya-a low level.

3) A minimum of 30 tons of product must safely be transported, which requires amendment of applicable regulations, as well as the improvement of roads, bridges, etc.

IV-7 Boma Stork Pasuruan

(1) Product mix and production plan

The production plan was set up based on the results of market research, and in consideration of the engineering possessed by P.T. Boma-Stork and the guidelines issued by the Indonesian government. Consequently, the plan consists of two categories of main items: (a) the equipment and machines for sugar plant and palm oil plant in line with the Indonesian government's guidelines, and (b) the boiler and pressure vessel, which are the main products of P.T. Boma-Stork. The cane mills for sugar plant, however, should better be manufactured at another plant in Indonesia. This is because cane mills will increase in size so much that they cannot be handled by the present building structure and crane capacity of P.T.Boma-Stork.

The loading plan was prepared under the precondition that easily machined or low addedvalue items will be farmed out for processing or fabricated at erection fields. The plant should inevitably make maximum use of both the floor area of the building and the existing production technology, which will lead to production of more and more items of high added value.

The production plan and loading plan in accordance with the above considerations are summarized in the following table.

			1989	1994	1999
PRODUCTION PLAN	Equipment for sugar & Palm oil plant		7,884	7,929	7,944
	Boilers & others		2,125	3,300	3,300
	TOTAL (A)		10,009	11,229	11,244
LOADING PLAN	Equipment for sugar & Palm oil plant	In house	199,610	162,610	153,310
		Subcontruct or site fabrication	446,520	362,700	341,740
	Boilers & others	In house	250,870	284,280	267,140
		Subcontract or site fabrication	66,890	77,000	72,430
	TOTAL	In house	450,480	446,890	420,450
		Subcontract or site fabrication	513,410	439,700	414,170
		TOTAL (B)	963,890	856,590	834,620
Total man.machine hours / Total production weight (B/A)			93.3	79.0	74.2

Unit : Production Plan = tons

Load Plan = Man/machine Hours (H)

Remarks : (1) The boilers include those for sugar plant and palm oil plant.

(2) The variation of B/A in 1989, 1994 and 1999 reflects the effects of skill proficiency after renovation, although slightly by the product mix in each year.

(2) Basic policy of the facility plan

Described below are the key points of the equipment plan detailed in Chapter 4 para 4.7.3 & 4.7.4 of the Report.

1) Workshop layout

① Crane capacity required for assembling a boiler is 35 tons as a minimum. A suitable capacity is established in consideration of the larger sizes of future boilers and the safe conveyance of assembled items. An optimum crane capacity is determined between a minimum of 35 tons and a maximum of 50 tons through overall estimation and comparison of the crane price and the building construction cost. In determining the location of the bay in which to install the large crane, total decision is made from viewpoints of both the processing flow and the feasibility of removing or moving the existing building. Of course, the total layout of the plant is an important consideration.

② The site of the previous foundry is now used, without little rearrangement, as a steel stock yard and a steel plate marking/cutting area. Such a use is quite problematic in light of material transport and operating efficiency. This site will be designated as an area requiring improvement.

③ Along with the selection of location of the bay for large assemblies described in ① above, the processing flow is improved, including relocation of plate forming machines.

2) Facility

① The processing flow for boiler and pressure vessel is improved, while the processing equipment is streamlined and strengthened. Specifically, cutting and beveling machines are strengthened, the plate forming equipment is increased in capacity, welding is automated, the equipment for drying of welding rods and flux is

streamlined, non-destructive examination equipment is introduced anew, a new stress relieving furnace is installed, and so on.

② With regard to machining equipment, the tube-plate drilling machines are strengthened, aged machines are replaced, and higher-efficiency machines are introduced.

③ The substation is already short in capacity. In fact, a substantial voltage drop is observed at a 6 kV reception of power. The entire set of power receiving and transforming equipment is replaced with a new set accommodating an input of 20 kV.

④ A gas producer is installed anew for use with the new stress relieving furnace scheduled.

⑤ The drainage system is strengthened to prevent flooding of the working floor in the rainy season.

(3) Production control system and training plan

Followings are the key points for the intensification of production control system as well as the scope and methods of training, while the details thereof are deseribed in Chapter 4 para. 4.7.5 of the Report.

1) Production control system

① The production control will be based on the present system, which will be increased in personnel and function with the increase in output.

② It is necessary to establish a consistent quality assurance system, which involves introduction of non-destructive examination equipment. A more strengthened system is intended, including an increase of engineers.

③ As more subcontractors are used for processing, a strengthened

system of subcontractor control is intended.

2) **Training plan**

① As a means of rapidly strengthening the quality control system, the plant will receive instructors from an overseas training consultant. The main theme given from the instructors will be quality control. For this purpose, a task force or working group is organized, with the main members consisting of the engineers and formen involved with the quality control at P.T. Boma-Stork. The members receive practical training under the instructions from the training consultant. This training is expected to result in a quality control manual and other kinds of practical output, and also to educate the participant members—a double purpose.

② The technical training consists of the proficiency training from the training consultant described above, and the practical training in operation and maintenance instructed by the commissioning engineer despatched from the equipment supplier.

3) **Personnel plan**

Table IV-7-1 shows the personnel plan for engineers and indirect workers, as prepared based on the loading plan, manpower plan, and the plinciples stated above.

For those existing machine tools which are reusable and are low in load factor, the personnel plan assumes that a fixed manpower allocation is not given but the operators of other machines are designated as appropriate.

(4) Implementation schedule

The renovation implementation schedule is to be planned under the preconditions described below.

1) The implementation should be completed within fiscal 1988 (ending in

March, 1938). To meet this target, it is assumed that the D/D (detailed design) consultant and the equipment machinery suppliers will be nominated in June, 1985 and May, 1986, respectively, and that the contract with the suppliers takes effect by June 30, 1986.

2) The construction drawings for the foundation of machinery and equipment are to be decided by the suppliers, but the foundation work can only be started after the individual loading plan and anchor plan are presented. Accordingly, in the detailed plan for approval of renovation implementation, it should be understood beforehand that the foundation has some allowances.

3) Production will unavoidably be lowered by the effects of the reconstruction, the foundation work for machines and equipment, and the jobs involved in the move to the new plant site. To minimize the reduction of output during this period, the following matters are taken into consideration.

   (1) To reduce the construction period to a minimum, the D/D consultant prepares the detailed construction plan and construction procedures, nominates (Indonesian) constructors at an early time (as soon as completion of D/D), and makes the constructors carry out prior study and preparation thoroughly. The D/D consultant carefully and properly control the construction work.

   (2) To avoid the influences on production activities due to replacement of the substation facilities, both the substation and secondary transformer are changed to a new layout.

4) The 20 kV transmission line presently runs at a position about 600 m from the P.T. Boma-Stork Pasuruan Plant. It is necessary for P.T. Boma-Strok themselves to file for the reception of 20 kV power to PLN (ministry of electric power), and to obtain prior confirmation against possible delay in the construction work performed by PLN.

Table IV-7-1 Personnel Program

Boma Stork Pasuruan Work Shop

ORGANIZATION	MAIN FUNCTION	PERSONNEL PLAN							
		1984		1989		1994		1999	
		MANAGER, ENGINEER & STAFF	WORKER	MANAGER, ENGINEER & STAFF	WORKER	MANAGER, ENGINEER & STAFF	WORKER	MANAGER, ENGINEER & STAFF	WORKER
General manager		1		1		1		1	
Quality control	1) work inspection in factory 2) material & subcontract inspection	7		5	10	5	12	5	14
Control	1) expediting of material & subcontract 2) maintenance 3) storing & inventry control	69		5	60	5	65	5	70
Factory manager		1		1		1		1	
Production planning (including product coordinator)	1) production scheduling 2) man/machine-hours planning 3) work coordination 4) product coordination	39		10	40	10	45	10	48
Production	1) plate work preparation 2) plate work welding 3) plate work fitting & assembling 4) machining 5) finishing & assembling 6) material & tool handling	341*		15	288	15	295	15	285
TOTAL		458*		37	398	37	417	37	417
				425		454		454	

NOTE: (1) Members of Engneering Dep't, Erection Dep't and Socretary are not Includeded in the abobe figures.
(2) * marked figers in 1984 are including the workers for site constraction and field fabrication.

V

OUTLINE OF THE RENOVATION PROGRAM

V Outline of the Renovation Program

V-1 Barata Surabaya Workshop

(1) Investment cost

Table V-1-1 shows the investment cost for this renovation. Total amount of 3,006.9 mil. yen including the foundation work and the installation of 33 new machine tools amounted to 70% of the total facility cost, including the buildings and the utilities. As for the present facility equipments which are of lower load or the ones used only in the peak period or used in a limited purpose such as rough machining apply necessary maintenance or modification and put into use repeatedly. The parts for the maintenance or modification shall be purchased from abroad and the modification work shall be executed by the workshop staff. The Table V-1-2 shows the above. Steel materials for the building structures shall be in the imported portion. And its fabrication, assembly and finish work shall be in the erection-site portion. The power receiving facility and communication equipments cover not only the machine shop but the whole Surabaya workshop. But judging from the almost exclusive use by the machine shop for the year of practice, the cost is appropriated for the machine shop.

The D/D (Detailed design) shall be engineered by a company under the responsible supervision of the D/D consultant. The company must have appropriate capability and the experience of the advanced thorough study and construction/civil engineering in Indonesia. This requirement shall result in minimized cost.

(2) Principal improvements

The expected effect after the execution of the renovation is to materialize the aim of this renovation plan. The concrete points of the effect, including the indirect effects, are presumed as follows.

1) Reinforcement of the production capacity

① The capacity-up of the crane facility and the machine tools shall enable the workshop to fill the bulky parts orders.

② Enlargement of the manufacturing range by installing the gear cutter and hardening apparatus as well as the completion of the special attachment shall widen the order acceptance scope.

2) Enhancement of the productivity

① Modernization of the facility and the completion of the special attachment shall shorten the machine hours.

② The improved layout shall shorten and rationalize the manufacturing flow.

③ The completion of the transportation facility will shorten remarkably the waiting hour in the machining and assembly work.

④ The training program shall yield the improved skill and the high degree of man power management.

3) Improvement of the quality

① The supplemented inspection equipments and tools, such as supersonic examiner, dynamic balancer shall make the thorough quality control possible.

② Advanced study shall be possible and early detection of the improper material or mis-fabrication shall shorten the machine hours.

(3) Workshop layout and the implementation schedule

Figure V-1-1 shows the workshop layout. The office to the west of D-E bays (large scale assembly bays) and the residential complex between the workshop and the JLN. NGAGEL can be removed. If the west gable is removed, direct transportation of the bulky parts from the assembly bay to the JLN. NGAGEL is possible. And in this large scale assembly bay the machine tools and the marking/inspection table for the heavy and bulky parts are set. Furthermore, the portable drilling machine is installed for the assembling work. Refer to the Chapter 4 Para. 4.1.3 & 4.1.4. for the details of the above.

Figure V-1-2 shows the renovation execution plan based on the foresaid requirements. As indicated, this plan shows the possible completion of the renovation by the fiscal year 1988 as advised by the Ministry of Industry. To be precise, due to the training program being applied as on-the-job training while in the actual production, the production activity under the newly installed facility equipments shall commence in the middle of 1988.

Table V-1-1 SUMMARY OF INVESTMENT COST

BARATA SURABAYA MACHINE SHOP

ITEM	FOREIGN PORTION (MIL.YEN)	DOMESTIC PORTION (MIL. YEN)	TOTAL (MIL. YEN)	Remarks*
1. Machine tool	2,682.9	324.0	3,006.9	Table 4-2
2. Steel fabrication equipment	125.7	9.8	135.5	Table 4-2
3. Miscellaneous equipment, tool etc.	574.3	5.4	579.7	Table 4-2
4. Handling equipment	151.0	7.8	158.8	Table 4-2
5. Machinery reforming	172.7	96.4	269.1	Table 4-3
6. Building & miscellaneous facilities	59.1	309.2	368.3	Table 4-4
7. Electrical & utility facilities	180.7	141.0	321.7	Table 4-4
(Subtotal-1)	(3,946.4)	(893.6)	(4,840.0)	
8. Detailed designing	84.5	36.3	120.8	Table 4-5
9. Implementing body	-	37.4	37.4	
10. Training	144.6	54.4	199.0	
(Subtotal-2)	(229.1)	(128.1)	(357.2)	
11. Contract tax	-	609.3	609.3	
12. Contingency				
12-1 Physical	125.3	71.5	196.8	
12-2 Escalation	260.5	438.6	699.1	
(Subtotal-3)	(385.8))	(1,119.4)	(1,505.2)	
TOTAL	4,561.3	2,141.1	6,702.4	

Remarks* : Details are specified in the tables under Chapter 4 para 4.1.4 of the Report.

Table V-1-2 SUMMARY OF PRODUCTION FACILITIES

(BARATA SURABAYA MACHINE SHOP)

(UNIT: SETS)

	NEW FACILITIES	RE-USE OF EXISTING FACILITIES		TOTAL
		TO BE IMPROVED	AS IT IS	
1. MACHINING FACILITIES	38	79	4	121
2. TOOL GRINDING MACHINES, ETC.	8	6	3	17
3. PLATE WORK FACILITIES	17	5	2	24
4. HANDLING FACILITIES	15	-	19	34
TOTAL	78	90	28	196

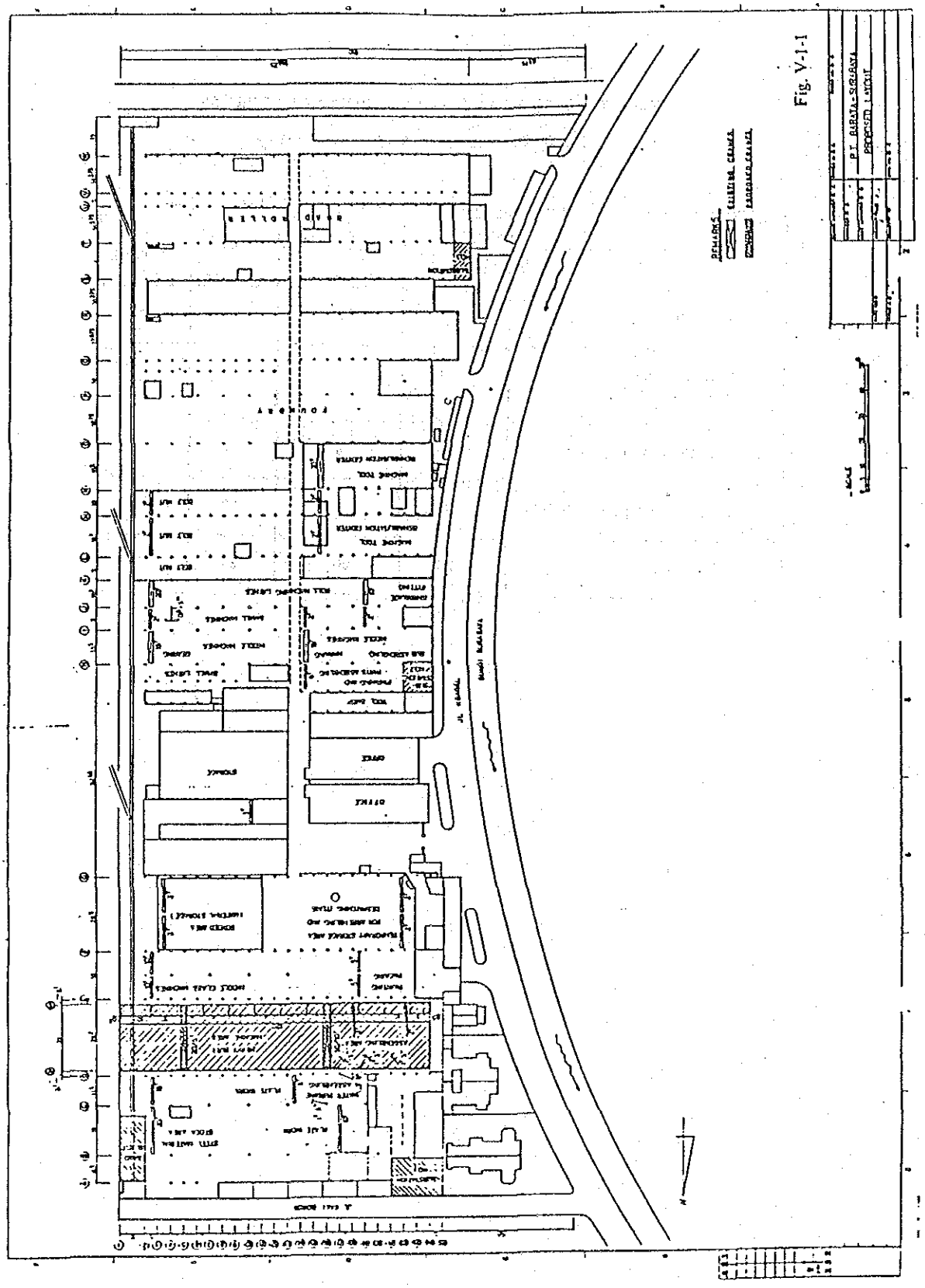
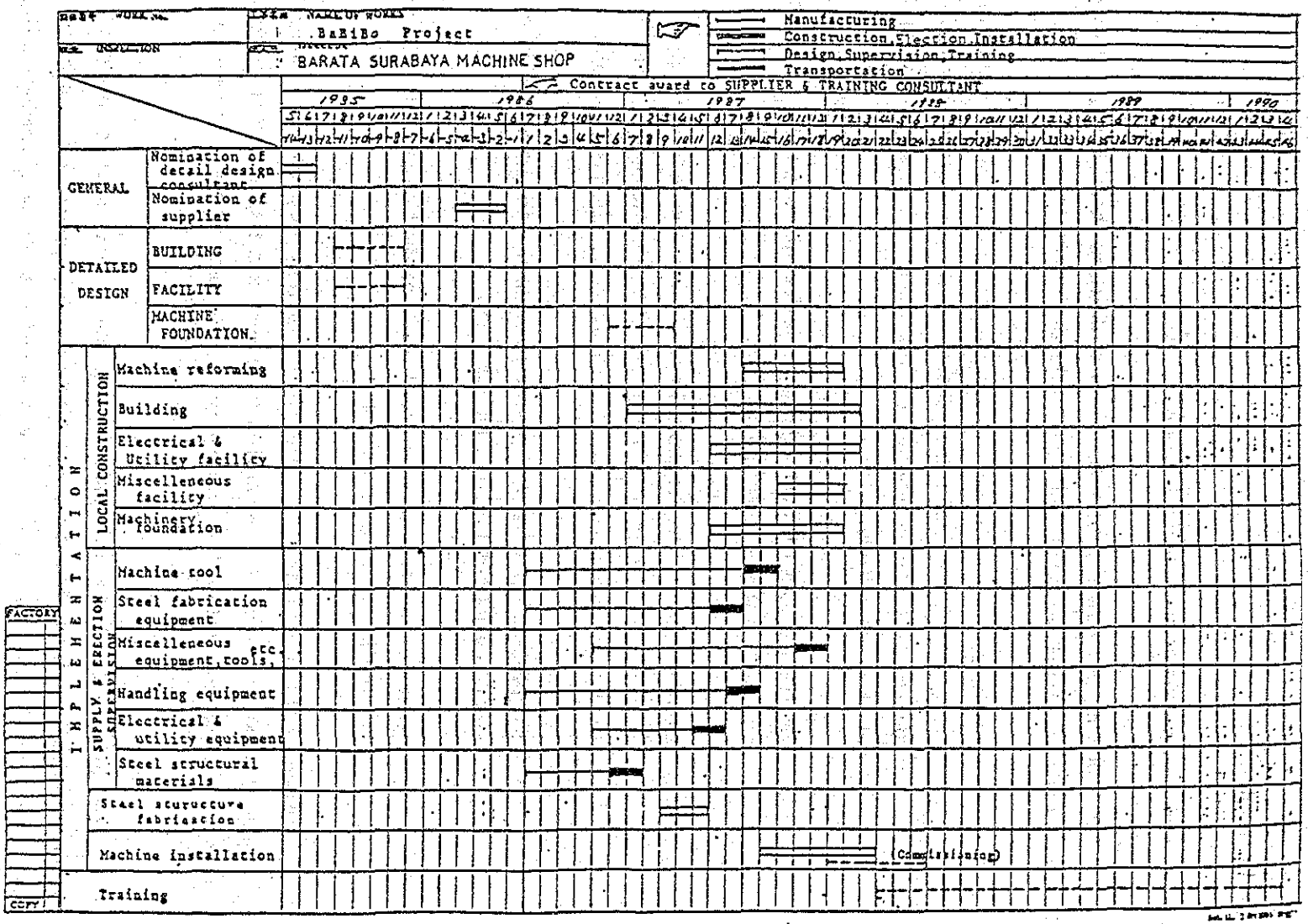


Fig. V-1-1

Fig. V-1-2 IMPLEMENTATION SCHEDULE



V-2 Barata Gresik

(1) Basic renovation program and its outline

The following procedures have been taken in drafting the renovation program based on the results of investigation and diagnosis on the present state.

i) Drafting a new optimum production plan with respect to the Gresik factory based on the REPELITA-IV of the Indonesian Government, market research conducted by the study team and study on the existing plant sites.

ii) Drafting a plan with respect to the capabilities of the new facilities pursuant to the new production plan.

iii) Comparison of the capabilities between the new facilities and existing ones, drafting a layout for the new factory, and review on the various problems involved in the transportation of products.

iv) Reviews on the costs and processes regarding the plant construction, and equipment and facility installations.

v) Reviews on the organizations and production technology after completion of the new factory.

Outline of the basic plan is that the Gresik factory may have an independent plate work and steel structure division separated from Surabaya factory which principally perform the production and sales of steel structures and plate works, and related field works.

The intent has been to achieve a product mix capable of producing conventional products such as machinery and processing equipment with its basic load centering around cement and sugar plants. The productive capacity of hardware, the so-called facility productivity has been designed to produce 15,230 t/y which far exceeds the present production record of approximately 5,000 t/y. The new factory may start production in October 1988.

Conversely, in order to provide a complete software system which is the responsibility of Gresik factory, various reviews have been made in regard to the training programs necessary for the cultivation and increase of managers, engineers and skilled workers, and improvement in the technical levels of these personnel for preventing problems from occurring in the course of plant construction and operation initiation. Reviews have also been made on the factory and personnel organizations.

1) Production plan classified into products manufactured by factory

① Product mix at Gresik factory

i) The product mix which is the basis of facility capacity design consists of the following two items:

a) Manufacturing of sugar and cement plant equipment.

b) Manufacturing of products which have so far been and will be manufactured by Surabaya factory in a close relation with the local region (hereinafter called the "BASIC LOAD").

ii) In the meantime, it is important that the technical levels of Gresik factory is consistent with that of the fabrication division of Surabaya factory, and in addition, permit to improve the technical levels as well as quality and productivity by adopting the new production technology. Judging from the classification of the products according to their types, Gresik factory is considered to be suitable for performing the works centering around steel structures and plate works.

iii) Consequently, as shown in Table V-2-1, the product mix of Gresik factory has been classified into 10 items that can be manufactured inside the factory, and 5 items of field works

(for convenience, hereinafter called "Site Work"). Thus the types, number and arrangements of the necessary equipment have been determined through the classification of products form.

② Planning production scale of Gresik factory

i) On making the market research on the cement and sugar plants and basic load to be manufactured by the Gresik factory, the factory's annual production scale has been determined based on the estimated productions from 1989 to 1993. Then review has been made as to the feasibility of the production of these plant equipment in Indonesia for seeking a local percentage.

ii) Next, the exclusive rates for the processing of these two types of plant equipment by intended for local production Gresik factory were determined. Steel structure and plate works were accorded a due exclusive factor, and productions were allotted to each product mix.

iii) In the meantime, investigations were performed on the factory production records in regard to the basic load as well. The basic loads for which production will be continued were also classified into steel structure and plate work in the same manner as described above item ii). The productions were allotted to each product mix accordingly.

iv) Also, the field processing and installation amounts of plant equipment and basic load were determined. Due attention was paid to calculate the number of machine tools and workers which may be required by the field work.

2) Factory load plan and required facilities

The product capacity of Gresik factory has been designed to achieve the productivity of 15,230 t/y based on the forecast of demand.

The demand was calculated based on the following three items: (1) The local supply percentage in Indonesia of cement plant equipment is assumed to be 60% with the exclusive rate of 60% for BA. BI. BO. (2) The local percentage of sugar plant equipment is assumed to be 95% with the exclusive rate of 100% for BA. BI. BO with respect to be objective plants (The objective plants account for 25% of the total plants). (3) The exclusive rate of basic load is 100%.

As a result, the average forecast value of demand covering from 1988 to 1993 is calculated to be 22,930 t/y, which may satisfy the factory load. The required facilities are calculated based on the following criteria:

① Review on whether the existing facilities can be diverted to the new factory

In accordance with the newly established product mix and its production plan, investigations were made in regard to the machine facilities belonging to the fabrication division of Surabaya factory for determining the facilities that can be diverted to the new factory.

The selection criteria applied were as follows:

i) Items to be investigated

Loading percentages, tolerance, workability, maintenance and modernization.

ii) The classification of items were made according to the following standard:

Class I : Can produce to the required condition without further improvement to the existing conditions.

Class II : Could possibly produce to the required condition with some rebuild/modernization.

Class III : Cannot produce to the required condition with any other rebuild/modernization.

iii) The facilities judged to be applicable shall be transferred to the new factory as its part of productive capacity.

However, even if the facilities were to be applicable, those that appear to have insufficient capability in terms of productive capacity and function shall not be applied.

② Review on new facilities

Although the factory productive capacity was determined according to the applicable product mix and its production plan, the following selection criteria were used in selecting the required facilities:

i) Setting the following items on each product mix

a) Product model

b) Product time

c) Estimated technical level after five years.

ii) Next, the criteria were determined

a) Principal scale of the man power and calculation of the amount of production time.

b) Decision of the type and number of the required facilities.

iii) Setting off the applicable old facilities against the required new facilities.

iv) In determining the above, the values obtained through our experience were implemented.

3) Plan for the improvement of the existing factory and construction of the new factory

As a result of survey on the Surabaya factory, the factory was recognized to be too small to attain the newly set product mix and its production plan.

In order to solve this problem, both Barata head office and Surabaya factory agreed that a new factory be constructed adjoining Gresik Foundry Shop subject to the approval of the Indonesian Government.

This clause describes the factory layout with the production of plate works and steel structure as its nucleus, and partial transfer of equipment from Surabaya factory.

① Basic plan of factory layout

Factory site area = 83,150 m^2

Total Material storage area = 600 m^2

Building space area = 17,500 m^2

Layout = Refer to the attached drawing Fig. V-2-1

Annual production = 15,230 t/y

In the preceding paragraph 2) ② the facilities and their number of units required to attain the production plan were determined. The factory layout was determined based on these data, and general procedures taken in this respect have been to:

i) Secure the required work area.

ii) Determine optimum equipment arrangement and manufacturing process flow.

iii) Determine the building shape.

iv) Give consideration to material storage yard and products carrying out route.

v) Minimize material handling.

② Production and inspection facilities

i) Production facilities

The following six items have been reviewed in accordance with the preparation, machining, forming, welding and assembly procedures which constitute the product manufacturing process. Summary of production facilities is shown on Table V-2-4.

a) Facilities and attached equipment for use in preparations.

b) Facilities for use in processing of machine

c) Facilities for use in forming

d) Facilities for use in welding

e) Assembling tools

f) Overhead traveling crane

Note: As for a) through e), the existing equipment of Surabaya factory applicable to the new factory is included.

ii) Inspection facilities

Inspection plays an important role in quality assurance system. At present, inspection is made by outside inspectors but it is recommendable that it should be done inside the plant by installing the facilities in the future.

The inspection facilities consist of the following items:

a) Equipment for use in the non-destructive examination for the inspections centering around the welded portion.

b) Equipment for use in the material test.

c) Equipment for use in measurement.

③ Basic plan for the attached facilities

Various attached facilities may be required according to the characteristics of product. The following four items have been reviewed with respect to Gresik factory. These facilities have been designed considering an optimum capacity for the type of each facility:

i) Heat treating facility

ii) Shot blast facility

iii) Acid-cleaning facility

iv) Painting facility

④ Basic plan for utility

i) The following electrical facilities shall be installed:

a) The transformer used in the existing foundry shall be diverted for use in the new factory.

b) Telephone facilities (60 telephones)

c) Paging device

d) Broadcast facilities

e) Illumination facilities for the inside and outside of premises.

f) Fire alarms (for office only)

g) Emergency generator (for emergency lights only)

h) Air-conditioning facilities for office.

ii) Wiring to the 8 items shall be provided for use with the machine tool

iii) Sewage and waste water disposal systems

a) Dirty water from toilet flows into the sewage disposal system.

b) Acid-cleaning facility includes the neutralization equipment

4) Factory construction work and installation plan

A factory will be constructed under the previously described project adjoining the Gresik foundary shop. In executing this plan, special care has been paid to the following.

① Land preparation (Refer to the attached drawing Fig. V-2-2)

This paragraph shall be regarded as a key point to determine whether the smooth accomplishment of factory construction and operation along the predetermined process table is possible:

i) Assuming that the total plant site area would be 83,150 m^2, the land preparation process shall be divided into Phase I (43,150 m^2) and Phase II (40,000 m^2, extension).

ii) In Phase I, the land will be dug down by about 1 m, then the soil from the site of Phase I will be piled on the site of Phase II.

iii) Water will be drained off from the land of Phase I, and sand will be replaced. Then the land will be raised by 1 m.

iv) The sand to be used for replacement shall consist of quality river sand of 40% and mountain sand of 60%.

v) The estimate for Phase II was excluded from the estimate of this occasion.

② The ground and pile

Because of comparatively soft ground, the use of piles with a length of 15 m was determined. The construction costs were computed on the assumption that the piles can be procured in Indonesia.

③ Building

The building main body shall be of a steel-frame building. The concrete construction shall be applied to the X-Ray room, and stress relief furnace, heating furnace and sewage disposal facilities. Offices are also included in the scope of construction.

④ Installation plan of equipment

i) Installing the equipment, the shortening of installation processes shall be attempted by grouping the equipment into large, medium and small in size.

ii) Formal acceptance of delivery shall be excecuted upon completion of test run of the equipment after installation.

As shown in the Table 3-2, the total installation may complete in October 1988. The development of the processes in the preparation of land, and performing civil engineering and building construction works smoothly may greatly affect on the accomplishment of the project.

⑤ *Visiting supervisor*

A foreign visiting supervisor or an Indonesian supervisor shall be considered with respect to the following items:

i) Civil engineering works, including land preparation.

ii) Building construction works.

iii) Equipment installation works.

iv) Electrical wiring works.

v) Piping works inside the building.

The duty of supervisor shall terminate upon completion of the construction work. Although the dispatch of a supervisor from the machine suppliers may sometimes be required for conducting a test run of equipment of special importance, generally only the submission of English manuals will be required.

(2) Renovation promotion program

In accordance with the basic plan described in the foregoing chapter, this chapter describes the hardware section of the renovation program, namely, the various technical data related to the promotion program in modurate detail.

1) Outline of the renovation promotion program

① Comparison before and after the renovation

In order to study the improvement degree resulting from the renovation, comparison has been made between the existing factory (Surabaya factory, fabrication division) and the new factory in regard to the production per unit area and direct worker.

The result of the comparison are shown in the table below:

	Before renovation (a)	After renovation (b)	Ratio (b/a)
Production per unit area (ton/year/m^2)	0.59	0.88	1.49
Production per direct worker (ton/year/man)	17.8	29.4	1.65

② Factory layout

The new factory has been characterized by the emphasis placed on the factory layout, and broadly grouping the bays according to the types of products, namely, the material preparation, steel structure, general plate, unit cylinder, heat exchanger assembly and pressure vessel assembly yards. Note that a carrying out gateway for the D-bay is installed at the west side for carrying out something long providing a sufficiently wide carrying out area and an easy access to the main road.