Feasibility Study Report on the Establishment of the Testing Laboratory and Quality Improvement Center for the Metalworking Industry in the Republic of Indonesia

Mar. 1989

Japan International Cooperation Agency

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THE ESTABLISHMENT OF THE TESTING LABORATORY
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FOR
THE METALWORKING INDUSTRY
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JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to a request from the Government of the Republic of Indonesia, the Japanese Government decided to conduct the feasibility study on the Establishment of the Testing Laboratory and Quality Improvement Center for the Metal-working Industry and entrusted the survey to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team headed by Mr.Takashi Imai, Yachiyo Engineering Co.,Ltd., from July 3 to August 9,1988.

The team held discussions with concerned officials of the Government of the Republic of Indonesia, and conducted a field survey. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will contribute to the development of the project and to the promotion of friendly relations between our two countries.

I wish to express my sincerest appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

March, 1989

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

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ABBREVIATIONS AND SYMBOLS

Organization and Company

B4T	:	Institute for Research and Development of Industrial Materials and Technical Products
BBIK	:	Institute of Research and Development for Chemical Industry
BKI PT	:	Indonesia Classification Bureau Co., Ltd.
BKPM	:	Investment Coordinating Board
BPPI	:	Agency for Industrial Research and Development
BPS	:	Central Bureau of Statistics
CEVEST	:	Center for Vocational and Extension Service - Training
CRDI	:	Ceramic Research and Development Institute
GAMMA	:	Federation of Indonesian Metalworks & Machinery Industry
GIAMM	:	Association of Automotive Component Parts Manf.
IBRD	:	World Bank
IRDCLI	:	Institute for Research and Development of Cellulose Industries
IRDTI	:	Institute for Research and Development of Textile Industries
IRIKP	:	Industrial Research Institute of Kanagawa Prefecture
ITB	:	Bandung Institute of Technology
ITS	:	Surabaya Institute of Technology
JETRO	:	Japan External Trade Organization
JICA	:	Japan International Cooperation Agency
KIM-LIPI	:	Research and Development Center for Calibration Instrumentation
LIPI	:	Indonesian Institute of Science
LUK	:	Laboratory for Strength and Material Component and Structure
MIDC	:	Metal Industry Development Center
MOI	:	Ministry of Industry in Indonesia
MOPW	:	Ministry of Public Works
P.T.Askrindo	:	Indonesia Credit Insurance Co., Ltd.
PT.BBI	:	PT.Boma Bisma Indora
PTKI	:	Industrial Chemistry Technology Education Center
PUSPIPTEK	:	National Center for Research, Science and Technology

Financial and Economic Terms

C & F	:	Cost and Freight
CIF	:	Cost, Insurance and Freight
EIRR	:	Economical Internal Rate of Return
FIRR	:	Financial Internal Rate of Return
FOB	:	Free on Board
GDI	:	Gross Domestic Investment
GDS	:	Gross Domestic Savings
GDP	:	Gross Domestic Product
GNP	:	Gross National Product
KCK	:	Working Capital Credit for Villagers
KIK	:	Investment Credit for Small Enterprises
KMKP	:	Permanent Working Capital Credit
M.	:	Thousand
M.M.	:	Million

Currency and Exchange Rate

Rp	:	Indonesia Rupiah
		(1 Japanese Yen = 12.77 Rupiah, July 29, 1988)
US$	:	U.S. Dollar
Yen	:	Japanese Yen

Technical Terms and Others

ASME	:	American Society of Mechanical Engineers
ASNT	:	American Society of Non-destructive Test
BS	:	British Standards
CNC	:	Computer Numerically Controlled
CKD	:	Complete Knock Down
CSF	:	Common Service Facility
DCI	:	Ductile Cast Iron
DIN	:	Deutsche Industrie Normen
EDM	:	Electro Discharging Machine

F/S	:	Feasibility Study
JIS	:	Japanese Industrial Standards
M/C	:	Machine
M/P	:	Master Plan
NC	:	Numerically Controlled
OJT	:	On-the-job Training
PT	:	Penetrant Test
Q.C.	:	Quality Control
R & D	:	Research and Development
RT	:	Radiography Test
SII	:	Standard Industri Indonesia
S/W	:	Scope of Work
T/A	:	Technical Assistance
TR	:	Training
Univ.	:	University
UT	:	Ultrasonic Test

CHAPTER 1

BACKGROUND AND OBJECTIVE OF THE STUDY

CHAPTER 1 BACKGROUND AND OBJECTIVE OF THE STUDY

1.1 Background

The key target of the industrial development policy of the Government of the Republic of Indonesia (hereinafter called the Indonesian Government) is to accomplish the goal of the Fourth Five-year Development Plan (Repelita IV), in building the foundation of the framework for further development which will be strengthened further in the Fifth Five-year Development Plan to reach a full fledged and sustained industry after the Sixth Five-year Development Plan. In light of the above, the structure of industry has to be strengthened and deepened as that implies, the linkage between different industries should be improved and well balanced development between large scale industry and small and medium scale industries should be promoted.

In line with this objective of the industrial development policy of the Indonesian Government, the Japan International Cooperation Agency (JICA) has proposed a development program for (1) the introduction of an institutionalized financing system, (2) technical cooperation and (3) the establishment of a testing laboratory and quality improvement center for the metalworking industry (hereinafter called the Center) through the "Study on Development of Linkage-type Industry in the Republic of Indonesia" (Master Plan) which was conducted as one of its fiscal 1985 projects.

In line with that proposal, the Indonesian Government has requested that JICA conducts a feasibility study (F/S) on the Center for promotion of the Indonesian metalworking industry. In response to that request, JICA dispatched a preliminary study team to Indonesia in February 1988 and reached an agreement on the scope of work (S/W) for execution of the feasibility study with the Ministry of Industry (MOI) and the Industrial Research and Development Agency (BPPI) of Indonesia.

In this study, a conceptual design for the above Center, which constitutes an integral part of the Master Plan for the Development of Linkage-type Industry in the Republic of Indonesia (hereinafter called Indonesia), has been conducted and its feasibility has been evaluated.

1.2 Objective of the Study

The feasibility study of the proposed project would be conducted from the technical and economic aspects, and the management of the organization aspect. The economic aspects will not only consider the results of the market survey of metalworking products but would also be based on a comprehensive understanding of the content of the requirements and the background of the proposed project. In addition, the feasibility study technology would be transferred to the Indonesian counterpart personnel during the execution of the feasibility study.

1.3 Scope of Work

The study has been conducted on the following items in accordance with the "Scope of Study" in the agreement on S/W signed on February 2, 1988.

1.3.1 Study on the background of the project and related information

(1) General condition of metalworking industry
(2) General condition of industrial standards
(3) Relative laws and regulations
(4) Analysis of existing data

1.3.2 Related and similar existing facilities

(1) Objectives, function and operation
(2) Administration and management
(3) Beneficiaries

1.3.3 Supply and demand relations between assembly-type industry and linkage-type industry

(1) Outline
(2) Technical and managerial problems for operation of linkage-type industry

(3) Requirements for the qualities of the parts used in assembly industry

1.3.4 Required quantity and quality of the services to be provided by the Center (time-series and regional studies)

1.3.5 Conceptual design for various plans of the proposed project

(1) Objective, function and operation
(2) Location (natural and socioeconomic conditions and utilities)
(3) Layout
(4) Equipment and facilities
(5) Organization and human resources
(6) Construction plan

1.3.6 Execution and operation plans

(1) Administrative structure
(2) Financing
(3) Project implementation program

1.3.7 Estimation and raising of necessary funds (including financial and economic studies)

1.3.8 Conclusion and recommendations

1.4 Technical Approach of the Study

The Study consists of two portions, namely (1) field survey in Indonesia and (2) the study in Japan. The field study in Indonesia was conducted for the period from the beginning of July, 1988 to the beginning of August, 1988, by 9 professionals. The study in Japan was carried out immediately after the field survey in Indonesia until the end of October, 1988.

The field survey in Indonesia was conducted mainly through "direct visit interview" with the firms belonging to the metalworking industries, and other related institutions including the technical institutes providing testing and inspection services, training and research and development (R & D) services to the industries. The survey on the industries focused on the understanding of the current situation of the Indonesian metal-working industries, the identification of the problems prevalent in the metalworking industries, and the location of the demand for the Center to be established from the qualitative and quantative viewpoints. Interviews with the technical service institutes included B4T and MIDC, and other similar governmental institutes.

Table 1.4-1 Number of Interviewed Organizations in Indonesia

1. Assembly-type industries	45
2. Linkage-type industries	22
3. Similar related institutes	23
4. Other organizations	19
Total	109

In order to complement the field survey, a "Questionnaire survey" was conducted, on the basis of the "Questionnaire" attached as Annex I to this report.

Table 1.4-2 Results of Questionnaire Survey

Number of firms to be surveyed	Number of effective answers	Rate of effective respondents
208	88 (total) 66 (assembly-type) 22 (linkage-type)	42.3 %

The study in Japan has included the review and analysis of the data collected during the field survey in Indonesia, and, in addition, a survey on the similar technical institutes was carried out. Results of the study have been summarized and presented in the Final Report.

The flow of the Study is summarized in Fig. 1.4.1.

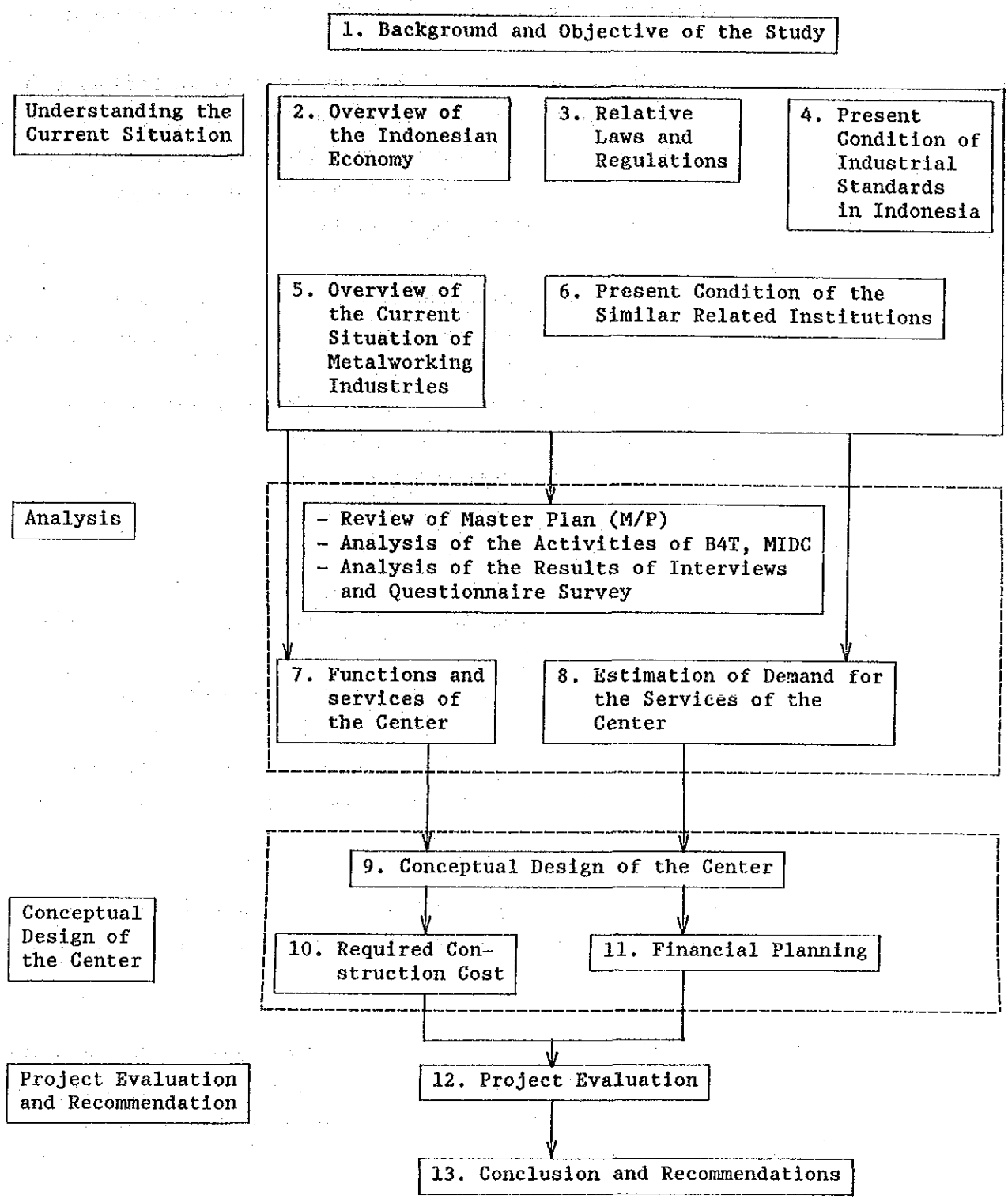

Fig. 1.4-1 Flow of the Study

1.5 Selection of Firms and Similar Related Institutions to be Surveyed

Metalworking industries and other similar governmental institutes to be interviewed and surveyed through the questionnaire were selected through the following methods. Typical firms were selected among association members of the Federation of Indonesian Metalworks and Machinery Industries (GAMMA) consisting of the following:

- Association of Indonesian Agricultural Machinery (ALSINTANI)
- Association of Indonesian Internal Combustion Engine Manufacturer (ABI)
- Association of Indonesian Steel Structure (APKOBI)
- Association of Indonesian Metalworks and Machineries (ASPEP)
- Association of Indonesian Machine Tools (ASIMPI)
- Association of Indonesian Metal Foundry (APLINDO)
- Association of Indonesian Construction Machinery Industry (AIMKI)
- Association of Indonesian Pumps Industry (AIPSI)
- Association of Indonesian Plant Industry Machinery (AIPPI)
- Association of Indonesian Manufacturers of Pressure Vessels (ASIBBI)

Also, firms having the factories located in the proposed regions to be visited (Jakarta, JABOTABEK, west Jawa and Surabaya) were selected. Moreover, one company from each industry of automobile, motorcycle, shipbuilding and electrical machine among assembly-type industries as selected in the Master Plan was chosen.

Those companies thus selected and linkage-type industries recommended by the BPPI of MOI and selected from the above proposed regions were visited in the survey.

The airmail questionnaire survey was sent to all GAMMA member companies. Furthermore, questionnaire survey sheets were sent to linkage-type industries recommended by the provincial offices of MOI in several localities in the provinces.

Institutes related to metalworking industry, common service facilities and institutes of technology having testing equipment and facilities for metalworking were selected as similar related institutions for purposes of the field survey.

Governmental institutes that seem to be directly or indirectly related to the establishment of the Center were also selected as object of the survey.

CHAPTER 2

OVERVIEW OF THE INDONESIAN ECONOMY

CHAPTER 2 OVERVIEW OF THE INDONESIAN ECONOMY

2.1 General

The land area of Indonesia is 1,920,000 km^2. Indonesia is the largest archipelago in the world, and consists of about 13,000 large and small islands. The Indonesian archipelago extends 5,100 km from east to west and 1,900 km from north to south in the equatorial area. The population of Indonesia is the largest in Southeast Asia. According to the latest population census held in 1985, Indonesia's population was 170 million. Although the rate of population increase is forecasted to decrease to 1.8 percent in the year 2000 from 2.2 percent in the early 1980's, the population in 2000 is estimated to reach 222,750,000. The land and resources are dispersed throughout the country because of its being an archipelago. Among islands in Indonesia, Kalimantan has the largest land area, and accounts for 28 percent of the total land area. Sumatera is the second largest, accounting for 25 percent of the total area. 61.9 percent of Indonesia's population is found on the island of Jawa although it accounts for only 7 percent of the territory of Indonesia. Second to Jawa, 20 percent of Indonesia's population is found on the island of Sumatera. The nationwide average population density in 1985 was 85 people/km^2, while that on the island of Jawa reached 755 people/km^2.

2.2 Economic Characteristics

Per capita GNP amount of Indonesia in 1986 is US$490. The annual average rate of per capita GNP growth in Indonesia for 21 years from 1965 to 1986 was 4.6 percent. The annual average rate of per capita GNP growth in the Philippines, Thailand, Malaysia and Singapore is 1.9 percent, 4.0 percent, 4.3 percent and 7.6 percent, respectively. The growth rate in Indonesia is regarded as relatively high. Per capita GNP amount in 1986 in the ASEAN countries except Brunei is as follows:

US$7,410 in Singapore
US$1,830 in Malaysia
US$ 810 in Thailand
US$ 560 in the Philippines

(Source: World Bank)

Although per capita income was relatively low, Indonesia's GNP in 1986 was US$75.2 billion because Indonesia has a large population. This amount was near the level of South Korea's GNP in the same year (US$98.1 billion). The annual average rate of economic growth from 1965 to 1980 was 7.9 percent, while that from 1980 to 1986 was 3.4 percent; the growth rate decreased drastically. In comparison with the fact that the average economic growth rate of the group of middle-income and lower middle-income countries to which Indonesia belongs, according to the classification of the World Bank is 6.6 percent and 2.1 percent; the rate of economic growth in Indonesia is relatively high.

Low economic growth in recent years has resulted from the aggravation of the international oil market, and the Indonesian Government has directed that the country emerges from being an oil-dependent economy.

2.3 Industrial Structure

The breakdown of domestic GNP by industry in 1986 is as follows:

Agriculture, forestry and fishery industries	26%
Mining and manufacturing industries (mining, manufacturing and construction industries)	32%
Service industry and other industries	42%

Domestic GNP of the manufacturing industry alone out of mining and manufacturing industries is 14 percent.

The breakdown of domestic GNP by industry in 1965 was as follows:

Agriculture, forestry and fishery industries	56%
Mining and manufacturing industries	13%
Manufacturing industry	8%
Service industry and other industries	31%

For the two decades, the share of the agriculture, forestry and fishery industries has drastically decreased, while the share of other sectors has increased. The share of the mining industry is comparatively high because of the oil production, while the share of the manufacturing industry is small.

The percentage of total employment in the agriculture, forestry and fishery industries, manufacturing and minerals, and service and other industries was 71 percent, 9 percent, 21 percent in 1965, and was 55 percent, 13 percent, 32 percent in 1985, respectively. The agriculture, forestry and fishery industries account for more than 1/2 of the total Indonesian work force although the value-added shares of the industries are less than 1/4. Over the 21 years from 1965 to 1986 the dependence on trade has considerably increased. In particular, dependence on exports increased from 5 percent in 1965 to 21 percent in 1986. The item exported in largest amount is petroleum, accounting for one third of the total export. Petroleum plus primary products in 1986 account for about 80 percent of the total export, while the export of manufacturing products in 1986 accounts for only 20 percent of the total. Timber and plywood have the largest share, accounting for one third of the export of manufactured products. Textile products are next in order. The import of industrial products accounts for about 3/4 of total imports, out of which the share of capital goods is the largest, and accounts for nearly 20 percent of total imports in recent years. By country, Japan was the leading customer in exports and imports. Exports to and imports from Japan in 1986 accounted for 45 percent and 29 percent, respectively. The share of the EC, the U.S. and ASEAN countries is also large.

2.4 Industrial Development

Full-scale industrial development has started since President Soeharto assumed office in 1966, and attached importance to domestic production of daily necessaries (e.g., textiles and food processing), basic materials (fertilizer, cement, iron, steel, chemical products and the like), capital goods and consumer durables (e.g., automobiles, home electric appliances). In other words, industrial development has been emphasized to foster industries which would manufacture import substitution products. As a result, industry has made rapid progress between 1969, when a series of Five-year Development Plans started, and 1981, when the oil boom came to an end. The anticipated results were fairly well in line with domestic production policy. Exports of light industry products such as plywood, textiles and so on during recent years show a favorable tendency. In addition, export of cement, fertilizer and iron and steel products has begun.

Since then, strategies for industrial development under the Soeharto administration have changed to emphasize exports from the initial aim of industrialization for import substitution. Policies have also been worked out to foster medium- and small-scale industry, and to capitalize and realize rural development for the dispersion of industry, in consideration of solving employment problems after the 1970's.

On the other hand, owing to the fact that the lower oil prices after 1983 led to recession, each industry at the last years of the Third Five-year Development Plan confronts severe operating conditions. Excessive investment, targeted at a high rate of economic growth from the late 1970's to the early 1980's, resulted in superfluous facilities. In particular, this tendency was conspicuous in the automotive industry and the electric machinery and household electric appliance industries.

2.5 Fourth Five-year Development Plan (Repelita IV)

The Fourth Five-year Development Plan was officially decided as Presidential Decree No. 21 (1984), and took effect as of April 1, 1984. At the same time, since 1982, the international oil market became worse, and thus Indonesia confronted a worsening situation in international balance of payments and national finance. To cope with this situation, in 1983 the Indonesian Government worked out a series of economic recovery policies such as introduction of counter purchases, promotion of non-oil exports, devaluation of the Rupiah, review of development projects, and financial and tax system reform.

The objective of these economic recovery policies is to avoid a crisis over international balance of payments and national finance, as a short-term plan, and decrease the economy's dependency on oil, as a long-term plan. The Fourth Five-year Development Plan emphasizes the economic recovery policy as one of the basic policies, and the economic progress guide is set relatively low.

Target values in the following items to be accomplished in the Fourth Five-year Development Plan are as follows:

Annual rate of population growth	2%
Annual rate of GDP growth	5%
Increase in new employment opportunities	9.3 million persons
Annual inflation rate	8%
Total investment amount	Rp. 145,224 billion
Annual increase rate of total investment	19.1%

The main purpose of the Fourth Five-year Development Plan is to improve living standards, intellectual abilities and welfare of the nation. In this Plan, the Indonesian people will create a fundamental base for growing by themselves. Top priority in this Plan is given to economic development. The Plan also focuses on foods self-sufficiency in the agricultural sector, and development of the machinery industry. Especially emphasized in the plan are items such as machine tools, agricultural machinery, heavy equipment, automobiles, ships and electric machinery.

The necessity of strengthening the structure of industry and linkage between up stream and down stream industries as well as between medium- and small-scale companies and large companies is emphasized. Industrial development will contribute to promotion of exports as well as increase of employment opportunities. Non-oil exports, in particular, industrial products, and careful foreign borrowing policy are emphasized in policies of the balance of payments of the nation and trade. As a whole, emphasis is placed on efficient operation of the economy, simplified procedures, rules and regulations and increase of roles in private sector.
Annual average growth rates of GNP by industry during the plan are as follows:

Agriculture	3%
Mining	2.4%
Industry	9.5%
Construction	5%
Transportation	5.2%
Others	5%

In the manufacturing sector the basic program comprises the following strategy: promotion of investment so as to deepen and strengthen the industrial structure as well as linkage between up stream and down stream industries and between industry with other economic sectors; development of metal and machinery industries development of small-scale industries; development of exports of industrial products; development of research, design and engineering capacity; and development of human resources for industry.

As can be seen in the above, industry is expected to be the leading sector. As a result, the share of agriculture in 1988 was decreased to 26.4 percent from 29.2 percent in the final fiscal year of the Third Five-year Development Plan, while the share of industry in the same year was increased. Economic structure with well-balanced agriculture and industry is about to be realized.

2.6 Present Condition of Industrialization

The actual Indonesian economy at the first year of the Fourth Five-year Development Plan faces a severe economic situation relative to foreign countries resulting from the lower oil prices and the increase in foreign debt, and it has become clear that it will be hard to accomplish the annual growth rate of GDP, which is 5 percent targeted in the Fourth Five-year Development Plan. As far as developmet expenditures of the Indonesian Government's budget is concerned, the achievement rate in 1984 was 95.1 percent, while that in 1985 was 84.6 percent and that in 1986 dropped to 54.1 percent. This was caused by the governmental budget cut owing to the decreased oil revenue which is the main revenue source. The development budget in 1987 was cut to 41.8 percent of value targeted in the Fourth Five-year Development Plan.

On the other hand, the Indonesian Government is promoting private business and consistently invites foreign investment of manufacturing industry. Priority is also given to investment with an export potential. Through continuous deregulation, a higher level of growth rate of manufacturing industry is maintained in spite of the sluggish oil sector. The growth rate of the manufacturing industry in 1983, which was 2.20 percent, lower than the growth rate of economy, which was 4.28 percent during the Fourth Five-year Development Plan, increased to 7.06 percent, compared to the growth rate of the economy which was 3.59 percent in 1987. The share of manufacturing sector in GDP, which was 12 percent in 1984, increased to 14 percent in 1987.

In terms of production value, the level was increased from Rp. 11 trillion in 1983 to Rp. 43 trillion in 1987, out of which the metal-working and machinery industries production value was increased from Rp.1.4 trillion to Rp.6.5 trillion. In the export of industrial products, the level increased from US$3.2 billion in 1983 to US$6.7 billion in 1987, an increase of 20.3 percent per annum.
Within the investment sector, the level increased year by year.

Between 1984 to 1987, the investment reached Rp. 15.9 trillion plus US$3.6 billion. In the employment opportunity, within the Fourth Five-year Development Plan up to the first semester of 1988, the industrial sector created more than 1.99 million new employment opportunities for the people, thus exceeding the targeted value of 1.40 million. The growth rate of manufacturing industry during Repelita IV drastically exceeds the growth rate of economy, and under recession the manufacturing industry takes the lead in the Indonesian economy.

CHAPTER 3

RELATIVE LAWS AND REGULATIONS

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3.1 Overview

The development plan of the industry sector in the Fourth Five-year Development Plan aims to equalize the distribution of wealth through industrial promotion. For this, the Indonesian Government has established numerous relative laws and regulations for the purpose of abolishing differentials between large and small companies, strengthening linkage between them, and promoting industry and exports.

The MOI considers that cultivation of linkage-type companies in the metalworking industry is indispensable for economic development in Indonesia through domestic industrialization policy, because there is a great difference among those companies (in the field of the metalworking industry) in managerial, technical and financing strength and the like.

There is no consolidated standard in the definition of the scale of industries and companies in Indonesia. The Central Bureau of Statistics (BPS), the MOI, the Bank of Indonesia and the Ministry of Trade individually define the scale according to their own different standards. The BPS classifies the scale of industry and companies on the basis of the number of employees, while other institutions classify them on the basis of investment, capital equity and PRIBUMI. (Refer to Table 5.1-1 for definitions of industries and companies.)

Table 3.1-1 Definitions of Industries and Companies

		BPS	MOI (Definition of manufacturing industry)	Bank Indonesia (Definition of all industries)	Ministry of trade (Definition of commerce and service industry)
Relative law			MOI Decree 176/M/SK/10/1978		Ministry of Trade Decree No. 4, Jan. 7, 1980
Number of employees	Handicraft	4 or more			
	Small-scale industry	5 - 19			
	Medium-scale industry	20 - 99			
	Large-scale industry	100 or more			
Capital equity and asset	Small-scale company		Three major requirements: 1) Investment in manufacturing facilities and equipment shall be less than Rp. 70 million. 2) Capital converted per employee shall be less than Rp. 625,000. (Operation capital shall be less than 1,000 dollars.) 3) Directors of company shall consist of PRIBUMI.	Two major requirements: 1) Capital equity (except land and buildings) shall not exceed Rp. 40 million. Capital equity in manufacturing and construction industries shall not exceed Rp. 100 million. 2) The PRIBUMI shall own 50% or more of capital and the majority of directors shall consist of PRIBUMI.	Gross asset value shall not exceed Rp. 25 million.
	Medium-scale company				Gross asset value shall not exceed Rp. 25 million to 75 million.
	Large-scale company				Gross asset value shall exceed Rp. 75 million.

In 1981 the MOI announced a development program for basic industry, i.e., a strategic and comprehensive plan for the realization of industrialization, and started the detailed strategy for industrialization. In the above development program, large-scale industry projects that become the principal support to realize industrialization for the future in Indonesia are nominated.

On the other hand, one of the important policies of the development program as promoted by the MOI is to deepen linkage between medium- and small-scale and large-scale companies, to promote the nation's economic development and to create a solid industrial structure. The development program enhancing such linkage will heighten the added value of the industrial sector, strengthen the nationwide industrial structure, and expand employment opportunities. For this purpose, the MOI has announced numerous regulations, implemental technical and management support and promoted development programs. Programs enhancing linkage in the metalworking industry have already been carried out mainly in the following fields.

- Machinery industry
- Electric machinery and electronics machinery industry
- Motorcycle industry
- Manufacturing industry
- Railway industry
- Ship building industry

Guidance and development programs are as follows:

- Regulations related to the use of domestically manufactured parts
- Technical and management support by engineers
- Establishment of common service facilities and cultivation for newly developed industrial products
- Establishment of a subcontracting system between assembly and linkage-type companies
- Finance (financing aid at lower interest) and taxation (exemption of corporate tax for 10 years after establishment of corporation)

- Educational and training support to subcontractors
- Managerial policy
- Industrial estate for accumulation of industries

These types of technical and management support, and development policies bring about the satisfactory results in developing cooperative relationship between assembly-type and linkage-type industries.

The linkage relation between small and large industries is kept in good condition in the diesel engine industry, machinery industry, and electric and electronics machinery industry, while linkage relation between small industry and medium- and large-scale industry is not kept in good condition because of the inferior quality, low accuracy, high prices and irregular delivery services.

Because the Indonesian government attempts to develop the subcontracting relation between large-scale and small-scale companies and to form a more well-balanced industrial structure, the upgrading of technical level and managerial ability of small-scale companies is indispensable.

In reality, a great gap exists between large companies that have been established through capital and technological introduction from foreign countries and small companies that can not get rid of their traditional practices. Most large companies, except for Persero, conceive that it is more economical to manufacture parts in their own factories by newly installing parts production lines, rather than to order parts from small companies with less reliability, in terms of technology, facilities, delivery services, prices and managerial attitude.

3.2 Policies for Domestically Manufacturing Parts

Although the deletion program for commercial vehicles which was scheduled to accomplish 100% localization by the year 1984 was announced in Presidential Decree No. 307, August, 1976, auto makers were not able to accomplish this target. As a result, in September 6, 1979 this

deletion program was revised under the Industry Minister's Decree to become a more realistic plan which aims to use domestically manufactured parts.

As a plan for manufacturing common parts among ASEAN countries has been agreed on the following policies have been formulated in Presidential Decree No. 168 in 1980.

- Standardization for design of commercial cars
- Domestic production rate: 85%
- Parts imports from ASEAN countries: the remaining 15%

At the same time, the import duty for CKD commercial cars has been abolished and the import duty for CKD passenger cars has been increased from 50% to 100%. One of the characteristics of policies for domestically manufactured automotive parts (Industry Minister's Decree No. 34/SK/2/1987) is that the deletion percentage of parts is not indicated but the items by type of car are clearly nominated. The Indonesian Government admits the introduction of foreign funds to cultivate parts manufacturers and the delay in the targeted date for achieving the deletion program. However, the realization of the deletion program is one of the most important basic policies of the Indonesian Government. As countermeasures against the increasing production cost caused by the deletion program, the MOI proceeds with the following:

- Integration and reduction of the number of assembly makers
- Decrease of types of cars to be locally produced through integration
- Limitation of domestic CKD assembly to 30 types of cars and integration into about five assemblers

A plan for the domestic manufacturing of automobile engines is considerably behind schedule, because preparations for that purpose are not complete.

3.3 Promotion of Medium- and Small-scale Industries

The national development plan in Indonesia has reached the stage of the final fiscal year of the Fourth Five-year Development Plan (1984/1985 to 1988/1989).
In the development plan, the following four development goals are set for the industry sector, to achieve increasingly balanced growth.

- Realization of a more balanced economic structure
- Expansion of employment opportunities
- Expansion of exporting industrial products
- Improvement of productivity in order to meet domestic demand and to reduce the dependence on imports

In line with these basic policies, the Directorate General of Small-scale Industry (DGSI) of the MOI formulated a Project of Guidance and Development for Small Industry (BIPIK) to foster its growth. Approaches to development are considered to foster the following:

- Clusters leading to expanded employment opportunities
- Small industry supplying the people's necessities
- Small industry in the field of agriculture and machinery
- Small industry that is capable of manufacturing products ordered from the Indonesian Government
- Small industry that is capable of exporting

The following assisting policy, policy for strengthening government-implementing system and policy for business environment are worked out to implement the BIPIK plan.

(1) Credit and taxation

Credit system for medium and small companies is as follows:

- Small scale investment credit (KIK)
- Permanent working capital credit (KMKP)
- Incentive house-ownership credit (KPR)
- Small credit for petty traders (KCK)
- Village general credit (Kepedes)

Income tax and re-investment tax are treated favorably to promote establishment of new companies.

(2) Establishment of common service facilities

The DGSI lends machinery, equipment, facilities and so on to cooperative associations for common use of cluster industries and supports the procurement of raw materials.

(3) Technical and managerial support by experts from the DGSI

At present, about 1700 experts are allocated in major cluster companies to conduct training and technical and managerial support.

(4) Fostering newly developing industrial products

The DGSI lends to typical cluster companies common service facilities in order to provide technical support for the development of new industrial products. It also provides technical support to install and handle expensive mechanical facilities.

3.4 Policy for Business Environment

3.4.1 Securing of business opportunities

(1) Permission for establishment of factory, etc.

Companies whose capital except for land and buildings exceed Rp. 10 million are required to get permission of the MOI when their new offices are established, resumed, expanded or moved.

Companies whose capital is in the range of Rp. 10 million or less to Rp. 500;000 or more are obligated to register with the MOI when their new offices are established, resumed, expanded or moved. There is no such regulation for companies having capital of Rp. 500,000 or less.

(2) Type of industries in which participation of large and medium companies is prohibited

Regulations were established in 1980 to prohibit participation of large and medium-scale companies in the type of industries operated by small companies. There are 129 prohibited types of industries. (MOI Decree No. 517/11/SK/80)

3.4.2 Policy for protection of small and medium industries

(1) Official demand

The following restrictions are set up by regulations when construction contracts ordered by ministries, local governments or state-owned companies are concluded and commodities are ordered.

1) domestically manufactured products, 2) economically-weak groups (small companies owned by the PURIBUMI) and 3) local industries are given priority.

The following two definitions of small industries owned by the PURIBUMI are assumed in the above decree.

1) Definition of such small industries is the same as that of the central bank in the field of manufacturing and construction industries and also the same as that of the Ministry of Trade in the field of commerce and service industry. Cluster is regarded as a small company.

The following system was established in 1980:

- 20% of advance payment prior to commencement of work applicable to small companies ordered from official demand
- System for furnishing funds necessary for executing contracted work

(2) Procurement of industrial products by the government

Although a policy for preferentially treating small- and medium-scale companies mainly consisting of the PRIBUMI was worked out in Presidential Decree No. 14 of 1979, such a policy was further expanded in Presidential Decree No. 14A of 1980.

The contents of the policy are as follows:

a. Preferential procurement of domestically manufactured products
b. Preferential procurement from economically-weak groups consisting of the PRIBUMI.
c. Preferential ordering from local industries

Contractors or manufacturers receiving orders from the government are obligated as a condition of the order to cooperate with local small industries consisting of the PRIBUMI (ordering to subcontractors, purchase of part components).

(3) Organizing of small- and medium-scale companies (organizing of cooperative associations)

Article 33, section 1 of the 1945 Constitution stipulates that cooperative associations in Indonesia act as a core of the nation's economy. It is the general understanding that Indonesia's economy is supported by state-owned companies, cooperative associations and private companies.

According to the law of Indonesia's cooperative associations established in 1967, cooperative associations are based on the Pancasila principle, and they are organization for uniting Indonesia's economy, promoting the national welfare and encouraging democracy and the stability of the national economy.

(4) Policy for assisting small- and medium-scale companies

As an assistance policy, financial guarantee (Rp. 0.5 billion or less) to cooperative associations is provided by state-owned banking facilities, and cooperative associations are exempted from corporate taxes for 10 years after their establishment. Small- and medium-scale companies are privileged to purchase raw materials from state-owned companies, public corporations and so on at lower prices. Furthermore, cooperatives for small credit for petty traders are privileged to receive subsidies of personnel expenses for industries engaging in cooperatives, subsidy for jointly purchasing fertilizer and the like, and application of increased prices to jointly sell to the Logistics Agency.

3.5 Policy for Strengthening Implementation

(1) Enhancement of R & D Center

The BPPI of MOI is the agency for uniting industry-related R & D institutions by sector and area, and there are central research and development institutes and industrial research laboratories under the control of BPPI of MOI.

Central research and development institutes are the central organization responsible for R & D activities in the industry sector, while industrial research laboratories are responsible for testing, inspecting and research to assist local industries. To support these activities, the Governor of North Sumatera promotes according to Keputusan Gubunur Kepala Daerah I, Sumatera Utara No. 954/1516/K/1987 (9-4-1987 Medan) that metalworking industries in North Sumatera should make use of an Industrial Research Laboratory in Medan under the direct control of the BPPI.

(2) Enhancement of Technical Center

The technical center gives instructions on technology and business management to clusters, and strives for promotion of clusters through establishment of common service facilities to achieve higher quality of products.

(3) Training

Various training programs are conducted to improve leadership by experts from the DGSI, and governmental and local governmental officers.

CHAPTER 4

PRESENT CONDITION OF INDUSTRIAL STANDARDS IN INDONESIA

CHAPTER 4 PRESENT CONDITION OF INDUSTRIAL STANDARDS IN INDONESIA

4.1 Industrial Standards

The National Standardization Council (DSN) was established in 1984, and the Technical Team for Industry Standardization (TTSI) was established under the control of MOI as a subordinate organization. As a result, the Industrial Standards (SII) in Indonesia were improved.

In and after 1985, the improvement of the industrial standards system and preparation of new industrial standards were made mainly by the TTSI. The number of industrial standards established was 2,246 as of July, 1988.

Fundamental and general standards (such as drawing symbols, dimensions, tolerance and fit, units, measuring method, etc.) have recently been established.

The number of standards established as SII compared with JIS is shown in Table 4.1-1. It is obvious from this table that Indonesia should make efforts to establish more standards. Some organizations and some companies in Indonesia are of the opinion that internationally recognized industrial standards such as ISO should be introduced as SII until such time as Indonesia's own standards are completed.

On the other hand, SII has not yet spread throughout the country. In particular, there are many companies that do not recognize the fundamental and general standards recently established while a few companies apply the industrial standards. Most companies use industrial standards and drawings prepared in the country of the joint venture partner companies. Subsequently, Indonesia should make greater efforts to spread SII throughout the country for the future.

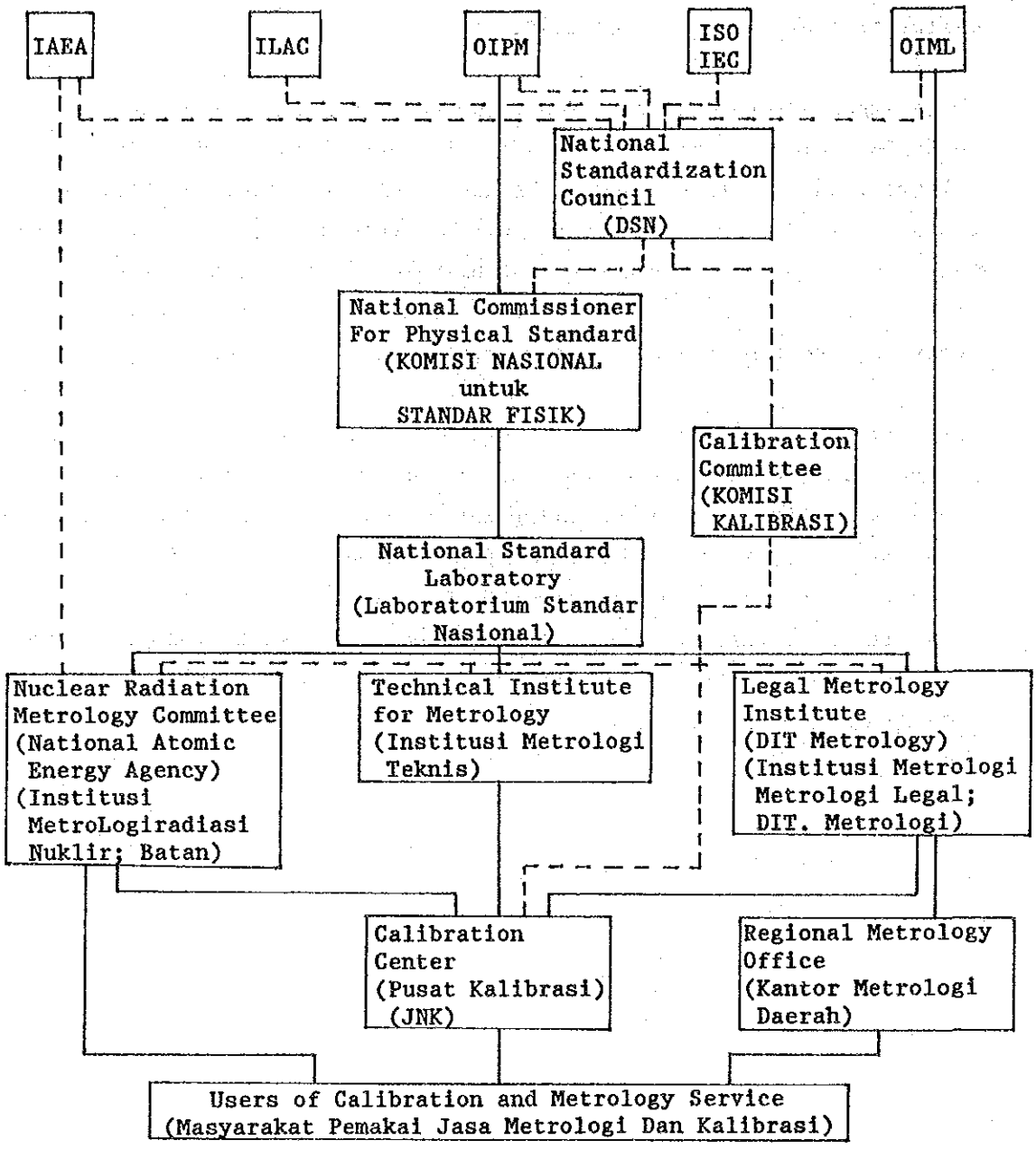
lTable 4.1-1 Comparison of SII and JIS in Numbers of Industrial Standards by Division

JIS divisions				SII divisions			
Total number of industrial standards		8,223		Total number of industrial standards		2,246	
G	Ferrous material and metallurgy	315		3.7.1	Ferro and steel metal industry	127	
H	Non-ferrous metals and metallurgy	362		3.7.2	Non-ferro metal industry	65	
B	Mechanical engineering	1,212	Sub-total 3,110	3.8.1	Metalworking machinery and equipment except electric machines	137	Sub-total 697
				3.8.2	Machines and equipment	81	
				3.9	Other processing industry	35	
D	Automotive engineering	354		3.8.4-3	Motor vehicle	84	
E	Railway engineering	225		3.8.4-2	Train	10	
F	Shipbuilding	542		3.8.4-1	Ship	158	
W	Aircraft and aviation	100					
Z	Fundamental and general	675		3.10	Basic engineering standard	94	

4.2 Calibration of Equipment and Tools

It is important to calibrate equipment and tools for making the authorized dimensional measurements. Industrial standards related to calibration of equipment and tools have been established as SII. As shown in Fig. 4.2-1 and Table 4.2-2, the organization for coordination of the national metrology has been established. Most assembly-type industries recognize the importance of the accuracy of dimensional measuring instruments and pressure measurement equipment.

There are many companies that calibrate measuring instruments in some method, i.e., comparison of new and old measuring instruments in accuracy, calibration of measuring instruments by using block gauges, or calibration of measuring instruments at national laboratories. They do not keep a record of calibration and the measuring instruments are not labelled as to validity date. Most of the linkage-type industries do not recognize the importance of calibrating equipment and tools, and they do not conduct any calibration.



IAEA: International Atomic Energy Agency
ILAC: International Laboratory Accreditation Conference
OIPM: Organization International des Poids et Mesures
ISO : International Organization for Standardization
IEC : International Electrotechnical Commission
OIML: Organization International de MetroLogie Legale
——— : Technical Coordination Route (Garis Koordinasi Teknis)
- - - - : Administrative Coordination Route (Garis Koordinasi Administratip)

Fig. 4.2-1 Organization Chart for Coordination of National Metrology
(Bagan Koordinasi Metrologi Nasional)

Table 4.2-2 National Calibration Network - Member and Scope of Services

Members / Scope of calibration services	Location	Flux intensity	Length	Weight	Time	Electric current	Temperature	Physics	Tolerances & Fit
1. Metal Industry Development Center (MIDC)	Bandung		•						•
2. Direktorat Metrologi	Bandung		•	•					•
3. National Atomic Energy Agency (BATAN)	Jakarta							•	•
4. PRMK?LMK - PLN Electrical Research Center	Bandung					•	•		•
5. PERUMTEL Directorate of Telcom.	Bandung				•	•			
6. PT.PINDAD	Bandung		•						•
7. PT BOMA BISMA INDRA (A State Establishment)	Surabaya		•						•
8. ITB Mechanical and Electrical Departments	Bandung		•			•			•
9. PUSLITABANG KIM	Serpong	•	•	•	•	•	•		•
10. Research and Development Center for Ind. Material & Tech. Goods	Bandung								•
11. PT.PAL INDONESIA	Surabaya					•	•		
12. PT INDUSTRI PESAWAT TERBANG NUSANTARA	Bandung		•			•			•
13. Laboratory for Strength of Materials (LUK - BPPT)	Serpong								•

Source: (MINISTRY OF INDUSTRY DIRECTORATE GENERAL OF MACHINERY AND BASIC METAL INDUSTRY)
ENGINEERING SUBSECTOR PROJECT STANDARDS DEVELOPMENT AND IMPROVEMENT (DRAFT FINAL REPORT)

CHAPTER 5

OVERVIEW OF THE CURRENT SITUATION OF METAL WORKING INDUSTRIES

CHAPTER 5 OVERVIEW OF THE CURRENT SITUATION OF METALWORKING INDUSTRIES

5.1 Position of Metalworking Industries among Manufacturing Industries

According to the Industrial Statistics published by the BPS, the metalworking industry sector is classified into four groups according to the number of persons engaged, i.e.:

- Large industry, 100 persons or more
- Medium industry, 20-99 persons
- Small industry, 5-19 persons
- Household industry, 1-4 persons

While the statistical data regarding the large and medium industries are available up to 1986, the data on small and household industries are very much limited, except for the year of 1974/75 and 1979.

5.1.1 Number of establishments and number of persons employed

While the number of establishments of large and medium industries was 500 in 1974/75, it increased to 1,272 in 1986. The number of persons employed also increased from 55,867 to 181,647 during the same period. The trend between 1982 - 1986 is summarized as follows:

Table 5.1-1 (1/2) Number of Establishments of Large and Medium Industries

Number of establishments of large and medium sized industries	1982	1983	1984	1985	1986
a. Metalworking industries	839	849	823	1,283	1,272
b. All manufacturing industries	8,020	8,027	8,006	12,909	12,765
a/b (%)	10.4	10.5	10.2	9.9	10.0

Note : The term "Metalworking" in this report includes metalworking and machinery industries.

Source: Industrial Statistics, BPS

Table 5.1-1 (2/2) Number of Employees of Large and Medium Industries

Number of persons employed (1,000)	1982	1983	1984	1985	1986
a. Metalworking industries	139	142	136	179	181
b. All manufacturing industries	1,067	1,119	1,197	1,684	1,691
a/b (%)	13.0	12.6	11.3	10.6	10.7

Note: The term "Metalworking" in this report includes metalworking and machinery industries.

Source: Industrial Statistics, BPS

It can be observed from the above table that within five years, the number of establishments of metalworking increased by 50 percent and number of employees increased by 30 percent. However, manufacturing industries as a whole showed a 60 percent increase both in the number of establishments and in the number of employees for the same period.

The number of employees per establishment in 1986 of the metalworking industries was 142, while that for all manufacturing industries was 132.

In 1986, metalworking industries occupy about 10 percent in the number of all establishments in the manufacturing industries, and the metalworking industries employ 11 percent of all the employees engaged in the manufacturing industries.

According to the statistics of the MOI, the number of clusters of the small scale metalworking industries is 1,015 and the number of persons employed in the clusters was 50,337 in 1983/84.

The geographical distribution of the small and household metalworking industries is summarized in Table 5.1-2.

Table 5.1-2 Profile of Small and Household Metalworking Industries (1983/84)

Area	Number of clusters	Ratio (%)	Number of employees	Ratio (%)	Number of employee per cluster (average)
Jawa Timur	576	57	12,474	25	21
Jawa Tengah (including D.I. Yogyakarta)	122	12	16,365	32.5	134
Jawa Barat	111	11	3,609	7	32
Sumatera	96	9	8,469	16.8	88
DKI Jakarta	5	0.5	577	1.2	115
Others	105	10.5	8,843	17.5	84
Total	1,015	100	50,337	100	49

Source: Ministry of Industry

Note: Cluster means gatherings of small and household industries.

5.1.2 Input cost, value of gross output and value of fixed capital formation

The total input cost, value of gross output and value of fixed capital formation in metalworking industries compared to the all manufacturing industries are described in Table 5.1-3.

Table 5.1-3 Input Cost, Value of Gross Output, and Value of Fixed Capital Formation

(Unit: Rp. billion)

	1984			1986		
	Input cost	Value of output	Value of capital formation	Input cost	Value of output	Value of capital formation
a. Metalworking industries	1,628.4	2,321.4	26.4	2,718.6	4,008.4	43.3
b. All manufacturing industries	9,522.8	14,613.8	172	16,529.0	25,877.0	279.3
c. a/b (%)	17.1	15.9	15.3	16.4	15.4	15.5

Source: Industrial Statistics, BPS

Metalworking industries increased by 67% in input cost, by 73% in gross output, and by 64% in fixed capital formation, while entire manufacturing sector, increases were 73.5% in input cost, 77% in gross output and 62% in fixed capital formation. These indicate that the rate of increase in metalworking industries are almost parallel to that for all manufacturing industries.

5.1.3 Value added and employment cost

The value added, and employment cost of the metalworking industries in 1984 and 1986 are described in Table 5.1-4.

For the period from 1984 to 1986, value added and employment cost of the metalworking industries increased by 86 percent, and 71 percent respectively, while value added and employment cost of the whole of manufacturing industries increased by 83 percent and 76 percent, respectively. The share of value added and employment cost of metalworking industries did not alter substantially during the period.

Table 5.1-4 Value Added and Employment

(Unit: Rp. billion)

	1984		1986	
	Value added	Employment cost	Value added	Employment cost
a. Metalworking industries	693.0	179.4	1,290.0	307.6
b. All manufacturing industries	5,091.0	1,073.4	9,348.5	1,888.1
c. a/b (%)	13.6	16.7	13.7	16.2

Source: Industrial Statistics, BPS

5.1.4 Average profile of the metalworking industries, large and medium sized

Base on the data described above, the average profile in 1986 of the metalworking industries could be summarized as follows:

Table 5.1-5 Average Profile in 1986 of Metalworking Industries, Large and Medium Sized

	Metalworking industries	All manufacturing industries
1. Employees per establishment (persons)	142	132
2. Output value per establishment (Rp. million)	3,151	2,027
3. Employment cost per establishment (Rp. million)	242	148
4. Input cost per establishment (Rp. million)	2,137	1,295
5. Value added per establishment (Rp. million)	1,014	732
6. Output value per employee (Rp. million)	22.19	15.35
7. Employment cost per employee (Rp. million)	1.7	1.12
8. Input cost per employee (Rp. million)	15.0	9.81
9. Value added per employee (Rp. million)	7.14	5.53

Source: Tables 5.1-1(1/2), 5.1-1(2/2), 5.1-3, 5.1-4

Metalworking industries showed higher figures in all indices than the average for all manufacturing industries. Especially, value added per employee of metalworking industries is larger by 20% than that of the average figure of all manufacturing industries.

5.2 Overview of the Sub-sector of the Metalworking Industries

The Industrial Classification used in Indonesia is compiled based on the International Standard Industrial Classification, 1968, which stipulates the classification of the sub-sectors of the metalworking industries as follows:

38 Manufacture of fabricated metal products, machinery and equipment
381 Manufacturing of fabricated metal products, except machinery and equipment
382 Manufacture of machinery except electrical
383 Manufacture of electrical machinery apparatus, appliances and supplies
384 Manufacture of transport equipment
385 Manufacture of professional and scientific and measuring and controlling equipment not elsewhere classified, and of photographic and optical goods

In accordance with above classification, the sub-sectoral indices are summarized in Table 5.2-1.

Table 5.2-1 Comparison between the Sub-sectors of the Metalworking Industries (1988)

Industry classification code	Number of establishments	Number of employees	Employment cost (Rp mil.)	Input cost (Rp mil.)	Value of output (Rp. mil)	Value added (Rp. mil)
381	556	59,123	84,833	853,737	1,214,556	360,616
382	180	16,307	23,216	128,523	202,171	73,648
383	186	38,719	57,948	629,294	916,837	287,544
384	307	65,099	139,463	1,097,371	1,660,869	563,498
385	43	2,388	2,189	9,659	14,146	4,487
Total	1,272	181,641	307,649	2,718,584	4,008,379	1,289,795

The biggest sub-sector is "manufacture of transport equipment (No. 384), while "manufacture of fabricated metal products (No. 381) is the second biggest sub-sector. "Manufacture of electrical apparatus, appliances and supplies" (No. 383) is the third biggest sub-sector. The above three sub-sectors together occupy almost 90 percent of the metalworking industries. The indices per establishment are summarized in Table 5.2-2.

Table 5.2-2 Productivity Indices of one Establishment (1986)

Industry classification code	Number of employees	Employment cost (Rp mil.)	Input cost (Rp mil.)	Value of output (Rp mil.)	Value added (Rp mil.)
381	106	152.5	1,535.5	2,184.0	658.5
392	90	128.9	714.0	1,123.2	409.2
383	208	311.5	3,383.3	4,929.2	1,545.9
384	212	454.2	3,574.5	5,409.9	1,835.4
385	55	50.9	224.6	328.9	104.3

Source: Table 5.2-1

Value added per establishment of the manufacture of transport equipment is the biggest. However, input-output ratio of manufacture of machinery (No. 382) shows the highest figures among all five sub-sectors. The indices per employee are summarized in Table 5.2-3.

Table 5.2-3 Productivity Indices per Employee (1986)

Industry classification code	Employment cost (Rp. million)	Input cost (Rp. million)	Output value (Rp. million)	Value added (Rp. million)
381	1.43	14.4	20.5	6.09
382	1.42	7.88	12.4	4.51
383	1.49	16.25	23.7	7.43
384	2.14	16.85	25.5	8.66
385	0.92	4.04	5.9	1.88

Source: Table 5.2-1

Manufacturer of transport equipment shows the highest figure in all indices per employee, however, the input-output ratio per employee in manufacture of machinery (No. 382) shows the highest figures among the five sub-sectors.

5.3 Geographical Concentration of the Metalworking Industries

Based on the statistics of BPS, the distribution by area of the metalworking industries is summarized in Table 5.3-1. Based on Table 5.3-1, the degree of concentration and the rate of growth by area are summarized in Table 5.3-2.

Table 5.3-1 Distribution by Area of Metalworking Industries

	No.	Propinsi	Number of establishment			Number of employee				Number of cost (1,000,000 Rp.)			
			1984	1985	1986	1984		1985	1986	1984		1985	1986	
Sumatera	1	D.I. Aceh	-	4	4	-		427	232	-		1,148	357	
	2	Sumatera utara	49	92	93	4,236		427	8,043	4,547		8,307	9,608	
	3	Sumatera barat	3	3	3	203		8,140	213	99		134	123	
	4	Riau	9	18	17	249	5,691	210	2,697	453	6,252	9,423	10,552	22,094
	5	Jambi	2	1	1	38		2,563	13	10		20	8	
	6	Bengkulu	-	-	-	-		36	-	-		-	-	
	7	Sumatera selatan	8	15	15	843		-	891	1,086		1,220	1,054	
	8	Lampung	3	7	7	122		1,166	441	57		432	392	
	9	D.K.I. Jaya	269	351	330	63,286		429	61,672	99,980		128,179	30,409	
	10	Jawa barat	158	308	316	30,613		68,572	51,865	42,018		66,463	94,412	
	11	Jawa tengah	91	110	115	8,280	10,109	43,774	9,440	7,030	7,947	7,973	8,868	10,512
	12	D.I. Yogyakarta	22	24	24	1,829		9,259	2,455	917		1,234	1,644	
	13	Jawa timur	178	311	301	25,198		2,300	41,389	20,630		43,691	46,649	
Kalimantan	14	Bali	3	6	6	111		40,343	171	79		148	152	
	15	Kalimantan timur	7	11	11	212		193	340	252		641	779	
	16	Kalimantan barat	4	1	1	144		361	76	242		147	188	
	17	Kalimantan tengah	-	-	-	-		73	-	-		-	-	
	18	Kalimantan selatan	1	2	2	18		-	37	7		14	29	
Sulawesi	19	Sulawesi selatan	9	6	11	944	1,950	41	958	1,439	2,610	1,427	1,812	4,712
	20	Sulawesi tengah	-	-	-	-		676	-	-		-	-	
	21	Sulawesi tenggara	-	-	3	-		-	65	-		-	8	
	22	Sulawesi utara	4	5	4	374		-	242	503		549	283	
Others	23	Nusa tenggara barat	2	2	2	127		379	242	70		96	108	
	24	Nusa tenggara timur	1	3	3	20		218	93	9		96	112	
	25	Maluku	-	1	1	-		95	10	-		2	1	
	26	Irian jaya	-	2	2	-		60	56	-		86	92	
	27	Timor timur	-	-	-	-		60	-	-		-	-	
		Total	823	1,283	1,272	136,647		179,375	181,641	179,428		271,428	307,840	

Table 5.3-2 Degree of Concentration and Growth Rate of the Metalworking Industries (large and medium) by Area

	Degree of concentration (%)			Growth rate (1984 - 1986)		
	Number of establish-ments	Number of employee	Employ-cost	Number of establish-ments	Number of employees	Employ-ment cost
DKI Jakarta	25.9	34	42.3	22.6	-2.6	30
Jawa Barat	24.8	28.5	30.6	100	69.4	124
Jawa Timur	23.6	22.8	15.1	69	64.2	126
Jawa Tengah D.I. Yogyakarta	10.9	6.5	3.4	23	17.6	32
Sumatera	11	6.9	72.	977	120	253
Others	3.8	1.3	1.4	48	17	81
Total	100	100	100	54.5	32.7	71

Source: Table 5.3-1

It can be observed from the above table that the majority of the metalworking industries are concentrated in DKI Jakarta and in Jawa Barat. However, the growth rate of DKI Jakarta for the recent three years from 1984 to 1986 is lower than that of the other areas. Moreover, the clusters of small industries concentrate in Jawa Timur in first place, followed by the central part of Jawa including Jawa Tengah and D.I. Yogyakarta, as shown in Table 5.1-2.

5.4 Present Condition of Metalworking Industry from the Technical Standpoint

Companies visited by the study team during the field survey are divided into assembly type industries and linkage type industries as described below:

5.4.1 Assembly-type industry

Most assembly type companies in Indonesia manufacture machines and assemble components and parts, in addition to assembling parts procured from the linkage type companies. Companies visited are divided into nine categories as follows. Also, the present condition of such industriesy is judged from the following aspects:

a. Quality control for components and parts which are manufactured within companies
b. Quality control of parts which are subcontracted
c. Quality control for machining and assembling
d. Relationship with subcontractors

(1) Industrial machines

The study team visited 11 industrial machine-related companies that are divided into six assembling companies and five parts manufacturing companies.

Assembling companies manufacture press brakes, shearing machines, presses, sand mixers, presses for roofing tile, power looms, rattan machines, machine tools, etc. whose mechanisms and structures are relatively simple. The market for these products is limited to within Indonesia, and such companies do not pay attention to quality control.

Casting and welded structural members are subcontracted. The quality control of materials to be procured is not emphasized and not related to of the grade of machines to be manufactured.

Manufacturing companies produce bearings, etc., and cast scrap materials, machine raw materials that are cast, and assemble parts. Because products and parts manufactured by these companies are delivered to assembly companies other than car-assembling companies, quality control is done within such companies, but the level of quality control is low.

(2) Agricultural machinery and equipment

In this survey, the study team visited two companies specializing in manufacturing agricultural machinery that receive technical assistance from Japanese companies. The outline of the two companies is as follows:

A company:

Finished products of engines for agricultural machines are purchased from other companies. Other parts except engines are manufactured and all processing from assembling to painting is done within the company.

A company melts scrap materials, casts and machines parts that were cast, and forms the steel plate using presses.

The company conducts tests of the chemical composition during the melting process and quality control of casting mold sand, but does not perform the quality control of welded structural members except for casting products.

B company:

B company assembles general-use engines, manufactures agricultural machines, and domestically markets the products manufactured. (The company delivers engines to A company, mentioned above.)

The company procures parts, components, raw materials, etc., from 39 subcontractors. The method of procurement is as follows:

i. The company furnishes only drawings to subcontractors and subcontracts the process from the procurement of raw materials to assembling of parts.
ii. The company furnishes drawings and raw materials to subcontractors and subcontracts the assembling of parts.

The company manufactures agricultural machinery in accordance with JIS, because it receives technical assistance from Japanese companies.

The quality of most parts procured from subcontractors does not affect the function of finished products, and the following inspection of parts procured is conducted.

i. Appearance test of all parts
ii. Dimensional inspection of major parts of component
iii. Sampling performance and material inspection of parts
iv. Hydrostatic test of casting products used in pressure-receiving portion after machining

Among subcontracted work, the defect rate of aluminum castings is 60%, and that of cast iron steel is 10%, while the defect rate due to miss-machining is 5%. B company has purchased CNC machining center, measuring instruments, tools, jigs, etc., for manufacturing gear cases, considering the promotion of the deletion program.

(3) Heavy equipment and construction machinery

The following three heavy equipment and construction machinery manufacturing companies were surveyed. These companies are joint corporations with foreign companies.

High technologies in various fields are required for manufacturing construction machinery. These companies do not have enough capability to manufacture such machinery. Therefore, all of the main components used to assemble construction machinery are imported. They procure other parts such as cabins, covers, seats, etc., from local subcontractors. The quality of the construction machinery assembled is kept in good condition under the control of foreign companies.

It is possible to manufacture main parts currently imported by themselves if they master the following items:

- Technologies in casting, forging and heat treatment
- Production technologies such as press, forming, welding and machining

(4) Automobiles and automotive parts

Two automobile assembling companies and two automotive parts manufacturing companies were surveyed. These four companies are Indonesia-Japan joint enterprises. The automobile industry is the most suitable industry for linking assembly type companies and linkage type companies, because it uses many kinds of components and parts and needs all fields ranging from elementary production technology to high technology.

The automobile assembling companies imports main components and import dies for press forming and thin steel plate for the car body. They do not procure any parts from local subcontractors, because their requirements for the quality, price and delivery time of components are very severe.

The regulations related to an import prohibition of complete built vehicles and the obligation to use domestically manufactured parts have been enforced by a policy of deletion program, and each company has begun to domestically manufacture these parts in accordance with the schedule under the deletion program. Casting products such as brake drums may be domestically manufactured at an earlier date from the viewpoint of the present technological level and the present quality of products in domestic companies, while it will take a long time to domestically manufacture casting products such as engines, etc., requiring precision machining technology and higher quality. It will take a longer time to domestically manufacture automotive parts requiring special specifications (e.g, life of springs, dielectric strength, etc.).

Although the automobile industries are making efforts to develop industrial technologies and to promote the deletion program, satisfactory results are not obtained at the present time.

(5) Electric machinery

One Japanese-affiliated company manufacturing integrating wattmeters was surveyed.

Integrating wattmeters have been domestically manufactured according to the schedule under the deletion program.

Company procures parts by following measures:

i.	Import from foreign countries	4%
ii.	In-house manufacturing	64%
iii.	Domestic procurement	32%

Domestically manufactured parts including in-house manufacturing account for 96%, and the breakdown of each item is as follows:

i. Import from foreign countries
   - Deeply drawn products

ii. Subcontracting to domestic subcontractors
   - Punched thin steel plate

iii. Domestic procurement
   - Aluminium ingots
   - Rubbers
   - Steel screws

The company uses Japan-made major manufacturing facilities, and conducts quality control and production control under the technical assistance of Japanese companies including the promotion of small group activities in the form of quality control circles.

(6) Shipbuilding

A state-owned shipbuilding company was surveyed. This company is engaged in building new ships and repairing ships.

i. Major components: Diesel engines, pumps, diesel generators, crank shafts, etc. are imported.

ii. Other parts: Most of the parts are manufactured by using machine tools of its own factory (e.g., lathes, radial boring machines, universal tool milling machines, shaping machines, etc.)

iii. Fabrication and welding of hull structure: Steel plates are procured together with mill sheets from P.T. Krakatau Steel. Although welders' training is conducted within and outside of the company, satisfactory results can not be achieved. An important necessity of this company is to strengthen such training.

iv. Inspection equipment: Welded portions are inspected within the company using X-ray radiography and ultrasonic inspection equipment, etc. for example.

An important task is to conduct the training and to level up the capability of welders. It is desirable, therefore, to establish officially authorized institutes for training and qualificating welders.

(7) Process equipment

Process equipment-manufacturing companies include food processing plant manufacturers (copra, sugar, coffee, tea, etc.), oil refinery plants, natural gas processing plants, fertilizer plant manufacturers, etc. Seven companies that only manufacture structural steel structures for plants, sheetworking products, boilers, etc., were surveyed in this study.

Surveyed companies have the following equipment necessary for sheetworking and welding work.

- Automatic gas and plasma cutting machines
- Bending rollers
- Forming presses
- Automatic welding equipment
- Stress relief furnaces
- Inspection equipment (e.g., PT, UT, RT, water pressure proof test equipment)

However, these companies are capable of assembling and manufacturing process equipment in accordance with drawings furnished by customers, although they do not have enough capabilities to design process equipment by themselves.

Applicable standards designated by customers (e.g., ASME, BS, DIN, JIS, etc.) are used to manufacture process equipment.

They have the following three items to be solved:

i. Training and qualification of welders
ii. Final inspection test and issue of certificate for products by public institutions
iii. Developing a special technical level, e.g., processing of higher grade steel plates which are used for high and low temperature high pressure vessels, and tanks including dangerous articles and corrosive gas

Process equipment manufacturing companies are at a relatively higher technical level relative to other manufacturing companies in Indonesia.

(8) Diesel engines

Six diesel engine manufacturing companies were surveyed. Some of the companies have formed joint ventures with foreign companies while the remaining ones receive technical tie-ups from foreign companies. Diesel engines can not be manufactured only by Indonesian companies, because it is difficult for them to process raw materials, and machine and assemble components and parts for diesel engines. These companies assemble components and parts using imported parts because they can not procure them from local linkage-type industries.

The use of domestically manufactured components and parts for diesel engines will become compulsory in this industry according to the deletion program. These companies are in the stage of planning the procurement of domestically manufactured components and parts, and manufacturing components and parts for diesel engines. More specifically, these companies make preparations for tools and jigs in their factories, and they lend tools, jigs, surface plates, etc., to their subcontractors and extend technical assistance service. Some companies have begun to domestically manufacture casting products such as cylinder heads, piston rings and so on.

The most important task of the deletion program is to improve the technical levels in such field as casting, forging and heat treatment.
Assembly-type industries should give subcontractors the technical supports on casting, forging and heat treatment technologies.

The MIDC has succeeded in production of a prototype engine block and is making a great contribution to the promotion of the deletion program.

(9) Other industries

1) Raw materials

P.T. Krakatau Steel; the integrated steel plant firstly built in Indonesia was surveyed. Hot rolled coil and plates (maximum thickness: 28 mm) are produced using a hot strip mill, and angles and channels are produced using a section mill.

Since demand for thin steel plates and cold thin plates will increase in Indonesia, the production facilities should be expanded to cope with the increasing demand. Customers point out the importance of delivery time and quality assurance of these products.

2) Structural steel and steel bar

Riding on the crest of the building boom in the big cities, demand for structural steel for buildings and supporting structures for process equipment, and reinforcing bars is considerably increased. P.T. Krakatau Steel does not produce rolled H beams, and structural steel manufacturers produce and market built-up H beams.

Domestically produced structural steel and reinforcing bars should be used according to the deletion program. However some contractors pay the import tax and use imported products, because demand can not catch up with the production.

The shortage of qualified welders and inspectors has become a technical problem.

3) Military products

P.T. PINDAD (Persero) has a higher technical level and plans to expand facilities that are conventionally provided in Indonesia, e.g., forging, plating, and wastewater treatment facilities. They will produce products using these facilities in the near future. This company has a high enough technical level to meet the requirements of the metalworking industry.

5.4.2 Linkage-type industry

The linkage-type industries which were surveyed are divided into six categories and technical comments are summarized according to the four items as mentioned below.

i. Maintenance of facilities and equipment
ii. Quality control of raw materials and scrap materials
iii. Management of manufacturing process
iv. Inspection of parts prior to their delivery

(1) Casting

Five casting manufacturers of cast iron parts, two aluminum casting manufacturers and two brass casting manufacturers were surveyed. These manufacturers are located in the Tegal and Ceper areas.

The five manufacturers of cast iron parts mainly use cupolas as a melting facility. Imported cupolas are purchased at first and

domestically produced cupolas are purchased next in their own factories.

Cupolas are maintained in a relatively good condition. Most of the above nine companies do not have molding facilities, and use the floor type molding. The strength, permeability and moisture of molding sand are not actually measured. The quality of scrap materials and sub-materials which are melted by cupola is not controlled, and control of chemical compositions analysis of cast iron is not conducted during the melting process. Therefore, the quality of products casted is not assured. Control of shapes of cast products is made only by visual inspection, and analysis of chemical composition and internal defects are not confirmed. The nine manufacturers seem to have a lower recognition of quality control. The aluminum and brass casting manufacturers produce products using the crucible furnace and floor molding system. The products are commercially marketed directly. The value of the products is created through the experience and knowledge of the skilled workers. The assembly-type industries produce cast iron parts by using their own casting facilities (e.g., high or low frequency induction furnaces), and automatic molding line. Some assembly-type industries conduct analyses of chemical composition, control of temperature of melted iron and molding sand, and use shot blasting machines. Some of them carry out visual and surface inspection. These industries have a higher consideration of quality control and inspection.

(2) Forging and heat treatment

Companies engaged in forging and heat treatment service were not surveyed. The technologies related to forging and heat treatment should be introduced into Indonesia, because these technologies will play an important role in producing such forged materials as machinery parts. One traditional blacksmith implements was surveyed. Some of the assembly-type companies recognize the importance of forging and heat treatment, and plan to introduce forging and heat treatment facilities.

(3) Sheetworking and welding

Three sheetworking and welding companies were surveyed and these companies manufacture cover plates, and exhaust pipes for agricultural machines.
These companies purchase steel plates, cut using gas cutting machines or shearing machines, bend and form using presses, and assemble, weld and perform finishing work relying on the experience of their skilled workers. They do not use drawings or welding procedure sheets necessary for quality control.
Components and parts manufactured in these companies do not require very high accuracy or strength. A technical problem is that non-destructive inspection of welded portions is not performed although the majority of these portions are manually welded, and skilled workers conduct visual inspection only.

(4) Plating

Several linkage-type plating companies are surveyed. These companies do not control plating solutions and conditions of plating, and conduct plating work according to the perception and experience of skilled workers. Some of the assembly-type companies recognize the importance of the plating process for components and parts for machines, and plan to introduce several kinds of plating facilities including wastewater treatment facilities.

(5) Presswork

One pressworking company was surveyed and this company delivers automotive and motorcycle parts formed with presses to assembly-type companies. The control of applicable standards, drawings and products is sufficiently made, because customers' requirements are very severe. Dies for press forming are produced by this company in accordance with drawings furnished by customers. The accuracy and life of such dies and accuracy of products are unknown. This company has a higher recognition of

quality control and inspection as evidenced by the fact that the defect rate is in the range of 5 to 8 percent. This company satisfies its customers' severe requirements. Since only one pressworking company was surveyed, the above would not be necessarily representative of the present conditions in this industry.

(6) Machining and machine assembly

Seven machining and assembly companies were surveyed, and these companies use lathes, radial boring machines, milling machines, planers, etc. However, they do not use special purpose machines and NC machine tools.

Most of the machines in use have deteriorated and, are not sufficiently maintained. Therefore, the accuracy of machined parts and productivity seem to be poor. Raw materials that are machined are mostly casting products. However, most of the seven companies do not perform acceptance inspection of these casting parts. Casting manufacturers deliver their products without any surface treatment (e.g., using shot blasting machines) and without removing burrs, or correcting such defects as blow holes, shrinkage, and the like. Machining companies do not inspect casting parts prior to their machining. Dimensional measurement of machine products is done during the manufacturing process. Machining companies check whether or not machined products are manufactured according to drawings furnished by customers. However, such companies do not perform the inspection of surface roughness and internal defects by using testing equipment.

CHAPTER 6

PRESENT CONDITION OF SIMILAR RELATED INSTITUTIONS

CHAPTER 6 PRESENT CONDITION OF SIMILAR RELATED INSTITUTIONS

6.1 Outline of Technical Assistance Service

Technical assistance institutions for the metalworking industry are broadly divided into the following three groups:

(1) Industrial Research and Development Institutes and Industrial Research and Development Laboratories under the BPPI of MOI. (Refer to Table 6.1-1)

(2) Common service facilities located within a mini industrial estate under the control of Directorate General of Small Industries of MOI. (Refer to 6.1-2)

(3) Technical assistance institutions other than those of MOI

Bandung Institute of Technology (ITB)
Surabaya Institute of Technology (ITS)
Indonesian Institute of Science (LIPI)
National Aviation and Aerospace Institute (LAPAN)
National Atomic Agency (BATAN)
Agency for the Assessment and Application of Technology (BPDT)

These technical assistance institutions play an important role in implementing the deletion program in various fields. However, there is a shortage of technical assistance extended for medium and small industries. To some extent, medium and small industries in Bandung area, where MIDC, B4T and ITB exist and in area where common service facilities are located, make use of the service of such institutions, while in any other area they do not really utilize those institutions. Two out of nine Industrial Research and Development Laboratories are equipped with laboratory equipment for metalworkig, which are not sufficiently able to extend technical assistance services in metalworking industries. The remaining laboratories are engaged mainly in technical assistance services in the field of food processing and chemical analysis. Activities of common service facilities are not sufficient in rendering technical services and only available in limited areas in Idonesia. Especially in Jakarta and Surabaya, governmental technical assistance institutions are limited, in spite of numerous metalworking industries.

As for the characteristics of technical assistance service provided by each institution, MIDC makes a great contribution to the promotion of the deletion program. It employs foreign engineers, it has manufacturing equipment for actual products and it is mostly engaged in carrying out research related to technology for manufacturing products. In the common service facility in Tegal under the control of the Directorate General of Small Industries of MOI, the operation of a casting shop and presswork shop is active.

Table 6.1-1 Institutes and Laboratories under the Jurisdiction of BPPI, MOI

Institutes and laboratories	Location
(1) Central Research and Development Institutes (9 institutions by sector)	
1) Chemical Industry Development Institute	Jakarta
2) Agroindustry Development Institute	Bogor
3) Metal Industries Development Center (MIDC)	Bandung
4) Textile Industry Development Institute	Bandung
5) Paper & Pulp Industry Development Institute	Bandung
6) Institute for Research and Development of Industrial Materials and Technical Products	Bandung*
7) Ceramics Industry Development Institute	Bandung
8) Leather & Plastics Industry Development Institute	Yogyakarta
9) Handicrafts and Batik Industry Development Institute	Yogyakarta
(2) Industrial Research Laboratories (9 research laboratories by area)	
1) Industrial Research Laboratory, Banda Aceh	Sumatera
2) Industrial Research Laboratory, Medan	Sumatera
3) Industrial Research Laboratory, Palembang	Sumatera
4) Industrial Research Laboratory, Semarang	Jawa
5) Industrial Research Laboratory, Surabaya	Jawa*
6) Industrial Research Laboratory, Banjar Braru	Kalimantan
7) Industrial Research Laboratory, Ujung Pandang	Sulawesi
8) Industrial Research Laboratory, Manado	Sulawesi
9) Industrial Research Laboratory, Ambon	Ambon

* Institutions relevant to the machine and metalworking industries.

Table 6.1-2 Progress of Mini Industrial Estate Development Program (1980-81)

Candidate site	Type of industry	Progress	
		Common service facility	Construction site for factory
1. Medan	Metalwork and woodwork		o
2. Padan	Metalwork	Δ	-
3. Bandung	Leather and electric	Δ	-
4. Tasikmalaya	Handicraft	Δ	-
5. Indramayu	-	-	-
6. Tegal	Metalwork	o	o
7. Semarang	-	o	o
8. Cilacap	-		o
9. Yogyakarta	Handicraft	o	o
10. Magetan	Leather	o	o
11. Sidoarjo	-	o	o
12. Denpasar	Handicraft	o	-

Note: It is not known whether the common service facility unique to the mini industrial estate has been provided, because Medan and Cilacap are part of a large industrial estate.

Δ = Completion of land acquisition for the common service facility
o = Completion

Source: ECFA, Preliminary Study Report for Small-scale Industries Development in Indonesia, 1982

6.2 Technical Service Function of Similar Existing Institutions

6.2.1 Similar Institutions Visited

The function and condition of the facilities are described for each of 16 laboratories for the metalworking industry out of 23 similar related institutions visited through this study.

(1) Laboratories visited

a. West Jawa area

1 B4T

2 MIDC

3 ITB

b. JABOTABEK area

4 CEVEST

5 KIM-LIPI

6 LUK

7 R & D Center for Metallurgy LIPI

8 P.T. BKI (Persero)

9 Sucofindo (Persero)

c. Central Jawa area

10 UPT Logam of LIK (Tegal)

11 UPT (Ceper)

12 Faculty Engineering Gadjah Mada University

d. East Jawa area

13 Balai Penelitian dan Pengambangan Industri (Surabaya)

14 ITS

e. Sumatera area

15 PTKI (Medan)

16 Balai Penelitian Logam Medan

(2) Fig. 6.2-1 shows the locations and the functions of similar related institutions visited.

(3) The functions of institutions surveyed are described below and summarized in Table 6.2-1.

① B4T

Function

1) Testing and inspection

(i) All kinds of material tests (strength, non-destructive, corrosion, microstructure, chemical and physical properties) and calibration of measuring equipment are conducted.

(ii) Standards applied, specifications and materials for test pieces are supplied by each customer. The B4T machines the test pieces, then conducts tests. As a result, the B4T judges the acceptance or rejection of such test pieces according to the standards and specifications supplied.

2) Inspection and quality assurance

The B4T conducts mainly non-destructive tests of plant equipment, ships and machinery to certify their quality according to the national regulations, and issues authorized inspection certificates.

Vessels inspected are as follows:

(i) Boilers
(ii) Heat exchangers
(iii) Storage tanks
(iv) Pressure vessels
(v) Miscellaneous

These vessels are inspected in the field.

3) Training of engineers

At the request of some parties, the B4T conducts training according to the need of the interest parties for among others for:

(i) Examiners from some industrial institutes
(ii) Examiners from some companies
(iii) Officials in the field of quality control
(iv) Welding instructors, especially to be employed in the gas oil industry
(v) Non radiation NDT operators, especially also those employed in the gas and oil industry

(vi) Contractors of the concrete industry and building supervisors in concrete technology

(vii) Students from some scientific disciplines in the supplementation of the final stages of their study

4) Corrosion and pollution control

(i) The B4T periodically conducts quality tests of water discharged from P.T. Pupuk Kujang to maintain the quality level of the water.

(ii) The B4T does research on corrosion and corrosion protection of equipment, drainage pipes and piping materials at chemical plants and textile factories.

② Metal Industrial Development Center (MIDC)

Function

The MIDC aims to offer technical assistance mainly to the medium- and small-scale metalworking industries in the following two activities.

1) Research on metal materials and production processes, fabrication of jigs and trial products for medium and small companies, and preparation of industrial standards (SII).

2) Sponsoring of training programs, seminars and exhibitions, and publication of periodicals such as "Metal Indonesia" for dissemination of technologies.

Various activities as described above are performed with Government assistance for the benefit of the medium and small industries, but training and other programs are also made available to the large companies on a contract basis. Facilities include the following workshops, in addition to classrooms and administrative facilities.

(i) Machining workshop

(ii) Casting workshop

(iii) Sheetworking and welding workshop

(iv) Heat treatment workshop

③ Bandung Institute of Technology (ITB)

Organization

Mechanical Dept. of ITB
- --- Design & Construction
- -- Energy Conversion
- -- Production Engineering for Forming and Materials*
- -- Production Engineering for Machining*
- -- Aeronautical Engineering

Function

The two organizations marked with asterisk (*) above have three laboratories which have the following equipment and carry out research activities.

1) Metallurgy laboratory
   - (i) Physical property testing equipment
   - (ii) Training equipment for welding
   - (iii) Presswork equipment
   - (iv) Mechanical property testing equipment
   - (v) Mold sand testing equipment for casting
2) Production Engineering Laboratory for Machining
   The ITB is provided with CNC, NC and EDM machines, and OJT training related to CNC programming, machining, etc., is given to university students.
3) Institute for Research of Measuring Instruments
   This institute has various kinds of calibration equipment for dimensional measurement tools, provides calibration of dimensional measurement tools upon request and issues calibration certificates.

④ Center for Vocational and Extension Service Training (CEVEST)

Function

1) Vocational training courses
   - (i) Machining
   - (ii) Welding
   - (iii) Sheetworking
   - (iv) Automobile
   - (v) Electricity

(vi) Electronics
(vii) Training materials development

2) Major items of technical cooperation received from Japan
(i) Guidance related to preparation of training program and curriculam
(ii) Guidance related to preparation and development of textbooks and training materials
(iii) Guidance on training methodology and teaching practice
(iv) Studies on trade skill certification system

Activity

Seven Japanese experts are dispatched to give guidance as mentioned above, and they actively give training to instructors coming from vocational training centers existing in 153 locations.

⑤ Calibration, Instrumentation and Metrology Laboratory (KIM-LIPI)

Function

This laboratory has the following service functions in the field of instrumentation and metrology.

1) R & D
2) Calibration
3) Instrumentation engineering
4) Technical advice (consultancy)
5) Training
6) Production of prototypes

Facilities

1) Calibration equipment for dial gauge
2) Square roughness meter
3) Laser ray equipment to calibrate squares
4) Three-dimensional measurement
5) Precision inside diameter measurement
6) Miscellaneous

It is the only laboratory that is capable of calibrating measuring equipment.

⑥ Strength of Materials, Components and Structures Laboratory (LUK)

Function

1) The LUK conducts quality tests of prototype machines by dividing the cause of failure in prototype machines into the following four groups.
   (i) Materials
   (ii) Design
   (iii) Manufacturing process
   (iv) Application
2) The LUK conducts the quality tests requested by domestic companies and submits test result reports. Also, the LUK is capable of conducting such tests in accordance with ASTM, JIS, DIN, etc., submitted by the customer.
3) The LUK keeps in constant readiness information on materials, parts and structures, and furnishes technical information service.
4) Training of engineers related to test and quality control

Facilities

1) Micro structure tester
2) Chemical analyzer
3) Mechanical tester (tensile strength, impact test and creep)
4) Non-destructive testing equipment (X-ray and ultrasonic)
5) Testing equipment for prototype machines
   (i) Simulation fatigue testing equipment for airplanes
   (ii) Running fatigue testing equipment for automobiles
   (iii) Tensile strength testing equipment for anchors
   (iv) Polarization analyzer of stress

The LUK functions as a research and testing institution for developing the advanced industry and technology, rather than as a technical assistance institution for medium and small industries.

⑦ R & D Center for Metallurgy (LIPI)

Function

1) The LIPI has a small induction furnace and mold sand test room, but does not make full use of them.
2) This center has a plating shop and experimental blast furnace for pig iron, and is capable of making stress analysis of bridges.
3) This center carries out more academic research compared to MIDC, but promotes the deletion program in areas such as plating etc. that are not performed by MIDC.

⑧ BKI PI

Function

1) Issue of test and inspection certificate
2) Consulting service in shipbuilding
3) Production of prototype products
4) Testing and inspecting services for offshore and transportation equipment, and ships

Facilities

1) Machine tools (for machining test pieces and prototypes)
2) Strength testing equipment (tensile and bending)
3) Torsion testing equipment
4) Impact machines
5) X-ray equipment
6) Ultrasonic equipment
7) Chemical composition analyzer

⑨ P.T. SUCOFINDO

Function

1) Cargo superintendence and inspection service
2) Fumigation and industrial hygiene service
3) Inspection and survey for industrial marine and engineering
4) Analytical laboratory and exploration
5) Agricultural produce and by-product inspection for import and export

6) Mineral and metal analysis
7) Coal analysis
8) Geo-technical
9) Petroleum and petrochemical services
10) Technical consultancy
11) Non-destructive testing service

Activities

1) This state-owned company is the only national inspection agent authorized by the following.
   - MOI
   - Ministry of Commerce
   - BATAN
   - BKK
   - Ministry of Transportation
   - Ministry of Mining and Energy
2) This company is active in chemical composition analysis among similar institutions, and reaches the international level. It also provides considerable actual results in non-destructive testing.

⑩ UPT Logam of LIK Tegal

Function

1) This center has a very old cupola in its casting shop, and uses three kinds of sand molds: green sand, CO_2 sand and cement sand.
2) This center supplies casting products to private machine manufacturers.
3) Some instructors from the MIDC are sent to provide technical assistance related to casting
4) This center's machining shop is provided with a brake press, hydraulic press and grinding lathe, as well as general machines.

(11) Unit Pelayanan Teknis (UPT), Ceper

Function

1) This center has lathes, a radial drilling machine, horizontal boring machine, plano miller, and shot blasting machine. It provides machining services of casting products upon request by local companies.
2) It has machine tools only, but does not have testing and inspection equipment. Therefore, this center acts as an agent of the B4T and the MIDC to issue certificates and test reports of casting products.

(12) Faculty of Engineering, Gadjah Mada University

Function

1) This university has experimental facilities, machining equipment and analyzers.
2) Experimental facilities including an induction melting furnace are new, on the whole.
3) This university is provided with state-of-the-art analyzers such as a spectrochemical analyzer, atomic absorption analyzer, electron microscope and scanning electron microscope.

(13) Balai Penelitian dan Pengambangan Industri (BPPI/Surabaya)

Function

1) The BPPI conducts analyses of industrial water, drinking water, drainage and seawater, and does research on feed for shrimp and lobsters. It does not have sufficient metalworking facilities, and is not active in metalworking.
2) Equipment
   (i) Tensile testing equipment
   (ii) X-ray inspection equipment
   (iii) Ultrasonic testing machine
   (iv) Optical microscope
   (v) Mold sand testing equipment
   (vi) Electroplating equipment

(14) ITS

Function

1) Because this university does not have enough metalworking facilities, its field of research is limited. All of its facilities are used for students' practice related to metalworking.
2) It has tensile strength testing equipment.

(15) PTKI

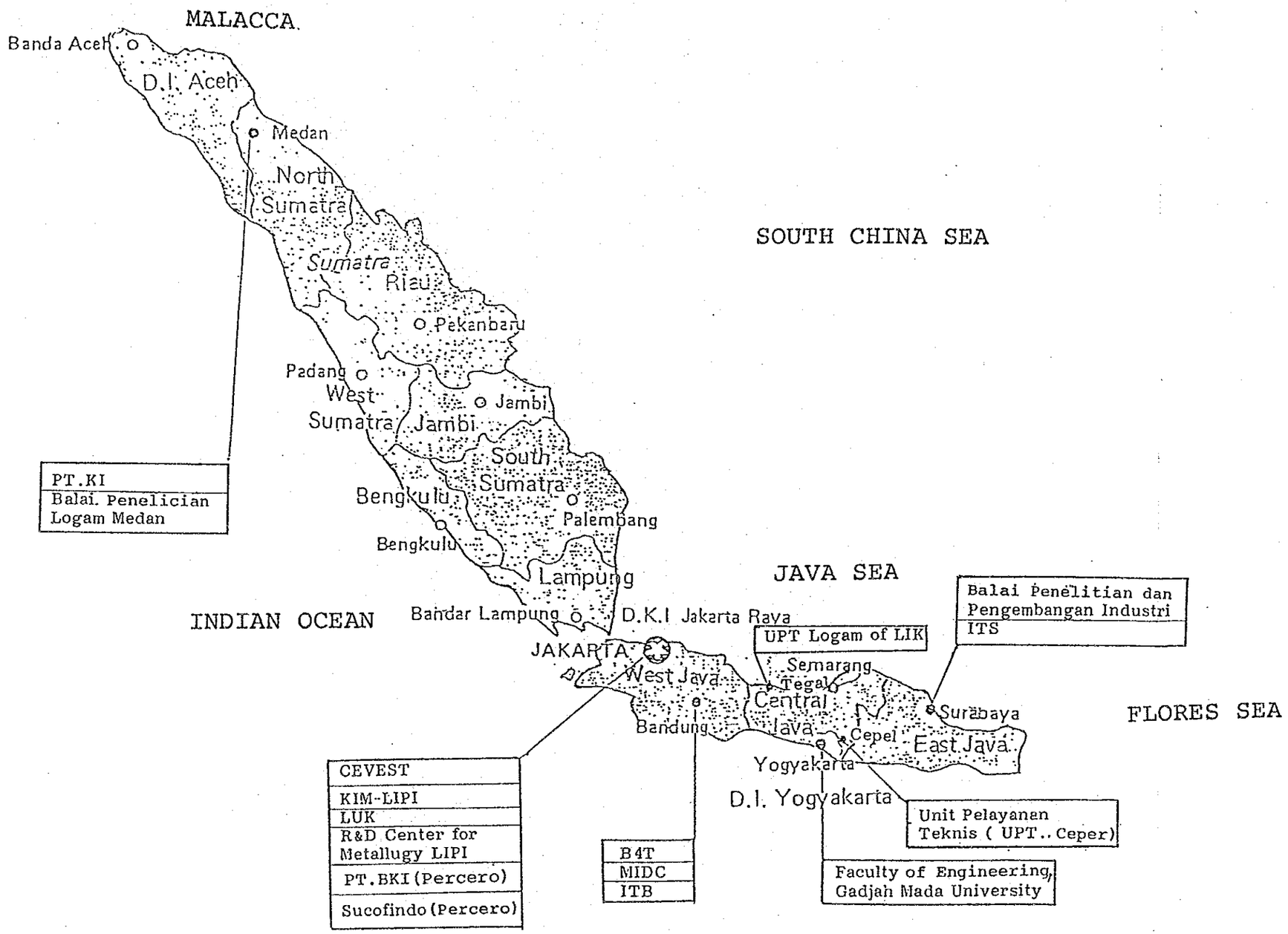
Function

1) The PTKI is engaged in chemical research, and has a maintenance shop.
2) It has mechanical property testing equipment, non-destructive testing equipment and a scanning electron microscope.
3) According to the explanation of the JICA experts, the PTKI has more experimental equipment than Sumatera University.
4) Medium and small companies in Medan will make full use of the PTKI as a center through employment of experts, because the PTKI has the latest equipment.

(16) Balai Penelitian Logam Medan (BPLM)

Function

1) Design and production of prototypes (e.g., agricultural machines, etc.) for medium and small companies.
2) Offering technical assistance services and seminars for medium and small companies
3) Inspection and technical assistance
   (i) The BPLM has a large experimental cupola, molding equipment and testing equipment for molding sand, and conducts training and technical assistance.
   (ii) The BPLM has chemical analyzer and mechanical property testing equipment, and carries out inspections and tests upon request.



Flg.6.2-1 Location of Similar Related Institutions Visited

Table 6.2-1 Functions of Similar Institutions Surveyed (1/2)

Areal Division	Belonging to	No.	Institution	Function
West Jawa	MOI	①	B4T	- Basic tests and inspections of materials - Non-destructive inspection of various plant equipment, ships and machinery - Issue of inspection certificate - Engineers' training
		②	MIDC	- R & D for improvement of metal-working and machining technologies, quality and productivitiy of industrial products - Technical assistance - Training of engineers, supervisors and operators
	University	③	ITB	- Physical property test - Welding practice - Presswork practice - Mechanical property test - Test for casting - Production engineering for machining - Calibration of dimensional measuring tools
JABOTA-BEK	Other Ministries	④	CEVEST	- Training of instructors for vocational training centers in Indonesia under the control of the Ministry of Manpower Affairs
		⑤	KIM-LIPI	Service function in the field of instrumentation and metrology - R & D - Calibration - Instrumentation engineering - Technical advice - Training - Production of prototypes
		⑥	LUK	- Quality test of prototype products - Material test - Keeping in constant readiness for information on materials, parts and structures, and furnishing of technical information service - R & D related to high technology - Engineers' training related to test and quality control
		⑦	R & D Center for Metallurgy(LIPI)	- R & D using experimental blast furnace for pig iron - Stress analysis of bridges - Research of deletion program in the field that is not implemented by MIDC

Table 6.2-1 Functions of Similar Institutions Surveyed (2/2)

Areal Division	Belonging to	No.	Institution	Function
JABOTA-BEK	State-owned	⑧	BKI-PT	- Issue of test and inspection certificate - Consulting service in shipbuilding - Prototype production - Consulting service in freight car
		⑨	Sucofindo	- Chemical composition analysis - Cargo superintendence and inspection of various industrial machines and equipment - Non-destructive test - Issue of analysis and inspection certificate
Central Jawa	MOI	⑩	UPT Logam of LIK Tegal	- Casting experiment - Technical assistance related to casting by instructors sent from MIDC
		⑪	Unit Pelayanan Teknis (UPT), Ceper	- Machining of large casting products - Mechanical property test (Agent of B4T and MIDC to issue certificate and test reports of casting products)
	University	⑫	Faculty of Engineering, Gadjah Mada University	Following are for practice of university students - Machining - Mechanical experiments - Instrumentally chemical analysis
East Jawa	MOI	⑬	Balai Penelitian dan Pengenbangan Indsiri (Surabaya)	- Analyses of industrial water, drinking water, drainage and seawater - Researches on feeds for shrimps and lobsters - Mechanical property test and X-ray inspection
	University	⑭	ITS	- ITS has various testing equipment, but such equipment are used for students' practice
Sumatera	MOI	⑮	PTKI	- Chemical research - Mechanical property test - Non-destructive test
		⑯	Balai Penelitian Logam (Medan)	- Design and production of prototype for medium and small companies - Material test - Various inspection upon request from medium and small companies

6.2.2 Present Condition of Similar Related Institutions by Area

Functions and services of existing similar institutions surveyed are described in (4) of 6.2.1. Nextly similar institutions were divided into five areas of west Jawa, JABOTABEK, central Jawa, east Jawa and Sumatera. A list of machinery and facilities owned by each institution is presented in Table 6.2-2. This table aims to evaluate functions of similar institutions by area. The present condition of similar institutions by area is as follows:

(1) West Jawa/Bandung area

There are the MIDC, B4T under the control of BPPI, MOI and ITB. The MIDC has an experimental shop having casting facilities, presses, sheetwork/welding, presswork, die making and CNC machines, and has a sufficient number of engineers. The MIDC is ahead of the Bandung area in the metalworking industry. The B4T has mainly testing and inspection equipment, and plays a vital role in testing and inspecting in the field of metalworking. These two centers make a great contribution to the promotion of the deletion program. The ITB has enough equipment and staff necessary for a higher grade of research, and plays an important role as a brain center.

(2) West Jawa/JABOTABEK area

There are the R & D Center for Metallurgy and KIM under the control of the Indonesian Institute of Science (LIPI) and LUK under the control of BPPT. However, the purpose of these institutes is to do research on the national and higher level. These institutes do not have research facilities for manufacturing metal products such as casting, forging, presswork, etc., and do not play an important role as technical assistance institutions for the metalworking industry, especially small companies. The CEVEST under the control of the Ministry of Manpower Affairs has presswork, welding and machining facilities. The main purpose of

CEVEST is to give training to staff in vocational training centers belonging to the Ministry of Manpower Affairs, and the CEVEST does not play an important role in promoting the deletion program to the metalworking industry.

(3) Central Jawa/Tegal area

A CSF under the control of the Directorate General of Small Industries of MOI exists in Tegal. A cupola, sheet bending machines, welding machines, presses and machining equipment in the CSF are operated.

(4) Central Jawa/Semarang area

An industrial research laboratory under the control of BPPI, of MOI exists, but does not have enough metalworking research facilities, and it is difficult to extend technical assistance related to metalworking.

(5) Central Jawa/Ceper area

The CSF in Ceper has some machine tools and a shot blast machine, but is not sufficiently equipped.

(6) Central Jawa/Yogyakarta

There is the Gadjah Mada University where sheetwork machines, presses, welding machines, induction melting furnace, various machine tools, non-destructive testing equipment, optical microscope, and so forth, have recently been installed.

(7) West Jawa/Surabaya area

There is an industrial research laboratory and ITS under the control of BPPI of MOI. This laboratory does not have enough metalworking facilities, and can not support the metalworking industry. The ITS has welding machines, non-destructive testing equipment and an optical microscope, but does not have research equipment for metal products such as casting facilities and presses, and can not support the metalworking industry. It is urgently necessary to strengthen the metalworking section in the industrial research laboratory.

(8) West Jawa/Cilegon

There is not research laboratory under the control of MOI or public institutions to provide technical assistance to medium- and small-scale companies. Research laboratory to support such companies should be considered in the future.

(9) Sumatera/Medan

The Medan Industrial Research Laboratory under the control of BPPI of MOI has casting facilities such as a cupola, and sand molding machine. It also has sheetwork/welding machines such as a sheet bending machine and a shearing machine, and machining equipment. This laboratory makes a great contribution to the promotion of the deletion program. Also, there is a chemical research laboratory having welding machines, machining equipment, some types of mechanical testing equipment, an optical microscope, X-ray radiography, X-ray diffraction meter, and so on which are relatively sufficient for the area.

6.2.3 Facilities Owned By Similar Institutions

Facilities owned by similar related institutions visited through the field survey are shown in Table 6.2-2. In this table, machinery and equipment are classified as follows:

- P-1 through P-62 Machine tools and facilities
- T-1 through T-23 Testing apparatus
- I-1 through I-29 Inspection equipment
- M-2 through M-19 Measuring equipment

Table 6.2-2 List of machines and facilities possessed by similar technical assistance institutions (1/8)

No.	Areal Division	West Jawa			Jabotabek						Central Jawa			East Jawa		Sematra	
	Belonging to	MOI		Univ.	Other Ministries					State-owned	MOI		Univ.	MOI	Univ.	MOI	
	Institution Name / Machine and Facility	B4T (Bandung)	MIDC (Bandung)	ITB (Bandung)	CEVEST	KIM-LIPI	Luk	R&D Center for Metallurgy LIPI	DKI PT (Persero)	Sucofindo (Persero)	UPT Logam of LIK Tegal	Unit Pelayaan Teknis (UPT)	Faculty of Eng. Gadjah Mada Univ. (yogyaka)	Dalai Penelition dan Pengembangan Industri (Surabaya)	ITS (Surabaya)	PTKI (Medan)	Balai Penelitian Logam Medan
	Machine Tools and Facilities																
P-1	Engine Lathe	-	o	o	o	o	o	-	o	-	o	o	o	o	-	o	o
P-2	NC Lathe	-	o	o	-	o	-	-	-	-	-	-	-	-	-	o	-
P-3	CNC Lathe	-	o	o	o	o	-	-	-	-	-	-	-	-	-	-	-
P-4	Vertical Lathe	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-	-
P-5	Machining Center	-	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-
P-6	Wood Lathe	-	-	-	-	-	-	-	-	-	o	o	-	-	-	-	-
P-7	Copying Milling Machine	-	o	o	o	-	-	-	-	-	o	-	o	-	-	-	-
P-8	Universal Milling Machine	-	o	o	o	o	-	-	-	-	o	-	o	-	-	-	-
P-9	Horizontal Milling Mechine	-	o	-	-	o	o	-	o	-	o	o	-	o	-	o	o
P-10	Vertical Milling Machine	-	o	-	o	-	-	-	-	-	o	-	-	-	-	-	-
P-11	Turret Milling Machine	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-
P-12	Shaper	-	o	o	o	o	o	-	o	-	o	-	o	o	o	-	o
P-13	Planer	o	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-
P-14	Hobing Machine	-	o	o	o	-	-	-	-	-	-	-	-	-	-	-	-
P-15	Bench Drilling Machine	o	o	o	o	o	o	-	o	-	o	-	o	o	o	o	o
P-16	Radial Drilling Machine	o	o	o	o	o	-	-	-	-	o	o	-	-	-	-	-
P-17	Horizontal Full Broaching Machine	-	-	o	-	-	-	-	-	-	-	-	o	-	-	-	-
P-18	Hack Saw Machine	o	o	o	o	o	o	-	o	-	o	-	-	o	o	o	-
P-19	Vertical Band Saw	-	-	-	-	-	-	-	-	-	o	o	-	-	-	-	-
P-20	Radial Arm Saw	-	-	-	-	-	-	-	-	-	o	o	-	-	-	-	-

Table 6.2-2 List of machines and facilities possessed by similar technical assistance institutions (2/8)

No.	Areal Division	West Jawa			Jabotabek						Central Jawa			East Jawa		Sematra	
	Belonging to	MOI		Univ.	Other Ministries					State-owned	MOI		Univ.	MOI	Univ.	MOI	
	Institution Name / Machine and Facility	DAT (Bandung)	MIDC (Bandung)	ITB (Bandung)	CEVEST	KIM-LIPI	Luk	R&D Center for Metallurgy LIPI	DKI PT (Persero)	Sucofindo (Persero)	UPT Logam of LIK Tegal	Unit Pelayaan Teknis (UPT)	Faculty of Eng. Gadjah Mada Univ. (yogyaka)	Balai Penelition dan Pengembangan Industri (Surabaya)	ITS (Surabaya)	PTKI (Medan)	Balai Penelitian Logam Medan
	Machine Tools and Facilities																
P-21	Universal Grinding Machine	-	o	o	o	o	-	-	-	-	-	o	o	-	-	-	o
P-22	Tool Grinder	o	o	o	o	o	o	-	o	-	o	-	o	o	-	o	o
P-23	Surface Grinder	-	o	-	o	o	o	-	-	-	-	-	-	-	-	-	-
P-24	Cylindrical Grinding Machine	-	o	-	o	-	-	-	-	-	o	-	-	-	-	-	-
P-25	Disc and Belt Sander	o	o	-	-	o	o	-	-	-	o	o	-	-	-	-	-
P-26	Sheet Bending Machine	-	o	o	o	-	-	-	-	-	-	-	o	-	-	-	o
P-27	Sheet Rolling Machine	-	o	o	-	-	-	-	-	-	-	-	o	-	-	-	o
P-28	Shearing Machine	-	o	o	o	-	-	-	-	-	-	-	-	-	-	-	o
P-29	Medium Duty Router	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-
P-30	Threading Machine	-	o	o	o	-	-	-	-	-	o	-	-	-	-	-	-
P-31	Spring Hammer	-	-	o	-	-	-	-	-	-	-	-	o	-	-	-	-
P-32	Pheneumatic Hammer	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-
P-33	Roul Plate	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-
P-34	High Speed Router	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-
P-35	Press Machine	-	o	o	o	-	-	-	-	-	o	-	o	-	-	-	-
P-36	Arc Welding Apparatus	-	o	o	o	o	o	-	o	-	o	-	o	-	o	o	-
P-37	Gas Welding Apparatus	o	o	o	o	o	o	-	o	-	o	-	o	-	o	o	-
P-38	Spot Welding Apparatus	-	o	o	o	-	-	-	-	-	o	-	o	-	-	-	-
P-39	MIG Welding Apparatus	-	o	-	-	-	-	-	-	-	o	-	-	-	-	-	-
P-40	Plasma Welding Mechine	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 6.2-2 List of machines and facilities possessed by similar technical assistance institutions (3/8)

No.	Areal Division	West Jawa			Jabotabek						Central Jawa			East Jawa		Sematra	
	Belonging to	MOI		Univ.	Other Ministries					State-owned	MOI		Univ.	MOI	Univ.	MOI	
	Institution Name / Machine and Facility	BMT (Bandung)	MIDC (Bandung)	ITB (Bandung)	CEVEST	KIM-LIPI	Luk	R&D Center for Metallurgy	BKI PT (Persero)	Sucofindo (Persero)	UPT Logam of LIK Tegal	Unit Pelayaan Teknis (UPT)	Faculty of Eng. Gadjah Mada Univ. (yogyaka)	Balai Penelition dan Pengembangan Industri (Surabaya)	ITS (Surabaya)	PTKI (Medan)	Balai Penelitian Logam Medan
	Machine Tools and Facilities																
P-41	NC Electro Discharge Machine	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-	-
P-42	Small Scale Induction Furnace	-	o	o	-	-	-	o	-	-	-	-	o	-	-	-	-
P-43	High Frequency Induction Furnace	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P-44	Cupola	-	o	o	-	-	-	o	-	-	-	-	-	-	-	-	o
P-45	Rotary Furnace	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P-46	Crucible Furnace	-	o	-	-	-	-	-	-	-	-	-	-	-	o	-	-
P-47	Machine of Wooden Pattern Production	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P-48	Green Sand Moulding Equipment	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	o
P-49	Sand Miller	-	o	o	-	-	-	o	-	-	-	-	o	-	-	-	o
P-50	Quenching/Tempering Furnace	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P-51	Salt Bath	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P-52	Heat Treatment Furnace	-	o	-	-	-	-	-	-	-	o	-	-	-	-	-	-
P-53	Shot Blast Machine	-	o	-	-	-	-	-	-	-	-	o	-	-	-	-	-
P-54	Sand Blast Machine	-	o	-	-	-	-	-	-	-	o	-	-	-	-	-	-
P-55	Electro Plating Equipment	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-
P-56	Precision Lathe	-	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-
P-57	Up right Drilling Machine	-	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-
P-58	N.C. Milling Machine	-	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-
P-59	Slotting Machine	-	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-

Table 6.2-2 List of machines and facilities possessed by similar technical assistance institutions (4/8)

No.	Areal Division / Belonging to / Institution Name / Machine and Facility	West Jawa			Jabotabek						Central Jawa			East Jawa		Sematra	
		MOI		Univ.	Other Ministries					State-owned	MOI		Univ.	MOI	Univ.	MOI	
		B4T (Bandung)	MIDC (Bandung)	ITB (Bandung)	CEVEST	KIM-LIPI	Luk	R&D Center for Metallurgy LIPI	DKI PT (Persero)	Sucofindo (Persero)	UPT Logam of LIK Tegal	Unit Pelayaan Teknis (UPT)	Faculty of Eng. Gadjah Mada Univ. (yogyaka)	Balai Penelition dan Pengembangan Industri (Surabaya)	ITS (Surabaya)	PTKI (Medan)	Balai Penelitian Logam Medan
	Machine Tools and Facilities																
P-60	Cemented carbide Tool Grinder	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-
P-61	Electric Brazing Machine	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-
P-62	Drill Grinder	-	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-

Table 6.2-2 List of machines and facilities possessed by similar technical assistance institutions (5/8)

No.	Areal Division	West Jawa			Jabotabek						Central Jawa			East Jawa		Sematra	
	Belonging to	MOI		Univ.	Other Ministries					State-owned	MOI		Univ.	MOI	Univ.	MOI	
	Institution Name / Machine and Facility	B4T (Bandung)	MIDC (Bandung)	ITB (Bandung)	CEVEST	KIM-LIPI	Luk	R&D Center for Metallurgy LIPI	BKI PT (Persero)	Sucofindo (Persero)	UPT Logam of LIK Tegal	Unit Pelayaan Teknis (UPT)	Faculty of Eng. Gadjah Mada Univ. (yogyaka)	Dalai Penelition dan Pengembangan Industri (Surabaya)	ITS (Surabaya)	PTKI (Medan)	Balai Penelitian Logam Medan
	Testing apparatus																
T-1	Gear Measurement Testing Machine	-	o	o	o	o	o	-	-	-	-	-	-	-	-	-	-
T-2	Universal Tensile Testing Machine	o	o	o	o	o	o	-	o	-	-	-	o	o	-	o	o
T-3	Rockwell Hardness Tester	o	o	o	o	o	o	-	-	-	-	-	o	o	o	o	o
T-4	Brainell Hardness Tester	o	o	o	-	o	o	-	-	-	-	-	o	o	-	o	o
T-5	Vickers Hardness Tester	o	o	o	o	o	o	-	o	-	-	-	o	o	o	o	o
T-6	Micro Hardness Tester	o	o	o	o	o	o	-	-	-	-	-	-	-	-	o	o
T-7	Universal Hardness Tester	o	o	o	-	o	o	-	-	-	-	-	-	-	o	-	o
T-8	Creep Testing Machine	-	-	o	-	o	o	-	-	-	-	-	o	-	-	-	-
T-9	Shore Seleroscope	o	o	o	-	-	o	-	-	-	-	-	o	-	-	o	o
T-10	Impact Testing Machine	o	o	o	o	o	o	-	o	-	-	-	o	o	o	o	o
T-11	Torsion Testing Machine	o	-	o	-	-	o	-	o	-	-	-	o	-	-	-	o
T-12	Patigue Testing Machine	o	-	o	-	-	o	-	-	-	-	-	o	-	o	-	o
T-13	Roundness Tester	-	-	o	o	o	o	-	o	-	-	-	-	-	-	o	-
T-14	Surface Roughness Tester	o	-	o	o	o	o	-	o	-	-	-	-	-	-	o	-
T-15	Heat Treatment Furnace	-	o	o	-	-	-	-	-	-	-	-	o	-	-	-	-
T-16	Magnetic Particle Testing Machine	o	-	-	-	-	o	-	-	-	-	-	-	-	o	-	o
T-17	Ultra-Sonic Non Destruction Tester	o	o	o	o	o	o	-	o	-	-	-	o	o	o	o	-
T-18	Universal Sand Strength Testers	-	-	-	-	-	-	o	-	-	-	-	o	-	-	-	o
T-19	Moisture Teller	-	-	-	-	-	-	o	-	-	-	-	o	-	-	-	o
T-20	Green Sand Hardness Tester	-	-	o	-	-	-	o	-	-	-	-	o	o	-	-	o
T-21	Sand Permeability Tester	-	o	o	-	-	-	o	-	-	-	-	o	o	-	-	o
T-22	Humidity Tester	o	-	o	-	-	o	-	-	-	-	-	-	-	-	-	-
T-23	Gas Corrosion Tester	o	-	o	-	-	o	-	-	-	-	-	-	-	-	-	-

Table 6.2-2 List of machines and facilities possessed by similar technical assistance institutions (6/8)

No.	Areal Division	West Jawa			Jabotabek						Central Jawa			East Jawa		Sematra	
	Belonging to	MOI		Univ.	Other Ministries					State-owned	MOI		Univ.	MOI	Univ.	MOI	
	Institution Name / Machine and Facility	B4T (Bandung)	MIDC (Bandung)	ITB (Bandung)	CEVEST	KIM-LIPI	Luk	R&D Center for Metallurgy LIPI	BKI PT (Persero)	Sucofindo (Persero)	UPT Logam of LIK Tegal	Unit Pelayaan Teknis (UPT)	Faculty of Eng. Gadjah Mada Univ. (yogyaka)	Balai Penelition dan Pengembangan Industri (Surabaya)	ITS (Surabaya)	PTKI (Medan)	Balai Penelitian Logam Medan
.	Inspection equipment																
I-1	Projector	o	o	o	o	o	o	-	-	-	-	-	o	-	-	o	o
I-2	Profile Projector	o	o	o	o	o	o	-	-	-	-	-	o	-	-	o	o
I-3	Hetallographical Microscope	o	o	o	-	-	o	-	-	-	-	-	o	o	o	o	o
I-4	Magnaflux	-	-	o	-	-	-	-	-	-	-	-	o	-	-	-	-
I-5	Temperature Controller Induction Furnace	-	-	o	-	-	-	-	-	-	-	-	o	-	-	-	-
I-6	Pyrometer	-	-	o	-	-	-	-	-	-	-	-	o	-	-	-	-
I-7	Electro Furnace	o	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I-8	X-Ray Radiography Unit	o	o	o	o	o	-	-	o	-	-	-	o	o	o	o	-
I-9	X-Ray Diffraction Unit	o	o	o	o	o	-	-	o	-	-	-	-	o	o	o	-
I-10	Carbon Determinator	o	o	o	-	o	o	-	o	-	-	-	o	-	-	-	o
I-11	Sulpher Determinator	o	o	o	-	o	o	-	o	-	-	-	o	-	-	-	o
I-12	X-Y Recorder	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I-13	Calibration Manometer	o	o	o	-	-	-	-	-	-	-	-	-	-	-	-	-
I-14	Stereo Microscope	o	o	o	-	o	o	-	-	-	-	-	o	-	-	-	o
I-15	Metallurgical Microscope	o	o	o	o	o	o	-	-		-	-	o	-	-	o	o
I-16	Box Furnace	o	-	o	-	-	o	-	-	-	-	-	o	-	-	-	-
I-17	Potensiostad and Electrod	o	-	o	-	-	o	-	-	-	-	-	-	-	-	-	-
I-18	Salt Spray	o	-	o	-	-	o	-	-	-	-	-	-	-	-	-	-
I-19	Electrodeposit Analyser	o	-	o	-	-	o	-	-	-	-	-	o	-	-	-	-
I-20	Flame Photometer	o	-	o	-	o	o	-	-	-	-	-	-	-	-	-	-

Table 6.2-2 List of machines and facilities possessed by similar technical assistance institutions (7/8)

No.	Areal Division	West Jawa			Jabotabek						Central Jawa			East Jawa		Sematra	
	Belonging to	MOI		Univ.	Other Ministries					State-owned	MOI		Univ.	MOI	Univ.	MOI	
	Institution Name / Machine and Facility	BAT (Bandung)	MIDC (Bandung)	ITB (Bandung)	CEVEST	KIM-LIPI	Luk	R&D Center for Metallurgy LIPI	DKI PT (Persero)	Sucofindo (Persero)	UPT Logam of LIK Tegal	Unit Pelayaan Teknis (UPT)	Faculty of Eng. Gadjah Mada Univ. (yogyaka)	Balai Penelition dan Pengembangan Industri (Surabaya)	ITS (Surabaya)	PPKI (Medan)	Balai Penelitian Logam Medan
I-21	Spectrophotometer	o	-	o	o	o	o	-	-	o	o	-	-	-	-	-	-
I-22	Netrogen Determinator	o	-	-	-	o	o	-	o	o	-	-	-	-	-	-	-
I-23	Emission Spectrometer	o	-	-	-	o	o	-	o	o	-	-	-	-	-	-	-
I-24	Infra Red Spectrometer	o	-	o	-	o	o	-	o	o	-	-	-	-	-	-	-
I-25	Gas Chromatography	o	-	-	-	o	o	-	o	o	-	-	-	-	-	-	-
I-26	Chemical Determinator	-	o	o	-	o	o	-	o	o	-	-	-	-	-	-	-
I-27	Weather Meter	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-
I-28	SEM (Scaning Micro Analyzer)	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-
I-29	Dye Peneterant Tester	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 6.2-2 List of machines and facilities possessed by similar technical assistance institutions (8/8)

No.	Areal Division	West Jawa			Jabotabek						Central Jawa			East Jawa		Sematra	
	Belonging to	MOI		Univ.	Other Ministries					State-owned	MOI		Univ.	MOI	Univ.	MOI	
	Institution Name / Machine and Facility	BAT (Bandung)	MIDC (Bandung)	ITB (Bandung)	CEVEST	KIM-LIPI	Luk	R&D Center for Metallurgy LIPI	DKI PT (Persero)	Sucofindo (Persero)	UPT Logam of LIK Tegal	Unit Pelayaan Teknis (UPT)	Faculty of Eng. Gadjah Mada Univ. (yogyaka)	Balai Penelition dan Pengembangan Industri (Surabaya)	ITS (Surabaya)	PTKI (Medan)	Balai Penelitian Logam Medan
	Measuring equipment																
M-1	Outside Micrometer	o	o	o	o	o	o	-	o	*	o	-	-	o	-	o	o
M-2	Inside Micrometer	o	o	o	o	o	o	-	o	*	o	-	-	o	-	o	o
M-3	Measuring Microscope	o	o	o	o	o	o	-	o	*	o	-	-	o	-	o	o
M-4	Set of Slip Gauges	o	o	o	o	o	o	-	o	*	o	-	-	-	-	-	-
M-5	Vernier Height Gauges	o	o	o	o	o	o	-	o	*	o	-	-	o	-	o	o
M-6	Vernier Caliper	o	o	o	o	o	o	-	o	*	o	-	-	o	-	o	o
M-7	Screw Meter	o	o	o	o	o	o	-	o	*	o	-	-	-	-	o	o
M-8	Dial Comparator	o	o	o	o	o	o	-	o	*	-	-	-	-	-	-	-
M-9	Lathe Tool Dynamometer	-	o	o	o	o	o	-	o	*	-	-	o	-	-	-	-
M-10	Twist Drill Dynamometer	-	o	o	o	o	o	-	o	*	-	-	o	-	-	-	-
M-11	Tool Tip Template	-	o	o	o	o	o	-	o	*	-	-	-	-	-	-	-
M-12	Set of Slip Gauge for Calibrating	-	o	o	o	o	o	-	o	*	-	-	-	-	-	-	-
M-13	Sprit Level	-	o	o	o	o	o	-	o	*	-	-	-	-	-	-	-
M-14	Sin Bar	o	o	o	o	o	o	-	o	*	-	-	-	-	-	-	-
M-15	Set of Six Adjustable Limit Calipers	-	o	o	o	o	o	-	o	*	-	-	-	-	-	-	-
M-16	Three Dimension Coordinate Measuring Machine	-	o	o	o	o	o	-	o	*	-	-	-	-	-	-	-
M-17	Multi Combination Meter	o	-	o	-	-	o	-	-	*	-	-	-	-	-	-	-
M-18	Calibration Equipment of Dial Gauge	-	-	o	-	o	o	-	-	*	-	-	-	-	-	-	-
M-19	Calibration Equipment of Square	-	-	o	-	o	o	-	-	*	-	-	-	-	-	-	-

(* not confirmed)

6.2.4 Functional Limit of Existing Similar Institutions

Though there are many institutions and research laboratories to support the metalworking industry, as reviewed in 6.2.1 through 6.2.3, they have the following functional limitations.

(1) Major institutions and research laboratories concentrate in the Bandung area, and are not sufficiently able to provide technical service in such a way to meet requirements of local companies on a nationwide basis. Similar existing institutions in provinces do not have sufficient facilities to meet local companies' requirements.

(2) An important task of the metalworking industry in Indonesia is to improve quality of casting products. The MIDC is engaged in R & D of manufacturing and product technologies of metalworking, and carries out transfer of technology to small and medium metalworking companies. However, due to limited manpower and budget, it is not able for MIDC to carry out transfer of technology to all small companies. Further establishment of research laboratories having advanced capabilities, in particular within the field of metalworking, is required. Introduction of steel casting and forging technology is indispensable to promote the deletion program, which in turn could further develop Indonesia's manufacturing capabilities.

(3) Precision machining and precision pressworking technologies within metalworking industries in Indonesia are not yet sufficiently developed, and the existing similar institutions do not have sufficient facilities for technological development in this field. They should have facilities for machining and inspecting high accuracy screws and gears.

(4) Existing similar institutions do not have inspection equipment and instruments for overall judgement of operating performance of metalworking products.

(5) Most of the institutions surveyed do not have facilities for forging, heat treatment, plating and precision machining. Therefore it is difficult for institutions to help industries accomplish the deletion program without having such facilities.

(6) Facilities' capacity of the existing similar institutions are not sufficient for quick inspection service required by the assembly-type companies.

6.3 Organization and Management of the Existing Technical Assistance Institutions

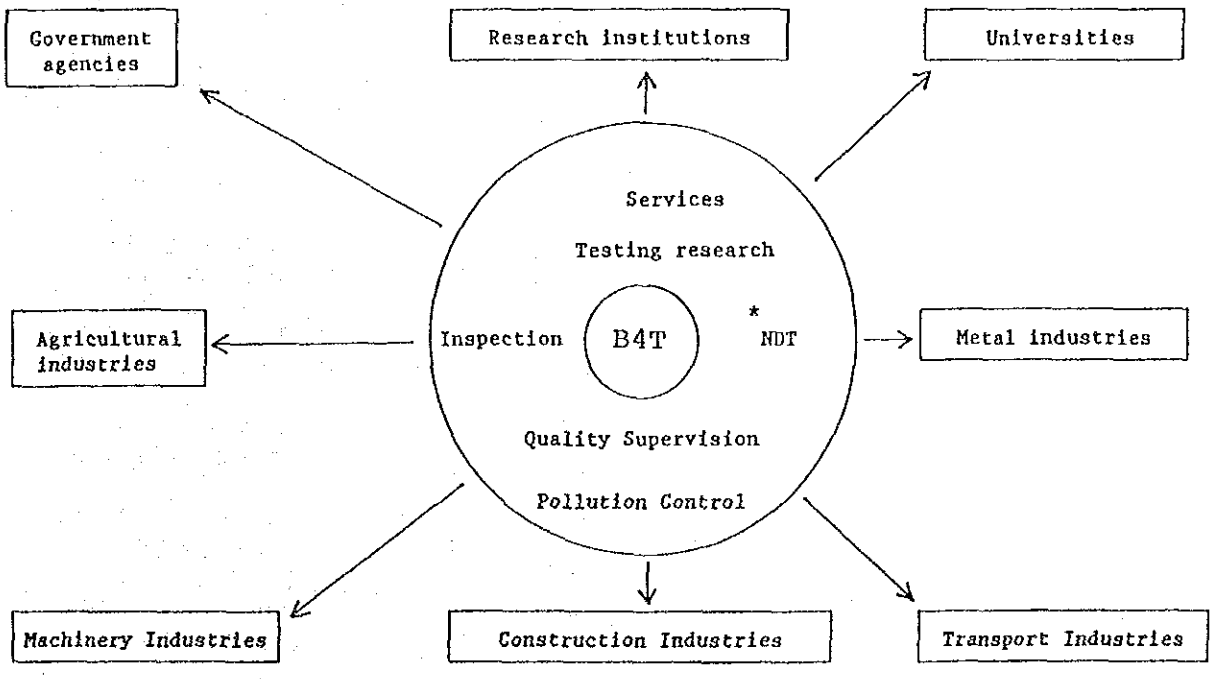
The study has been conducted on the organizational structures and management systems of 6 central research and development institutes belonging to the BPPI. The institutes are:

- Institute for Research and Development of Industrial Materials and technical products (B4T, Bandung)
- Metal Industries Development Center (MIDC, Bandung)
- Chemical Industry Development Institute (IRDCI, Jakarta)
- Ceramics Industry Development Institute (CRDI, Bandung)
- Textile Industry Development Institute (IRDTI, Bandung)
- Paper and Pulp Industry Development Institute (IRDCLI, Bandung)

6.3.1 Organization and management of B4T

(1) Function

B4T provides technical services to industries which manufacture, especially, plant equipment and automotive components, and provides conditioned based maintenance to process industries.
The services include: (i) testing, (ii) inspection, (iii) certification, (iv) calibration, and (v) training.
The major activities of B4T are summarized as follows:



* Non destructive testing

(2) Organization and personnel structure

1) The organization of B4T is described in Fig. 6.3-1.

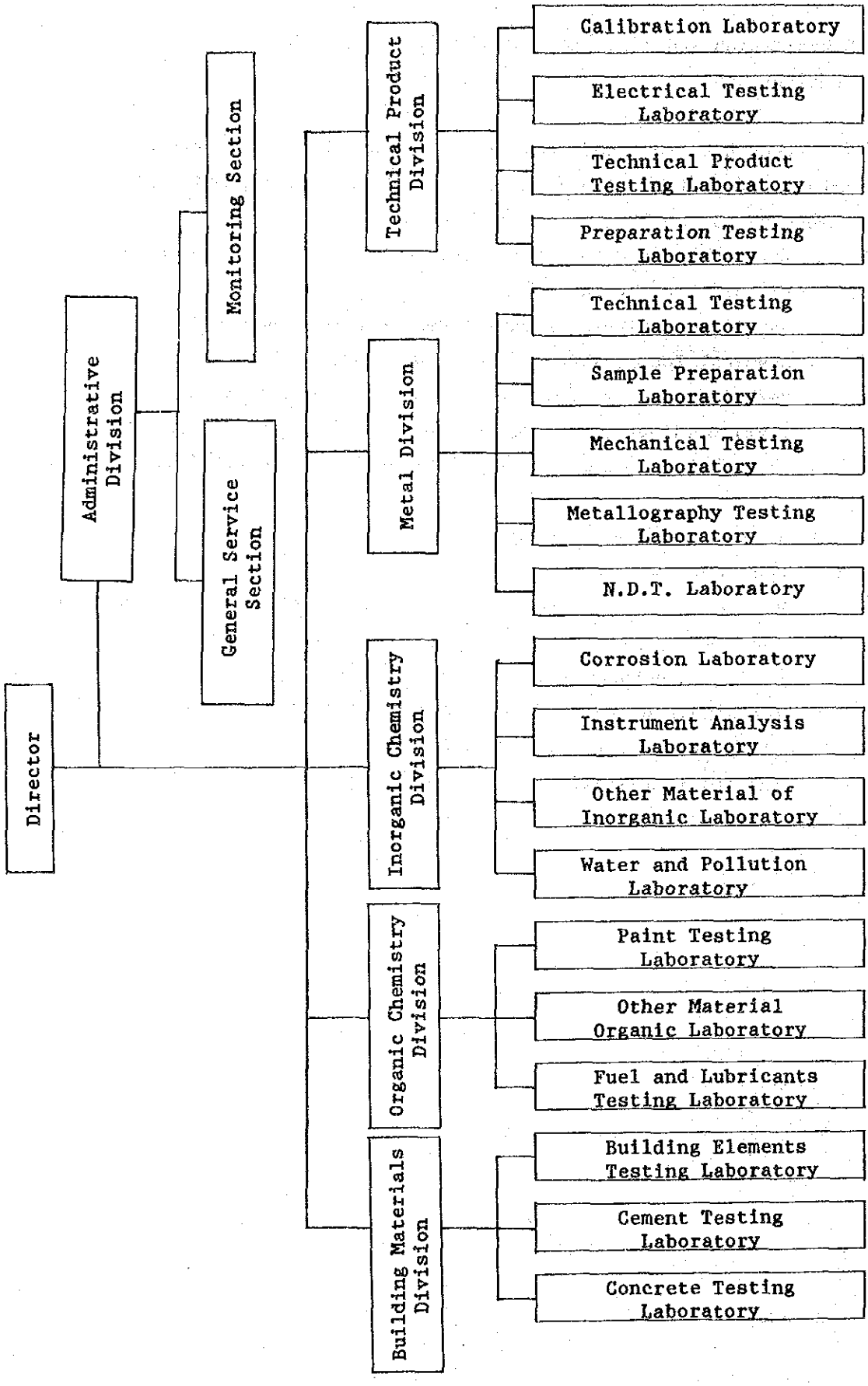


Fig. 6.3-1 Structure and Organization of B4T

2) B4T consists of 6 departments under the control of the Director. Its personnel structure in 1988 is as follows:

	Persons	Percentage	Engineers with more than 3 years' experience
(i) graduates of 5 year universities (S1)	22	(9)	(18)
(ii) graduates of 3 year universities (D3)	28	(12)	(28)
(iii) graduates of senior high school	114	(49)	(38)
(iv) others	68	(30)	
total	232	(84)	

3) The individual function of each position is as follows:

(i) The Director:
- To make decisions on short term and long term programs
- To manage the personnel and their activities
- To evaluate the activities

(ii) The Head of the Division:
- To develop the short term and long term programs
- To coordinate the personnel and their activities
- To make periodical reports

(iii) The Head of the Laboratory:
- To develop specific activities
- To actuate personnel
- To prepare concepts of the reports

(iv) The Operators:
- To carry out routine testing
- To maintain the equipment
- To record test results

(3) Salaries, fringe benefits, compensation

1) Salaries:

Basically, the salary system is divided into the following four groups.

(i) Grade I (min. education: Elementary) Rp. 33,200 - Rp. 100,200/month

(ii) Grade II (min. education: Senior High School) Rp. 55,200 - Rp. 157,000/month

(iii) Grade III (min. education: Academic) Rp. 81.000 - Rp. 200,200/month

(iv) Grade IV (min. education: Academic + Experience) Rp. 93,200 - Rp. 265,600/month

2) Fringe benefits:

Wife/husband; 5% of salary

Each child ; 2+1/2% of salary, max. 3 children

3) Compensation:

(i) Functional compensation (Rp. 18,500 - Rp. 69,000)

(ii) Incentive (Rp. 10,000 - Rp. 50,000)

(4) Budget and operation cost

The operation budget, provided by the government, consists of routine budget and project budget.

The budget of the recent two years is as follows:

(Unit: Rp. 1,000)

	1986/87	1987/88
Routine budget	410,250	426,950
closing	435,575	497,085
Project budget	141,383	39,339
closing	141,383	39,339
Total budget	551,633	466,289
closing	576,958	536,424

While the routine budget in 1987/88 increased by 14% against the previous year, the project budget in 1987/88 decreased by 70% against the previous year.

The contents of the routine budget are divided into salary and operation cost. The details of the routine budget are as follows:

(Unit: Rp. 1,000)
(Closing basis)

	1986/87	1987/88
Salary	286,876	295,935
Operation cost	148,700	201,150

The salary amount in 1987/88 increased by about 3% against the previous year.

The details of the project budget are as follows:

(Unit: Rp. 1,000)

	1986/87	1987/88
Honoraria	89,368	9,180
Operation cost	52,015	30,159

Since B4T is a governmental institute, the service revenue from industries is remitted to the national treasury. The details of such revenues on a closing basis are as follows:

(Unit: Rp. 1,000)

	1986/87	1987/88
Honoraria	86,331	78,613
Operation cost	114,901	196,576
Total	201,232	275,189