

the process oils appropriate for the various kinds of synthetic rubber and diethyl-glycol (DEG) for rubber soles begin as soon as possible. Although details are not yet known, it is said that a carbon black plant is currently under construction in Indonesia.

Real import substitution for sub materials should be a main goal to be achieved in the near future.

4) Establishment of Quality Standards for Sub Materials

As stated previously, most manufacturers were found to be using imported sub materials. Domestically made sub materials such as sulphur, clay and calcium carbonate were seen in use in only a few of the factories visited during the field survey. However, according to the site inspection during the field survey, these sub materials were found to be of relatively inferior quality.

For example, the sulphur powder was not fine enough and not even in consistency and had to be put through a sieve. A reason for the relatively inferior quality might be the delay in the establishment of a system of quality standards for sub materials. Currently, there are very few industrial quality standards for sub materials and to facilitate quality improvement, the earliest possible establishment of SII is highly recommended.

Some examples of the industrial quality standards for sub materials in SII are shown in Table 3-6-11.

Table 3-6-11: Examples of Sub Materials in SII

Item	Code Number
Zinc Oxide	SII. 0345 - 80
Stearic Acid	SII. 0851 - 83
Sulphur (for Tires)	SII. 0861 - 83
Plasticizer (DOP)	SII. 0978 - 85
Calcium Carbonate (for plastic)	SII. 1256 - 85
Resin Test Method	SII. 1661 - 85
Carbon Black (ISAF No. 220 Type)	SII. 0860 - 83

Source: Indonesian Industrial Standard Catalogue 1988

5) Research and Development

If new types of natural rubber are to be developed in the near future, new types of sub materials will be required in accordance with the technical progress and development of the new products. Therefore, research and development aimed at new sub materials will be required in the near future.

(3) Technical Development

Recently, rubber products for use in automobile parts, electrical appliance parts, etc., are increasingly required to have highly sophisticated characteristics such as oil resistance, heat resistance and fire resistance. In order to meet these requirements, the technology for

mixing natural rubber with synthetic rubber has become increasingly important. It has become nearly impossible to use only natural rubber in the production of rubber products to be used in sophisticated industrial products such as automobiles.

1) Modified Natural Rubber

As stated in 3.6-(1) Improvement of Raw Materials, improvements in raw materials such as RSS, SIR and latex, along with research and development aimed at new form rubber and new functional rubber, are very important. To succeed in modifying natural rubber it will be necessary for natural rubber producers to make great efforts to gather technical information from abroad through such means as collection of new rubber samples and regular attendance at international symposiums, etc.

Table 3-6-12: Example of Modified Natural Rubber

Kinds	Characteristics
Hevea plus MG	Natural rubber graft copolymerised with methyl methacrylate. High hardness, good mechanical properties and strong flex resistance.
SP Rubber	Coagulation mixture of natural latex and vulcanized latex, good machining quality.
Epoxy natural rubber	Epoxide natural rubber with good oil resistance

Source: Japan Rubber Association

2) Design and Technology of Raw Material Mixing

Most of the rubber product manufacturers visited during the field survey are mixing materials in their own factories. However, only eight companies have the capability to design material mixing and only five companies have evaluation and testing equipment. Fostering of designers for material mixing through the "support systems" to be mentioned in 3.6-(6) is urgently necessary.

Table 3-6-13 shows the desired minimum evaluation/testing equipment to be possessed by rubber-based product manufacturers

Table 3-6-13: Recommended Evaluation/Testing Equipment for the Manufacturers

Testing Equipment	
1	Testing & Mixing Roller Mill
2	Mooney Viscometer
3	Curelastmeter or Rheometer
4	Testing & Moulding Press
5	Cutter etc.
6	Tensile Tester
7	Heat Aging Tester

3) Mixing Technology for Synthetic Rubber

The physical characteristics of rubber such as tensile strength, modulus of elasticity, elongation etc., are influenced by curing (vulcanization) time and the technique of mixing the vulcanization agent and accelerators. The influence of these becomes more complicated when synthetic rubber is mixed with natural rubber.

Demand for natural rubber will increase because of the increase in demand for rubber products such as automobile components, rubber vibration insulators and dock fenders which use relatively large amounts of natural rubber. However, as stated previously, in light of the increasing sophistication required of rubber auto parts or electrical appliance parts, the development of purely synthetic rubber parts is now in progress and, accordingly, ways to add the new types of synthetic rubber to the existing SBR, NBR, CR, EPDM/EPM, FKM, CHC/CHR, etc., are now being developed.

Natural rubbers are not naturally uniform in quality, leading to the different vulcanizing time to be applied in the manufacturing process.

Compared with synthetic rubbers, natural rubbers have relatively well balanced physical characteristics and are superior in solidity and elasticity to synthetic rubbers, in spite of their inferiority in weather resistance, oil resistance and fire resistance. If the market price for natural rubber were to stabilize, demand for natural rubber would be expected to increase in the future.

Some suggestions on how to improve the physical inferiority are shown in Table 3-6-14.

Table 3-6-14: Suggestions for the Improvement of Physical Characteristics of Natural Rubber

Improvement of oil resistance	Utilization of epoxy natural rubber Mixing and dipping of oil or filler into natural rubber
Improvement of weather resistance	Mixing with paraffin and antioxidant
Improvement of flame resistance	Mixing of fire retardant

Table 3-6-15 shows the synthetic rubbers used in Indonesia and the sources of supply.

Table 3-6-15: The Supply Sources and Characteristics of Synthetic Rubbers used in Indonesia

Kinds	Characteristics	Imported from
SBR	General purpose synthetic rubber. Stable vulcanization speed and easy process control .	Taiwan, Korea, Japan, England
NBR	Good oil resistance and good cold resistance	Japan, Canada
CR	Good weather resistance and ozone resistance	Japan
EPDM	Good weather resistance, heat resistance and ozone resistance	Japan
Silicone	Good heat resistance	Japan
IIR	Good chemical stability. Extremely small gas permeability	Canada, U.S.

Source: Field Interview and Survey Questionnaires

Indonesian rubber product manufacturers who are currently forced to import most of the synthetic rubber they use should consider using as much domestic natural rubber as possible for rubber products by developing the optimum mixing method which requires the least synthetic rubber. At the same time, they should strive to meet the quality requirements for sophisticated products such as auto parts.

In Japan, an optimum mixing method has been established to change the quality of synthetic rubber in response to fluctuations in the price of natural rubber so that the most economical mixing of materials can be attained.

At present, however, it appears that Indonesian manufacturers are insufficiently financed to satisfy such requirements and it would take a long time to solve this problem. As a result, the "support system" to be mentioned in 3.6-(6) will play an important role in this matter.

4) New Product development

As a result of progress in developing technology related to the mixing method of natural and synthetic rubbers, it will be possible to manufacture new rubber products. In this case, a new rubber product can be defined as:

- [1] A product which has not yet appeared on the world market
- [2] A product which is made by changing existing structures and materials
- [3] A product which is made through new applications of existing conventional technology, etc.

For the development of new rubber products, an integrated system in terms of industrial standards, sales promotion, production, etc., should be established. In Indonesia, rubber product manufacturers obtain information related to new product development through their sales agents or buyers. However, there are not many new product development planners and it appears that most of the managerial staff are not very interested in this area.

It is quite possible, however, that if the "support system" proposed in 3.6-(6) were completed and advice regarding new product development became available to managers, their attitude in this regard might change.

(4) Quality Control

Quality control is considered to be one of the measures required to economically produce a product with a quality level which will meet the requirements of buyers. Based on the requirements of buyers, manufacturers must attempt to produce the most economical product with the lowest cost and the most adequate quality standard, all the while considering which choices are most advantageous in terms of profit. As for methods of quality control, it is considered important to take integrated measures. As a result, quality control today includes measures not only at the manufacturing plant where the product is actually manufactured, but at every level of the enterprise. This method is called total quality control (TQC) and is designed to enhance corporate competitiveness. In other words, TQC is a cooperative movement with participation by all members of a company in the effort to constantly improve the quality of the company's workmanship.

This means that at all stages and in all departments all members work simultaneously to produce good services or good products in a cost-effective, efficient, easy and safe manner.

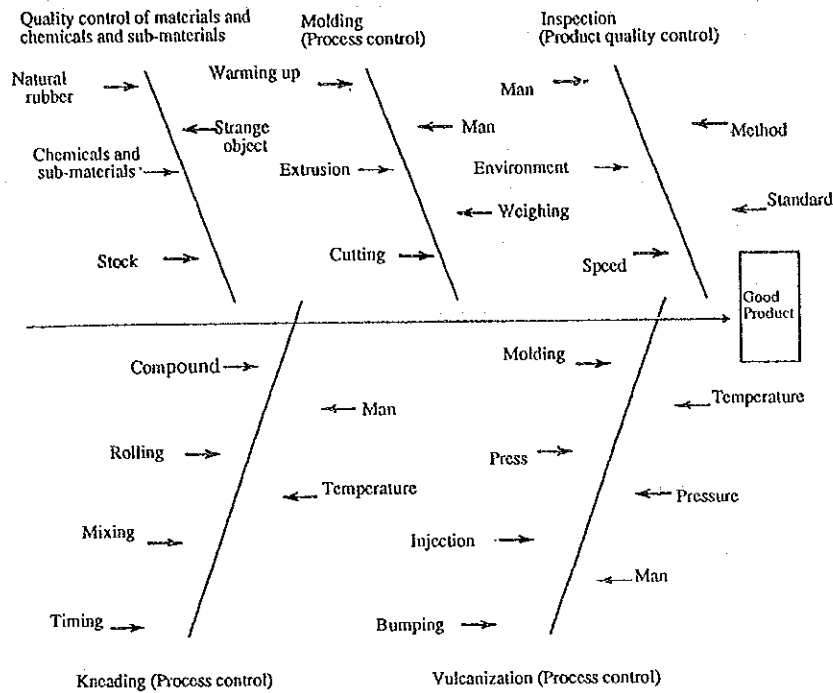
If there are defects in products, they will be related to product quality control. In the case of a cost problem, it will be related to cost control. If there is a problem with sales, it will be resolved by marketing control.

Thus all corporate activities should be targeted separately but the results of the efforts should always be evaluated in terms of an integrated control system. It appears that Indonesian rubber product manufacturers have had little interest in quality control as only one company among those visited during the field survey was conducting QC activities.

In order to fully understand the role of quality control in rubber-based product manufacturing, it is said in Japan that a fishbone chart of factors can be effectively used.

Fig.3-6-6 shows one example of a fishbone chart to be used for quality control.

Fig.3-6-6: Fishbone Chart for Quality Control



1) Quality Control of Raw Materials

The consistent quality of raw materials is most important. If every lot of raw materials is physically and chemically different from the others, the final products produced will be completely different from each other. Moreover, if raw materials are not inspected when they are received, an additional change in manufacturing conditions for molding and vulcanization could become necessary.

Among the companies visited during the field survey, with the exception of six companies belonging to Category I, none had a system for inspecting raw materials at the stage of reception.

2) Quality Control of Chemicals and Sub Materials

The situation with these items is the same as that of raw materials, as mentioned above.

3) Processing Control

To manufacture products with identical quality and to prevent defects, manufacturing process control and standardized actions and operations are required. At the factory where solid rubber is used as a raw material, a Banbury mixer and kneader is utilized to mix the raw materials with chemicals and sub materials. A specific order must be used in the mixing process as must control by electronic calculator.

In the case of mixing with an open roll machine, the order of the mixing process, cutting and time control must be enforced. At the molding stage, the order of the molding process must be followed and measures to prevent defects are required.

Finally, during the vulcanization stage, uniformity of the product quantity to be vulcanized, bumping, stable curing temperature, regulated curing time, etc., are the important factors.

Only six of the companies visited during the field survey were found to satisfy the requirements of the operational standardization mentioned above.

As for latex products, during the production process, viscosity testing, mechanical stability testing and testing of the rate of cure, etc., should be conducted. It is also necessary to search for functional problems with processing machines by checking the appearance of the final products.

The condom factory, two examination glove factories and one surgical glove factory among those latex product manufacturers visited during the field survey are conducting process control as mentioned above. Other examination glove factories which have stopped operations appear to have had an insufficient knowledge of process control.

4) Quality Control of Final Products

Inspection of final products before delivery should be conducted according either to the requirements of the buyers (appearance, quality, etc.) or to some other criteria to ensure that the products satisfy the standards set by the manufacturer. Testing can be done in the form of total inspection or by random sample. The results of the testing as well as an explanation of problems should be conveyed to the employees in a clear and simple manner through the use of such techniques as posting on a bulletin board. Among the companies visited, only one (Category I) was conducting this type of quality control of final products.

(5) Development of Factory management

1) Securing of Personnel

Most of the rubber product manufacturers visited during the field survey were lacking in the capability to carry out technical development (raw materials, mixing techniques, synthetic rubber mixing techniques, new product development, etc.) and were also lacking in technical personnel who were qualified to conduct quality control.

Mandatory personnel training utilizing the "support system" discussed in 3.6-(6) is highly desirable. A few joint venture companies visited during the field survey are conducting inside training of employees using the so-called OJT system. However, most of the other rubber product manufacturers have no employee training system.

Among the SIR and RSS natural rubber processors, there are many cases where quality control staff are sent to PPMB or other public research institutes for training. In Indonesia, there are clear distinctions between natural rubber producing companies and rubber product manufacturers in terms of their factory management activities.

2) Modernization of Manufacturing Equipment

Except for a few joint venture companies, most rubber product manufacturers produce products which are oriented toward domestic sales. The quality standards required in the domestic market are relatively less severe and the products are often made on order without product stock.

Therefore, the manufacturers do not feel a great need to introduce mass production systems. As a result, they are not particularly keen to make investments for equipment modernization and appear to be satisfied with their relatively obsolete production machinery and equipment.

To become truly export-oriented factories, it is recommended that they establish some integrated production lines which run from kneading through to sheeting and cutting and stocking and which incorporate automated, labor-saving mixing machines. This is because material mixing technology is considered to be extremely important and a manufacturer should make its own mixed rubber without relying on outside mixing factories.

In efforts to modernize equipment, it is recommended that compression molding machines and injection molding machines, both equipped with temperature regulation apparatus, be introduced.

3) Safety and Sanitation Control

In manufacturing rubber products, mechanical power, pressing and heat are constantly used and static electricity is easily generated, producing the danger of electrification for workers. In addition, among the various chemicals and sub materials used, there are some which are harmful to the human body.

In most of the factories visited during the field survey, employees were seen working without safety shoes, safety caps, operating gloves or masks. With the exception of some companies, most of those visited appeared to have little concern for safety or sanitation.

During factory production, worker safety can be maintained if operations are carried out according to a certain operation standard, if tools and machines are well maintained and if the operating environment is kept in good order. As a result of safety and sanitation control in a plant, improved operating effectiveness, a lower rate of absenteeism, higher morale and improved human relations, among other things, can be expected. And these improvements will lead to the overall improvement of productivity and the prevention of industrial accidents.

4) Establishing Efficient Management

To develop new products and manufacture on a continuous basis, the following factors are considered prerequisites.

- [1] Marketing (clients, sales area, sales route)
- [2] Price setting
- [3] The required product quality and functions

- [4] The applicable production technology
- [5] Effective use of working capital, etc.

Except for a few joint venture companies, it appeared that most of the manufacturers visited during the field survey did not meet the above requirements satisfactorily. It is recommended that management capability be developed and that production planning be raised to an adequate level through an education and training system for managers.

5) Introduction of the GMP System

Introduction of the Good Manufacturing Practices (GMP) system as part of TQC efforts is recommended for Indonesian rubber-based product manufacturers. It is highly desirable that this be done as soon as possible.

GMP can be defined as the standards of manufacturing and quality control required in order to supply good quality products. The main goals of the GMP are as follows:

- [1] To operate in a factory which is sufficiently clean to allow for the manufacture of clean products
- [2] To operate precisely according to the rational standards and criteria established
- [3] To use the appropriate equipment for testing the manufacturing method and to perform regular inspections
- [4] To operate every manufacturing process with the goal of avoiding any kind of operational error such as contamination or errors in the mixing of materials and to keep records of each operation
- [5] To adequately test raw materials, sub materials, semi-finished products and final products and to ensure that they are in line with the established standards
- [6] To cope with any claims which occur in an appropriate and quick manner
- [7] To clearly assign responsibility for manufacturing control and quality control

With the adoption of the GMP system, the rubber-based product manufacturers would be able to achieve improvements and to establish efficient factory management.

6) Measures to Avoid Problems in the Community

Rubber-based product manufacturing can cause problems in the community where it is performed. For example, it can be hazardous to the environment by creating air pollution, water pollution, etc. The rubber-based product manufacturers visited during the field survey were mostly small in size and producing on a small scale.

Therefore, at present, there are no serious environmental or social problems related to their production activities. However, in the future, if they intend to expand their production equipment to become export oriented producers, they will be obliged to give careful consideration to measures to avoid creating problems in the community.

(6) Creation of a Support System

1) Personnel Development and the Education System

In Indonesia, only the Agricultural Technology Institute in Bogor has any instruction concerning rubber production. However, even here the courses are not compulsory subjects. Moreover, there are no professors specializing in rubber production. Lecturers invited from BPP Bogor, PTP, PPMB, etc., sometimes give lectures regarding rubber, but they do not perform experimental work. And the installation of testing or experimental equipment appears to be inadequate.

It is recommended that a formal curriculum regarding rubber production and manufacturing be established at the university level, including provisions for experimental research. While rubber and other high polymer material technology should be treated as a formal part of university curricula, it is also recommended that complete courses on manufacturing of rubber-based products including lectures and laboratory work be set up at facilities such as Pendidikan Teknologi Kimia Industri (P.T.K.I.) or the Trade Training Center. P.T.K.I. already has some experience in lecturing and conducting experiments in the field of rubber production and the Trade Training Center is being prepared for inauguration in January 1990.

2) Reorganization and Renovation of Equipment at Public Research Institutes and Cooperation among Them

As mentioned previously, there are several institutes related to rubber in Indonesia such as the BPP Sungai Putih, BPP Bogor (supervised by the Ministry of Agriculture), PPMB (supervised by the Ministry of Trade) and BBKKP Yogyakarta (supervised by the Ministry of Industry). However, in general, there is no cooperation among them and they do not have sufficient equipment and facilities to perform the physical and chemical tests required for the development of new rubber products.

In Indonesia, there is no integrated coordinating organization for the promotion of the rubber-based product industry. Relevant government ministries such as the Ministry of Agriculture and the Ministry of Industry function independently. The Ministry of agriculture is mainly in charge of quality improvement of clones and guidance for small holders. The Ministry of Trade is mainly in charge of export inspection of sheet rubber (RSS, Crepe, etc.) and technically classified rubber (SIR) and has established a center for training in trade procedures (Indonesia Export Training Center: IETC). Meanwhile, the Ministry of Industry is mainly in charge of establishing the industrial standards for rubber products but is considered to be insufficiently equipped with the necessary equipment, facilities and personnel.

As stated above, the reorganization and renovation of public research institutes to enable them to assist in new product development, as well as the establishment of cooperation among them, would contribute greatly to the fostering of the Indonesian rubber-based product industry.

Figure: 3-6-7: The Research Institutes belonging to the Ministry of Agriculture, the Ministry of Trade and Ministry of Industry

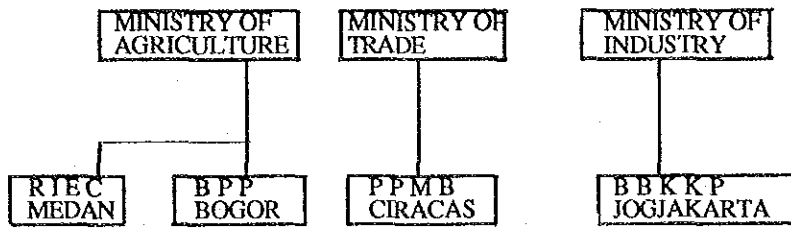


Fig.3-6-7 shows the research institutes belonging to the Ministry of Agriculture, the Ministry of Trade and the Ministry of Industry, respectively.

Table 3-6-16: Research Institutes under Each Ministry and their Main Activities (for Rubber)

Ministry	Research Institute	Main Activities							Beneficiaries of Information
		Improvement of Quality of Clones	Plantation Management	Testing and Inspection of Rubber Materials	Testing of Rubber-based Products	Standards	Development of New Products & Technology	Training of Personnel	
Ministry of Agriculture	BPP Sungai Putih	○	○	○	○	○	○	○	• Plantations & small holders
	BPP Palembang	○	○	○	○	○	○	○	• Plantations & small holders
	BPP Bogor			○	○	○	○	○	• Plantations & small holders • Manufacturers of rubber-based products and users
Ministry of Trade	PPMB			○	○	○	○	○	• Mainly branches of PPMB, SIR manufacturers
	PPMB branches Export Training Center (IETC)			○				○	• Mainly SIR manufacturers • Government and rubber-based product manufacturers
Ministry of Industry	BBKKP (Institutes for research and development of leather and allied industries)				○	○	○	○	• Manufacturers of rubber-based products
	BBBBT, Bandung							○	• Manufacturers of rubber-based products

Table 3-6-17: Main Testing Equipment for Latex at BPP (Sungai Putih)

Equipment	
1	Centrifuge
2	pH meter
3	Viscometer
4	Kyeldahl Distillation Apparatus
5	Autoanalyser
6	Klaxon Stirrer
7	Ball Mill
8	Stirrer
9	Mixer
10	Oven
11	Hot plate
12	Muffle Furnace
13	Oven Vacuum
14	Waterbath

Source: Field Interview

Table 3-6-18: Main Testing Equipment for Rubber at BPP (Sungai putih)

Equipment	
1	Plastmeter
2	Oven
3	Infrared Drying Apparatus
4	Muffle Furnace
5	Mooney Viscometer
6	Lovibond Comparameter
7	Reometer
8	Tensile Tester
9	Cutter
10	Relaxometer
11	Tripsometer
12	Hardness Tester

Source: Field Interview

Table 3-6-19: Main Equipment for Rubber at BBBT (Bandung)

Equipment	
1	Specimen Cutting Press
2	Tensile Strength Tester
3	Geer Type Aging Tester
4	Abrasion Tester
5	Flexing Tester
6	Oil Bath
7	Resilience Tester
8	Hose Pressure-burst Tester
9	Loadcell Type Universal Tester

Source: Field Interview

Table 3-6-20: An Example of Testing Fees at BPP Bogor

Item and Condition		Rate of fee (Rp)
Rate of cure test		4,000
Mooney viscosity test		3,000
Mooney scorch test		4,000
Curing test		1,000
Tensile test		1,000
Aging test	24 hours	1,000
	72 hours	3,000
	168 hours	3,000
Oil resistance test	24 hours	3,000
	48 hours	4,000
	96 hours	5,000
Ozone test	24 hours	5,000
Burning test		5,000

Source: Field Interview

Table 3-6-21: Main Equipment for Rubber at BPP Bogor

Equipment	
1	Mixing Roll Mill Tester
2	Banbury Mixer Tester
3	Calender Roll
4	Injection Machine
5	Small-size Rotocure
6	Moulding Press Tester
7	Moulding Press
8	Vulcanizer
9	Curometer
10	Curelasmeter
11	Tensile Strength Tester
12	Load Cell Type Universal Tester
13	Abrasion Tester
14	Flexing Tester
15	Resilience Tester
16	Ozone Weather Meter
17	Creep Tester
18	Infrared Spectrophotometer
19	Spectrophotometer
20	Gas Chromatograph
21	Thermal Analyser
22	Latex Testing Apparatus

Table 3-6-22: Main Equipment for Rubber at PPMB (Jakarta)

Equipment	
1	SIR Testing Apparatus
2	Mixing Roll Mill Tester
3	Rheometer
4	Molding Press
5	Spectrophotometer
6	FID/ECD/FPD Gas Chromatograph)
7	ECD/FID Gas Chromatograph
8	Atomic Absorption Spectrophotometer
9	Fluorescence Spectrophotometer
10	Inductively Coupled Plasma Spectrophotometer
11	FT-IR Spectrophotometer
12	Thermal Analyser
13	Relaxometer
14	DIN Abrasion Tester

Source: Field Interview

3) Reinforcement of Public Research Institutes Based on the Characteristics of Rubber Product Manufacturers

Cooperation among the research institutes is considered to be important and such cooperation should be based on a good understanding of the characteristics of each rubber product producing area in Indonesia. BBKPP in Yogyakarta, under the Ministry of Industry, performs testing of rubber products such as rubber soles, rubber boots, rubber hose, examination gloves, etc., at the request of rubber-based product makers in various areas of Indonesia. It also performs testing of leather goods and plastic goods.

However, as stated previously, its testing facilities are insufficient and, in addition, the location of the institute is rather inconvenient because it is far from the main areas where rubber-based product manufacturers are located such as Jakarta, Bogor, Medan, Surabaya, etc. The reinforcement of local research institutes should be conducted in consideration of the importance of the regional characteristics of the rubber-based product industry.

Table 3-6-23: Main Equipment for Rubber at BBKPP (Yogyakarta)

Equipment	
1	Mixing Roll Mill Tester
2	Curometer
3	Molding Press
4	Specimen Cutting Press
5	Hardness Tester
6	Load Cell Type Universal Tester
7	Abrasion Tester
8	Flexing Tester
9	Crease Flex Tester
10	Dirt Impact Tester
11	Weather Meter
12	Gas Chromatograph
13	Infrared Spectrophotometer
14	Drying Oven

Source: Field Interview

4) Strengthening of the Rubber-based Product Industrial Federation

It seems that the Federation of Indonesian Rubber Industries (FIKI) is not yet fulfilling its expected role satisfactorily. The top managers of the member associations exchange information on management, marketing, etc., among themselves and sometimes negotiate with government authorities. However, none of the associations has published an annual activity report or a general brochure to explain their activities.

Indonesian rubber-based product manufacturers are mostly small and medium-size companies. FIKI comprises only manufacturers of relatively large size and is expected to take a leading role in giving advice to small and medium-size manufacturers through its activities. As previously pointed out, Indonesian rubber product manufacturers are generally weak in marketing capability and have not yet introduced a GMP system. As a measure to solve the marketing problem, the dispatch overseas of marketing missions sponsored by FIKI's member associations or the unification of purchasing sources into a specific organization are recommended.

As for the GMP system, it is recommended that specialists on quality control be invited to visit. An example of this type of activity is the seminar on technology by the Japan Rubber Association which is co-sponsored by the Ministries of Industry, Agriculture, Trade, and others. This type of seminar will surely contribute to the activities of the Federation of Indonesian Rubber Industries. In addition to these activities, Indonesian rubber production technicians could participate in the federation or could create a new technical association concerned with rubber product manufacturing in the future.

5) Establishment of an Academic Circle Related to Rubber Products

For the promotion of rubber product manufacturing technology, the establishment of an academic circle would be a very effective measure.

In Japan, the Japan Rubber Association has been in existence since 1923. For more than 60 years, the members, including technicians, scholars and corporate managers, have contributed as an authority from the Japanese academic world to the development of the Japanese rubber industry.

To date, the association has held various conferences and symposiums. The following subjects which have been taken up by the Japanese association would be considered helpful for the Indonesian rubber product associations:

- Design for mixing of raw materials
- Techniques for mixing raw materials
- The progress of recent technology in rubber product manufacturing
- Recent trends and directions with regard to chemicals and sub materials used in rubber products.

It may take some time for Indonesia to establish an effective academic circle for rubber products but a first step must be taken. A seminar co-sponsored by the Japanese association and FIKI might be considered a first step.

6) Completion of Indonesian Industrial Standards

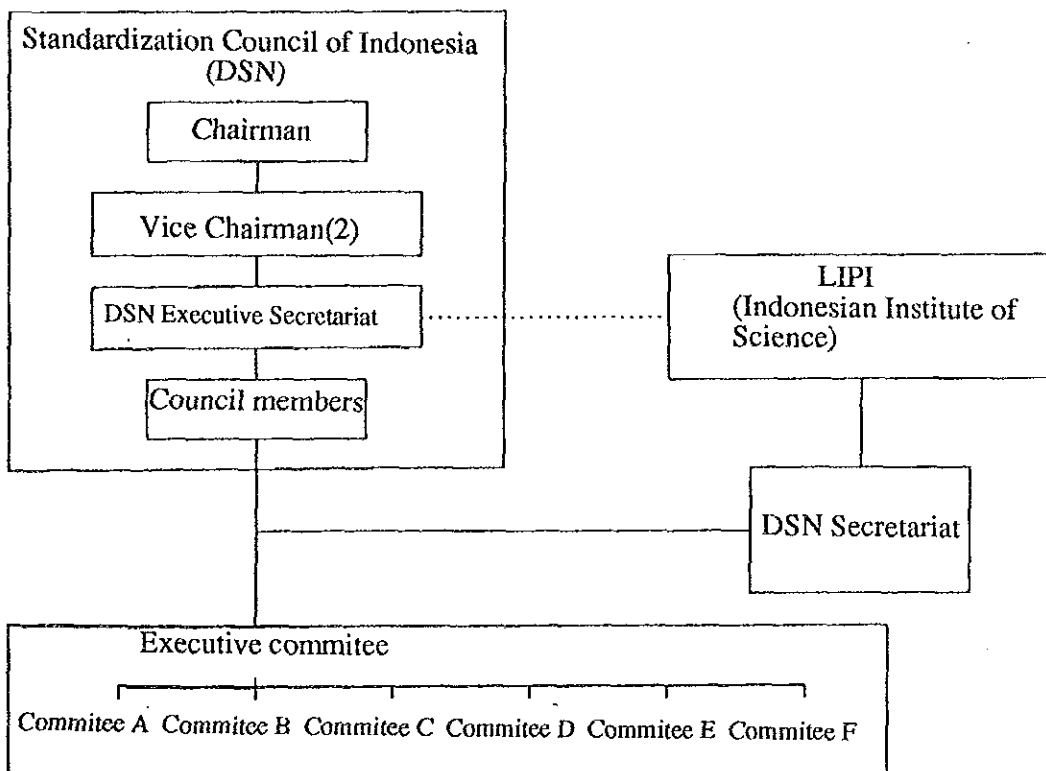
In Indonesia, there have been several sets of industrial standards with separate standards at each supervising ministry such as the Ministry of Agriculture, the Ministry of Industry, the Ministry of Trade, etc., according to the nature of the industrial goods concerned. During the process of industrial development in the country, the items which each ministry supervises have changed. Thus processed goods are not necessarily under the supervision of the Ministry of Industry but may fall under the Ministry of Agriculture if the industrial products are processed from agricultural materials, and vice versa. In addition, some products are subject to several sets of standards from several different ministries. This is one reason why Indonesian industrial standards have not received sufficient recognition in the world export market.

Indonesian manufacturers are producing their products with reference to international standards such as JIS, ISO or ASTM. As long as they manufacture their products in this way and remain not very well versed in international standards, as they are at present, it will be virtually impossible to produce viable export-oriented products.

To dispel the confusion caused by the various standards set by various ministries for a single product, the Indonesian government is working quickly to establish a unified industrial standard system, the so-called SII.

All Indonesian producers concerned would be very appreciative if the SII system could be established as soon as possible.

Fig.3-6-8: Organization Chart for Establishment of SII Standards



The chairman of the DSN Standardization Council of Indonesia is from the State Minister for Research and Technology. There are two supporting vice chairmen under the chairman of DSN. The DSN executive secretariat consists of the members from LIPI (Indonesian Institute of Science).

The councillors from 12 ministries deliberate twice a year on the SII original drafts submitted from the executive committee.

The executive committee is composed of members from six ministries and deliberates on the original SII drafts prepared by six sub committees, four times a year. Each of the six sub committees, which hold meetings once a month, is composed of 14 members - 2 manufacturers, 2 neutral members and 10 governmental officers.

Table 3-6-24 shows the number of JIS standards related to rubber products.

Table 3-6-24: Number of JIS Standards Related to Rubber Products

JIS Standard	Number
Terminology	1
Method of testing and measurement	17
Raw materials	7
Mixing agents	6
Product	
Tires	19
Belt	11
Hose	34
Canvas	4
Footwear	8
Rubber vibration insulator	13
Electric cord	5
Others	40

Table 3-6-25 shows SII standards related to rubber-based products.

Table 3-6-25: SII Standards Related to Rubber-based Products

Product	Code Number
Tire for passenger car	S11.0476-81
Tire for truck and bus	S11.0477-81
Tire for light truck	S11.0478-81
Tire for motorcycle	S11.0479-81
Life jacket	S11.0479-81
Molded rubber sole	S11.0920-83
Vulcanized rubber for hand water pump	S11.1096-84
Components	
Molded rubber sheet for shoe soles	S11.1097-84
Latex foam rubber	S11.1241-85
Rubber carpet	S11.1242-85
Hospital sheet rubber	S11.1243-85
Rubber water pipe for vehicle	S11.1244-85
Testing method for rubber packing	S11.1449-85
Rubber glove	S11.1655-85
Fatigue test for V belt	S11.1813-85
Dimension of narrow V belt drives for vehicles	S11.1816-87
Rubber roll for rice hull milling machine	S11.1902-86
Rubber sole for sports shoes	S11.1903-86
Foam sizes for household mattress and cushion	S11.1904-86
Hardness of rubber roll for tanning leather	S11.1905-86
Rubber seals for glass of road vehicles	S11.1999-86
Rubber base for cow	S11.2080-87
Rubber bearings for bridges	S11.2081-87
Rubber bearing for vehicles	S11.2089-87
Vulcanized rubber belt for vehicles	S11.2085-87
Tube/tire compound for motorcycle	S11.2086-87
V Belt for industry use	S11.2090-87
Rubber floor mat	S11.2094-87
Dock fender	S11.2281-88

7) Establishment of an Export Inspection System

International authorization systems concerning the quality of industrial products are being established at present by ISO or IEC.

In order for Indonesian rubber-based products to be recognized and appreciated in the world market, it is necessary to establish national standards for various rubber-based products compatible with the international level of quality assured by the government.

For this purpose, along with the completion of Indonesian industrial standards as stated in the preceding paragraph, the establishment of an export inspection system and authorized factory system should be achieved.

To be more concrete, a government support system for the completion of SII and government recognition of an authorized factory system would be necessary for the completion of the export inspection system and the establishment of the inspection organization.

Export inspection would be conducted in two ways. One way is through the authorized factory system. The other is through export inspection (the so-called "lot inspection") to be conducted at every stage of the actual export of the products.

Table 3-6-26: Features of the Export Inspection System

Method	Lot Inspection
[Factory Side] Company qualification	Any manufacturers of export products and exporters
Required quality of export products	Superior to the standard level of export product quality
Object of Inspection	Product inspection at every stage of delivery
Expenditure	Can be expensive according to the frequency of inspection
Improvement of awareness of quality control	Fairly well expected
[Inspection Side] Number of inspectors	Many inspectors required

At the lot inspection stage, the products inspected would be categorized into classes A, B or C. Classes A and B are exportable grades. Even class C products could be exported if the buyers are satisfied with the quality conditions.

Export inspection of the export products is conducted by an integral evaluation in terms of both quality and appearance. Criteria for judgement and standard inspection manuals should be completed.

The general features of the export inspection system are shown in Table 3-6-26. At present, the completion of Indonesian industrial standards and the establishment of an export inspection system by lot inspection are urgently required. An authorized factory system is also desirable in order to complete the export inspection system in the very near future.

(7) Introduction of Foreign Investment and Technology

In promoting the Indonesian rubber-based product industry and exports from it, introduction of foreign investment and technology may be said to be essential.

Possible methods of introducing foreign investment and technology would be joint ventures, introduction of technology under licensing contracts, employment of foreign experts, and sponsoring of seminars and training programs. Of these, joint ventures would be the best method in that they would allow the simultaneous introduction of capital, technology, management knowhow and export marketing channels.

This is well understood by the Indonesian rubber industry, which is keenly interested in joint ventures and the introduction of foreign technology. However, the needs of the industry in this respect have not been sufficiently met and thus promotion of this is urgent and should be undertaken as soon as possible.

The following activities may be considered effective in leading to the introduction of foreign capital and technology:

1) Collection and Provision of Information on Foreign Companies

It was learned from this survey that the rubber-based product industry lacks sufficient overseas information, particularly information regarding foreign companies. The industry is therefore not able to find partners for possible tie-ups because it lacks the information to even get started. The result, naturally, has been a lack of progress in establishing such tie-ups.

Companies should first of all work on their own to collect information from their own business contacts and from producers of natural rubber. However, of greater importance and effect would be the comprehensive collection and provision of such information by industrial associations and public entities.

For the time being, it is necessary to prepare a list of members of related organizations in the main producer countries.

2) Provision of Industrial Information to Foreign Investors

In parallel with the provision of information to domestic companies, effort must be made to establish a system for the provision of industrial information to foreign investors. It became clear through the current survey that there is a lack of information regarding the Indonesian rubber product industry. Industrial information is disseminated through the various organizations and institutions and the coverage rate is low. Foreign investors cannot easily find promising partners. Under these conditions, tie-ups with overseas companies cannot be promoted.

Note that the collection and provision of information assumes the creation of a system of computerized control, etc., considering the undeveloped state of the industry and the fluid state of the companies in it.

3) Seminars and Training on Joint Venture Business

Due to a lack of experience, companies have very little knowledge about tie-ups with foreign capital. It will be necessary to bring in experts from inside and outside of Indonesia to disseminate practical information among the companies.

4) Dispatch of Investment Missions

The Indonesian BKPM has dispatched investment missions to Japan, Europe, the U.S., South Korea, Taiwan, and other areas in the past several years in cooperation with various foreign banks, etc., but there has not been an active level of participation in these by rubber product producers. More positive use should be made of these types of opportunities.

FIKI and other industrial organizations should display more initiative in terms of dispatching investment missions. The missions' activities should aim mainly at exchanging information and views and setting up communication channels so that they will lead to continuous exchanges with the industrial associations and other organizations in the host countries.

5) Employment of Experts

A powerful means of introducing technology is to bring in foreign experts. Leaving aside joint ventures and companies with ties with foreign capital, general companies would find it valuable to consider this.

However, it costs a considerable amount to bring in a foreign expert and the number of companies which could bear the expense is limited. Therefore, it would be practical to make use of assistance from official foreign institutions.

It is necessary to study related systems overseas and to publicize information regarding the same in the industry.

6) Strengthening of Ties with Official Foreign Institutions

In proceeding with the above activities, the best thing to do would be to seek cooperation from official foreign institutions.

7) Improvement of Investment Related Systems

Investment-related systems in Indonesia have been greatly improved in recent years under the government policy of deregulation. It is desired that the deregulation policy be firmly maintained in the future as well and that investment-related systems be made increasingly more open. At the same time, it is desired that various government agencies function more efficiently in implementing their policies on foreign capital, industry and commerce as well as taxes.

(8) Strengthening of Marketing

As stated in sections 3-3 and 3-4, individual companies are still weak when it comes to their ability to establish their own marketing channels. It is urgent, therefore, to strength the systematic support from industrial organizations and official organizations.

The following may be said to be types of support for the private sector which would directly lead to the establishment of marketing channels:

1) Collection and Provision of Basic Information on Overseas Markets

The information covered here should, for the time being, be on foreign users, distribution channels, trends in supply and demand and in prices, changing needs, specialized trade fairs and other events, and overseas standards.

Possible sources of information would be member lists and publications of overseas industrial organizations, statistics and other data on key countries and international organizations, publications of important research organizations and independent surveys.

2) Provision of Information to Foreign Buyers

The principle is the same as that in the provision of industrial information to foreign investors ((7)-2)).

3) Participation in Overseas Trade Fairs, Sponsoring of Exhibitions and Sponsoring of Domestic and Overseas Business Meetings

It is necessary to make more positive use of exhibitions and business meetings on the industrial organization level with the support of the government. Among the various trade fairs and exhibitions, the greatest emphasis should be placed on internationally famous specialized trade fairs. Independent exhibitions would be effective in the sense of enabling one to focus on visitors with a high degree of interest in the field. For business meetings, the best way to arrange them is to use occasions offered by trade fairs, etc.

4) Dispatch of Survey Missions Overseas

The dispatch of survey missions would be effective for collecting information and for strengthening lines of communication with overseas users. The entities involved would be the same as those mentioned in the previous section, for the time being. The information collected must be provided to the rubber-based product manufacturing industry on a broad scale.

5) Sponsoring of Seminars and Training Courses on Trade Business

In view of the general lack of export experience, it is considered necessary to quickly establish basic courses on trade practices. The entities doing this could be the same as those for "participation in overseas trade fairs, etc." The courses should be offered in locations which cover Jakarta and other main production areas.

6) Strengthening of Ties with International Companies and Foreign Trade Organizations

In proceeding with the above activities, it would be effective to seek cooperation from international corporations and foreign trade organizations.

3.7 Recommendations for Comprehensive Promotion Programs for the Rubber-based Product Industry

(1) Basic Concept for Comprehensive Promotion Programs

It is impossible to make end products competitive in terms of quality and price unless the rubber-based product industry is vertically integrated from the upstream sector (raw materials) to the downstream sector (manufactured products) and unless essential areas of the industry are effectively inter-linked and maintained at high levels. In quality control, the essential factors can be summarized by the "5 Ms":

Materials
Machinery
Method
Measurement
Man

Although these factors can be described as necessary for the control of the quality of manufactured products, two other factors - marketing and investment - should be added in formulating export development programs, the main objectives of this study. Meanwhile, there are eight basic issues with respect to the development of the rubber-based product industry. These were specifically described in "3.6 Issues Concerning the Development of the Rubber-based Product Industry" of this study. They include improvement of raw materials, production and supply of essential chemical agents and sub materials, technical development, improvement of quality control, development of factory management, creation of a support system, introduction of foreign investment and technology and strengthening of marketing. Their relationship with the 5Ms mentioned above can be described as follows.

Materials	: Improvement of raw materials and production and supply capability for essential chemicals and sub materials
Machinery	: Development of factory management, introduction of foreign investment and technologies
Method	: Creation of a support system, technical development
Measurement	: Creation of a support system, improvement of quality control
Man	: Development of factory management, strengthening of marketing, introduction of foreign investment and technology

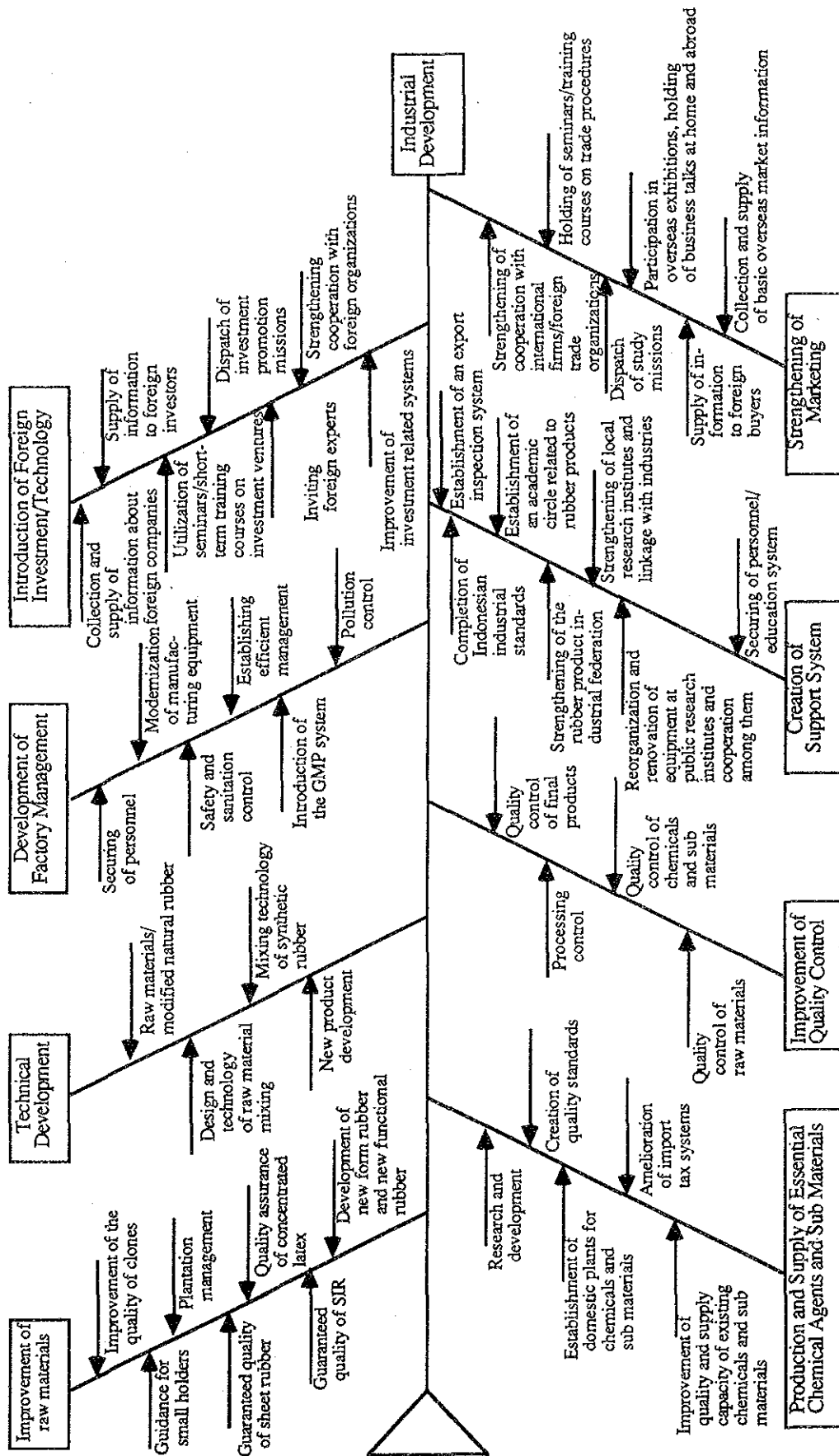
Table 3-7-1 illustrates completely the relationship between the 5Ms and the eight basic issues. Fig. 3-7-1 is a fish-bone chart which illustrates the inter-linkage of factors in the flow from upstream (raw materials) to downstream (manufactured products) after breaking down these eight issues and five factors. The basic concept behind the recommendations for comprehensive promotion programs for the rubber-based product industry is to effectively integrate and inter-link these eight issues from upstream (raw materials) to downstream (manufactured products). There are many companies with insufficient structures in terms of human resources, capital resources, technology and production capability. Manufacturers of tires/tubes and rubber shoes are the exceptions. In the export sector in particular, results and willingness are very poor. Accordingly, strong support from the public sector will be essential for the development of the rubber-based

product industry as an export industry. Several approaches can be considered in order to create this support system: first, the establishment of cross-sectional apparatus to coordinate and control the promotion measures of related ministries and agencies and second, the creation of support systems for activities by private sector companies.

Table 3-7-1: Issues Related to the Promotion of the Rubber-based Product Industry

Materials		Method/technologies		Measurement		Machinery		Human resources	
Improvement of raw materials	Production and supply of essential chemical agents/sub materials	Technical development	Creation of support system	Improvement of quality control	Development of factory management	Introduction of foreign investment and technology	Strengthening of marketing		
<ol style="list-style-type: none"> (1) Improvement of the quality of clones (2) Guidance for small holders (3) Plantation management (4) Quality assurance of sheet rubber (5) Quality assurance of latex (6) Quality assurance of SIR (7) Development of new form rubbers and new functional rubber 	<ol style="list-style-type: none"> (1) Improvement of quality and supply capacity of existing chemical agents/sub materials (2) Amelioration of import tax system (3) Establishment of domestic plants for chemical agents (4) Establishment of quality standards (5) R&D 	<ol style="list-style-type: none"> (1) Raw materials /modified natural rubber (2) Design and technology of raw material mixing (3) Mixing technology of synthetic rubber (4) New product development 	<ol style="list-style-type: none"> (1) Personnel development/education system (2) Reorganization and renovation of equipment at public research institutes and cooperation among them (3) Strengthening of linkage between local research institutes and industry (4) Strengthening of the rubber product industry federation (5) Establishment of academic circle related to rubber products (6) Establishment of industrial standards for products (7) Establishment of export inspection system 	<ol style="list-style-type: none"> (1) Quality control of raw materials (2) Quality control of chemical agents and sub materials (3) Processing control (4) Quality control of final products 	<ol style="list-style-type: none"> (1) Securing of personnel (2) Modernization of manufacturing equipment (3) Safety and sanitation control (4) Establishment of efficient management (5) Introduction of GNP system (6) Pollution control 	<ol style="list-style-type: none"> (1) Collection and supply of information on foreign companies (2) Supply of industrial information to foreign investors (3) Use of seminars /training courses for investment ventures (4) Dispatch of investment promotion missions overseas (5) Invitation of foreign experts (6) Strengthening of cooperation with foreign organizations (7) Establishment of investment related system 	<ol style="list-style-type: none"> (1) Collection and supply of overseas market information (2) Supply of information to foreign buyers (3) Participation in overseas exhibitions /holding of business talks at home and abroad (4) Dispatch of study missions overseas (5) Holding of seminar/training courses on trade procedures (6) Strengthening of linkage with foreign firms/foreign trade organizations 		

Fig. 3-7-1: Fishbone Chart of Issues in the Promotion of the Rubber-based Product Industry



1) Concept of Functions of Policy Coordinating Organization (establishment of apparatus for coordination and control of promotion measures)

In Indonesia, the following ministries and agencies are responsible for providing guidance to and overseeing the development of the rubber-based product industry.

Improvement of quality of clones, production, sales of natural rubber:
Ministry of Agriculture

Production of rubber-based products:
Ministry of Industry, Ministry of Cooperatives, local governments

Export promotion for rubber-based products:
Ministry of Commerce, Ministry of Industry,
the National Agency for Export Development (NAFED)

Investment policy/administration:
Investment Coordinating Board (BKPM), Ministry of Industry

However, there is no organization which coordinates industrial policy in general. Accordingly, it may be essential to strengthen the functions of these ministries and agencies as well as to establish a coordinating organization.

For the establishment of a coordinating organization, understanding and cooperation on the part of related ministries, agencies and industrial associations is required. Consultation on whether such a coordinating organization should be established should be undertaken as soon as possible among related ministries and agencies.

[1] Organization

It is possible that this coordinating organization could be established in the form of a research organization or a committee which would represent the following organizations.

Government agencies:	Ministry of Agriculture, Ministry of Industry, the National Agency for Export Development (NAFED), Investment Coordinating Board (BKPM), Ministry of Finance
Local government in main production regions:	DKI Jakarta, West Java, Central Java, East Java, South Sumatra, North Sumatra, West Kalimantan, etc.
R&D/testing organization:	BPPB (Balai Penelitin Perkebunan Bogor) (Research Institute For Estate Crops/Ministry of Agriculture) BBKKP (Balai Besar Industri Barang Kulit Karat & Plastik) (Ministry of Industry) PPMB (Pusat Pengujian Mutu Barang) (Ministry of Commerce)

Industrial Associations:

GAPKINDO, FIKI, ASTA, AIKI,
APRISINDO, AIKABLI

[2] Functions

The functions of this organization may include overseas PR activities and domestic promotion activities. It is desirable that domestic promotion activities comprehensively cover areas ranging from production and technologies to domestic sales and exports. The creation of various research funds and their management may be important activities for this organization.

[3] Method of establishment

It may be significant to study in advance successful examples of similar organizations in neighboring countries at the time when the organization was established. For example, the Malaysia Rubber Research & Development Board under the Ministry of Primary Industry is in charge of coordinating these organizations in Malaysia and in Thailand the Rubber Research Institute under the Ministry of Agriculture & Cooperative comprehensively manages promotion measures for various sectors ranging from raw material rubber to rubber-based products.

2) Creation of Support System as a Public Sector Support Measure in Comprehensive Promotion Programs

The creation of a support system is one of the eight issues described in "3.6 Issues Concerning the Development of the Rubber-based Product Industry" and is the most important issue as shown in the fact that it is positioned at the heart of the fish in the fishbone chart (Fig. 3-7-1: Fishbone Chart of Issues in the Promotion of the Rubber-based Product Industry).

All eight issues are crucial for the growth of and promotion of exports from Indonesia's rubber-based product industry. Needless to say, it is desirable that problems be overcome and issues realized through self-reliant efforts by private sector companies. However, there are limits on what self-reliant efforts by private sector firms can accomplish and, as a result, strong support by the public sector is absolutely necessary.

Although in the creation of a public sector support system it is important to establish functions for coordination and control of promotion measures, as described previously, this may take time because it is somewhat an ideal and a long-term policy issue.

On the other hand, the creation of a support system is expected to play a key role in the promotion of Indonesia's rubber-based product industry in the future because it has the most effective, supportive and influential effect on the realization of the other seven issues. Table 3-7-2 shows seven issues for the promotion of the rubber-based product industry and the support system for each issue.

Table 3-7-2: Issues Which Will Receive Support through the Creation of a Support System

Issues	Issues which will receive support through the creation of a support system	Support systems which have a particularly close relationship
Improvement of raw materials	<ul style="list-style-type: none"> • Improvement of quality of clones • Guidance for small holders • Management of plantations • Development of new form rubbers and new functional rubbers 	Reorganization and renovation of equipment at public research institutes and cooperation among them
Production and supply of essential chemical agents /sub materials	<ul style="list-style-type: none"> • Amelioration of import tax system • Establishment of quality standards 	Strengthening of industrial organizations Establishment of industrial standards for products
Technology development	<ul style="list-style-type: none"> • Raw materials/modified natural rubber • Design and technology of raw material mixing • Mixing technologies of synthetic rubber • New product development 	Reorganization and renovation of equipment at public research institutes and cooperation among them
Improvement of quality control	<ul style="list-style-type: none"> • Quality control of raw materials • Quality control of essential chemical agents/sub materials • Process control • Quality control for products 	Personnel supply/education system
Development of factory management	<ul style="list-style-type: none"> • Securing of personnel • Safety/sanitation control • Establishment of efficient management • Pollution control 	Personnel supply/education system Reorganization and renovation of equipment at public research institutes and cooperation among them
Introduction of foreign investment /technology	<ul style="list-style-type: none"> • Collection and supply of information about foreign firms • Supply of industrial information for overseas investors • Utilization of seminars/training courses on investment ventures • Dispatch of investment missions • Strengthening of cooperation with foreign organizations 	Strengthening of industry organizations
Strengthening of marketing	<ul style="list-style-type: none"> • Collection and supply of basic overseas market information • Supply of information on foreign buyers • Participation in overseas exhibitions, holding of exhibitions/business talks at home and abroad • Dispatch of study missions overseas • Strengthening of cooperation with international firms/foreign trade organizations • Holding of seminars/training courses on trade procedures 	Strengthening of industry organizations

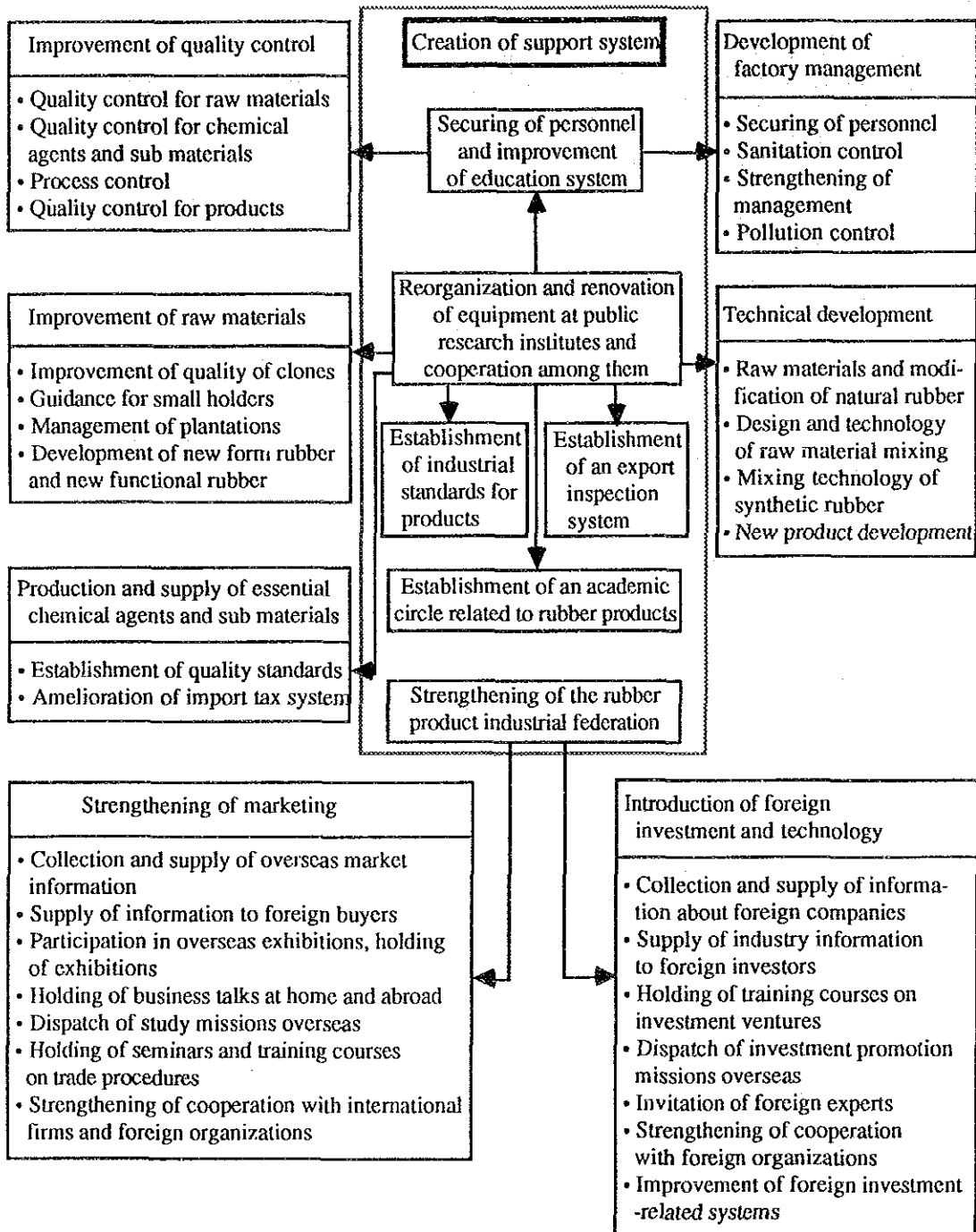
Table 3-7-3 shows that the role of public sector organizations in the creation of a support system has effects on other areas of the support system.

Table 3-7-3: Effects of Public Research Institutes on Other Areas of the Support System

Reorganization and renovation of equipment at public research institutes and cooperation among them and linkage with local industries	<ul style="list-style-type: none">• Personnel supply/education system• Establishment of industrial standards for• Establishment of academic circle• Establishment of an export inspection system
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Fig. 3-7-2 illustrates inter-linkage between the issues and their influential effects, summarized in Table 3-7-2 and Table 3-7-3.

Fig. 3-7-2: Relationship between the Creation of a Support System and Issues and Its Effects on Issues



As shown in Fig. 3-7-2, it is evident that the particularly important issues include the role of public sector R&D organizations, the vitalization of industrial associations for the strengthening of marketing and the introduction of foreign investment and technologies. Based on the basic concept for comprehensive promotion programs described above, the following promotion programs will be recommended in the following chapter, mainly regarding the strengthening of public sector R&D organizations and the vitalization of industrial associations.

(2) Recommendations for Promotion Programs

1) Reorganization of Public Sector R&D Organizations, Modernization of Equipment and Strengthening of the Cooperation among Organizations

[1] Necessity for a central research organization

As described in "3-6-(6)-2) Reorganization and Renovation of Equipment at Public Research Institutes and Cooperation among Them" and "3-6-(6)-3) Reinforcement of Public Research Institutes Based on the Characteristics of Rubber Product Manufacturers," all existing research organizations related to rubber-based products in Indonesia still have problems to be solved in the areas of equipment, materials and human resources. The cooperation between research organizations is also weak. On the other hand, as indicated in "3-6-(3)-3) Technical Development," the development of industrial sectors such as automobiles and electrical machinery is expected in the future. As a result, the development of the rubber-based product industry is necessary to meet requirements for advanced technologies and high performance demanded by these industries. There are many issues in the area of R&D including the development of new rubber with new functions and new form or the optimum mixing technologies of natural rubber and synthetic rubber. If R&D activities in these areas are left to the private sector manufacturers, it is needless to say that difficulties will occur in terms of financing and efficiency.

Accordingly, it seems likely that the strengthening of public sector R&D organizations is of great significance as one factor in the creation of a support system.

For the strengthening of public sector R&D organizations, the selection of an organization which will play a key role and the improvement of its functions as a central organization should be implemented as the first step. A further study is necessary to choose an organization to assume this key role. Generally speaking, however, a research organization located in a region where manufacturers of industrial rubber-based products and latex products are concentrated, and relatively near the capital, would easily be able to maintain cooperation with industry as well as liaise and coordinate with headquarters offices of the Ministry of Industry.

In any case, the central R&D organization should function to coordinate the interests of all concerned while maintaining close cooperation with each existing R&D organization.

Fig. 3-7-3: Linkage Between a Research Institute with Key Functions and Other Research Institutes

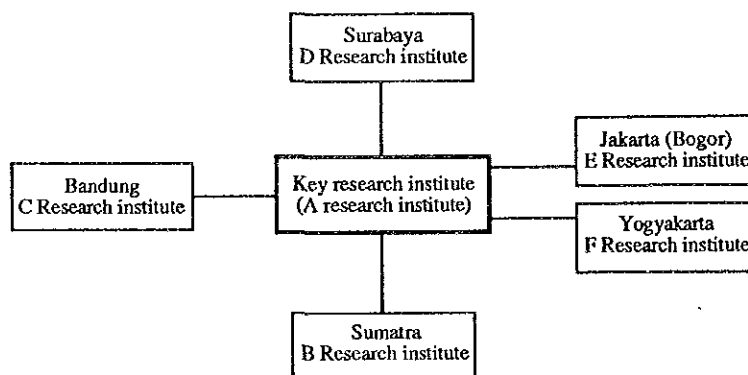


Fig.3-7-3 shows linkage between the central R&D organization and other R&D organizations in summarized form.

Table 3-7-4: Example of the Functions of Key Research Institutes

Expected functions and details of activities	Expected effects and goals	Remarks
1. Formulation of programs for strengthening of key research institutes and linkage among research institutes, introduction/modernization of machinery/equipment	1. Research functions overall can be strengthened through key functions which a specified institution will assume. The mutual linkage among public research institutes becomes easy through them.	1. Selection of key research institutes [1] Although all existing research institutes may be candidates, it appears that further study is required.
2. Target setting for R&D at public research institutes	2. R&D becomes easy through goal setting for R&D at public research institutes	[2] Further study regarding location and staff appears to be necessary
3. Collection of overseas technological information	3. Technical capability can be improved through dissemination of overseas technical information to industries	
4. Publication of annual report/production technology guidebook	4. The technology level of people in the industry can be improved through the publication of annual reports and production technology guidance books on rubber-based products	2. Machinery and equipment [1] Unvulcanized rubber testing machinery
5. Planning for SII standards/certification of SII qualified factories	5. A quality control system can be established at the corporate level through the establishment of SII standards/certification system of SII qualified factories	[2] Rubber-processing technology facilities [3] Machines for testing rubber-based products' physical/chemical properties evaluation
6. Establishment of export inspection system	6. Evaluation as export commodity can be improved through establishment of export inspection system	[4] Equipment for research and on-the-job training
7. Education for technicians	7. Education level of the technicians of rubber industry and related organizations should be upgraded.	[5] Equipment for training courses/seminars
8. Research on rubber-based product production/utilization of new synthetic rubber/optimum mixing technologies for natural rubber and synthetic rubber	8. The production technology level can be improved through R&D and public relations activities regarding newly developed technologies	[6] Printing equipment
9. Consigned testing/research	9. Service to industries becomes possible through consigned testing and research services	

Table 3-7-5: Proposals for Specific Projects to Establish Well-organized Research Institutes under the Ministry of Industry and to Modernize their Facilities

Institutes to be Strengthened	Purposes and Objectives	Machinery and Equipment to be Strengthened	Expected Functions and Activities	Development of Human Resources and Technology Transfer	Expected Effects and Targets	Remarks
Sumatra PTKAI Pendidikan Kimia Industri Medan (ex. JICA grants/technology cooperation projects)	<p>1. Many rubber factories are located in the Medan region. Development of these rubber factories can be expected in the future.</p> <p>2. The center can be used for human resource development and as an R&D facility because it functions both as a vocational school and a technology development center</p> <p>3. A course for rubber industry engineering should be set up.</p>	<p>1. Testing machines and equipment for physical/chemical performance evaluation of rubber-based products</p> <p>2. Testing facilities for rubber processing technology research/teaching /training</p> <p>4. A building for education and testing will be required in the future</p>	<p>Activities to help guarantee the quality of products and develop new products</p> <p>(1) Academy</p> <p>In addition to the presently required subjects, new subjects should be introduced in the rubber industry course</p> <ul style="list-style-type: none"> • Introduction to macromolecule chemicals, outline of the rubber-based product industry, latex chemicals, natural rubber, synthetic rubber, equipment and sub materials for rubber, testing methods, quality control (2) Short-term courses • Rubber processing course, quality control course for rubber-based products (3) R&D • Compounding/processing technology, quality control/performance evaluation technology 	<p>1. Technology cooperation by experts on rubber (invitation of experts from overseas)</p> <p>2. Training of staff at home and overseas (MRRDB of Malaysia) (Agricultural College in Bogor) (Testing Institute in Ciracas) (Indonesia Export Training Center (IETC) in Jakarta)</p>	<p>1. Because courses covering the rubber-based product industry are elective subjects at existing colleges and universities, systematic lecturing on the rubber industry is necessary to foster middle-level engineers</p> <p>2. R&D (compounding/processing technology) support for local rubber-based industries through consultations on technology</p> <p>Retraining of factory engineers and training of new employees</p>	<p>1. There is no problem with land and utilities (electricity)</p> <p>2. Review is required concerning boilers and water supply</p>

Institutes to be Strengthened	Purposes and Objectives	Machinery and Equipment to be Strengthened	Expected Functions and Activities	Development of Human Resources and Technology Transfer	Expected Effects and Targets	Remarks
Jogyakarta BBKPP Institute for Research and Development of Leather and Allied Industries Yogyakarta	<ol style="list-style-type: none"> In the field of rubber, there is no other institute under the Ministry of Industry Most machinery and equipment relating to rubber are obsolete 	<ol style="list-style-type: none"> Testing facilities for unvulcanized rubber Physical/chemical performance evaluation/testing equipment for rubber-based products 	<ol style="list-style-type: none"> Short-term courses <ol style="list-style-type: none"> Rubber processing courses Quality control course for rubber-based products R&D <ol style="list-style-type: none"> Compounding/processing technology Quality control/performance evaluation technology Training courses/seminars 	<ol style="list-style-type: none"> Training of staff at home and abroad (MRRDB of Malaysia) (Agricultural College in Bogor) (Testing Institute in Ciracas) (Indonesia Export Training Center (IETC)) Lectures on production/evaluation technology for engineers of manufacturing companies 	<ol style="list-style-type: none"> Through systematic lectures on production of rubber-based products, middle-level engineers of rubber manufacturing companies will be fostered and supplied Lectures about production/evaluation technology for engineers of rubber-based product manufacturers 	Lack of staff
Bandung EBBBT Balai Besar Bahan & Barang Teknik Bandung	<ol style="list-style-type: none"> Bandung is a main center of Indonesia's rubber-based product industry The institute conducts product evaluation testing for rubber-based product manufacturers in the Bandung region However, almost all of the existing facilities related to rubber are obsolete Product evaluation using modern facilities 	<ol style="list-style-type: none"> Testing facilities for unvulcanized rubber Physical/chemical performance evaluation/testing equipment for rubber-based products 	<ol style="list-style-type: none"> Activities to help guarantee the quality of products and develop new products <ol style="list-style-type: none"> Assigned testing for unvulcanized rubber Assigned performance evaluation Assigned chemical analysis 	<ol style="list-style-type: none"> Testing methods for unvulcanized rubber Collection methods for test samples from rubber-based products 	<ol style="list-style-type: none"> Activities to support quality control testing/inspection by small holders in the suburbs of Bandung Mainly checks of final products 	Lack of staff

Institutes to be Strengthened	Purposes and Objectives	Machinery and Equipment to be Strengthened	Expected Functions and Activities	Development of Human Resources and Technology Transfer	Expected Effects and Targets	Remarks
BPPI in Surabaya Balai Peneliban Dan Pengembangan Industri Surabaya	<p>1. There are few rubber-based product manufacturers in the Surabaya region. Growth in the industry can be expected in the future.</p> <p>2. There are no institutes for guidance located in the region.</p> <p>3. Through introduction of testing and research equipment for rubber, middle-level rubber engineers will be fostered and supplied.</p>	<p>1. Physical/chemical performance evaluation/testing machinery for rubber-based products</p> <p>2. Testing facilities for processing technology for solid rubber</p> <p>3. Production facilities for latex products</p>	<p>Activities to help guarantee the quality of products and develop new products</p> <p>(1) Short-term courses</p> <p>Solid rubber processing course</p> <p>Latex product processing course</p> <p>Quality control course for rubber-based products</p> <p>(2) R&D Compounding/processing technology</p> <p>Quality control/performance evaluation technology</p> <p>(3) Training courses/seminars</p>	<p>1. Training of staff at home and abroad (MRRDB of Malaysia) (Agricultural College in Bogor) (Testing Institute in Ciracas) (Indonesia Export Training Center (IETC) in Jakarta)</p>	<p>1. Through systematic lectures on the production of rubber-based products, middle-level engineers of rubber manufacturing companies will be fostered and supplied</p> <p>2. Technological support for local rubber-based industries through R&D (compounding/processing technology) and consultation on technology</p> <p>3. Retraining of factory engineers and training of new employees</p> <p>4. Planning for SH</p>	<p>1. Review of land and the number of staff required</p> <p>2. Review of requirements concerning boilers and water supply</p>

A basic concept of the functions of a central organization is shown in Table 3-7-4.

[2] Reorganization of existing R&D organizations and modernization of equipment

As already mentioned, the reorganization of existing R&D organizations and the modernization of their equipment are required in view of their current status. Taking into account the concept of central functions as well as mutual cooperation and complementary linkage, as described in the previous section [1], specific details for reorganization of these organizations and modernization of their equipment are presented as an example in Table 3-7-5 by taking the case of an existing R&D organization under the Ministry of Industry.

2) Vitalization of Industrial Associations for Introduction of Foreign Investment/Technology and Strengthening of Marketing

[1] Introduction of foreign investment/technologies

The importance of the establishment of a technological guidance system through the strengthening of public sector R&D organizations is already described as a premise for the development of Indonesia's rubber-based product industry as an export industry. However, this is not necessarily enough. No doubt, the manufacturers' ability in terms of dynamic technical innovation and product development is a basic issue for the development of the industry. It is, therefore, important to create an environment to strengthen this ability.

However, the current technical ability of local manufacturers is insufficient, generally speaking. It is difficult to expect development without assistance. Autonomous development does not appear to be an effective way because it requires huge amounts of investment and a long learning period. Generally, it is expected to produce unsatisfactory results.

In consideration of these facts, it is necessary to introduce foreign capital and technologies to heighten the technical level of the industry to an international level. Consequently, activities to promote the introduction of foreign investment and technologies have as much significance as "Reorganization of public-sector R&D organizations."

There are no serious shortfalls in Indonesia's related regulations and systems. The regulations on foreign investment have been radically improved as a result of the deregulation policies introduced by the government in the past years. A Japanese joint venture manufacturer in the rubber-related product industry says, "There are no decisive factors which deter investment, although there is room for further improvement."

Accordingly, it may be said, the urgent issues are promotion activities for the dispatch and reception of missions for investment attraction and technology exchanges and the creation of an environment which will enable these activities to produce successful results.

[Activities Required for the Promotion of the Introduction of Foreign Investment/Technologies]

Creation of a Better Environment

- Preparation of information concerning Indonesia's rubber-based product

manufacturers

- Collection and supply of information about foreign firms and investors
- Holding of seminars and training courses about joint ventures and technological cooperation

Promotion Activities

- Dispatch of missions overseas for the promotion of foreign investment and introduction of foreign technologies
- Reception of missions for foreign investment and technological exchanges

These activities should be implemented mainly by industrial associations and their member firms in close tie-up with the Ministry of Industry and The Investment Coordinating Board (BKPM). The creation of a fund for these activities is a significant issue to be discussed.

In establishing a better environment, priority should be placed on public relations activities to enlighten people about the importance of joint ventures and technological cooperation and the production of PR materials (brochures about the industry and firms) for the dissemination of information in overseas countries. Indonesia's exports of rubber-based products are still so small that Indonesia's industry is not well-known in other countries. Due to the lack of awareness of the industry in foreign countries, prejudices exist. As a first step, efforts should be made to heighten the awareness of the Indonesian industry in foreign countries. To that end, production of PR materials is the minimum requirement. However, at the moment, these materials are decisively insufficient at both the industry and company level. It is necessary to realize the difficulties the industry will face in attempting to move into international business if manufacturers in the industry do not have any company brochures or product catalogs.

Counterparts for exchanges of missions will be industrial associations in each foreign country. Accordingly, priority should not be placed on publishing general information such as descriptions of the investment environment, something which is usually supplied by these missions. Rather, the focus should be on the exchange of information and opinions as well as on the creation of a pipeline which will lead to continuous exchanges in the future.

The promotion of foreign investment and technology introduction depends largely on the vitalization of industrial association activities and the strengthening of exchanges with overseas counterpart associations.

[2] Strengthening of overseas marketing

Exports of Indonesian-made rubber-based products have not really taken off yet. This fact in itself is a deterrent factor for export expansion for two reasons. First, it means that knowhow and experience in overseas marketing and export procedures have not yet been accumulated by the industry, leaving manufacturers somewhat reluctant to start exporting. Second, because of low awareness of Indonesia's products among overseas buyers, there is little chance of receiving inquires. As with the promotion of foreign investment and introduction of foreign technologies, it appears to be necessary to offer assistance for moving into international business.

In the formulation of overseas marketing strategies, products should be grouped into the following categories.

a. Products with a high ratio of direct sales from manufacturers to users, such as industrial rubber-based products

b. Products which sit in inventory during distribution before sales to consumers and end-users such as sanitary/medical products or sports articles

A look at the distribution route in Japan for industrial rubber-based products, in which the Indonesian government has expressed a strong interest, shows that 30-40 percent of the products are directly supplied from manufacturers to users while the remainder go through wholesalers, including first, second or third stage wholesalers, and retailers before sales to users.

In the case of industrial rubber-based products, direct sales from manufacturers have a relatively higher ratio. In particular, automobile components are supplied in the form of direct delivery. Deliveries from parts manufacturers to automakers are made several times per day. As a result, parts manufacturers are located nearby the automakers' factories. Given business practices such as this, it is almost impossible for parts manufacturers located in other areas to enter into the market.

This, needless to say, makes it difficult for overseas manufacturers to directly approach the market. It would appear to be almost impossible for overseas manufacturers to secure marketing channels unless they are integrated with production lines of Japanese rubber-based product manufacturers.

In the case of rubber gloves, another item in which the government has interest, there are several different distribution routes. Examination gloves are sold through wholesalers to users such as hospitals while rubber gloves for home use are sold through retailers to consumers. In any case, rubber gloves are held in inventory at the stage of distribution. In this sense, the manufacturers' counterparts in terms of export business are importers or wholesalers. In this sense, their distribution channel will be an ordinary one. Production sharing based on joint ventures with foreign manufacturers or production and technological cooperation can also be considered as one option. Measures for strengthening overseas marketing for products which go through usual distribution routes such as overseas importers and wholesalers are listed below.

Creation of a better environment

- Collection and supply of basic information concerning overseas markets
- Supply of detailed information for foreign buyers
- Holding of seminars and training courses on export procedures

Promotion activities

- Participation in overseas exhibitions, holding of exhibitions/business talks
- Dispatch of study missions overseas
- Strengthening of competitiveness with international firms and overseas trade organizations

These activities should be implemented mainly by industrial associations and their member firms in close tie-up with the Ministry of Commerce and the National Agency for

Export Development (NAFED). The importance of the role assumed by the industrial association has already been described in the previous section.

In creating a better environment, activities to enlighten domestic manufacturers and the production of PR documents for overseas markets should be given priority for the reasons already referred to.

Exhibitions/business talks or mission programs should be comprehensive, taking into account the attraction of foreign investment and the introduction of technology, to make these activities more effective.

Furthermore, it is more practical to implement these programs in close cooperation with overseas trade organizations. In the case of Japan, JETRO's Jakarta center is engaged in the promotion of exports of Indonesian products to Japan while maintaining close relationships with the Ministry of Commerce and NAFED. Links with overseas trade organizations should be expanded and diversified to create more pipelines with more foreign countries.

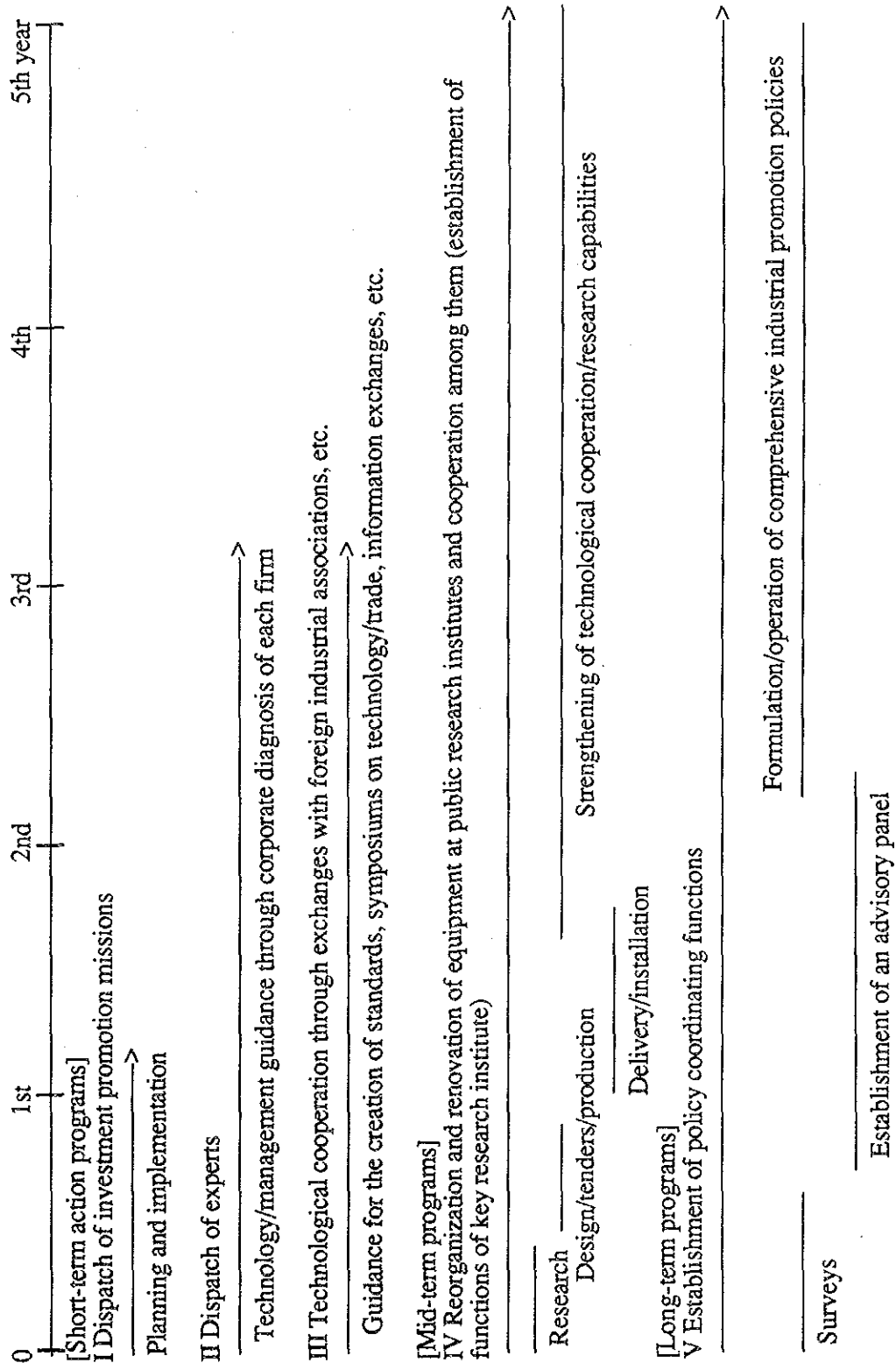
(3) Proposals for Comprehensive Promotion Programs for the Rubber-based Product Industry

In this section, concrete proposals for the promotion of Indonesia's rubber-based product industry will be presented in three categories including short-term, mid-term and long-term programs based on "3.7-(1) Basic Concept for Comprehensive Promotion Programs and 3.7-(2) Recommendations for Promotion Programs." Proposals for programs for the promotion of the rubber-based product industry are shown in Table 3-7-6 and their implementation schedule is shown in Table 3-7-7.

Table 3-7-6: Programs for the Rubber-based Product Industry (Proposed)

Proposed programs	Details	Methods
Short-term action programs	<ul style="list-style-type: none"> • Technology and management guidance for each firm • Various technological cooperation arrangements (guidance for creation of standards, symposium on technology/trade, information exchanges, etc.) • Dispatch of investment promotion missions overseas 	<ul style="list-style-type: none"> • Guidance through foreign technology experts • Exchange with foreign industry organizations • - ditto -
Mid-term programs	Reorganization and renovation of equipment at public research institutes and cooperation among them	After the selection of the most suitable organization from among existing organizations based on a detailed survey in the future, the status of key research institute shall be given to the organization and its functions will be established.
Long-term programs	Establishment of policy coordinating functions	Ministries and other government agencies, local governments, Public research institutes, Industrial organizations

Table 3-7-7: Schedules for Implementation of Promotion Programs for the Rubber-based Product Industry



APPENDIX: Information for Promotion of Joint Venture Investment and Technology
Cooperation

(1) Japanese Rubber-based Product Manufacturers Interested in Investment in
Indonesia and / or Technical Tie-up with Indonesian Companies.

(Interested in Investment and Technical Tie-up)

- | | | |
|------------------------------|---|--|
| 1) Name of Company | : | MARUGO INDUSTRY CO., LTD. |
| Address of Head Office | : | 1680-1 Chayamachi, Kurashiki, Okayama |
| Paid-up Capital | : | ¥50,000,000 |
| Annual Sales (Million Yen) | : | 5,000 |
| Ratio of Overseas Production | : | 30% |
| Number of Employees | : | 260 |
| Main Production Items | : | Rubber footwear, gloves, industrial rubber |

(Interested in Investment and Technical Tie-up)

- 2) Name of Company : MEIJI RUBBER 7 CHEMICAL CO., LTD.
Address of Head Office : 10-2, Nishi Shinjuku 1-chome, Shinjuku-ku,
Tokyo TEL(344)3951
Paid-up Capital : ¥690,000,000
Annual Sales (Million Yen) : 25,000
Ratio of Overseas Production : 0%
Number of Employees : 790
Main Production Items : Rubber hose for automobile, absorber, rubber
components for shipyard, paper mill, iron
steel factory, urethane foam, plumbing rubber &
components, rubber components for office
automation and audio visual equipment, rubber
roll, urethane roll, belt blanket for printing
machine, injection and molding product of
synthetic resin, ultra high pressure nylon
hose, plastic pallet

(Interested in Investment and Technical Tie-up)

- 3) Name of Company : SHOWA RUBBER CO., LTD.
Address of Head Office : 8th Fl. Kyo Bldg. 3-13 Kyobashi 2-chome,
Chuo-ku, Tokyo
Paid-up Capital : ¥583,000,000
Annual Sales (Million Yen) : 8,000
Ratio of Overseas Production : 0%
Number of Employees : 450
Main Production Items : Rubber lining, rubber roll, rubber sole,
rubber separator (for lead storage battery)
rubber nipple, rubber stopper for medical
use, ball for tennis and base-ball

(Interested in Investment and Technical Tie-up)

- 4) Name of Company : NANSHIN CO., LTD.
Address of Head Office : 21-4 Hachobori 3-chome, Chuo-ku, Tokyo
Paid-up Capital : ¥180,000,000
Annual Sales (Million Yen) : 7,000
Ratio of Overseas Production : 5%
Number of Employees : 300
Main Production Items : Caster, transportation equipment

(Interested in Investment and Technical Tie-up)

- 5) Name of Company : ARAI SEISAKU CO., LTD.
Address of Head Office : 30-1 Horikiri 3-chome, Katsushika-ku, Tokyo
Paid-up Capital : ¥400,000,000
Annual Sales (Million Yen) : 14,990
Ratio of Overseas Production : na
Number of Employees : 687
Main Production Items : Oil seal, rolling, roller, etc.

(Interested in Investment and Technical Tie-up)

- 6) Name of Company : BRIDGESTONE CORPORATION
Address of Head Office : 10-1 Kyobashi 1-chome, Chuo-ku, Tokyo
Paid-up Capital : ¥37,860,000,000
Annual Sales (Million Yen) : 621,420
Ratio of Overseas Production : na
Number of Employees : 889
Main Production Items : Tire and tube, automobile components, chemical products, sports equipment.

(Interested in Investment and Technical Tie-up)

- 7) Name of Company : KOHSHIN RUBBER CO., LTD.
Address of Head Office : 1-8 Kojo 1-chome, Wakabayashi-ku, Sendai,
Miyagi
Paid-up Capital : ¥120,000,000
Annual Sales (Million Yen) : 12,150
Ratio of Overseas Production : 5.8%
Number of Employees : 501
Main Production Items : Footwear, industrial rubber-based products,
rainwear.

(Interested in Investment and Technical Tie-up)

- 8) Name of Company : ASICS CORPORATION
Address of Head Office : 1-1 Minatojima Nakamachi 7-chome, Chuo-ku,
Kobe, Hyogo
Paid-up Capital : ¥22,430,000
Annual Sales (Million Yen) : 110,050
Ratio of Overseas Production : na
Number of Employees : 1851
Main Production Items : Sports equipment, leisure equipment,

(2) Indonesia Rubber-based Product Manufacturers interested in
Joint Venture Investment and Technical Tie-up with Japanese Companies

(Interested in Investment and Technical Tie-up)

1) Name of Company: PT. EKA LATEXINDO
 Address of Head Office: 19th FL. MID PLAZA, JL. Jend. Sudirman Kav.
10-11 Jakarta 10220
 Tel: 5703766 Fax: 583555
 Address of Factory: Jl. Pamah KM 18.5.TG. Morawa. Medan
 Tel: 323945 Fax: _____
 Name of Chief Executive: HANDOKO WINATA
 Name of Responsible Person Name: SOBIRIN KARATADIPURA
 for Contact: Designation: DIRECTOR
 Year of Establishment: 1988
 Production: Hasn't produced yet
 Paid-up Capital: Rp. 500.0.000.-
 Share holders: Indonesian: _____ (Investor; PMDN)
 Foreign: _____
 Main Bank: BANK NIAGA
 Land & Factory Area: Land; 4,890 m² Factory; 1800 m²
 Main Production Items: Examination Glove

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)					
Number of Employees					

(Interested in Investment and Technical Tie-up)

2) Name of Company: PT.LATEXINDO SEJAHTERA
Address of Head Office: Jl. Pluit Raya No. 200 Blok VI/6
Jakarta Utara
Tel: 6690655, 6696956 Fax: 6697174
Address of Factory: Jl. Raya Serang Km 51 Desa Sentul Kec. Balaraja,
Kab. Tangerang, Jawa Barat-Indonesia
Tel: _____ Fax: _____
Name of Chief Executive: HUBERT SADELI, Ir.
Name of Responsible Person Name: Hubert Sadeli, Ir.
for Contact: Designation: President
Year of Establishment: July 10, 1987
Production: January, 1988
Paid-up Capital: Rp. 2000.000.000,-
Share holders: Indonesian: 100%
Foreign: _____ (Investor;)
Main Bank: Bank Bali
Land & Factory Area: Land; 11.275 m² Factory; +/-1500 m²
Main Production Items: Latex Surgical Gloves and Examination Glove

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)	—	—	—	450.000	180.000
Number of Employees		5	7	65	40

(Interested in Investment and Technical Tie-up)

3) Name of Company: PT. NUSA DIPA PERDANA
Address of Head Office: Jl. KH. MOH MANSYUR No. 11 Blok B/12
Jakarta 10140 INDONESIA
Tel: 3805317/18 Fax: 6621-3806608
Address of Factory: Jl. RAYA SERANG KM 3 (CIBODAS BESAR)
TANGERANG (JABAR) INDONESIA
Tel: (99)22321 Fax: _____
Name of Chief Executive: LEO ANDYANT
Name of Responsible Person Name: PRIJATUR TANSUNU
for Contact: Designation: FACTORY MANAGER
Year of Establishment: 1988
Production: 1989
Paid-up Capital: _____
Share holders: Indonesian: 100%
Foreign: ----- (Investor;)
Main Bank: _____
Land & Factory Area: Land; 14.730 m² Factory; 1500 m²
Main Production Items: EXAMINATION GLOVES

Annual Sales Turnover & Number of Employees (at the end of the year)

(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)					
Number of Employees				70	72

(Interested in Investment and Technical Tie-up)

4) Name of Company: PT. PERKASA RUBBERINDO
Address of Head Office: JL. K.H. HASYIM ASHARI 11A, JAKARTA
Tel: 3810282, 3810283, 3810284 Fax: 36471
Address of Factory: JL. SETIA MEKAR KM 38-39
Tel: _____ Fax: _____
Name of Chief Executive: IBRAHIM RISJAD
Name of Responsible Person Name: MUHAMMAD SALIM
for Contact: Designation: KUASA DIREKSI
Year of Establishment: 1988
Production: _____
Paid-up Capital: Rp. 3.671.700.000.-
Share holders: Indonesian: Rp. 3.671.700.000.-
Foreign: _____ (Investor;)
Main Bank: BANK NEGARA INDONESIA 1946
Land & Factory Area: Land; 20.000 m² Factory; _____ m²
Main Production Items: GLOVES

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)					
Number of Employees					178

(Interested in Investment and Technical Tie-up)

5) Name of Company: PT. Tata Rubberindo Industries
Address of Head Office: Jl. Gatot Subroto Kav. 22 Lt. 12
Tel: 514115, 514119 Fax: 5201673
Address of Factory: JL. RAYA SERANG KM 13.8 TANGERANG
Tel: _____ Fax: _____
Name of Chief Executive: Willy Brata
Name of Responsible Person Name: Limman Nugroho
for Contact: Designation: Managing Director
Year of Establishment: 1988
Production: 1989
Paid-up Capital: Rp. 2,500,000,000.-
Share holders: Indonesian: Rp. 2,500,000,000.-
Foreign: _____ (Investor; Domestic)
Main Bank: Bank Pacific
Land & Factory Area: Land; 15,500 m² Factory; 2900 m²
Main Production Items: Latex Examination Gloves

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)					611.712
Number of Employees					300

(Interested in Investment and Technical Tie-up)

6) Name of Company: PT. TRIAS ARIANDINI
Address of Head Office: Jl. Lamandau 1/5 Jakarta
Tel: 713639 Fax: 713639
Address of Factory: Jl. Raya Bogor Km 41.2 Cibinong
Tel: (99)82194 Fax: _____
Name of Chief Executive: Dwinanto, B.E.
Name of Responsible Person Name: Dwinanto, B.E.
for Contact: Designation: Director General
Year of Establishment: 1988
Production: 1989
Paid-up Capital: Rp. 1,000,000,000.-
Share holders: Indonesian: Rp. 1,000,000,000.-
Foreign: _____ (Investor;)
Main Bank: BDN
Land & Factory Area: Land; 20,000 m² Factory; 1000 m²
Main Production Items: RUBBER GLOVES

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)					
Number of Employees					100

(Interested in Investment and Technical Tie-up)

7) Name of Company: Industri Karet "Panca Setia"
Address of Head Office: _____
Tel: _____ Fax: _____
Address of Factory: Jl. Binjei Km. 12 Medan
Tel: 29127 Fax: _____
Name of Chief Executive: Budianto Chandra
Name of Responsible Person Name: Rizal
for Contact: Designation: Deputy Director
Year of Establishment: 1975
Production: 1978
Paid-up Capital: Rp. 8.000.000.-
Share holders: Indonesian: _____
Foreign: _____ (Investor;)
Main Bank: Private Bank
Land & Factory Area: Land; _____ m² Factory; _____ m²
Main Production Items: O RING ; SOLE

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)					
Number of Employees	25	30	30	30	35

(Interested in Investment and Technical Tie-up)

8) Name of Company: PT INDO YAKIN MAJU
Address of Head Office: JL. SUTOMO No. 476-478 Medan
Tel: 515944 Fax: 25465
Address of Factory: Jl. Binjei Km. 12.5 Desa Mulyorejo
Medan-Sunggal
Tel: _____ Fax: _____
Name of Chief Executive: Hengky Wijaya
Name of Responsible Person Name: Wahab Musa
for Contact: Designation: Manager
Year of Establishment: 1981
Production: 1981
Paid-up Capital: Rp. 300.000.000.-
Share holders: Indonesian: Rp. 200.000.000.-
Foreign: _____ (Investor; _____)
Main Bank: Bank Bumi Daya, Belawan Branch Office
Land & Factory Area: Land; _____ m² Factory; _____ m²
Main Production Items: Rice Hulling Rubber Rolls, Camel Back and Wheel

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)	283,678	518,160	1,284,567	1,125,661	
Number of Employees	18	24	28	26	

(Interested in Investment and Technical Tie-up)

9) Name of Company: N.V. KALIBARU
Address of Head Office: Jalan Arjuna 50, Bandung.
Tel: 022-612079 Fax: 65-22-612461
Address of Factory: Same
Tel: _____ Fax: _____
Name of Chief Executive: Ir. Hadi Suganda
Name of Responsible Person Name:
for Contact: Designation:
Year of Establishment: 1954
Production: 1955
Paid-up Capital: _____
Share holders: Indonesian: 100%
Foreign: _____ (Investor;)
Main Bank: BCA; Bank Bali.
Land & Factory Area: Land; 9,000 m² Factory; 7,000 m²
Main Production Items: Rubber and Plastic Automotive Parts, Rice Hulling
Roll

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)			1,200,000	1,500,000	
Number of Employees			130	150	

(Interested in Investment and Technical Tie-up)

10) Name of Company: PT KARYA PUTRA SANGKURIANG (KPS)
Address of Head Office: KEBAKTIAN I No. 63 KIARA CONDONG,
BANDUNG INDONESIA
Tel: 78298 Fax: _____
Address of Factory: KEBAKTIAN I No. 63 KIARA CONDONG,
BANDUNG INDONESIA
Tel: 78298 Fax: _____
Name of Chief Executive: H. MOCH MUCHRI
Name of Responsible Person Name: SUHEDAR
for Contact: Designation: MANAGER ASSISTANT
Year of Establishment: 1973
Production: RUBBER PROFILE
Paid-up Capital: _____
Share holders: Indonesian: _____
Foreign: _____ (Investor;)
Main Bank: BAPINDO
Land & Factory Area: Land; 3,155 m² Factory; 2,027 m²
Main Production Items: WINDOW SEAL & PROTECTOR (THREE
MATERIALS

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)	486,456	604,297	733,273	1,135,778	1,072,871
Number of Employees	40	60	70	80	100

(Interested in Investment and Technical Tie-up)

11) Name of Company: PT NAGA SAKTI JAYA HARAPAN
Address of Head Office: JL. K.L. YOS SUDARSO KM. 8.6 MEDAN
Tel: 22957 Fax: _____
Address of Factory: JL. K.L. YOS SUDARSO KM 8.6 MEDAN
Tel: 22957 Fax: _____
Name of Chief Executive: JENSEN
Name of Responsible Person: Name: LEWIS W.
for Contact: Designation: PRODUCTION SUPERVISOR
Year of Establishment: 1985
Production: 1986
Paid-up Capital: Rp. 331,609,540.-
Share holders: Indonesian: Rp. 331,609,540.-
Foreign: _____ (Investor; _____)
Main Bank: ANK TANI, BANK DAGANG NEGARA
Land & Factory Area: Land; 12,463 m² Factory; 4,627 m²
Main Production Items: COMPOUND (CAMEL BACK)

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)				719,383	327,671
Number of Employees		38	40	41	65

(Interested in Investment and Technical Tie-up)

12) Name of Company: PERUSAHAAN DAERAH ANEKA KIMIA
Address of Head Office: Jl. Ngagel No. 89 Surabaya
Tel: (31)66610/68514 Fax: (31)67465
Address of Factory: Jl. Ngagel No. 139-141 Surabaya
Tel: (31)68133/68134 Fax: _____
Name of Chief Executive: Ir. DWIPURWO PANGARSO
Name of Responsible Person: Name: Ir. DWIPURWO PANGARSO
for Contact: Designation: Director General
Year of Establishment: 1919
Production: 1919
Paid-up Capital: Rp. 1,961,220,232,-
Share holders: Indonesian: Rp. 1,961,220,232,-
Foreign: _____ (Investor; _____)
Main Bank: BDN, BNI 1946, BPD Jawa Timur
Land & Factory Area: Land; 6.980 m² Factory; 6.880 m²
Main Production Items: Industrial Rubber Goods

Annual Sales Turnover & Number of Employees (at the end of the year)
(Whole company)

	1985	1986	1987	1988	1989
Annual Sales (RP 1,000)					
Number of Employees	143	144	131	131	138

