CHAPTER IV. PRESENT SITUATION OF THE PARTS AND COMPONENTS INDUSTRY IN INDONESIA

1. AUTOMOTIVE PARTS AND COMPONENTS INDUSTRY

1.1 PRESENT SITUATION OF THE AUTOMOTIVE PARTS AND COMPONENTS INDUSTRY

1.1.1 History of the Automotive Parts and Components Industry in Indonesia

Indonesia's automotive parts and components industry has developed along with the government's policy for localizing production. According to data from the MOIT, the number of companies manufacturing automotive parts in Indonesia in 1995 was 131 (as opposed to 124 in 1994), while the number of types of parts being manufactured was 43 (the same as in 1994). According to the directory 1996/97 of GIAMM (Association of Indonesian Automotive Parts Manufacturers), 115 companies are registered as its members.

(1) Changes in Localization Policy for Parts and Components

In the latter half of the 1970s, based on an order from the Minister of Industry and another from the Director of the General Agency for Basic Metal and Machine Industries, Indonesia adopted a policy of localizing the production of parts and components. Called a "deletion program," this policy "deleted," in stages, parts and components recognized as CKD imports, which then automatically became parts and components designated for local production.

In the 1980s, in accordance with this policy of locally producing designated parts and components, the use of locally made parts and components was made obligatory; moreover, 90 automotive parts and components, including engine parts, were added to the list of designated parts and components.

The designated automotive parts and components of those days can roughly be divided into two categories. One consists of parts and components with superior cost competitiveness: tires and other rubber products, seats, batteries, spark plugs, wheel rims, pistons, shock absorbers, etc. The other consists of parts and components that were added to the list as a result of the government's localization policy: parts and components related to components such as engines, transmissions, brake systems, chassis, steering systems, etc.

At that time, the government was also trying to promote the export of products other than gas and oil products. Accordingly, a notification encouraging the export of cars was distributed to automotive manufacturers. However, these manufacturers were concerned that, if they gave exclusive priority to using the high-added value parts and components in the second category of designated parts and components, car production costs would become excessively high. Moreover, there were cases where designated parts and components were being merely assembled or processed locally without being studied in detail, as a result of which the superstructure of the domestic parts and components industry grew far faster than its foundations.

In June 1993 the government began a thorough revision of its localization policy. The new policy did away with the compulsory use of parts and components designated for local production, allowing manufacturers to instead choose which locally made parts and components to use. On the other hand, under the new policy, the local content ratio of parts and components and the local content ratio of added value are calculated for each type of car and each of the main parts and components. Then, based on those ratios, import duties and luxury taxes are imposed and incentives are provided for fields in which investment is prohibited.

(2) The New Policy's Localization Point System

In the new policy, import duties are imposed according to local content ratio as calculated on a "Localization Point System." Under the previous policy, designated parts and components had to be made locally, but under the new policy companies can promote local production at their own pace, with their import duties being lowered in proportion to their

efforts. As cost considerations serve as a motive force of localization under this policy, the improved cost competitiveness of exports is also one of the benefits that the policy can be expected to produce.

Table 4-1-1 Definition of Car Category

Categories	CAPACITY (GVW/CC)	
Category I	Up to 5 Tons	(Pick up, Mini Bus)
Category II	5 - 10 Tons	(Truck, Bus)
Category III	10 - 24 Tons	(Truck, Bus)
Category IV	Cat. I - 4x4	(Cat I, 4×4 : Jeep)
Category V	Heavy Duty (>24 Tons)	
Prime Sedan	Up to 1600 cc	
Sedan	> 1600 cc	

Source: MOIT

Table 4-1-2 Localization Points of Components by Car Category

COMPONENT	CAT I	CAT II	CAT III	CAT IV	SEDAN
1. Engine	25.0	25.0	25.0	25.0	25.0
2. Transmission	13.1	13.2	13.1	13.1	13.1
3. Drive Axle	13.1	11.5	11.8	11.0	3.3
4. Steering	3.6	4.2	4.1	4.3	1.8
5. Clutch	1.8	1.4	1.7	1.6	0.8
6. Brake System	2.0	4.9	5.4	4.1	1.9
7. Chassis & Body	15.1	16.8	16.7	16.8	20.0
8. Suspension	6.3	5.2	5.6	5.2	3.7
9. Universal	5.0	6	5.9	6.2	8.3
10. Other Component	5.0	5.0	4.2	5.5	12.1
11. Assembling	5.0	1.8	1.5	2.2	5.0
12. Design Engineering	5.0	5.0	5.0	5.0	5.0
TOTAL	100.0	100.0	100.0	100.0	100.0

Source: MOIT

Table 4-1-3 Import Duty Percent by Local Content Ratio

1. Sedans & Station Wagons

L-Content %	<20	20≦LC≦30	30<LC≦40	40<LC≦60	>60
BM CKD	100	80	60	40	0

2. Category I (Pick ups & Minibuses)

L-Content %	<20	20≦LC≦30	30<LC≦40	>40
BM CKD	40	30	20	0

3. Category II & III (Trucks & Buses)

L-Content %	<20	20≦LC≦30	>30
BM CKD	40	20	0

4. Jeeps (4 x 4)

L-Content %	<20	20≦LC≦30	30<LC≦40	>40
BM CKD	40	30	20	0

5. Component for Sedans, Cat. I & Cat. IV

L-Content %	<20	20≦LC≦30	30<LC≦40	>40
BM CKD	40	30	20	0

6. Components for Cat. II & III

L-Content %	<10	10≦LC≦20	>20
BM CKD	40	20	0

Source: MOIT

1.1.2 The Extent of Local Production of Automotive Parts and Components

(1) General Situation of Local Parts and Components Production

Under the old localization policy for automotive parts and components, foreign parts and components manufacturers who entered Indonesia did so mainly to manufacture designated parts and components. From 1990 through 1993, the volume of spark plugs, V-belts, brake systems, gaskets, control cables, seats, pistons, shock absorbers, etc., that were produced locally continued to increase. Engines, transmissions, chassis and frames, etc.,

provided the greatest revenue. However, since the new policy, with its Localization Point System, went into effect in 1994, the annual quantity of parts produced, measured according to the value of production in 1993, increased by a factor of 1.46 in 1994 and a factor of 2.00 in 1995 (by a factor of 1.37 from 1994), according to the source provided by the MOIT. During this period, the components whose local production increased the most included clutch systems, brake drums, chassis and frames, exhaust systems, pistons, fuel tanks, etc.

On the other hand, the value of the cars produced in 1995 increased 14.74% from 1994, while the value of imported automotive parts and components increased only 8.45%. This disparity is believed to indicate an advance in local production of automotive parts and components.

Table 4-1-4 shows the growth in local content for each category of cars from 1994 to 1996.

Table 4-1-4 Progress of Local Content in Car Production

(Unit:Points)

No.	Year / Category	1994	1995	1996
1	PASSENGER CAR	5.00 - 42.96	5.02 - 42.24	6.38 - 42.15
2	COMMERCIAL CAR			
	- CATEGORY I	12.20 - 51.02	5.39 - 48.14	5.47 - 45.39
	- CATEGORY II	21.60 - 37.50	23.40 - 33.67	22.00 - 33.97
	- CATEGORY III	24.87 - 36.32	29.27 - 35.06	22.52 - 34.82
	- CATEGORY IV	1.00 - 31.99	2.20 - 30.79	2.20 - 30.16

Source: MOIT

(2) The Extent of Major Assemblers' Local Parts and Components Production

Based on the new localization policy for automotive parts and components, the main automotive assemblers and parts and components manufacturers in Indonesia are increasing their local production by calculating the localization points for each category of car and part

and component they produce, and then, based on a consideration of the tax incentive rates that correspond to the calculated points, choosing to locally manufacture or purchase those parts and components whose local manufacture or purchase will provide a major cost advantage.

On the other hand, the major manufacturers from Japan, Europe and the United States, expecting the Asian markets to grow, are moving ahead with business strategies that call for, among other things, the development of cars exclusively for Asia and the building of reciprocal supply systems for parts and components. Thus, companies which have already entered Indonesia are considering whether it is possible or not to regard it as a production base that will not just meet domestic demand but also supply all ASEAN or Asian markets and to build such a production system. Since the volume of production in Indonesia is small, it would be difficult in a short period, relying only on the domestic market, to develop technology and products that could become leaders, in terms of quality and cost, in the ASEAN countries. Therefore, in addition to the above-mentioned choosing of parts and components, also of importance in the promotion of local production are the business strategies of the major automotive manufacturers, as these strategies significantly affect the development of supporting industries.

a. Average amounts of local content in automotive parts and components

Table 4-1-5 shows the average amounts of local content in each category of car in 1994.

Table 4-1-5 Average Points of Local Content by Category

4 Wheel Vehicle	Local Content (1994)
CAT I	37.52
CAT II	26.99
CAT III	28.31
CAT IV	12.70
SEDAN	5.09

Source: MOIT

b. Average local content in each category of car of each main brand

Table 4-1-6 shows the average points of local content in each category of car of each main brand in 1994.

Table 4-1-6 Average Amount of Local Content by Brand

(Unit: Points)

Brand	CAT I	CAT II	CAT III	CAT IV
TOYOTA	42.35	23.25	—	—
DAIHATSU	38.48	23.25	—	19.83
MITSUBISHI	38.00	23.25	13.94	—
SUZUKI	34.67	—	—	19.83
ISUZU	—	23.45	13.94	—
NISSAN	—	—	13.94	—
MERCEDES	—	23.25	13.94	3.1
CHEVROLET	34.67	—	—	—

Source: MOIT

(3) Local Content of Components by Category

Table 4-1-7 shows the average points of local content in each component of each category of car in 1994.

Table 4-1-7 Average Amount of Local Content of Parts and Components

(Unit: %)

Component	CAT I	CAT II	CAT III	CAT IV	PSR CAR
Engine	29.62	24.65	20.19	24.39	19.15
Transmission	9.70	11.27	9.35	7.50	7.91
Drive Axle	20.00	12.38	9.01	20.69	2.64
Steering System	24.79	11.06	10.04	19.17	8.36
Clutch	22.76	25.36	20.87	41.94	18.56
Brake System	52.02	56.19	50.65	42.00	17.51
Chassis, Frame	75.00	74.97	61.93	45.61	18.97
Suspension	38.43	33.78	31.28	56.40	12.93
Universal	41.23	40.57	0.00	71.10	23.59

Source: MOIT

(4) Local Content of Individual Parts and Components

According to the localization point table made by the MOIT, the current local content ratios of automotive parts and components which are identified by the data supplied by the MOIT are shown in the Table 4-1-8. In addition, for some parts and components whose current local content ratios cannot be identified directly from the data, their local content ratios are calculated from averaging the local content ratios of main manufacturers of the parts and components. If the local ratios of parts and components are not identified, the space for the local content ratios is left blank.

Table 4-1-8 Localization Points and Current Status of Local Content Ratios of Automotive Parts and Components (Category I)

(Unit: Points)

Category I	Parts Items	Localization Points	Local content ratios 1995	Local content ratios 1994
1. Engine	1.1 Air Filter	0.052	68.51	70.30
	1.2 Alternator	1.373	16.43	10.00
	1.3 Bearing	0.052	11.80	32.23
	1.4 Bearing Cap	0.325	66.70	0.00
	1.5 Camshaft	2.203	32.00	41.00
	1.6 Connecting Rod	0.765	14.00	41.00
	1.7 Cover, Cylinder Head	0.325	30.10	
	1.8 Crankshaft	2.528	47.90	41.00
	1.9 Cylinder Block	3.850	96.00	83.85
	1.10 Cylinder Head	3.850	30.00	
	1.11 Exhaust Manifold	0.325	39.70	58.00
	1.12 Flywheel	0.411	6.00	94.30
	1.13 Fuel Filter	0.052	68.51	71.32
	1.14 Gasket	0.054	43.33	71.08
	1.15 Intake Manifold	0.325	39.70	
	1.16 Motor Starter	1.513	14.45	10.00
	1.17 Oil Filter	0.052	68.50	69.20
	1.18 Piston & Piston Ring	0.767	74.17	65.36
	1.19 Pulley Crankshaft	0.104		0.00
	1.20 Radiator	0.859	73.21	71.51
	1.21 Rocker Arm	0.221	12.00	42.00
	1.22 Spark Plug	0.052	70.83	43.81
	1.23 V Belt	0.020	10.00	76.00
	1.24 Oil Pan	0.259		75.00
	1.25 Air Filter Housing	0.163		0.00

	1.26 Fan Shroud	0.169		
	1.27 Water Overflow Tank	0.052		0.00
	1.28 Timing Case & Cover	0.233		
	1.29 Air Intake Pipe	0.010		
	1.30 Engine Support	0.030		81.20
	1.31 Engine Hanger	0.026		21.43
	1.32 Others	1.236		
	1.33 Engine Assembly	2.683		
	Adjustment	0.001		
	Engine Sub-total	25.000	37.69	29.62
2. Transmission	2.1 Bearing	0.196		
	2.2 Case	1.734	55.70	
	2.3 Clutch Housing	1.203	50.00	
	2.4 Cover	1.203	100.00	
	2.5 Extension Housing	0.743	38.90	
	2.6 Gear	1.805		
	2.7 Input Shaft/Main Shaft	2.107		
	2.8 Shift Fork/Speed Shaft Rail	1.505		
	2.9 Synchronizer	0.373		
	2.10 Others	0.974		
	2.11 Transmission Assembly	1.257		
	Transmission Sub-total	13.100	12.30	9.70
3. Drive Axle	3.1 Bearing	0.207		
	3.2 Companion Flange	0.117	69.80	
	3.3 Differential Case	0.324		
	3.4 Differential Gear	1.932		
	3.5 Drive Shaft	2.753		
	3.6 Housing	2.256		
	3.7 Hub Wheel	0.968		78.00
	3.8 Pinion Shaft	0.234	13.50	
	3.9 Propeller Tube	0.644		
	3.10 Side Bearing Nut	0.117		
	3.11 Yoke	1.554		
	3.12 Others	0.675		
	3.13 Drive Axle Assembly	1.319		
	Drive Axle Sub-total	13.100	23.35	20.00
4. Steering	4.1 Bearing	0.019	0.00	
	4.2 Knuckle Arm	0.293	0.00	
	4.3 Steering Column	0.082		98.00
	4.4 Steering Gear	0.325	0.00	
	4.5 Steering Shaft	0.455	60.00	
	4.6 Steering Wheel	0.716	100.00	76.41
	4.7 Tie Rod End	0.358	0.00	
	4.8 Tie Rod Linkage	0.180	0.00	
	4.9 Cover Steering Column	0.180	0.00	
	4.10 Shim	0.050		
	4.11 Others	0.570		

	4.12 Steering Assembly	0.342		
	Steering Sub-total	3.600	24.73	24.79
5. Clutch	5.1 Cover	0.197	100.00	
	5.2 Cushion Rubber	0.017	11.00	
	5.3 Diaphragm	0.347	0.00	
	5.4 Disc Plate	0.132	100.00	
	5.5 Facing	0.198	0.00	85.67
	5.6 Hub	0.198	0.00	
	5.7 Pivot	0.033	100.00	75.00
	5.8 Pressure Plate	0.149	100.00	19.25
	5.9 Torsion Spring	0.066	100.00	75.00
	5.10 Others	0.149		
	5.11 Clutch Assembly	0.314		
	Clutch Sub-total	1.800	42.59	22.76
6. Brake	6.1 Backing Plate/Body Caliper	0.601		
	6.2 Brake Lining/Pad	0.043	75.00	79.38
	6.3 Brake Shoe/Plate	0.342		75.00
	6.4 Cylinder Wheel/Piston Caliper	0.167		
	6.5 Drum/Disk	0.434	98.00	88.71
	6.6 Support Caliper	0.037		
	6.7 Master Power	0.060		
	6.8 Master Cylinder	0.060		
	6.9 Others	0.060		
	6.10 Brake Assembly	0.196		
	Brake Sub-total	2.000	54.19	52.02
7. Chassis & Body	7.1 Back Panel/Back Doord	0.323		77.38
	7.2 Cross Member	0.392		99.00
	7.3 Door	2.629		77.38
	7.4 Engine Hood/Front Panel	1.712		77.50
	7.5 Fender	0.901		77.88
	7.6 Floor/Rear Deck	1.729		78.13
	7.7 Roof	1.955		78.88
	7.8 Side Panel	2.548		79.00
	7.9 Side Rail/Chassis	0.836		94.25
	7.10 Trunk	0.000		0.00
	7.11 Others	0.468		
	7.12 Chassis & Body Assembly	1.604		
	Chassis & Body Sub-total	15.100		75.00
8. Suspension	8.1 Front Spring	0.727		75.25
	8.2 Non-Drive Axle	0.911		0.00
	8.3 Rear Spring	0.675		73.80
	8.4 Shock Absorber	3.362	51.59	55.46
	8.5 Others	0.500		
	8.6 Suspension Assembly	0.125		
	Suspension Sub-total	6.300		38.43

9. Universal	9.1 Battery	0.075		79.98
	9.2 Brake/Fuel Tube	0.051	35.33	55.39
	9.3 Bumper	0.139		76.64
	9.4 Control Cable	0.140	58.84	71.31
	9.5 Dashboard	0.084		64.17
	9.6 Fuel Tank	0.278	43.82	43.80
	9.7 Horn	0.035	44.97	66.67
	9.8 Lamp	0.020		0.00
	9.9 Mirror	0.053		74.00
	9.10 Muffler & Exhaust Pipe	0.102	60.00	43.35
	9.11 Paint	0.429		
	9.12 Plastic Parts	0.360	90.90	80.83
	9.13 Rubber Parts	0.461	75.00	77.75
	9.14 Safety Glass	1.262	97.00	99.00
	9.15 Seat & Seat Frame	0.305	81.54	41.35
	9.16 Sticker & Strip	0.016		75.00
	9.17 Tire	0.093		92.50
	9.18 Jack	0.093	61.84	67.10
	9.19 Weather Strip	0.084		78.00
	9.20 Wheel Rim	0.398	76.57	77.42
	9.21 Window Regulator	0.051	41.35	54.65
	9.22 Windshield Washer	0.070	40.85	0.00
	9.23 Wiring Harness	0.117	54.63	56.29
	9.24 Floor Mat/Carpet	0.017		79.31
	9.25 Head Lining	0.017		86.96
	9.26 Door Trim	0.017		82.50
	9.27 Sun Visor	0.006		80.09
	9.28 Arm Rest	0.017		77.28
	9.29 Grips Assist & Push Handle	0.006		0.00
	9.30 Sliding Seat	0.058	29.95	37.16
	9.31 Reclining Seat	0.059	18.05	5.09
	9.32 Safety Belt	0.072	97.00	27.72
	9.33 Oil Seal	0.005		61.83
	9.34 AC	0.500		75.25
	9.35 Meter Cluster	0.200		
	9.36 Control Door Lock	0.100		
	9.37 Power Window	0.050		
	9.38 Radio Tape	0.100		
	9.39 Others	1.050		
	Adjustment	0.010		
	Universal Sub-total	7.000		
10. Other Component		3.000		
11. Assembling		5.000		
12. Design Engineering		5.000		
TOTAL		100.000		

Source: MOIT

Table 4-1-9 shows the average local content ratios of parts and components for motorcycles.

Table 4-1-9 Average Local Content Ratios of Parts and Components for Motorcycles

(Unit: %)

Sub Components	Parts	Local content (Average)
1. Engine & Transmission	1.1 Cover	36.511
	1.2 Rubber Parts	44.148
	1.3 Gasket	14.409
	1.4 Bearing	33.525
	1.5 Pedal Gear Change	60.201
	1.6 Cylinder Head	75.000
	1.7 Cylinder Block	58.000
	1.8 Piston	68.634
	1.9 Kick Starter Pedal	77.215
	1.10 Flywheel/Cen/Magnetic	36.000
	1.11 Piston Ring	46.671
	1.12 Crank Case	24.000
	1.13 Cylinder Sleeve	40.000
	1.14 Cam Shaft	41.100
	1.15 Cam Chains	0.000
	1.16 Crank Starter	41.000
	1.17 Air Cleaner System	32.758
	1.18 Spark Plug	10.905
	1.19 Drive Chain	8.250
	1.20 Rear Sprocket	68.000
	Sub-total	33.691
2. Wheel, Axle & Suspension	2.1 Front/Rear Axle	69.643
	2.2 Hub	64.100
	2.3 Wheel Rim	47.727
	2.4 Tire & Tube	95.000
	2.5 Front Fork & Absorber	58.988
	2.6 Rear Cushion & Absorber	58.157
	Sub-total	63.857
3. Steering System	3.1 Steering Handle	73.448
	3.2 Steering System/Column	56.007
	Sub-total	64.477
4. Brake System	4.1 Brake Disk/Lining	85.667
	4.2 Pad Assy./Brake Shoe	75.600
	4.3 Brake Pedal/Lever	55.501
	4.4 Caliper/Panel	76.600
	Sub-total	55.880

5. Electrical & Instrument	5.1 Head Lamp	43.560
	5.2 Tail Lamp/Rear Comb.	57.019
	5.3 Pilot/Winker Indicator	67.291
	5.4 Light/Winker Switch	50.760
	5.5 Stop Lamp Switch	59.180
	5.6 Flasher	48.670
	5.7 Ignition Coil	48.075
	5.8 Rectifier/Regulator	51.592
	5.9 Horn	70.576
	5.10 Reflector	77.956
	5.11 Electric Starter	44.770
	5.12 Battery	83.430
	5.13 Contact Point/CDI	22.151
	5.14 Wiring Harness	51.554
	5.15 Ampere Meter, Fuel/Oil Gauge	15.888
	5.16 Speedometer/Tachometer	42.834
	5.17 Connector Control Cable	63.238
	5.18 Lock	51.785
	Sub-total	34.220
6. Frame Body	6.1 Main Frame	52.626
	6.2 Bracket	65.105
	6.3 Fuel/Oil Tank	70.349
	6.4 Cap	55.064
	6.5 Chain Case	74.926
	6.6 Main & Side Stand	57.277
	6.7 Rear/Front Fender	72.150
	6.8 Seat Assy.	77.255
	6.9 Side Cover/Cowling	76.750
	6.10 Back Mirror	74.000
	6.11 Leg Shield	51.000
	6.12 Muffler Assy.	50.103
	6.13 Plastic Cover	76.488
	6.14 Rear ForksArm	59.444
	6.15 Step Bar, Foot Rest	69.089
	6.16 Mudguard	67.052
	6.17 Luggage Carrier	78.400
	6.18 Emblem/Name Plate	76.000
	6.19 Fuel Cock	57.172
	6.20 Tool Set	77.708
	Sub-total	58.392
7. Others	7.1 Carburetor	76.000
	7.2 Clutch Assy.	10.000
TOTAL		41.172

Source: MOIT

Table 4-1-10 and Table 4-1-11 show the current status of procurement of individual parts

and components by two automotive assemblers in Indonesia. Methods of procurement are classified into in-house production, domestic procurement and import.

Table 4-1-10 Status of Procurement by Company A (Category I; 1995)

Company A Category I	Parts	Local content point	Procurement		
			In-house	Domestic	Import
1. Engine	1.1 Air Filter	0.052		□	
	1.2 Alternator	1.373		□	
	1.3 Bearing	0.052		□	
	1.4 Bearing Cap	0.325	□ CM		
	1.5 Camshaft	2.203			□
	1.6 Connecting Rod	0.765			□
	1.7 Cover, Cylinder Head	0.325	□ M	□C	
	1.8 Crankshaft	2.528	□ CM		
	1.9 Cylinder Block	3.850	□ CM		
	1.10 Cylinder Head	3.850	□ M		
	1.11 Exhaust Manifold	0.325	□ M	□C	
	1.12 Flywheel	0.441	□ CM		
	1.13 Fuel Filter	0.052		□	
	1.14 Gasket	0.054		□	
	1.15 Intake Manifold	0.325	□ M		
	1.16 Motor Starter	1.543		□	
	1.17 Oil Filter	0.052		□	
	1.18 Piston & Piston Ring	0.767	□ CM		
	1.19 Pulley Crankshaft	0.104			□
	1.20 Radiator	0.859		□	
	1.21 Rocker Arm	0.221			□
	1.22 Spark Plug	0.052		□	
	1.23 V Belt	0.020		□	
	1.24 Oil Pan	0.259	□ PM		
	1.25 Air Filter Housing	0.163		□	
	1.26 Fan Shroud	0.169			□
	1.27 Water Overflow Tank	0.052		□	
	1.28 Timing Case & Cover	0.233			□
	1.29 Air Intake Pipe	0.010			
	1.30 Engine Support	0.030		□	
	1.31 Engine Hanger	0.026			□
	1.32 Others	1.236			
	1.33 Engine Assembly	2.683	□		
	Adjustment	0.001			
	Engine Sub-total	25.000		12.03	

2. Transmis-sion	2.1 Bearing	0.196			□
	2.2 Case	1.734		□ M	□ C
	2.3 Clutch Housing	1.203		□ M	□ C
	2.4 Cover	1.203			□
	2.5 Extension Housing	0.743		□ M	□ C
	2.6 Gears	1.805			□
	2.7 Input Shaft/Main Shaft	2.107			□
	2.8 Shift Fork/Speed Shaft Rail	1.505			□
	2.9 Synchronizer	0.373			□
	2.10 Others	0.974			
	2.11 Transmission Assembly	1.257		□	
	Transmission Sub-total	13.100		2.73	
3. Drive Axle	3.1 Bearing	0.207			□
	3.2 Companion Flange	0.117			□
	3.3 Differential Case	0.324			□
	3.4 Differential Gears	1.932			□
	3.5 Drive Shaft	2.753		□	□ F
	3.6 Housing	2.256			□
	3.7 Hub Wheel	0.968			□
	3.8 Pinion Shaft	0.234			□
	3.9 Propeller Tube	0.644		□	
	3.10 Side Bearing Nut	0.117			□
	3.11 Yoke	1.554			□
	3.12 Others	0.675			□
	3.13 Drive Axle Assembly	1.319	□		
	Drive Axle Sub-total	13.100		3.67	
4. Steering	4.1 Bearing	0.049			□
	4.2 Knuckle Arm	0.293			□
	4.3 Steering Column	0.082			□
	4.4 Steering Gear	0.325			□
	4.5 Steering Shaft	0.455			□
	4.6 Steering Wheel	0.716		□	
	4.7 Tie Rod End	0.358			□
	4.8 Tie Rod Linkage	0.180			□
	4.9 Cover Steering Column	0.180	□		
	4.10 Shim	0.050			□
	4.11 Others	0.570			□
	4.12 Steering Assembly	0.342			□
	Steering Sub-total	3.600		0.70	
5. Clutch	5.1 Cover	0.197		□	
	5.2 Cushion Rubber	0.017			□
	5.3 Diaphragm	0.347		□	
	5.4 Disc Plate	0.132		□	
	5.5 Facing	0.198		□	
	5.6 Hub	0.198			□
	5.7 Pivot	0.033			□

	5.8 Pressure Plate	0.149		□	
	5.9 Torsion Spring	0.066			□
	5.10 Others	0.149			□
	5.11 Clutch Assembly	0.314		□	
	Clutch Sub-total	1.800		0.91	
6. Brake	6.1 Backing Plate/Body Caliper	0.601			□
	6.2 Brake Lining/Pad	0.043		□	
	6.3 Brake Shoe/Plate	0.342		□	
	6.4 Cylinder Wheel/Piston Caliper	0.167			□
	6.5 Drum/Disk	0.434		□ CM	
	6.6 Support Caliper	0.037			□
	6.7 Master Power	0.060			□
	6.8 Master Cylinder	0.060			□
	6.9 Others	0.060			
	6.10 Brake Assembly	0.196		□	
	Brake Sub-total	2.000		1.19	
7. Chassis & Body	7.1 Back Panel/Back Door	0.323	□		
	7.2 Cross Member	0.392	□		
	7.3 Doors	2.629	□		
	7.4 Engine Food/Front Panel	1.712	□		
	7.5 Fender	0.904	□		
	7.6 Floor/Rear Deck	1.729	□		
	7.7 Roof	1.955	□		
	7.8 Side Panel	2.548	□		
	7.9 Side Rail/Chassis	0.836	□		
	7.10 Trunk	0.000			
	7.11 Others	0.468	□		
	7.12 Chassis & Body Assembly	1.604	□		
	Chassis & Body Sub-total	15.100		11.87	
8. Suspension	8.1 Front Spring	0.727		□	
	8.2 Non-Drive Axle	0.911			□
	8.3 Rear Spring	0.675		□	
	8.4 Shock Absorber	3.362		□	
	8.5 Others	0.500			
	8.6 Suspension Assembly	0.125		□	
	Suspension Sub-total	6.300		2.37	
9. Universal	9.1 Battery	0.075		□	
	9.2 Brake/Fuel Tube	0.051		□	
	9.3 Bumper	0.139	□		
	9.4 Control Cable	0.140		□	
	9.5 Dashboard	0.084			□
	9.6 Fuel Tank	0.278	□		
	9.7 Horn	0.035		□	
	9.8 Lamps	0.020			□
	9.9 Mirror	0.053		□	
	9.10 Muffler & Exhaust Pipe	0.102		□	

	9.11 Paint	0.429	□		
	9.12 Plastic Parts	0.360		□	
	9.13 Rubber Parts	0.461		□	
	9.14 Safety Glass	1.262		□	
	9.15 Seat & Seat Frame	0.305		□	
	9.16 Sticker & Strip	0.016		□	
	9.17 Tire	0.093		□	
	9.18 Jack	0.093		□	
	9.19 Weather Strip	0.084		□	
	9.20 Wheel Rim	0.398		□	
	9.21 Window Regulator	0.051			□
	9.22 Windshield Washer	0.070			□
	9.23 Wiring Harness	0.117		□	
	9.24 Floor Mat/Carpet	0.017		□	
	9.25 Head Lining	0.017		□	
	9.26 Door Trim	0.017		□	
	9.27 Sun Visor	0.006		□	
	9.28 Arm Rest	0.017		□	
	9.29 Grips Assist & Push Handle	0.006		□	
	9.30 Sliding Seat	0.058		□	
	9.31 Reclining Seat	0.059		□	
	9.32 Safety Belt	0.072			□
	9.33 Oil Seal	0.005			□
	9.34 AC	0.500		□	
	9.35 Meter Cluster	0.200		□	
	9.36 Control Door Lock	0.100			□
	9.37 Power Window	0.050			□
	9.38 Radio Tape	0.100		□	
	9.39 Others	1.050			
	Adjustment	0.010			
	Universal Sub-total	7.000		3.51	
10. Other Component		3.000		0.00	
11. Assembling		5.000		5.00	
12. Design Engineering		5.000		2.00	
TOTAL		100.000		43.61	

Note: □ shows procurement of parts and components. C-Casting, M-Machining, P-Presswork, F-Forging

Source: Prepared by the Study Team based on interview survey results of assemblers.

Table 4-1-11 Status of Procurement by Company B (Category I; 1995)

Company B Category I	Parts	Local content point	Procurement		
			In-house	Domestic	Import
1. Engine	1.1 Air Filter	0.052		□	
	1.2 Alternator	1.373		□	
	1.3 Bearing	0.052			□
	1.4 Bearing Cap	0.325	□M	□ M	
	1.5 Camshaft	2.203		□ C	□
	1.6 Connecting Rod	0.765		□	□
	1.7 Cover, Cylinder Head	0.325	□ M		
	1.8 Crankshaft	2.528		□M	□
	1.9 Cylinder Block	3.850	□ M	□M	
	1.10 Cylinder Head	3.850		□	□
	1.11 Exhaust Manifold	0.325	□M	□	
	1.12 Flywheel	0.441		□	
	1.13 Fuel Filter	0.052		□	
	1.14 Gasket	0.054		□	
	1.15 Intake Manifold	0.325	□M	□	
	1.16 Motor Starter	1.543		□	
	1.17 Oil Filter	0.052		□	
	1.18 Piston & Piston Ring	0.767	□M	□	
	1.19 Pulley Crankshaft	0.104			□
	1.20 Radiator	0.859		□	
	1.21 Rocker Arm	0.221		□	□
	1.22 Spark Plug	0.052		□	
	1.23 V Belt	0.020		□	
	1.24 Oil Pan	0.259			□
	1.25 Air Filter Housing	0.163			□
	1.26 Fan Shroud	0.169			□
	1.27 Water Overflow Tank	0.052		□	□
	1.28 Timing Case & Cover	0.233			□
	1.29 Air Intake Pipe	0.010			□
	1.30 Engine Support	0.030		□	
	1.31 Engine Hanger	0.026		□	
	1.32 Others	1.236			
	1.33 Engine Assembly	2.683	□		
	Adjustment	0.001			
	Engine Sub-total	25.000			
2. Transmission	2.1 Bearing	0.196	□M	□	
	2.2 Case	1.734	□M	□	
	2.3 Clutch Housing	1.203	□M	□	
	2.4 Cover	1.203	□M	□	
	2.5 Extension Housing	0.743			□
	2.6 Gears	1.805			□
	2.7 Input Shaft/Main Shaft	2.107			□

	2.8 Shift Fork/Speed Shaft Rail	1.505			□
	2.9 Synchronizer	0.373			□
	2.10 Others	0.974			
	2.11 Transmission Assembly	1.257	□		
	Transmission Sub-total	13.100			
3. Drive Axle	3.1 Bearing	0.207			□
	3.2 Companion Flange	0.117		□	
	3.3 Differential Case	0.324			□
	3.4 Differential Gears	1.932			□
	3.5 Drive Shaft	2.753		□	
	3.6 Housing	2.256		□	
	3.7 Hub Wheel	0.968			□
	3.8 Pinion Shaft	0.234		□	
	3.9 Propeller Tube	0.644		□	
	3.10 Side Bearing Nut	0.117		□	
	3.11 Yoke	1.554			□
	3.12 Others	0.675			
	3.13 Drive Axle Assembly	1.319			
	Drive Axle Sub-total	13.100			
4. Steering	4.1 Bearing	0.049			□
	4.2 Knuckle Arm	0.293			□
	4.3 Steering Column	0.082		□	
	4.4 Steering Gear	0.325			□
	4.5 Steering Shaft	0.455		□	
	4.6 Steering Wheel	0.716	□	□	
	4.7 Tie Rod End	0.358		□	
	4.8 Tie Rod Linkage	0.180			□
	4.9 Cover Steering Column	0.180			□
	4.10 Shim	0.050			□
	4.11 Others	0.570			
	4.12 Steering Assembly	0.342	□		
	Steering Sub-total	3.600			
5. Clutch	5.1 Cover	0.197		□	
	5.2 Cushion Rubber	0.017		□	
	5.3 Diaphragm	0.347		□	
	5.4 Disk Plate	0.132		□	
	5.5 Facing	0.198		□	
	5.6 Hub	0.198		□	
	5.7 Pivot	0.033		□	
	5.8 Pressure Plate	0.149		□	
	5.9 Torsion Spring	0.066		□	
	5.10 Others	0.149		□	
	5.11 Clutch Assembly	0.314		□	
	Clutch Sub-total	1.800			

6. Brake	6.1 Backing Plate/Body Caliper	0.601		□	
	6.2 Brake Lining/Pad	0.043		□	
	6.3 Brake Shoe/Plate	0.342		□	
	6.4 Cylinder Wheel/Piston Caliper	0.167		□	
	6.5 Drum/Disk	0.434		□	
	6.6 Support Caliper	0.037		□	
	6.7 Master Power	0.060		□	
	6.8 Master Cylinder	0.060		□	
	6.9 Others	0.060		□	
	6.10 Brake Assembly	0.196		□	
	Brake Sub-total	2.000			
7. Chassis & Body	7.1 Back Panel/Back Door	0.323	□		
	7.2 Cross Member	0.392	□		
	7.3 Doors	2.629	□		
	7.4 Engine Food/Front Panel	1.712	□		
	7.5 Fender	0.904	□		
	7.6 Floor/Rear Deck	1.729	□		
	7.7 Roof	1.955	□		
	7.8 Side Panel	2.548	□		
	7.9 Side Rail/Chassis	0.836	□		
	7.10 Trunk	0.000			
	7.11 Others	0.468			
	7.12 Chassis & Body Assembly	1.604	□		
	Chassis & Body Sub-total	15.100			
8. Suspen-sion	8.1 Front Spring	0.727		□	
	8.2 Non-Drive Axle	0.911			□
	8.3 Rear Spring	0.675		□	
	8.4 Shock Absorber	3.362		□	
	8.5 Others	0.500			
	8.6 Suspension Assembly	0.125		□	
	Suspension Sub-total	6.300			
9. Univer-sal	9.1 Battery	0.075		□	
	9.2 Brake/Fuel Tube	0.051		□	
	9.3 Bumper	0.139	□		
	9.4 Control Cable	0.140		□	
	9.5 Dashboard	0.084			
	9.6 Fuel Tank	0.278		□	
	9.7 Horn	0.035		□	
	9.8 Lamps	0.020			□
	9.9 Mirror	0.053		□	
	9.10 Muffler & Exhaust Pipe	0.102		□	
	9.11 Paint	0.429		□	
	9.12 Plastic Parts	0.360	□		
	9.13 Rubber Parts	0.461		□	
	9.14 Safety Glass	1.262		□	
	9.15 Seat & Seat Frame	0.305		□	

	9.16 Sticker & Strip	0.016		□	
	9.17 Tire	0.093		□	
	9.18 Jack	0.093		□	
	9.19 Weather Strip	0.084		□	
	9.20 Wheel Rim	0.398		□	
	9 21 Window Regulator	0.051			□
	9.22 Windshield Washer	0.070			□
	9.23 Wiring Harness	0.117		□	
	9.24 Floor Mat/Carpet	0.017		□	
	9.25 Head Lining	0.017		□	
	9.26 Door Trim	0.017		□	
	9.27 Sun Visor	0.006		□	
	9.28 Arm Rest	0.017			□
	9.29 Grips Assist & Push Handle	0.006	□		
	9.30 Sliding Seat	0.058	□		
	9.31 Reclining Seat	0.059			□
	9.32 Safety Belt	0.072		□	
	9.33 Oil Seal	0.005		□	
	9.34 AC	0.500		□	
	9.35 Meter Cluster	0.200			□
	9.36 Control Door Lock	0.100			□
	9.37 Power Window	0.050			□
	9.38 Radio Tape	0.100			□
	9.39 Others	1.050			
	Adjustment	0.010			
	Universal Sub-total	7.000			
10. Other Component		3.000			
11. Assembling		5.000			
12. Design Engineering		5.000			
TOTAL		100.000			

Note: □ shows procurement of parts and components. C-Casting, M-Machining

Source: Prepared by the Study Team based on interview survey results of assemblers.

(5) Parts that Will be Increasingly Produced Locally

The following is an example of an automotive assembler's localization plan for the future production of parts and components. (It includes parts and components that will be increasingly produced locally as well as parts and components that will be newly produced locally).

Table 4-1-12 Example of an Automotive Assembler's Localization Plan for the Future Production of Parts and Components

Components	Parts and Sub Components
Engine	Air Filter, Bearing, Connecting Rod(F,M), Cylinder Head(C), Fuel Filter, Intake Manifold(C), Piston & Piston Ring, Air Filter Housing, Timing Case & Cover, Engine Support
Transmission	Case(C), Clutch Housing(C), Extension Housing(C), Gears(F,M), Input Shaft/Main Shaft(F,M),
Drive Axle	Companion Flange, Differential Case, Differential Gears, Housing, Yoke
Steering	Steering Assembly
Clutch	Cushion Rubber, Hub, Pivot, Torsion Spring
Brake	Backing Plate/Body Caliper, Support Caliper, Master Cylinder
Universal	Dashboard, Lamps, Window Regulator, Safety Belt, Oil Seal

Note: C-Casting, F-Forging, M-Machining
Source: Prepared by the Study Team based on interview survey results.

1.1.3 Outline of the Automotive Parts and Components Industry in Indonesia

(1) Target Companies of the Study

According to the MOIT, the number of automotive parts and components manufacturers which should be included in the target companies of this study is 151. All these 151 companies are of course included in the target of the study. However, this number only includes OEM (the first tier) and REM parts and components manufacturers and does not include what is called the second and third tier ones.

On the other hand, the study team visited a total of more than fifty automotive parts and components manufacturers during the first and second field survey. The first and second tier manufacturers are included in the twenty-one companies. These companies visited by the study team are also included in the target of the study.

In addition, the study team conducted a questionnaire survey of about eight hundred automotive, electric and electronic, and machinery parts and components manufacturers in Indonesia. A total of 313 responses to the questionnaire were returned, of which 149 responses were from automotive parts and components manufacturers. The automotive parts and components manufacturers responding to the questionnaire are also included as the target companies.

As mentioned above, the target companies of the study are i) 151 companies listed by the MOIT, ii) Companies visited by the study team, and iii) Companies responding to the questionnaire. In this study, companies included in category i) and ii) are mainly discussed and those included in iii) are also mentioned if necessary.

(2) Location of the Target Companies

The automotive parts and components manufacturers listed by the MOIT are divided into five regions, that is, DKI Jakarta, West Java, Central Java, East Java and North Sumatra. The number of companies located in each region is shown in Table 4-1-13.

Table 4-1-13 Location of Automotive Parts and Components Manufacturers

Location	Number of companies
DKI Jakarta	106
West Java	30
Central Java	2
East Java	10
North Sumatra	3
Total	151

Source: MOIT

98% of the manufacturers are concentrated on Java. The number of companies located around Jakarta is the largest and occupies approximately 70% of the total. In addition, companies located in West Java including Jakarta and its peripheral areas occupy approximately 90% of the total. On the contrary, the number of companies located in East and Central Java is relatively small, and only three companies are located in North Sumatra, other than Java.

(3) Number of Companies by Production Item

According to the MOIT, the number of automotive parts and components manufacturers was 124 in 1994, 131 in 1995 and 151 in 1996. Table 4-1-14 shows the number of manufacturers producing parts and components which are produced by a relatively large number of manufacturers.

Table 4-1-14 Number of Manufacturers of Representative Parts and Components for Cars

Name of parts and components	Number of manufacturers	Name of parts and components	Number of manufacturers
Engines	10	Brake System & Parts	13
Alternators	4	Chassis & Body	14
Cylinder Blocks	5	Suspension Parts	8
Gaskets	5	Shock Absorbers	5
Motor Starters	3	Fuel Tanks	8
Pistons & Piston Rings	6	Mufflers& Exhaust Pipes	14
Radiators	5	Seats & Seat Frames	9
Spark Plugs	4	Wheel Rims	10
Transmissions	5	Wiring Harnesses	5
Drive Axles	3	Door Trims	5
Steering System & Parts	9	Reclining Seats	4
Clutch System & Parts	5	Air Conditioners	3

Source: MOIT

1.1.4 Estimation of Market Size of Automotive Parts and Components

(1) Domestic Production Value of Automotive Parts and Components

Table 4-1-15 shows the domestic production value of automotive parts and components.

Table 4-1-15 Domestic Production Value of Automotive Parts and Components

(Unit: Million Rp.)

	1991	1992	1993	1994	1995
Engines	620,161	434,113	455,838	618,395	768,231
Transmissions	142,119	106,590	111,919	155,288	193,943
Wheel rims	67,513	55,222	57,983	109,979	137,207
Seats/seat frames	44,208	33,864	35,557	9,750	131,157
Chassis Frames	88,292	66,219	69,529	101,914	128,375
Steering systems	87,443	65,582	70,861	100,144	125,914
Brake systems	63,612	47,709	50,095	74,964	102,451
Air conditioners	30,224	57,654	60,536	68,732	89,932
Cabins	63,652	47,739	50,126	68,664	88,901
Axles, propeller shafts	44,490	33,368	35,036	55,635	75,275
Leaf springs	34,951	26,214	27,525	51,102	67,455
Wire harnesses	23,885	17,914	18,810	22,310	61,595
Clutch systems	20,171	15,129	15,885	41,160	61,152
Brake drums	10,795	8,096	8,501	40,000	48,960
Cable controls	55,085	27,638	29,810	37,389	45,989
Starters	22,749	17,062	17,915	30,188	45,758
Spark plugs	29,648	24,950	26,198	34,205	45,151
Alternators	23,391	17,544	18,421	24,696	40,191
Exhaust systems	5,412	4,059	4,262	31,673	36,234
Pistons	3,038	2,138	2,245	26,745	36,106
Radiators	18,922	16,264	17,077	27,219	34,791
Shock absorbers	29,207	21,905	23,000	27,382	33,772
Filters	18,556	13,918	14,622	21,609	30,258
Rubber parts	13,310	9,986	10,484	16,834	25,779
Fuel tanks	10,397	7,798	8,188	18,637	24,712
Rear body	14,844	11,133	11,690	16,507	21,372
Brake, fuel tube	8,376	6,282	6,546	10,684	17,399
V-belts	10,223	7,856	8,248	9,535	11,187
Brake linings	4,222	3,164	5,181	7,771	10,102
Piston rings	3,238	2,429	2,550	3,568	4,520
Horns	1,216	912	958	2,860	4,150
Gaskets	953	715	750	2,160	3,645
Washer tanks	925	973	1,022	1,842	3,223
Jacks	1,025	768	807	1,376	2,202
Total	1,646,253	1,212,907	1,278,175	1,870,917	2,557,089

Source: MOIT

The total production value of automotive parts and components decreased from the previous year of 1992, but it has been increasing since 1993. Especially in 1994 and 1995, in response to the rapid expansion of domestic automotive production, the production value of automotive parts and components increased greatly. The annual growth rates are 46.4% in 1994 and 36.7% in 1995.

In 1995, automotive parts and components which are the largest in production value are engines, followed by transmissions, wheel rims, seats and seat frames, chassis frames, steering systems and brake systems. Especially, engines occupy more than 30% of the total production value of automotive parts and components.

On the other hand, Table 4-1-16 shows the domestic production volume of automotive parts and components. Though production volume fluctuates from part to part, the production volume of most parts and components increased rapidly in 1994 and 1995.

Table 4-1-16 Domestic Production Volume of Automotive Parts and Components

	Unit	1991	1992	1993	1994	1995
Brake systems	Unit	313,392	235,044	246,796	333,175	409,805
Cabins	Unit	135,973	101,980	107,078	144,555	177,805
Chassis Frames	Unit	230,995	173,246	181,908	245,576	302,058
Rear body	Unit	65,612	61,290	64,354	86,878	106,860
Engines	Unit	249,290	174,503	183,228	247,358	304,250
Axles, propeller shafts	Unit	209,328	156,996	164,846	222,542	273,727
Steering systems	Unit	209,328	156,996	164,846	222,542	273,727
Transmissions	Unit	224,718	168,539	176,966	238,904	293,852
Clutch systems	Unit	213,518	160,139	168,146	420,000	546,000
Shock absorbers	Piece	1,550,879	1,163,159	1,221,316	1,441,152	1,729,382
Radiators	Piece	246,993	211,601	222,180	353,496	434,894
Exhaust systems	Piece	239,283	179,462	188,436	1,266,936	1,393,630
Filters	Piece	4,554,013	3,415,509	3,586,284	4,231,816	5,501,361
Pistons	Piece	761,325	830,231	871,742	1,028,656	1,337,253
Piston rings	Piece	3,957,484	2,968,113	3,116,518	3,964,858	4,757,830
Wheel rims	Piece	1,015,557	830,674	872,208	1,571,130	1,932,490
Fuel tanks	Piece	224,718	168,538	178,964	372,733	484,553
Leaf springs	Ton	25,533	21,150	22,308	39,309	51,102
Seats, seat frames	Unit	257,482	197,237	207,098	57,000	741,000
Spark plugs	Piece	33,886,567	28,327,566	29,743,944	34,205,536	41,046,643
Brake drums	Piece	473,084	354,813	372,554	1,600,000	1,920,000
Brake linings	Piece	715,677	536,313	1,036,158	1,295,197	1,554,236
Cable controls	Piece	15,036,339	7,544,241	7,921,454	9,347,316	11,216,779
Wiring harnesses	Unit	400,135	300,102	315,110	371,830	594,928
Air conditioners	Piece	79,208	75,828	79,620	89,262	116,041
Brakes, fuel tubes	Unit	242,258	181,694	190,778	305,245	457,867
Gaskets	Unit	249,290	216,983	227,832	540,000	810,000
Rubber parts	Ton	2,783	2,088	2,192	3,507	5,261
V-belts	Piece	6,676,736	5,130,346	5,386,864	6,356,498	6,992,148
Alternators	Piece	250,544	187,908	197,304	259,956	914,338
Starters	Piece	252,192	189,144	198,604	317,766	476,650
Jacks	Piece	72,815	54,612	57,342	91,747	137,621
Horns	Piece	226,758	170,069	178,572	520,000	728,000
Washer tanks	Piece	241,396	133,403	276,806	460,490	644,685

Source: MOIT

(2) Export and Import Value

Table 4-1-17 shows the total export and import value of automotive parts and components. It is one of the characteristic features that import value is much larger than export value. The import value of automotive parts and components has been increasing rapidly since

1993. The annual growth rates of import value were 24.9% in 1993, 84.9% in 1994 and 16.9% in 1995. On the other hand, the export value of automotive parts and components has also been increasing, though the total export value is much smaller than the total import value.

Table 4-1-17 Total Export and Import Value of Automotive Parts and Components

(Unit: thousand US$)

	1991	1992	1993	1994	1995
Total export value	16,128.6	46,099.8	66,304.9	79,762.8	159,918.9
Total import value	1,182,749.6	1,059,709.9	1,324,036.2	2,448,698.2	2,863,159.5

Source: MOIT

Table 4-1-18 shows the export value of automotive parts and components produced by members of GIAMM and their main destination.

Table 4-1-18 Export Value and Destination of Automotive Parts and Components (1995)

Parts and Components	Export Value (US$)	Main Destination
AC Generators, Starter Motors	744,810	Malaysia
Air Conditioners	3,660,371	Japan, Malaysia, Philippines, Thailand, EU
Alternators	181,226	Malaysia, Thailand
Bar Comp Locks, Tumbler Disks	600,736	Thailand
Batteries	19,590,601	U.S., Asia
Brake Linings	172,845	Singapore, Taiwan, Philippines
Clutch Covers, Pressure Plates	81,602	Japan
Clutch Facings	1,670,528	Japan, Singapore, Taiwan, Malaysia, Thailand, U.S., Germany
Combination Flashers	3,564	Japan
Combination Switches	4,455	Japan
Component Parts for Lights	220,878	Japan
Control Cables	1,319,375	Japan, Korea, Malaysia
Cylinder Blocks	62,215,305	Japan, Malaysia, Thailand
Door Lock System	454,578	Japan
Filters	11,422,413	Japan, Taiwan, Singapore, Malaysia, Germany
Flashers	1,574,315	Japan, Australia
Handle Levers	35,586	Japan
Hazard Flashers	3,659	Japan
Hoists	264,962	Singapore, Malaysia
Horns	18,711	Japan
Lamp Cords for Speedometers	2,910,980	Japan
Mufflers	671,874	Japan
Radiators	8,627,604	Japan, Taiwan, Singapore, Malaysia
Relays	1,332335	Japan
Rim Comp, Base, Lens	1,549,544	Malaysia
Safety Glasses	189,995	U.S.
Shock Absorbers	1,659,389	Japan, Malaysia, Thailand
Spark Plugs	5,489,545	Japan, Taiwan, Singapore, Malaysia, Thailand
Starters	104,805	Malaysia, Thailand
Turn Signal Switches	82,823	Japan
Wiring Harnesses	32,458,745	U.S., Australia
Total	159,918,896	

Source: GIAMM

1.1.5 THE RELATIONSHIP BETWEEN ASSEMBLERS AND PARTS MANUFACTURERS

(1) Policies and Practices Towards Subcontractors

Automotive parts and components manufacturers can be divided roughly into two groups. One is composed of foreign affiliates, companies that have technical tie-ups with foreign companies, and companies that receive technical guidance from the source of their orders: automotive assemblers and parts and component manufacturers. The other group is composed of purely local companies. At present each assembler does business with 10-100 subcontractors - a wide disparity. However, 50-60% of these subcontractors are foreign affiliates, and these foreign affiliates account for about 90% of the value of the assemblers' subcontracting business.

It is important for assemblers to nurture and develop Indonesian parts and components manufacturers in order to deal with the government's localization policy for parts and components production, but also to further the reciprocal supply systems for parts and components that they, the assemblers, are building in the Asian markets. Therefore, to the contractors with whom they do business, assemblers stress meeting delivery deadlines and reducing defects, and also provide instruction about production technology and control technology so as to raise the quality of subcontractor operations. Specifically, instruction is provided regarding such matters as: how to look at drawings; methods of process design; jigs, tools and other equipment; the establishing of working conditions; the designing of inspections; inspection methods; the use of the signboard method for conducting visible control; the use of a delivery control board and a quality control board; TPM for maintenance of dies and other equipment; etc.

Moreover, assemblers, due to their reciprocal supply systems in Asian markets and Indonesia's new localization policy for parts and components, have gone from the era when, under the old localization policy, they gave greater priority to localizing parts and components production rather than to cost, to an era when they must manufacture parts and components that can win in cost competition; they therefore need to implement

expeditiously policies that give priority to both quality and cost.

On the other hand, with regard to cultivating new local parts and components manufacturers, it is not enough to merely transfer production technology to them for the production of complicated automotive parts and components. Unless these manufacturers' quality control is improved, using them, it is said, will be difficult.

(2) Evaluation of Subcontractors

The information in this section is therefore based on a survey that the study team conducted, using a "Plant Management Diagnosis Chart" and other means, when the team visited local parts and components manufacturers, and on interviews with assemblers.

a. Evaluations based on company visit survey

There is a considerable gap between, on the one hand, foreign affiliates, companies that have technical tie-ups with foreign companies and companies that receive technical guidance from assemblers, and, on the other hand, purely local companies.

b. Evaluation using plant management diagnosis chart

Based on this chart, seven items were evaluated: (i) orderliness, (ii) materials control, (iii) production management, (iv) quality control, (v) progress control, (vi) receiving inspections, and subcontracting and purchasing control, and (vii) equipment management.

- On a scale of 1 to 5, with 5 being highest, the foreign affiliates, and the companies that have technical tie-ups or that have receive technical guidance, were rated around 3.1 to 4.3 for all of the items on the chart. However, their ratings for production management and progress control were somewhat low.

- The purely local companies were rated around 1.9 to 2.8 for all of the items. Their

ratings were generally lower than those of the foreign affiliates and the companies that have technical tie-ups or receive technical guidance. Their scores for production management and progress management were particularly low. The level of their quality control was also low. In addition, they had problems with equipment management.

c. Assemblers' evaluations of subcontractors

There are various problems with subcontractors, but the main ones are late deliveries and inconsistent quality.

- The rate of on-time deliveries is low. There are cases where it is not clear even on the day before a scheduled delivery day whether the delivery will be on time.
- The product defect rate in receiving inspections is high. In extreme cases, it has reached 50%. Moreover, there is a disparity of about 20% between the defect rate of foreign affiliates' products and that of local companies' products.

d. Problems with subcontractors

Based on the assemblers' evaluations of subcontractors, the main problems with subcontractors are believed to be the following.

- The Problem of Delivery Control (Progress Control)

For subcontractors, delivery control involves the following. First, based on the delivery plan for deliveries to the assembler, they establish a production schedule. Next they give job instructions to the workplace and the workers. Then, as the work is being done, they discern its progress and manage this according to the production schedule so as to be able to meet the delivery plan.

At local companies this system is weak. There are companies that do not give their workers adequate instruction or use a delivery control board in factory management.

There are also companies that have such a board but do not write the production schedule or the progress of work on it.

In addition, there are companies that do not have or do not post the written process specifications (work methods, working conditions, working hours) and job instructions (the number and quantity of articles to be made) that should be posted near workers. Under such circumstances, it is difficult to meet delivery deadlines.

- The Problem of Product Defects

Product defects can be divided into three groups: material defects, work defects and inspection defects. As far as assemblers are concerned, however, the primary kind of defect in products from subcontractors is defects that the subcontractor fails to catch because of a faulty final inspection. With regard to inspections systems, moreover, there is a disparity between the local companies that have received the ISO 9000 certification and those that have not. Among local companies there are also some that do not have drawings posted near the workers, or that have them posted on workplace walls where workers can not see them. When workers have to rely on memory to carry out work and inspections, it is difficult to guarantee quality.

Even among excellent local companies, only 50-70% produce their dies, jigs and tools in-house, and even fewer, 25-50%, do the designing involved in such in-house production. Among other local companies, there is little in-house production due to, among other things, a shortage of engineers; and the levels of maintenance technology are also low. To achieve stable product quality, it is necessary to have the ability to maintain such technology and conduct minor repairs is necessary.

(3) Development of Subcontractors

Development of the first and second tier subcontractors is indispensable when automotive assemblers wish to achieve the higher ratios of local content of parts and components. For this, most assemblers are trying to help their subcontractors in every way.

The most usual types of assistance from assemblers for quality improvement of products manufactured by their subcontractors are dispatch of assemblers' professionals to subcontractors for guidance or training of subcontractors' employees at the assemblers' factories.

On the other hand, in the case of major automotive assemblers in Indonesia, a systematic development programs for their subcontractors are prepared. One example of such a program is as follows.

At first, subcontractors are classified into small, medium and large companies. As for large companies, improvement of technology is mainly being attempted through joint venture and/or technical collaboration with foreign parts and components manufacturers. Assistance for the development of technology is therefore not directly made by assemblers but by their foreign joint venture and/or technical collaboration partners.

On the other hand, in the case of medium scale companies, they are recognized as the main target of assemblers' subcontractor development programs. Above all, the first priority is given to relatively smaller companies which are related to medium scale subcontractors. This is because their technological level is relatively lower than larger companies and their business resources are restricted. They have difficulties in many cases when they try to develop their technological level by themselves without assistance from assemblers. For this, the development of these companies' technology through assemblers' development programs and an increase in the local content ratio of automotive parts and components as a result is expected by assemblers. The following are the contents of subcontractor development programs supplied by assemblers, and their related or group companies.

- Apprenticeship and training of jig technology
- Apprenticeship and training of welding technology fabrication and thick plate
- Apprenticeship and training program for plastic product and thin plate welding technology
- Apprenticeship and training program for die manufacturing and machines
- Certification program, quality management system in collaboration with PT. Sucofindo

- Apprenticeship and training program for rubber technology
- Training program for manufacturing management (Cost analysis / budget, production management)
- Financing Support Program (Equity and working capital)

In the case of medium sized companies of relatively larger scale, development is being attempted through joint product development between assemblers and subcontractors, assistance for introduction of ISO9000 and an invitation to training programs run by principal automotive manufacturers, etc.

In actuality, though small scale companies are recognized as the target for the next development stage by assemblers, their priority is much lower. Medium sized subcontractors of relatively smaller scale mentioned above are the immediate and main targets of the development programs.

1.2 SELECTION OF PRIORITY PARTS AND COMPONENTS AND ESSENTIAL TECHNOLOGIES IN THE AUTOMOTIVE PARTS AND COMPONENTS INDUSTRY

1.2.1 Classification of Automotive Parts and Components and the First Screening Process

First, automotive parts and components are classified according to the localization point table made by the MOIT. Then, the first screening of the automotive parts and components in order to select the parts and components as candidates for the priority parts and components was conducted by judging technological difficulties of each part and component through the experiences of the study team members as technological experts. The main standards for the selection at this point are summarized briefly as follows:

(i) Parts and components whose weights to the total production costs of cars are small, that is, whose points in the local content point table are low, and whose market size is not large, are excluded.
(ii) Parts and components which have been localized substantially and for which the technological level necessary for manufacturing is low are excluded.
(iii) Parts and components whose current local content ratios are high but which are highly dependent on imported parts and components other than raw materials are included.

Through these steps, the following seventy-one parts and components were selected as candidates for the priority parts and components.

- **Engine parts and components (18)** : Air Filters, Alternators, Bearing Caps, Camshafts, Connecting Rods, Crankshafts, Cylinder Blocks, Cylinder Heads, Exhaust Manifolds, Flywheels, Fuel Filters, Gaskets, Starter Motors, Oil Filters, Pistons & Piston Rings, Radiators, Spark Plugs, Oil Pans
- **Transmission parts and components (7)** : Cases, Clutch Housings, Covers, Extension Housings, Gears, Input shafts/Main Shafts, Shift Forks/Speed Shaft Rails
- **Drive Axle parts and components (7)** : Companion Flanges, Differential Gears, Drive

Shafts, Housings, Wheel Hubs, Propeller Tubes, Yokes

- **Steering parts and components (2)** : Steering Columns, Steering Shafts
- **Clutch parts and components (5)** : Covers, Disk Plates, Facings, Pressure Plates, Torsion Springs
- **Brake parts and components (3)** · Backing Plates/Body Calipers, Brake Shoes/Plates, Drums/Disks
- **Chassis & Body parts and components (7)** : Doors, Engine Hoods/Front Panels, Fenders, Floor/Rear Decks, Roofs, Side Panels, Side Rails/Chassis
- **Suspension parts and components (4)** : Front Springs, Non-Drive Axles, Rear Springs, Shock Absorbers
- **Universal parts and components (18)** : Batteries, Brake/Fuel Tubes, Bumpers, Control Cables, Dashboards, Mirrors, Mufflers & Exhaust Pipes, Plastic Parts, Rubber Parts, Safety Glass, Seats & Seat Frames, Tires, Jacks, Weather Stripping, Window Regulators, Wiring Harnesses, Safety Belts, Air Conditioners

1.2.2 Priority Estimation of the Selected Parts and Components

The seventy-one automotive parts and components which were selected as the result of the first screening have been classified into three groups based on the following grouping standards in order to estimate the priority.

Grouping standards in order to estimate the priority of the selected automotive parts and components

(i) **Group 1**: Parts and components which should be localized for a further increase in localization

- Parts and components whose localization points in the localization point table are high (Localization points>0.5)
- Parts and components whose current local content ratios are low (local content ratios<40%)

(ii) **Group 2**: Parts and components which have a potentiality to be competitive in the international market in the future and are necessary to be localized

- Parts and components whose localization points in the localization point table are high (Localization points>0.5)
- Parts and components whose current local content ratios are high (local content ratios>40%)

(iii) **Group 3**: Parts and components which have already been exported but need to be more competitive for further expansion of market

- Parts and components whose export value is very large in 1995 according to the statistics of export value of automotive parts and components compiled by GIAMM (Export value of more than one million US Dollars, but excluding parts and components which belong to Group 1 and 2)

According to the above grouping standards, 71 selected parts and components were classified and priority was estimated group by group. The names of selected parts and components belonging to each group and the results of priority estimation are shown in Table 4-1-19 (Group 1), Table 4-1-20 (Group 2) and Table 4-1-21 (Group 3). In each of the three tables, each part and component is estimated with the points of A=3 points, B=2 points and C=1 point and then the parts and components whose total points are higher are chosen for the second screening. In addition, considering the needs of assemblers surveyed, priority of parts and components which assemblers are planning to procure domestically is estimated higher than those which assemblers are planning to manufacture in-house.

Table 4-1-19 Table of Estimation for Priority of the Selected Automotive Parts and Components (Group 1)

Estimation Criteria / Parts and Components	Local content ratios	Import Substitution effect	Technological difficulties	Influence for other parts	Possibility of mutual production	Domestic related technology level	Size of investment	Raw material	Labor intensive	Possibility of mass production	Second screening	Assemblers/Æ needs		Final estimation of priority
												In-house	Domestic procurement	
Standards for estimation	small > large	large > small	small > large	large > small	large > small	existed > not existed	small > large	existed > not existed	large > small	large > small				
Engine parts and components														
1.2 Alternator	B	A	B	B	A	A	B	C	B	A	B		□	A
1.5 Camshaft	C	A	C	B	C	B	A	C	B	A	C	□	□C	A
1.6 Connecting Rod	B	A	A	C	B	A	B	C	A	B	C		□FM	A
1.10 Cylinder Head	C	A	C	A	C	B	B	C	A	A	C	□		C
1.16 Motor Starter	B	A	B	B	A	A	B	C	B	A	B		□	A
Transmission parts and components														
2.5 Extension Housing	C	A	A	B	C	B	A	A*	A	A	A		□CM	A A
2.6 Gears	A	A	A	A	A	B**	B	C	C	A	A		□FM	A A
2.7 Input Shaft / Main Shaft	A	A	A	A	A	B**	B	C	C	A	A		□FM	A A
2.8 Shaft Fork / Speed Shaft Rail	A	A	A	A	A	B**	B	C	C	A	A		□F	A A
Drive axle parts and components														
3.4Differential Gears	B	A	A	A	A	B**	B	C	C	A	B	□		C
3.5 Drive Shaft	A	A	A	A	A	B**	B	C	C	A	A		□	A A
3.6 Housing	A	A	A	B	C	B	A	A*	A	A	A	□		C
3.9 Propeller Tube	A	A	A	C	B	A	A	C	A	B	A		□	A A
3.11 Yoke	A	A	B	C	B	B**	A	C	B	A	B	□		C
Brake parts and components														
6.1 Backing Plate/Body Caliper	A	A	A	A	A	A	A	C	A	A	A		□	A A
Suspension parts and components														
8.2 Non-Drive Axle	A	—	—	—	—	—	—	—	—	—	—	Imported		—

Note: * Made of aluminum; ** Having heat treatment problems; C-Casting, F-Forging, M-Machining;

Standards for estimation of local content ratios: A:0-13%, B:14-27%, C:28-40%

Source: JICA Study Team

Table 4-1-20 Table of Estimation for Priority of the Selected Automotive Parts and Components (Group 2)

Estimation Criteria / Parts and Components	Local content ratios	Import Substitution effect	Technological difficulties	Influence for other parts	Possibility of mutual production	Domestic related technology level	Size of investment	Raw material	Labor intensive	Possibility of mass production	Second screening	Assemblers' needs		Final estimation of priority
												In-house	Domestic procurement	
Standards for estimation	small > large	large > small	small > large	large > small	large > small	existed > not existed	small > large	existed > not existed	large > small	large > small				
Engine parts and components														
1.8 Crankshaft	C		C	A	C	B*1	B	C	B	B	C	☐		C
1.9 Cylinder Block	A		C	A	C	B	B	C	A	A	B	☐		C
1.18 Piston & Piston Ring	B		B	B	B	A	B	C*2	B	A	B		☐	A
1.20 Radiator	B		A	B	A	A	B	C	A	A	B		☐	A
Transmission parts and components														
2.2 Case	C		A	B	C	B	A	A*3	A	A	A		☐	A A
2.3 Clutch Housing	C		A	B	C	B	A	A*3	A	A	A		☐	A A
2.4 Cover	A		A	A	B	A	A	A*3	A	A	A		☐	A A
Drive axle parts and components														
3.7 Hub Wheel	B		B	B	A	A	B	A*3	A	A	A	Imported		B
Chassis & body parts and components														
7.3 Doors	B		A	A	A	C*4	B	C	A	A	B	☐		C
7.4 Engine Hood / Front Panel	B		A	A	A	C	B	C	A	A	B	☐		C
7.5 Fender	B		A	A	A	C	B	C	A	A	B	☐		C
7.6 Floor / Rear Deck	B		A	A	A	C	B	C	A	A	B	☐		C
7.7 Roof	B		A	A	A	C	B	C	A	A	B	☐		C
7.8 Side Panel	B		A	A	A	C	B	C	A	A	B	☐		C
7.9 Side Rail/Chassis	A		A	A	A	C	B	C	A	A	A	☐		C

Table 4-1-20 Table of Estimation for Priority of the Selected Automotive Parts and Components (Group 2) (Continued)

Suspension parts and components														
8.1 Front Spring	B		B*5	C	A	C*5	B	C	B	A	C		☐	B
8.3 Rear Spring	B		B*5	C	A	C*5	B	C	B	A	C		☐	B
8.4 Shock Absorber	C		B	A	A	A	B	B*6	B	A	A		☐	A A
Universal parts and components														
9.14 Safety Glass	A		C	A	B	A	B	C	A	A	B		☐	A
9.34 AC	B		B	A	A	A	B	C	B	A	B		☐	A

Note: *1 Excluding heat treatment

*2 Excluding those made of aluminum

*3 Those made of aluminum

*4 Having technology problems for dies and molds

*5 Having technology problems for heat treatment

*6 Those made of aluminum or rubber

Standards for estimation of local content ratios: A:81-100%, B:61-80%, C:40-60%

Source: JICA Study Team

Table 4-1-21 Table of Estimation for Priority of the Selected Automotive Parts and Components (Group 3)

Estimation Criteria / Parts and Components	Local content ratios	Import Substitution effect	Technological difficulties	Influence for other parts	Possibility of mutual production	Domestic related technology level	Size of investment	Raw material	Labor intensive	Possibility of mass production	Second screening	Assemblers/Æ needs		Final estimation of priority
												In-house	Domestic procurement	
Standards for estimation	small > large	large > small	small > large	large > small	large > small	existed > not existed	small > large	existed > not existed	large > small	large > small				
Engine parts and components														
1.1 Air Filter 1.13 Oil Filter 1.17 Fuel Filter	B	C	A	A	A	A	B	C	B	A	A		☐	A A
1.22 Spark Plug	C	B	B	C	A	A	B	C	C	A	C		☐	B
Clutch parts and components														
5.5 Clutch Facing	B	C	A	A	A	A	B	C	B	A	B		☐	A
Universal parts and components														
9.1 Battery	B	C	A	B	A	A	B	C	A	A	A		☐	A A
9.4 Control Cable	B	C	A	A	A	A	B	C	A	A	A		☐	A
9.7/9.8 Electric Parts (Flasher, Lamp, Lamp Cord, Horn, Switch)	C	B	A	A	A	A	B	C	B	A	A		☐	A A
9.17 Tire	A	C	B	A	A	A	B	A	A	A	A		☐	A A
9.23 Wiring Harness	C	B	A	A	A	A	A	C	A	A	A		☐	A

Note: Standards for estimation of local content ratios: A:86-100%, B:68-85%, C:50-67%

Source: JICA Study Team

As a result, the selected priority parts and components which are ranked as AA or A after the final priority estimation are the following twenty-eight.

(i) **Group 1 (11 parts and components)**: Parts and components which should be localized for a further increase in localization (Note: the part and component number in the localization point table is shown in parentheses)

These are crucial parts and components which should be localized rapidly. They are recognized as priority parts and components for localization by assemblers.

- **Engine parts and components (4)** : Alternators(1.2), Camshafts(1.5), Connecting Rods(1.6), Motor Starters(1.16)
- **Transmission parts and components (4)** : Extension Housings(2.5), Gears(2.6), Input shafts/Main Shafts(2.7), Shift Forks/Speed Shaft Rails(2.8)
- **Drive axle parts and components (2)** : Drive Shafts(3.5), Propeller Tubes(3.9)
- **Brake parts and components (1)** : Backing Plates/Body Calipers(6.1)

(ii) **Group 2 (8 parts and components)**: Parts and components which have a potentiality to be competitive in the international market in the future and need to be localized (Note: the part and component number in the localization point table is shown in parentheses)

Modernization of manufacturing technology and equipment as well as further localization is necessary for these parts and components to be more competitive in the international market in the future. AssemblersÆ needs for localization of these are very high.

- **Engine parts and components (2)** : Pistons & Piston Rings(1.18), Radiators(1.20)
- **Transmission parts and components (3)** : Cases(2.2), Clutch Housings(2.3), Covers(2.4)
- **Suspension parts and components (1)** : Shock Absorbers(8.4)
- **Universal parts and components (2)** : Safety Glasses(9.14), Air Conditioners(9.34)

(iii) **Group 3 (9 parts and components)**: Parts and components which have already been

exported but need to be more competitive for the further expansion of market (Note: the part and component number in the localization point table is shown in parentheses)

The export value of each of these parts and components in 1995 was more than one million US dollars. They can be said to have competitiveness in the international market at present. In order for Indonesia to be selected as a production base for automotive assemblers' international mutual procurement of parts and components, an increase in competitiveness of these parts and components through rationalization and modernization of production systems is necessary in the future.

- **Engine parts and components (3)** : Air Filters(1.1), Fuel Filters(1.13), Oil Filters(1.17)
- **Clutch parts and components (1)** : Facings(5.5)
- **Universal parts and components (5)** : Batteries(9.1), Control Cables(9.4), Electric Parts(9.7/9.8), Tires(9.17), Wiring Harnesses(9.23)

1.2.3 Selected Priority Parts and Components and Relation to Manufacturing Processes

The relation between selected priority parts and components and the manufacturing processes necessary for producing these parts and components is shown in Table 4-1-22. The essential manufacturing processes necessary for producing the priority automotive parts and components selected are metal working technology such as (i) casting, (ii) forging and (iii) presswork. In addition, (iv) plating & surface treatment, (v) heat treatment and (vi) machining are also necessary technologies for the second tier subcontractors and in-house processing.

Table 4-1-22 Relation between Selected Prior Parts and Components and the Manufacturing Processes

	Assembly	Casting	Forging	Machining	Presswork	Sheetwork	Rolling press	Welding	Plating	Surface treatment	Heat treatment	Painting	Plastic molding	Rubber molding	Sintering	Glass processing	Final priority
Group 1																	
1.2Alternator	○	○	○	○	○		○	○	○	○	○	○	○	○			A
1.5 Camshaft	○	○	○	○	○		○	○	○	○	○	○	○	○			A
1.6 Connecting Rod	○		○	○	○					○	○						A
1.16 Motor Starter		○	○	○							○	○					A
2.5 Extension Housing		○		○							○	○					AA
2.6 Gears			○	○			○				○						AA
2.7 Input Shaft / Main Shaft			○	○			○			○	○						AA
2.8 Shift Fork/Speed Shaft Rail			○	○							○						AA
3.5 Drive Shaft			○	○			○			○	○						AA
3.9 Propeller Tube		○	○	○		○	○			○	○						AA
6.1 Braking Plate/Body Caliper				○	○			○		○		○					AA

Table 4-1-22 Relation between Selected Prior Parts and Components and the Manufacturing Processes (Continued)

Group 2																	
1.18 Piston & Piston Ring		○		○						○	○						A
1.20 Radiator	○				○			○	○	○		○					A
2.2 Case		○		○	○	○		○			○	○					AA
2.3 Clutch Housing		○		○							○	○					AA
2.4 Cover		○		○							○	○					AA
8.4 Shock Absorber	○	○	○	○	○			○		○	○	○		○			AA
9.14 Safety Glass																○	A
9.34 AC	○	○	○	○	○			○	○	○	○	○	○	○			A
Group 3																	
1.1Air Filter	○			○	○					○		○					AA
1.13 Fuel Filter	○			○	○					○		○				○	AA
1.17Oil Filter	○			○	○					○		○					AA
5.5 Facing				○											○		A
9.1 Battery	○								○				○				AA
9.4 Control Cable					○				○					○			A
9.7/9.8 Electrical Parts	○			○	○				○				○			○	AA
9.17 Tire														○			AA
9.23 Wiring Harness					○				○								A

Source: JICA Study Team

Relations between parts and components which are ranked as AA and manufacturing processes are as follows.

(i) **Group 1**: Parts and components which should be localized for a further increase in localization

Needs for improvement of casting and forging parts and components are especially high for localization. For this, improvement of casting and forging technology is indispensable. The most important key technologies are forming and manufacturing technology of cores for casting parts, and surface hardening and die repairing technology for forging parts. In addition, development of the heat and surface treatment industry is necessary for localization of gears and shafts.

(ii) **Group 2**: Parts and components which have the potential to be competitive in the international market in the future and need to be localized

Needs for improvement of casting and forging parts and components are very high for localization, and improvement of related technology is indispensable. On the other hand, in the case of shock absorbers, the export value was 1,659 thousand US dollars in 1995 which is large enough to be thought of as being competitive in the international market. However, cost reduction of parts, above all, of material costs which occupy a large part of the total production costs is necessary for further expansion of exports in the future.

(iii) **Group 3**: Parts and components which have already been exported but need to be more competitive for further expansion of market

For increasing competitiveness of these parts and components in the international market, improvement of automation technology for stable quality and design technology of jigs and fixtures for efficiency is necessary for the establishment of mass production technology. As for die manufacturing and factory control technology, strengthening of rationalization technology and methods which are suitable for repeated production such as quality control, cost control and reduction of lead time in addition to rationalization of production

equipment and improvement of maintenance technology is necessary.

1.2.4 Secondary and Tertiary Subcontracting Industries for the Automotive Industries

One of the characteristics of the automotive industry is that not only is its industry size measured by assemblers' total production value very large, but also it has a wide expanse of supporting industries. In the case of a leading Japanese automotive assembler, for example, the number of primary subcontractors is about 350, while that of secondary subcontractors is estimated at 2,000 and that of tertiary, over 10,000. From the case of the automotive industry of advanced countries, the types of production processes that these secondary and tertiary subcontractors undertake are a) casting, b) forging, c) heat treatment, d) surface treatment, e) press, f) machining, g) die and mold making, h) jig and fixture making, etc., which are more or less overlapping with those of primary subcontractors.

In Indonesia, on the other hand, the total number of primary subcontractors is only about 60 including 21 Astra Component Group companies even in the largest automotive assembler, PT. Toyota-Astra Motor. Although there is no exact estimation, the number of secondary subcontractors is very limited and their company size, technology and management levels are much lower than those of the primary ones. Further, there are no recognized tertiary subcontractors. Most of the primary subcontractors are either joint venture companies with foreign manufacturers or Indonesian manufacturers which have technical collaboration agreements with foreign manufacturers. The reasons that the primary subcontractors use the secondary ones are lack of technology and high costs in the case of in-house production, followed by insufficient production capacity and small production lots.

Also, the development of these secondary and tertiary subcontractors would help development of the primary subcontractors and then become one of the key factors for the successful development of all of Indonesian industry. It is urgent that the technical levels in the above process areas should be enhanced to bring about successful industrial development in Indonesia. For most of the local manufacturers who intend to enter the market, the major areas that they should aim at would rather be those which should be undertaken by secondary and tertiary subcontractors.

2. ELECTRICAL AND ELECTRONIC PARTS INDUSTRY

2.1 PRESENT SITUATION OF THE ELECTRICAL AND ELECTRONIC PARTS INDUSTRY

2.1.1 History of the Electrical and Electronic Parts Industry in Indonesia, and the Progress of Localization

As previously mentioned, the recent deregulation in Indonesia has spurred the expansion of the export oriented industry, which includes the consumer electrical and electronic industry. However, most of the local production has not yet gone beyond labor intensive, knock-down type work because the supply of parts and materials in Indonesia is still very limited, and most requirements are dependent on foreign imports.

In the beginning of the 1990s, the Indonesian government adopted various supporting policies on foreign investments and tax exemptions to develop the electrical and electronic industry, realizing the importance of the role of the supporting industries.

Despite such governmental support, the localization ratio of consumer electrical and electronic products is still low at 30 to 35%, including supplementary materials. In addition, most major parts, precise parts, and functional parts are imported from foreign countries such as Singapore, Malaysia, and Japan.

Major parts, components and materials, which are procured in the country, are classified into four categories by source as follows:

a. Assemblers' in-house production	:	tuners, magnetic heads, compressors, etc.
b. Japanese affiliated companies	:	pipes, plastic molding parts, plastic resins, speakers, wire, switches, VCR heads, motors, transformers, etc.
c. Foreign affiliated companies	:	press parts, plastic molding parts, plastic resins, tape mascots, wire, speakers, CRTs, transformers, components, etc.

d. Domestic companies : press parts, plastic molding parts, pump cast housings, PCBs, DG coils, antennas, batteries, corrugated cardboard, urethane material, cooling oil, printed material, ink, solder, tapes, etc.

By the number of items, procurement from domestic companies is large, but, in terms of value, it is less than 50% of the total local procurement. In addition, domestic companies produce few critical parts and components. Subsequently, assemblers have to depend heavily on parts and components which are imported from foreign countries and/or produced by foreign affiliated companies in Indonesia.

2.1.2 Outline of the Electrical and Electronic Industry

The electrical and electronic industry in Indonesia is roughly divided into two categories by product as follows:

Category 1: Manufacturers of parts and components
Subcontractors who manufacture parts, components, semi-finished products, etc.

Category 2: Manufacturers of raw materials and material processed parts
Subcontractors who manufacture metal process parts, plastic molding parts, etc., and raw materials for such parts.

These products are further classified as shown in Table 4-2-1, below.

Table 4-2-1 Classification of Electrical and Electronic Parts

	Electronic Parts	Mechanical Parts	Others
Assembled Parts	FBTs, PCBs, Tuners, Transformers, Remote controllers, Switches, Motors, Wire-harnesses, VCR heads, Coils, Volume controls, Relays, Speakers, Mikes, etc.	Keyboards, Drum units, CD drive units, DDS, Connectors, Sockets, etc.	Printed materials, Packages, etc.
Unit Parts	Condensers, Registers, Inductors, Ferrite cores, IC, Transistors, Filters, Diodes, etc.	Body parts, Frames, Cabinets, Metal fixtures, Plastic mold parts, Metal processed parts, etc.	
Raw Materials	Phenol, Plastic tip, Carbon, Ceramic, Ferrite, Iron, Copper, ABS resin, Glass, Silicon, Paper, etc.		

Source: Comprehensive Study on Industrial Development in the Philippines, Engineering Consulting Firms Association, Japan

Table 4-2-2 summarizes the flow of the production of major electrical and electronic components and products. There are no detailed statistics in Indonesia specifically on electrical and electronic parts.

As previously mentioned, assemblers in the electrical and electronic industry can be further classified into specific fields of the industry. However, electrical and electronic parts manufacturers do not necessarily fall into specific fields of the industry except for a few Japanese affiliated companies. Some parts manufacturers produce not only electrical and electronic parts but also produce automotive parts, machinery parts, etc.

Table 4-2-2 Production Flow of Electronic Products and Components

Commodity	unit	1991/2	1992/3	1993/4	Rate (%)
Central Telephone & PABX	line unit	365,373	481,372	600,248	38.9
HF-SSB	unit	5,165	6,197	7,128	11.9
Radio Broadcast	unit	25	30	32	44.2
PCM/multiplex	unit	38	38	45	2.9
Small Earth Station	unit	33,725	42,393	46,642	15.8
VHF/UHF single channel	unit	13	13	43	55.1
TV Relay Stations	unit	5,615	8,646	9,046	18.9
Integrated circuits	mill. unit	176	211	221	14.8
Telephone sets	1,000 unit	728	1,081	1,208	127.8
Automobile radios	unit	1,032	1,184	1,200	9.9
Micro computers	unit	37,000	44,933	53,017	52.0
Radios/Cassette Radios	1,000 unit	3,788	5,293	5,660	25.3
Television sets	1,000 unit	1,581	1,856	1,476	19.7
Automobile Radios/cassettes	1,000 unit	1,467	1,650	1,700	39.1
Amplifiers	1,000 unit	187	288	120	7.5
Tuners	1,000 unit	1,098	2,012	4,416	113.8
Loudspeakers	1,000 unit	26,086	34,889	30,000	21.7
Resistors	1,000 unit	11,903	13,430	15,182	50.8

Source: Ministry of Industry and Trade

Some of the representative Japanese affiliated parts manufacturers are a compressor factory for air-conditioners and refrigerators, a foundry for compressors and water pumps, and factories to produce wire-harnesses for electronic appliances, condensers, transformers, counters, PCBs, and so on. Some domestic companies, which are fully owned by domestic Indonesians, manufacture products such as VCR heads, electrical bulbs, OA equipment, main components of telephone line controllers, batteries, distribution transformers, after sales service parts and components, and plastic molding parts for consumer electrical appliances in technical cooperation with foreign companies. However, those who do not receive technical assistance from Japanese or other foreign companies have relatively low level of technology.

In Indonesia, there are no companies who conduct large-scale production of electronic devices such as variable condensers, switches, and volumes. Instead, multinational

electronic parts manufacturers produce those devices in Thailand and Malaysia in very large volume, and export their products to Indonesia.

Whether multinational electronic parts manufacturers set up their factories in Indonesia depends on how electrical and electronic products assemblers expand their production in the country. In order to encourage foreign investments into the industry, an industrial estate "LIKE" exclusively for electronic parts and components production is now under construction in the outskirts of Jakarta, and special incentives for foreign companies in the fields of lower taxes and easier investment approval.

2.1.3 Estimate of the Market Size of the Electrical and Electronic Parts and Components Industry

Because the electrical and electronic parts industry is closely related to the electrical and electronic industry, as stated in Chapter 2-3 "Present Situation of the Electrical and Electronic Industry in Indonesia," the market size of the former is determined by the market size of the latter. Taking consumer electrical products, for example, the demand is expected to keep expanding until beyond 2000 as it has shown double digit annual increases in recent years. This will increase the demand for electrical and electronic parts as well. In the electronic and telecommunication industry, as summarized in Table 4-2-3, the total production value of "parts and components" shows an approximately 70% increase over the previous year in 1994 and 1995.

Table 4-2-3 Production Flow of the Electrical, Electronic, and Telecommunication Industry

Category	Year			Annual Increase	
	1990	1994	1995	94-95	90-95
A. Consumer Products	1,491,2	5,005.8	7,734.9	54.5	39.0%
Electronic products	649.8	3,187.3	5,089.2		
Electrical products	841.4	1,818.4	2,645.7		
B. Industrial Products	483.3	1,836.9	2,951.6	60.7%	43.6%
C. Parts & Components	254.9	1,979.8	3,244.3	63.9%	66.3%
Components	75.7	489.9	761.5		
Parts	179.2	1,489.9	2,482.8		
Total	863.06	7,134.77	10,898.74	52.75%	66.06%

Source: Laporan Kegiatan '95, Ministry of Industry and Trade, 1995

2.1.4 Relationship between Assemblers and Parts/Components Manufacturers

(1) Major Policies for the Supporting Industries

The Indonesian government has put a priority on the development of the electrical and electronic parts and components industry. It has prepared the following measures to increase the competitiveness of the domestic supporting industries while giving incentives to investments from foreign countries.

a. Joint work and research with B4T on the establishment of an electrical and electronic equipment development center

b. Joint study with PPK and the SMI department of the Ministry of Cooperatives on the training and development of the supporting industries in the electrical and electronic industry

c. Continuation of the SMID project, which is supported by UNIDO, aiming at the industrial development of the electrical and electronic industry

d. Holding of training programs several times a year at each major city throughout Indonesia to improve product quality, establish quality assurance, and to improve designing capability in the production of electrical and electronic parts and components

In addition, in October, 1993, the government took measures to decrease the import duties of major materials which are necessary for the production of electrical and electronic parts and components.

(2) Evaluation of the Supporting Industries

The Study Team visited assemblers, and parts and components manufacturers of electrical and electronic appliances in the JABOTABEK area, Surabaya, Yogyakarta, Batam, and Medan, and obtained information about the level of technology, the flow of products, and the procurement of parts, components and material through an interview survey.

Major electrical and electronic appliances currently produced in Indonesia are black and white TVs, color TVs, radio cassette players, refrigerators, and air-conditioners. However, most parts and components are imported or procured from foreign affiliated companies, and only assembly and the adjustment of the products are done by these companies.

Major electrical and electronic parts and components currently produced in Indonesia are small motors, parabola antennas, speakers, printed circuit boards (assembly only), semiconductors (assembly only), transformers, coils, and so on. Key parts and components such as connectors, switches, tuners, etc., are completely dependent on imports from foreign countries including Singapore and Taiwan.

Various plastic molding parts and metal press parts are assembled into electrical and electronic parts and components. These plastic parts are produced locally using molds and dies, more than 90% of which are said to be imported. Because molds and dies represent the most important production technology, Indonesia is considered to be highly dependent on foreign countries in its technology. Every manufacturer is

concerned about the possibility of the procurement and repair of molds and dies in Indonesia so that it can increase the localization of molding parts and press parts.

As far as geographical characteristics are concerned, large scale consumer electrical appliance manufacturers are concentrated in the JABOTABEK area, while the assemblers of precision electronic products are concentrated in Bandung. In Surabaya, domestic assemblers produce semi-assembled products. In Batam, many Singapore affiliated manufacturers produce small parts.

As most products produced by assemblers, most of whom are Japanese affiliated companies, are exported, the specifications and quality of the parts and components which are used for the production must satisfy the same level as those produced in Japan, for example. As a result, most parts and components used to assemble electrical and electronic products are delivered by foreign affiliated companies, most of which are Japanese companies, or are imported except for a few which are produced by domestic companies. Some assemblers, however, pointed out that even Japanese affiliated parts and components manufacturers sometimes get in trouble with delivery and quality assurance, where defective parts are mixed with good ones.

(3) Development of the Supporting Industries

Approximately 40 companies were visited and interviewed by the Study Team in both the first field survey (focused on assemblers) and the second field survey (focused on parts and components manufacturers). The Study Team has gained an understanding of the present situation and the problems of the procurement and the export/import of materials, parts and components, although the whole picture of the supporting industry of the electrical and electronic industry has not yet been completely determined. Specific problems and measures are stated below.

The first problem is the difficulty in the domestic procurement of materials, parts and components by assemblers. Although every Japanese affiliated company wants to increase the localization of materials, parts and components, they have so far achieved no more than 35% localization including raw materials and supplementary materials. Key parts and components which may affect the functions and the characteristics of finished products are rarely procured locally. Semiconductor related parts, tuners, magnet material, compressors, and CRTs are imported. In addition, dies for presses and molds for plastic injection molding, which are the most important elements in the production of plastic molding products, totally depend on imports. The level of the procurement of materials, parts and components by assemblers in Indonesia is considered to lag behind that of Thailand or Malaysia.

The second problem is the difficulty in the local procurement of materials and components by electrical and electronic parts and components manufacturers. Materials such as special steel, silicon steel, and thin steel sheets is imported while regular steel sheets are locally procured. As to plastic resins, PP, PE, PS, ABS, and PVC are the only materials produced in Indonesia, and other materials are imported or supplied by customers. Key functional parts and components, and ornamental parts are principally supplied by customers or are imported. In those cases, domestically procured parts and components are generally more expensive than imported ones. Both Japanese affiliated companies and domestic large scale manufacturers import dies and molds from Singapore, Taiwan, etc., and face problems in delivery time and after sale maintenance. The delivery of imported dies and molds from Singapore or Taiwan usually takes two to four months. If some part of the dies and molds needs to be modified, delivery time would be extended even to six months. In addition, another extra set of identical dies and molds needs to be secured for safety purposes. Then, the total cost of dies and molds imported from Singapore or Taiwan would be nearly the same as those imported from Japan.

The third problem is the attitude of the industry towards technology and production. Joint venture companies with foreign companies and domestic companies which have some relation with foreign companies or foreign affiliated companies are willing to improve technology and productivity, and to develop new products. However, they are only eager to gather technology information, but lack skills and practical knowledge of production control and quality control, without realizing the real meaning of quality and delivery.

The fourth problem is a lack of basic skills in electricity and electronics. Most companies prefer *politek* graduates rather than university or college graduates. For example, Politek Electronik Surabaya which was established with the assistance of the Japan International Cooperation Agency (JICA) has curriculums in both theory and practice, and sends approximately 100 graduates to the industry every year. Politek Electronik Surabaya has developed a basic educational system, but this is not sufficient to manufacture electrical and electronic products. An educational system which includes the curriculums of practical production technology is necessary to meet the needs of the industry.

In terms of the number of parts, press parts and plastic molding parts are used to assemble electrical and electronic appliances much more often than forging parts or casting parts. A variety of press and plastic parts are used inside and outside (the case) of TVs, stereo sets and personal computers.

Key elements of technology are lacking in Indonesia but what is necessary for the supporting industry of the electrical and electronic industry is production technology, mainly precise machining. In addition, the production technology of precision press dies and plastic molds, as well as maintenance capability and forming technology are also very important.

In the telephone and telecommunication industry, demand for which continues to expand rapidly, it is considered that it takes a long time to produce key parts of semiconductors and to assemble them in Indonesia except for some simple printed circuit boards. These components, however, do not use forging or casting parts. It is urgently requested that Indonesia localize precision press parts for tuners, dials, switches, etc., which are all imported at present.

There are few Indonesian wholly owned companies who can supply electrical and electronic parts to foreign affiliated assemblers. However, relatively large numbers of companies have the desire to improve their technology level according to the results of company visits and a questionnaire survey. To raise the technology level and product quality of those companies could lead to strengthening the Indonesian electrical and electronic parts industry. At present, some Japanese affiliated companies support domestic parts manufacturers through employee training and consulting by experts. Some domestic manufacturers send their employees to such organizations as ITS and POLMAN, and are trying to develop new technology.

In addition, state owned companies and companies with sufficient funds are working to improve their practical technology level, using the JODC scheme. Industrial associations relating to the electronic industry have not begun the systematic development of the supporting industry including the holding of technology seminars. The reasons for the insufficient activities of industrial associations are considered to lie in the lack of funds.

As seen in the history of industry development in other ASEAN countries, needs for plastic injection molding technology and press working technology are definitely increasing. Therefore, it is imperative to develop these essential technologies step by step.

2.2 SELECTION OF PRIORITY PRODUCTS AND ESSENTIAL TECHNOLOGIES IN THE ELECTRICAL AND ELECTRONIC PARTS INDUSTRY

2.2.1 Classification of Electrical and Electronic Parts and Components

The electrical and electronic industry is comprised of a very wide variety of products. Representative products and their constituent parts and components are shown in Table 4-2-4.

Figure 4-2-1 illustrates the flow of the production of electrical and electronic products in general, and parts and components groups at each stage of the production flow.

Figure 4-2-1 Electrical and Electronic Parts and Components Groups

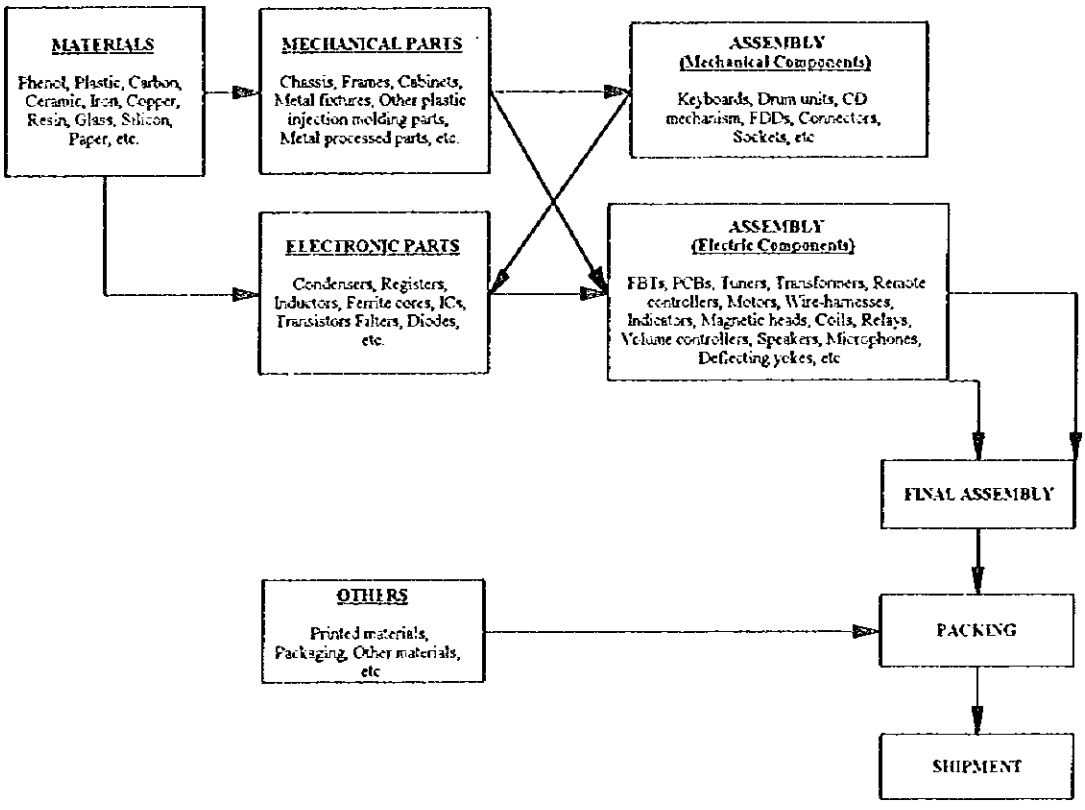

Table 4-2-4 Electrical & Electronic Products and Their Constituent Parts & Components

	Product Category	Audio Visual								Household					Telecommunication & Information							
	Product	Color TVs	Monitor displays	Videos	Camcorders	Stereo sets	CD players	Auto. stereo sets	Microwave ovens	Refrigerators	Rice cookers	Washing machines	Air-conditioners	Cellular phones	Cordless phones	Facsimiles	PC copiers	Personal computers	Word processors	Laser beam printers	Dot printers
Parts and Components																						
Mechanical Parts	Components: Mechanical components			○		○	○	○	○	○	○	○	○						○	○	
	Components: Plastic enclosures	○	○	○	○	○	○	○					○	○	○	○	○	○	○	○	○
	Components: Glass panels	○	○																		
	Components: Plastic panels		○	○	○	○	○	○	○									○			
	Components: Electronic panels	○									○	○	○	○	○	○	○		○	○	○
	Components: Chassis	○	○	○	○	○	○	○								○	○	○	○	○	○
Electrical and Electronic Parts and Components	PCB: PCB (one side, both sides)	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	PCB: PCB (multi-layer)	○	○	○	○	○	○	○						○	○	○	○	○	○	○	○
	PCB: PCB (flexible)	○	○	○										○	○	○	○	○	○	○	○
	Indicators																				
	CRT	○	○																○		
	I.C (black & white, color)		○	○	○	○	○	○	○		○		○	○	○	○	○	○	○	○	○
	Tuners: BS tuners	○		○																	
	Tuners: TV tuners	○		○																	
	Tuners: FM tuners					○		○													
	Tuners: AM tuners					○		○													
	Motors: Induction motors									○		○	○								
	Motors: DC motors			○															○	○	○
	Motors: DD motors					○	○	○	○												
	Motors: Micro motors					○	○														
	Motors: Fan motors								○	○						○	○	○		○	○
	Speakers: Micro speakers			○					○		○	○	○	○		○	○	○	○	○	○
	Speakers: Telephone speakers													○	○						
	Speakers: Audio speakers	○				○	○	○													
	Speakers: Microphones			○	○	○								○	○						
	Heads: Thin layer magnetic heads for F/Ds and H/Ds																	○	○		
	Heads: Rotating heads for VTRs			○	○																
	Connectors: Electrical connectors	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Connectors: Low voltage/small current connectors	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Connectors: Large current connectors								○		○		○				○			○	
	Connectors: High voltage connectors	○	○						○								○			○	
	Switches: Keyboard switches																	○	○		○
	Switches: Touch panel switches	○							○		○	○	○	○	○	○	○		○	○	○
	Switches: Button switches													○	○	○					
	Switches: Remote control switches	○		○	○	○	○						○								
	Switches: Electrical switches	○																			
	Electronic Parts: Resistors, condensers, inductances, diodes, etc.	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Electronic Parts: Semiconductors	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Electronic Parts: Sensors	○	○	○	○	○	○	○	○	○		○			○	○	○	○	○	○	○

	Product Category	Audio Visual							Household					Telecommunication & Information						
	Product	Color TVs	Monitor displays	Videos	Camcorders	Stereo sets	CD players	Auto. stereo sets	Microwave ovens	Refrigerators	Rice cookers	Washing machines	Air-conditioners	Cellular phones	Cordless phones	Facsimiles	PC copiers	Personal computers	Word processors	Laser beam printers	Dot printers
Parts and Components																					
Condensers	Aluminum electrolytic condensers (large)	○	○	○	○	○							○			○		○	○	○	
	Aluminum electrolytic condensers (large)	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○
	Aluminum electrolytic condensers (chip)	○		○			○							○				○			○
	Plastic molding tantalum condensers						○	○	○	○	○	○						○	○	○	
	Plastic dip tantalum condensers						○	○	○	○	○	○						○	○	○	
	Chip tantalum condensers			○		○	○			○	○	○	○	○	○			○			
	Double layer electrical condensers			○		○	○												○	○	
	Disc ceramic condensers	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○
	Cylindrical ceramic condensers					○		○													
	Chip laminating ceramic condensers	○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Condenser networks																				
	Semi-fixed condensers	○		○		○	○							○	○						
Resistors	Chip fixed resistors (square)	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Carbon filter fixed resistors	○	○	○		○	○	○	○	○	○	○	○		○	○	○	○	○	○	
	Metal oxide filter fixed resistors	○	○	○		○	○		○	○	○	○	○		○	○	○	○	○	○	
	Metal film fixed resistors	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	Solid resistors	○	○						○				○								
	Wound fixed resistors	○	○	○		○			○	○	○	○	○			○		○	○		
	Fuse resistors	○	○	○		○															
	Resistor networks					○							○			○		○	○	○	
	Thermistors	○	○	○	○	○		○	○	○	○		○			○	○	○	○	○	○
	Rotary volume controllers	○	○	○		○	○	○		○											
	Slide volume controllers	○		○		○			○												
	Semi-fixed volume controllers	○	○	○	○	○	○	○	○					○	○	○	○	○	○	○	
Coils	Variable inductors	○		○		○		○					○	○	○						
	Fixed inductors	○	○	○		○		○						○	○		○			○	
	Coils (inductors)	○	○	○			○	○	○	○	○	○	○	○	○	○	○		○		
	Peaking coils	○	○	○		○		○	○	○	○	○		○	○		○				
Filters	EMI filters	○				○								○	○				○		
	SAW filters	○		○										○	○						
	LC filters	○	○	○										○							
	Line filters	○	○	○			○		○				○		○	○	○	○		○	○
	Noise filters	○	○	○			○									○	○	○		○	○
	Ceramic filters	○		○		○	○	○						○	○						
Semiconductors	Transistors	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Diodes	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	ICs	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	LSIs	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	LCDs	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	LEDs	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Sensors	Temperature sensors								○	○	○		○			○					○
	Humidity sensors			○	○								○				○			○	
	Light sensors	○	○	○	○	○	○	○					○			○	○			○	
	Fuses	○																			

2.2.2 Priority Assessment of Electrical and Electronic Parts and Components

Based on Table 4-2-4, the assessment of priority products to which priority in localization should be given was carried out. The results of the assessment are summarized in Table 4-2-5. The assessment of priority products was done from three points of view: (a) econonic impact, (b) technological impact, and (c) comprehensive competitiveness, which is aggregate competitiveness created by the difficulty of market entry, product competitiveness, and so on. The results of the assessment were summarized as comprehensive priority, and were graded on an A, B, C basis. The contents of these criteria are explained in the first section of this chapter.

The following parts and components were selected as tentative priority ones. These are thought to be given priority to be developed in the future in Indonesia.

Classification	Priority Parts and Components
Mechanical parts/ components	Plastic cases, Plastic injection parts, Press parts, Machine processed parts
Electrical parts/ components	PCB (one side, both sides, multi-layer), Induction motors, DC motors, Audio speakers, Electrical connectors, Low voltage connectors, Very low current connectors
Electronic parts/ components	Resistors, Condensers, Semiconductors

Following these parts and components, flexible printed circuit boards, liquid crystals (black and white, and color), micro speakers, button switches, and sensors were given priority.

Table 4-2-5 Results of the Assessment of Priority Parts and Components Groups in the Electrical and Electronic Industry

		Product Category	Audio Visual							Household					Telecommunication & Information								Eco. Impact (total)	Technological Impact	Compe. Competitiveness	Comprehensive Priority
		Product	Color TVs	Monitor displays	Videos	Camcorders	Stereo sets	CD players	Auto. stereo sets	Microwave ovens	Refrigerators	Rice cookers	Washing machines	Air-conditioners	Cellular phones	Cordless phones	Facsimiles	PC copiers	Personal	Word processors	Laser beam printers	Dot printers				
Economic Impact			A	B	C	C	A	C	C	C	A	B	B	B	B	B	A	A	B	C	C	C				
Mechanical Components	Components	Mechanical components			C	C	A		C	C		B						A					C	B	B	B
		Plastic enclosures	A	B	C	C	A	C	C		A		A	B	B	B	A	A	B	C	C	C	A	A	B	A
		Glass panels	A	B																			C	B	C	C
		Plastic panels	A	B	C		A		C														B	B	B	B
		Electronic panels	A		C	C	A								B		A	A			C	C	B	A	C	B
		Chassis	A	B	C	C	A										A	A			C	C	B	A	C	B
	Other	Other injection molding	A	B	C	C	A	C	C	C	A	B	B	B	B	B	A	A	B	C	C	C	A	A	B	A
		Other presses	A	B	C	C	A	C	C	C	A	B	B	B	B	B	A	A	B	C	C	C	A	A	B	A
		Other machining	A	B	C	C		C	C	C	A		B	B				A					A	A	B	A
Electrical and Electronic Parts and Components	PCB	PCB (one side, both sides)	A	B	C	C	A	C	C	C	A	B	B	B	B	B	A	A	B	C	C	C	A	A	B	A
		PCB (multi-layer)	A	B	C	C	A	C	C	C					B	B	A	A	B	C	C	C	B	A	B	A
		PCB (flexible)	A	B	C	C	A	C							B	B	A	A	B	C	C	C	B	A	B	B+
	Indicators																									
		CRT	A	B																			B	B	C	C
		LC (black & white, color)			C	C	A	C				B			B		A	A	B	C	C	C	B	A	B	B+
	Tuners	BS tuners	A																				C	B	C	C
		TV tuners	A																				C	B	C	C
		FM tuners					A																C	B	C	C
		AM tuners					A																C	B	C	C
	Motors	Induction motors								C	A		B	B									A	B	A	A
		DC motors			C													A	B	C	C	C	A	B	A	A
		DD motors				C	A	C	C													C	B	B	B	B
		Micro motors						C											B	C		C	C	B	C	C
		Fan motors								C	A						A	A	B		C	C	B	C	B	B
	Speakers	Micro speakers			C			C									A	A	B	C	C	C	C	B	B	B+
		Telephone speakers													B	B							C	C	C	C
		Audio speakers	A				A		C														B	B	A	A
		Microphones					A																C	B	C	C
	Heads	Thin layer magnetic heads for F/Ds and H/Ds																	B	C			C	B	C	C
		Rotating heads for VCRs			C	C																	C	B	C	C
	Connectors	Electrical connectors	A	B	C	C	A	C	C	C	A	B	B	B	B	B	A	A	B	C	C	C	A	B	A	A
		Low voltage/small current connectors	A	B	C	C	A	C	C	C	A	B	B	B	B	B	A	A	B	C	C	C	A	A	B	A
		Large current connectors								C	A	B	B	B				A			C		C	B	B	B
		High voltage connectors	A	B						C								A			C		C	B	C	C
	Switches	Keyboard switches																	B	C			C	C	B	C
		Touch panel switches	A				A					B					A	A					C	A	B	B
		Button switches	A	B	C	C	A	C	C	C			C		B	B	A				C	C	B	B	B	B+
		Remote control switches	A				A							B									C	B	C	C
		Electrical switches	A	B			A			C	A		C	B									B	B	A	B
	Electronics Parts	Resistors, condensers, inductances, diodes, etc.	A	B	C	C	A	C	C	C	A	B	C	B	B	B	A	A	B	C	C	C	A	A	B	A
		Semiconductors	A	B	C	C	A	C	C	C	A	B	C	B	B	B	A	A	B	C	C	C	A	A	B	A
		Sensors	A	B	C	C	A	C	C	C	A	B	C	B			A	A	B	C	C	C	B	A	B	B+

2.2.3 Determination of Priority Essential Technologies

Priority parts and components selected in the previous section are the kinds of products which are produced on a large scale and are intended to be exported. Multinational companies have know-how and distribution channels to produce and distribute those parts and components. Therefore, the introduction of foreign companies who have reputed international brand names should be the main focus of the development strategy of the industry. In order to lure these companies, the development of essential technologies for Indonesian domestic companies is regarded as imperative.

Among essential technologies, some are indispensable for production but some are not. In addition, some can be transferred in a relatively short period, while some can only be done in a medium to long time period. Based on that understanding, essential technologies necessary for the production of the priority parts and components, which were selected in the previous section, are listed. Among them, priority essential technologies, which are given special priority in the development of the industry, are determined. The results of the determination are shown in Table 4-2-6.

From Table 4-2-6, a matrix of six categories of essential technologies is set up by the possible time of achievement and the degree of the priority of each essential technology, as shown in the following table.

Degree of Priority	Time of Achievement	
	Short Term	Medium to Long Term
High (A)	Single press, Metal sheet press, Injection molding (ordinary), Insert molding, Machining, Die (single press), Die (metal sheet press), Mold (ordinary plastic injection)	Heat treatment
Moderate (B)	Painting, Printing, Soldering, Ultrasonic wave bonding	Progressive press, Transfer press, Turret punch, Injection molding (engineering plastic), Plating, Grinding, Surface quenching, Welding, Die (progressive press), Mold (engineering plastic), Surface mounting
Low (C)	(nothing)	Compression molding, Metal hoop molding, Two-color injection molding, Die (transfer press), Die (die-casting), Mold (rubber), Mold (glass)

In short, press technology (single press, metal sheet press), plastic injection molding technology (ordinary injection molding, insert molding), machining technology, die and mold technology (single press, metal sheet press, injection mold), and heat treatment technology are selected as very high priority technologies.

Table 4-2-6 Determination of Priority of Essential Technologies

Product Category		Mechanical Parts				Components								Electronic Parts		Necessity of Essential Technologies	Time of Achievement		Priority of Essential Technologies
Parts and Components		Plastic enclosures	Other injection molding	Other presses	Other machining	PCB (one side, both sides)	PCB (multi-layer)	Induction motors	DC motors	Audio speakers	Electrical connectors	Low voltage/small current connectors		Resistors, condensers, etc.	Semiconductors		Short Term	Medium to Long Term	
Essential Technologies																			
Presses	Single			○				○	○		○	○			○	◎	◎		A
	Metal sheet			○						○						◎	◎		A
	Progressive							○	○									◎	B
	Transfer																	◎	B
	Turret punch			○													◎	◎	B
Molding	Injection (ordinary)	○	○							○						◎	◎		A
	Injection (engineering plastic)		○									○						◎	B
	Compression										○				○			◎	C
	Insert	○	○													◎	◎		A
	Metal hoop																	◎	C
	Two-color																	◎	C
Machining		○	○	○	○	○	○									◎	◎		A
Surface Treatment	Plating				○													◎	B
	Grinding				○													◎	B
	Painting		○														◎		B
	Printing		○														◎		B
	Surface quenching				○													◎	B
Heat Treatment		○	○	○	○											◎		◎	A
Bonding	Welding				○													◎	B
	Soldering					○	○										◎		B
	Microwave	○															◎		B
Dies and Molds	Press (single)			○				○	○	○	○	○			○	◎	◎		A
	Press (metal sheet)			○						○						◎	◎		A
	Press (progressive)							○	○									◎	B
	Press (transfer)																	◎	C
	Plastic (ordinary)	○	○													◎	◎		A
	Plastic (engineering plastic)		○									○						◎	B
	Die-casting																	◎	C
	Rubber																	◎	C
	Glass																	◎	C
Surface Mounting						○	○											◎	B

3. MACHINE PARTS INDUSTRY

3.1 PRESENT SITUATION OF THE MACHINE PARTS INDUSTRY

3.1.1 History of the Machine Parts Industry in Indonesia, and the Progress of Localization

(1) The Growth of the Machine Parts Industry

As mentioned earlier, the industrial structure in Indonesia has significantly changed since the latter half of the 1980s. This change is also noted in the machine parts industry based on results of the questionnaire survey. The survey item on the establishment year of companies in the industry, showed that among 138 companies who responded, only 7 companies were established before the 1960s, 31 companies in the 1970s, 44 companies in the earlier half of the 1980s and 34 companies in the latter half of the 1980s. Thus, about 60% of the total companies responding were established in the 1980s. For further information, 22 companies were established in the earlier half of the 1990s, and the total number of companies newly established has been decreasing since the peak in the 1980s.

(2) The Extent of Local Parts Production by the Main Manufacturers

a. The extent of local production in the machine industry

According to MOIT's "Laporan Kegiatan Tahun 1994-1995," the extent of local production in the machine industry is as follows.

Sub-industry	Local Content Ratio
(i) Fabricated machinery	47-91%
(ii) Agricultural machinery	85-90%
(iii) Electronic machinery	20-85%
(iv) Machine tool industry	20-52%
(v) Construction machines	20-85%

b. Company interviews

The following information about the extent of local production in the machine industry was obtained through interviews with companies in the industry.

(i) Diesel engine manufacturer

This company produces approximately 200 small diesel engines a month. The engines have a local content ratio of approximately 60%. Cylinder blocks and cylinder heads are imported from Japan.

The company also produces metal press parts with a local content ratio of approximately 80%. Part of its heat processing is subcontracted to local companies.

(ii) Textile machine manufacturer

The local content ratio of this company's products is estimated to be around 80% for old weaving machines and 20% for new weaving machines.

(iii) Construction machine manufacturer

This construction machine manufacturer, a certain Company K, procures 35-40% of its parts locally. Its products whose production has been localized include welded-construction parts for metal plates, driver's seat covers, track links, etc.

(iv) Pump manufacturer

Each month this company produces approximately 1,500 pumps for agricultural pumping for home use and for ships. Its locally produced parts include impellers and casings for centrifugal pumps.

(v) Agricultural machinery manufacturer

This company manufactures cultivators and rice hullers. However, it has a technical tie-up with a Japanese company, so its manufacture of hand tractors (2PS) and rice hullers is done 100% in-house.

(vi) Manufacturer of electrical generators and electrical welding machines

Fifty generators are manufactured monthly; 60% of the raw materials are imported from Japan; about 40% of the manufacturing is done in-house.

100 to 150 DC welding machines are manufactured each month; 20% of the raw materials are imported from Japan and 80% are procured domestically; lathe processing in particular is subcontracted.

3.1.2 General Situation of the Machine Parts Industry

(1) Location

As indicated in the information in Section 4 of Chapter 2, about the regions where the new machine industry factories built over the past three years have been located, the companies in the industry are concentrated in the capital region of Jakarta and in the province of West Java.

The main industrial cities in West Java include Tangerang, Serang, Bekasi, Karawang, Purwakarta, Bogor, Bandung, Sumedang, and Cirebon.

The questionnaire survey results show that most of the companies who responded were from DKI Jakarta and east Java. Among the 159 companies responding, almost half are located in JABOTABEK and one fourth are in east Java.

(2) The Number of Companies and the Value of Shipments in Each Sub-industry of the Machine Industry

In 1993, there were 247 companies in the machine industry. The total value of their shipments was approximately 1.5 trillion Rp. Of these 247 companies, 49, comprising the largest group, made special machines and equipment for industry. The second largest group, composed of 29 companies, made parts for machines and equipment. However, the shipments of these two groups accounted for only small portions of the total value of machine industry shipments: 1.5% and 4.0%, respectively.

The companies whose shipments had the largest value are those that manufacture lifts, tractors, bulldozers, etc.; the value of their shipments, 525.2 billion Rp, accounted for approximately 1/3 of total shipment value. Next were the companies related to internal combustion engines: their share of total shipment value was 20.4% (Refer to Table 4-3-1).

Table 4-3-1 Number of Establishments and Production in the Machinery Industry

	Classification of Industry	Number of Establishments		Production	
		Number of Establish-ments	Share	Billion Rp.	Share
3821 1	Manufacture of Steam Engines, Turbines and Windmills	6	2.4%	2.3	0.2%
3821 2	Manufacture of Internal Combustion Engines	10	4.0%	310.4	20.4%
	Diesel Engines			(182.4)	
	Engines			(87.8)	
	Steering Systems			(23.2)	
	Generators			(8.8)	
	Spare Parts			(3.7)	
3821 3	Manufacture of Components and Parts of Prime Movers	10	4.0%	16.3	1.1%
	Piston Rings			(6.5)	
	Automotive Jacks			(3.5)	
3821 4	Repair and Maintenance of Prime Movers	5	2.0%	4.4	0.3%
	Spare Parts			(3.8)	
3822 1	Manufacture of Agricultural Machinery and Equipment	16	6.5%	43.4	2.9%
	Hand Tractors			(18.4)	
	Coconut Oil Processors			(4.9)	
3823 1	Manufacture of Metal Working Machinery	7	2.8%	23.4	1.5%
	Machinery Equipment			(9.1)	
	Construction Machines			(2.6)	
3823 2	Manufacture of Wood Working Machinery	3	1.2%	20.0	1.3%
	Plywood Machine Cutters			(19.6)	
3824 1	Manufacture of Textile Machinery	8	3.2%	59.8	3.9%
	Weaving Machines			(31.9)	
	Spare Parts			(17.1)	
3824 3	Manufacture of Shore Construction Equipment	3	1.2%	16.5	1.1%
	Accessories			(9.0)	
3824 5	Manufacture of other Industrial Machinery and Equipment	32	13.0%	82.9	5.5%
	Processing			(22.4)	
	Tea Processors			(9.6)	
	(Pressure Vessels)			(8.9)	
	Heat Exchangers			(6.2)	
	Urea Processor Machines			(3.7)	
	Machinery Equipment			(3.6)	

3824 6	Manufacture of Components and Parts of Special Industrial Machinery	49	19.8%	22.1	1.5%
	Spare Parts			(4.6)	
3825 3	Manufacture of Electronic Office, Computing and Accounting Machinery	6	2.4%	82.1	5.4%
	Typewriters			(61.2)	
	CPU Cases			(5.2)	
	Monitors			(4.4)	
	Computers			(4.0)	
3829 1	Manufacture of Sewing Machines	4	1.6%	24.4	1.6%
3829 2	Manufacture of Lifting and Hoisting Machinery, Tractors, Bulldozers and the Like	21	8.5%	525.2	34.6%
	Dozer Shovels			(75.8)	
	Hydraulic Excavators			(64.5)	
	Tractors			(62.9)	
	Transportation Equipment			(60.4)	
	Wheel Loaders			(44.4)	
	Electric Distributors			(32.9)	
	Motor Graders			(26.3)	
	Forklift Trucks			(22.6)	
3829 3	Manufacture of Blowers, Compressors and the like	23	9.3%	55.2	3.6%
	Pumps			(18.2)	
	Water Hand Pumps			(9.7)	
	Gates			(6.4)	
	Industrial Pumps			(6.2)	
3829 4	Manufacture of Air Conditioners, Refrigerators and the like	9	3.6%	63.9	4.2%
	Components			(11.9)	
	Air Conditioners			(11.5)	
	Compressors			(8.9)	
	Air Conditioner Parts			(7.8)	
3829 5	Manufacture of Machinery and Equipment	6	2.4%	106.0	7.0%
	Army Equipment			(75.0)	
	Railway Fixtures			(9.5)	
	Vacuum Circuit Breakers			(6.2)	
	Air Breaks			(4.9)	
	Generators			(3.4)	
3829 6	Manufacture of Components and Parts of Machinery and Equipment	29	11.7%	61.2	4.0%
	Ball Bearings			(14.9)	
	Axles			(13.8)	
	Air Filters			(8.9)	
	Parts of Machinery			(7.7)	
	Spare Parts			(7.5)	
	Total	247	100.0%	1,519.5	100.0%

Source : "Statistik Industri Besar dan Sedang, 1993", BPS

(3) Present Situation of Major Machine Parts

a. Parts for pumps

Production statistics for pump and bulb castings in Indonesia are not clear. Based on the interview survey with P.T. EBARA INDONESIA, P.T. GETEKA FOUNINDO and P.T. KSB INDONESIA, and the technical reports collected and studied, the following analysis is made.

(i) P.T. EBARA INDONESIA produces pumps with diameters of 50~500 mm. They are mostly used for water pumps for buildings and circulation pumps for air conditioners. Water pumps and fire fighting tanker pumps are also produced up to a maximum diameter of 1,200 mm. In the agricultural pump market, Chinese made pumps are expanding their market share because of their low prices.

(ii) Major parts of pumps are made of castings. The most important part is the pump case which is manufactured of casting products in-house and other iron casting (70 tons/month), bronze casting (7 tons/month) and flange pulleys which are ordered from outside.

(iii) TORISHIMA PUMP has a foundry factory of P.T. GETEKA FOUNINDO as a sister company. Therefore, TORISHIMA can purchase iron castings, ductile iron castings and impellers and the cases of industrial pumps with diameter of more than 50 mm, amounting to 30 tons/month.

(iv) German pumping manufacturers, KSB established P.T. KSB INDONESIA in 1994, which produces iron castings, ductile iron castings for water pumps and water supply parts, amounting to 350 tons/month.

(v) Joint venture companies for pumping manufacturers have small sized foundries for their own use because local casting manufacturers can not supply qualified castings for electrical pumps. As there are a number of local pumping manufacturers, casting manufacturers should be developed to supply good quality and low cost castings to local manufacturers.

The casting method used is manual molding by self hardening molding process because of the small production lot and relatively large casting products. Therefore, it is important to establish manufacturing technology which uses wooden pattern and molding technology.

(vi) There is a specialized factory for manual operation pumps in Ceper, producing 3,500 sets/month for casting, manufacturing and fabricating (casting products of 100 tons/month by 110 persons).

b. Parts for machine tools

For the machine tool industry in Indonesia, production is confined to small sized conventional lathes and CNC machining centers by PINDAD. About 80% of parts for small sized lathes are locally produced, and major parts representing bed made of casting products are produced by PINDAD. A small sized machining center has been established by PINDAD in a joint venture with FANUC, with all control system equipment made by FANUC and the local content of the machining center is about 50% including tool holders.

Regarding other machine tools, cheap ones are imported from China, Taiwan, India, etc. while high performance tools come from Japan, Europe, etc.

Near Bandung, a factory which produces parts for spinning and weaving machinery has the technology to produce small parts such as gears, shafts, pulleys, etc.

However, this factory has not yet reached the level to produce parts for high performance machine tools from the viewpoint of productivity and accuracy of dimensions because much of the manufacturing process is done by conventional machines.

c. Replacement parts for textile machinery

Recently, the textile industry has grown rapidly in Indonesia, having about 6,000,000 spindles, a figure which is more than Japan (less than 5,000,000 spindles). The textile industry is well developed with the introduction of new technology such as air jets and water jets.

Local production of consumable parts such as gears, belts, string shift reverse, and guidance has been accelerating. It is said that the locally produced content of textile machinery is 80% in old machines and 20% in new ones. Further import substitution should be promoted by means of technology transfer of casting and heat treatment.

d. Parts for diesel engines

Diesel engine casting demand among machinery parts is assumed to be the second largest one following automotive engines. There are no previous statistics on producing engine castings which totaled 4,300 tons in 1994.

Diesel engines for industrial use other than for automotive, construction machinery and transportation machinery are mostly used for agricultural diesel engines such as cultivators, rice mills, water pumps, diesel engines for fishing vessels and power generators.

This interview survey was conducted for joint venture companies with Japanese companies such as P.T. YANMAR DIESEL INDONESIA, P.T. NIIGATA SANTANA and the local company of P.T. AGRINDO.

(i) P.T. YANMAR DIESEL produces small diesel engines at a rate of 200 units/month. They are used for cultivators with 8.5 Hp (30.6%), common machinery (18%), civil work (11.7%), rice mills (10.8%), pumps (9%) and longtail engines for fishing vessels (9%).

(ii) P.T. NIIGATA SANTANA produces large vessel diesel engines (500~10,000 Hp) and power generating diesel engines (330~8,000 Kw, with 5,000 Kw having the largest share). In 1995 the local content was 20%. In 1996, the target for local content is set at 60%, to be achieved by means of outsourcing various casting, forging and metal presswork items.

(iii) P.T. AGRINDO produces several kinds of agricultural machinery, e.g, rice mills. Casting engines are produced in its foundry. A sister company, P.T. TAIYO ELECTRIC INDONESIA produces applied products such as diesel generating units and arc welding machines. These products are produced in small lots. Therefore, joint venture between Japanese and local companies is desired for producing such casting and forging products.

(iv) There are 11 diesel engine manufacturers which belong to GIAMM. Various kinds of diesel engines are produced and the manufacturers can also produce major parts. However, local companies to produce casting products should be developed. It is also important to consider international price competitiveness with Chinese diesel engines in terms of the ASEAN free trade zone

(v) Young engineers wanted technical guidance for the manufacturing of crank shafts made of high strength ductile cast iron with 80 kg/mm2 because twist

machines are expensive for the localization of large scale casting crank shaft.

3.1.3 Estimate of Size of Machine Parts Market

(1) The Value of Domestic Production of Machine Parts

As mentioned in Section 4 of Chapter 2, in Indonesia machine parts are considered part of the "component industry" and the "component industry" is the largest sub-industry of the machine industry. It also has a higher rate of domestic production than the other sub-industries.

Various kinds of machine parts are manufactured in Indonesia. Based on shipment value, the main ones are industrial machine parts, weaving machine components, ball bearings, axles, air filters, machine components, lathes, etc. (Refer to Table 4-3-2).

Table 4-3-2 Production of Components and Parts of Special Industrial Machines and Machinery & Equipment in 1993

Description	Unit	Quantity	Value (Million Rp.)
Spare Parts	*	-	4,606
Factory Equipment	*	-	2,414
Weaving Equipment	Ton	1,593	2,116
Weaving Components	000 Pcs	106	1,887
Cast Steel	Ton	712	1,637
Lathe Goods	Ton	51	772
Spare Parts for Pumps	Ton	300	580
Vacuum Filters	Unit	2	560
Food Pans	Unit	5	550
Flyers	000 Bh	2,083	520
Screw Presses	Unit	25	506
Bobbins	000 Pcs	883	478
Other			
Total of Special Industrial Machines			22,127
Description	Unit	Quantity	Value (Million Rp.)
Ball Bearings	000 Pcs	5,751	14,910
Axles	Ton	13,731	13,797
Air Filters	*	-	8,926
Machine Components	Ton	2,950	7,695
Spare Parts	*	-	7,526
Lathes	*	-	1,240
Gears	Pcs	58,085	1,115
Brake Blocks	000 Pcs	137	1,032
Factory Tools	*	-	935
Concrete Goods	Ton	223	412
Sewing Machine Components	Set	12,500	411
Pulley Fans	000 Pcs	92	315
Pumps	Pcs	983	98
Rotary Pumps	Pcs	20	20
Other			
Total of Machinery and Equipment			61,153

Note: Listed items are selected for their large production value.
Source: "Annual Survey of Large and Medium Manufacturing Establishments," 1993

(2) Quantities and Values of Imports and Exports

Over the past two years, the import dependency rate of the "component industry" has

been 86-87% (Refer to Table 4-3-3). Compared to "fabricated machinery" and the "machine tool industry," whose import dependency rates are 97% and 98%, respectively, the "component industry" could be said to have progressed in terms of the localization of production.

Table 4-3-3 Import Dependency Ratio of Component and Parts Machinery and Equipment

(unit: million US$)

	1994	1995
Production Value	335.9	364.9
Imports	1,496.6	1,720.5
Exports	93.6	106.3
Import Dependency Ratio	86.1%	86.9%

Table 4-3-4 shows the changes in value of imports and exports of the machine parts in various SITC, three-digit classifications during 1991-1994. As can be seen in the table, imports of diesel engine parts and air pump parts had the greatest value, while exports of machine tool parts and parts for metal processing machines were of minimal value.

Table 4-3-4 Export and Import Trends of Spare Parts of Selected Machinery and Equipment

(unit: million US$)

SITC	Item		1991	1992	1993	1994
713	Engine Parts	Export	8.8	9.0	11.2	13.6
		Import	409.1	367.0	439.1	717.8
735	Machine Tool Parts	Export	0.0	1.3	0.5	0.4
		Import	28.1	16.7	23.2	25.1
737	Metal Working Machinery Parts	Export	0.3	0.7	1.2	1.6
		Import	140.1	255.3	123.3	121.1
742	Liquid Pump Parts	Export	3.2	6.6	4.5	2.0
		Import	190.8	264.1	216.1	210.4
743	Air Pump Parts	Export	0.8	14.7	40.9	54.6
		Import	341.1	424.2	378.3	376.8

Source: Export and Import Statistics.

(3) Questionnaire Survey

According to the questionnaire survey implemented in this study, manufacturers of machine parts responded to questions of their coverage of market demand as follows;

a. Existing production capacity to meet the market demand

Among 156 companies responding, 70% answered that "existing production capacity is enough", 20% answered "Not enough" and 10% answered "Excess capacity".

b. Production expansion plan

Regarding companies' plans to invest in new machinery and equipment in the future, almost half of the companies (77 companies) are planning to invest in "facilities for production expansion."

c. Export plan

Of 91 parts assembling companies responding on export, almost 70% answered in the affirmative to " Planning to start export" or " Planning to expand export." This share is equivalent to almost 40% of the total number of parts assemblers which have export plan.

3.1.4 The Relationship between Assemblers and Parts Manufacturers

(1) Interview Survey

In interviews with assemblers, they were asked about their policies and practices towards parts manufacturers, their evaluations of subcontractors, their policies for nurturing subcontractors, and so forth. The information gained from these interviews was as follows.

a. Diesel engine manufacturer

(i) Policy and practice towards subcontractors

This company manufactures small, multi-purpose diesel engines (for the agriculture and fishing industries and for general use). It does business with approximately 100 local companies, and subcontracts work, primarily parts machining and parts casting, to approximately 50 companies.

(ii) Evaluation of subcontractors

The biggest problem is quality. Every item that is delivered is inspected. For example, in the case of cast parts, the initial defect rate is 10% for products made by Japanese affiliates, but reaches 20-30% for products made by local companies.

(iii) Policy for nurturing subcontractors

The company had the experience of working to raise the level of a subcontractor that manufactured castings but that company then switched to the automobile manufacturing industry, so that its deliveries to this company were often late. As this indicates, the question for this company is how much effort to put into nurturing subcontractors.

b. Pump manufacturer

(i) Policy and practice toward subcontractors

This company manufacturers various kinds of pumps as well as water treatment equipment. It subcontracts machining work to 10-15 companies.

As a result of technical guidance from an automobile manufacturer, it raised its technical level. In the future it plans to increase its number of subcontractors.

(ii) Evaluation of subcontractors

Sometimes, when the company gives all of its subcontracting orders to local companies; the defect rate reaches around 30%. The company subcontracts work on stainless steel shafts, but the defect rate for that is about 3%.

(iii) Policy for nurturing subcontractors

The company frequently lends jigs, tools, etc., to subcontractors, teaches them work procedures and then has them do the work. About once a month it returns delivered items that are defective to subcontractors, attaches comments to the

items and has the subcontractors redo them. Also, if necessary, it provides technical instruction once a month and uses other methods as well to nurture subcontractors.

c. Diesel generator manufacturer

(i) Policy and practice toward subcontractors

This manufacturer is a foreign affiliate that makes, among other things, large diesel generators of 200 PS or more.

It subcontracts almost all of its machining work (particularly lathe machining). However, its orders are small, so only small companies will accept them.

(ii) Evaluation of subcontractors

In the case of local companies, especially small ones, there are problems with delivery deadlines and product quality.

Most of the subcontracted work involves the machining of outer diameters with an NC lathe. However, there are problems with the precision of dimensions. There was a case when the subcontractor was given the engineering drawings but didn't fully understand them, and didn't conduct complete inspections either, so the +/- 0.01 allowance wasn't maintained. The defect rate is approximately 5%. With new subcontractors the defect rate for dimensions sometimes reaches 100%.

When work is subcontracted, the subcontractor is given the engineering drawings, the work drawings and a sample, but it is not possible to adequately design work processes based on engineering drawings.

(iii) Policy for nurturing subcontractors

This manufacturer needs to improve the technical level of its heat processing (surface processing). Its management of heat processing temperature is bad. It therefore needs to nurture a manufacturer specializing in this area.

The core material of generators, silicon steel, is expensive if purchased from overseas. This company therefore needs to nurture the kind of heat processing skills used for hardening the surface of ordinary steel.

d. Cutting tool manufacturer

This company, a joint venture involving foreign capital, manufactures and re-ginds carbide cutting tools that have special specifications. It is the only company in Indonesia that manufactures carbide tools.

(i) Policy and practice toward subcontractors

The company imports regular carbide tools and holders from overseas. Regarding special tools, however, it is now looking into subcontracting work, including re-grinding, to local companies.

(ii) Evaluation of subcontractors

Even if subcontractors have the ability to use the tools, if they do not have technical knowledge about them, they can not do the re-grinding.

(iii) Policy for nurturing subcontractors

If the primary subcontractors in the auto industry should come to want to improve their production equipment, an improvement in their production skills is necessary.

In the work processes of subcontractors, even when an item is known to be defective, it is often sent on to the next process. The company needs to teach

basic quality control: defective items must not be sent on to the next process.

If such basic changes in thinking are not effected, local companies will not mature.

(2) Questionnaire Survey

Based on the questionnaire survey results, characteristics of machine parts manufacturers are as follows.

a. Production pattern

Among 139 companies responding, almost 60% are large-variety and small-volume producers.

b. Production planning

Among 150 companies responding, almost 60% determine "production based on order," 20% determine "production based on demand forecast" and 20% determine both "production based on order and demand forecast."

c. Number of customers/assemblers

Almost 40% of parts suppliers have 1~5 customers/assemblers followed by 20% with 6~10 customers/assemblers. Thus, almost 60% have less than 10 customers/assemblers. Almost 20 % have more than 51 customers/assemblers.

d. Difficulties in subcontracting business

Queried on the main difficulties the company faces in expanding or penetrating the subcontracting business, almost half of parts suppliers selected "Lack of information

on potential customers," followed by "Difficulty in penetrating an established subcontracting relationship" and " Insufficient competitiveness in cost, quality, and delivery."

e. Complaints from customers/assemblers

Almost half of the responding companies answered that the most serious or frequent complaints from customers were " High pricing " and " Delivery (delay or inconstant)" and one fourth of them chose " Technology capabilities of development (insufficient)" as their answer.

f. Kind of assistance from customers/assemblers

Most of the surveyed companies expect to receive some kind of assistance from their customers/assemblers. One company per 3~4 companies has been receiving "technical support" and "Supplies of materials, dies and molds, etc.," and almost 20% of them have been receiving "Financial support" and "Managerial assistance."

g. OEM production

Almost half of the surveyed companies answered that they are producing OEM goods.

h. Sales to general market or after-market

Almost 60% of surveyed companies answered that their sales are to the general market or after-market.

i. Market

Only a small number of the surveyed companies export to other countries and EPTE and most of the companies (90%) sell their products in the domestic market.

j. Use of subcontracting companies

Almost 70% of surveyed companies use subcontracting companies and have plans to expand that use, therefore, it is assumed that there are many secondary subcontractors.

3.2 SELECTION OF PRIORITY PRODUCTS AND ESSENTIAL TECHNOLOGIES IN THE MACHINERY PARTS INDUSTRY

3.2.1 Identification of Major Machinery Parts and Their Levels

In the general machinery industry, not only the kinds of parts and components used but also the types of finished products manufactured by assemblers are quite varied. Thus, in this section, first, three products of a) diesel engines for general purposes, b) centrifugal pumps and 3) universal machine tools, which are the typical machinery products in Indonesia, are selected. Then, their major parts and components are listed, and their current levels of local procurement are examined. The results are summarized in Table 4-3-5.

By type of finished products, in brief, major casting parts and components such as cylinder blocks and cylinder heads are mostly dependent on imports, while metal press parts are mostly procured locally, in diesel engines for general purposes. In pumps, many of the major casting parts are produced in-house by pump manufacturers, and the production of a part of small casting parts such as flanges or pulleys are locally sub-contracted. There are only a few limited items which are imported among parts and components of pumps. As for the machine tool parts, there are almost no machine tool manufacturers in Indonesia. Thus, a limited number of machine tool parts and components are locally produced mainly for maintenance purposes.

Table 4-3-5 Parts and Components of Major Machinery Products and Their Procurement Methods in Indonesia

Types of Product	Types of Parts	Procurement Measures		
		In-house	Local	Imports
1. Engines for General Purposes	1.1 Air Filters		X	
	1.2 Alternators			X
	1.3 Bearings			X
	1.4 Bearing Caps		X	
	1.5 Camshafts			X
	1.6 Connecting Rods			X
	1.7 Covers, Cylinder Heads		X	
	1.8 Crankshafts			X
	1.9 Cylinder Blocks		X	
	1.10 Cylinder Heads			X
	1.11 Exhaust Manifolds		X	
	1.12 Flywheels		X	
	1.13 Fuel Filters		X	
	1.14 Gaskets			X
	1.15 Intake Manifolds		X	
	1.16 Starter Motors			X
	1.17 Oil Filters		X	
	1.18 Pistons & Piston Rings		X	
	1.19 Pulley Crankshafts			X
	1.20 Radiators		X	
	1.21 Rocker Arms			X
	1.22 V Belts			X
	1.23 Oil Pans		X	
	1.24 Air Filter Housings			X
	1.25 Fan Shrouds			X
	1.26 Water Overflow Tanks		X	
	1.27 Timing Cases & Covers			X
	1.28 Air Intake Pipes			X
	1.29 Engine Supports		X	
	1.30 Engine Hangers		X	
2. Centrifugal Pumps	2.1 Casings	X		
	2.2 Inlet Ports	X		
	2.3 Impellers	X		
	2.4 Impeller Fitting Nuts	X		
	2.5 Liner Rings	X		
	2.6 Packing		X	
	2.7 Packing Glands		X	
	2.8 Packing Gland Bolts		X	
	2.9 Main Shafts	X		
	2.10 Bearing Housings	X		
	2.11 Ball Bearings			X
	2.12 Shaft Couplings			X
	2.13 Coupling Bolts		X	
	2.14 Common Beds	X		

	2.15 Fitting Bolts	X	
	2.16 Foundation Bolts	X	
	2.17 Drain Plugs		X
	2.18 Priming Cups	X	
	2.19 Priming Cocks		X
	2.20 Purge Cocks		X
3. Universal Machine Tools	(Structure)		
	3.1 Beds		X
	3.2 Columns		X
	3.3 Saddles		X
	3.4 Tables		X
	3.5 Circular Tables		X
	3.6 Brackets		X
	3.7 Covers		X
	(Fast Head Stock)		
	3.8 Fast Head Stock ,Body		X
	3.9 Fast Head Housings		X
	3.10 Spindles		X
	3.11 Balance Weights		X
	3.12 Cylinders		X
	3.13 Driving (Index) Heads		X
	3.14 Gears		X
	3.15 Chains		X
	3.16 Sprocket Wheels		X
	3.17 Pulleys		X
	3.18 Covers		X
	(Feed Motion)		
	3.19 Feeding Motors		X
	3.20 Feed Screws/Feed Rods		X
	3.21 Brackets		X
	3.22 Bonds and Fastener Parts, etc.		X

Source : The Study Team

3.2.2 Production Processes of Major Machinery Parts

Taking machine tools which are one of the representative products of the machinery industry as an example, their major parts are classified by their production processes. Table 4-3-6 summarizes the results of the classification of 366 major parts of machine tools (machining center excluding control units).

Table 4-3-6 Breakdown of Major Machine Tool Parts by Production Process

	Structure	Fast Head Stock	Feed Motion	Tool Exchanger	Tool Magazine	Pallet Changer and Pool	Others	Total	Share (%)
Fray iron castings	65	32	22	15	6	4		144	39.3
Ductile castings	13	7	2	5	2	1		30	8.2
Alloy castings	1							1	0.3
Ordinary steel castings	3	1		3				7	1.9
Special steel castings	1	3		1	1			6	1.6
Copper alloy castings	4	1		3				8	2.2
Alum. alloy castings	4	2		1	4			11	3.0
Alum. die castings		1						1	0.3
Zinc alloy castings							1	1	0.3
Iron precision castings		1		3				4	1.1
Iron and steel forging parts	1	16	7	16	5	3		48	13.1
Noniron forging parts				1				1	0.3
Powder metallurgy products				1				1	0.3

Metal press parts		1	1		1		1	4	1.1
Welded structure parts	6	1	2	3	13	13	11	49	13.4
F.R.P.						1	2	3	0.8
Other parts of miscel. materials			1					1	0.3
Plastic parts	1	1			9			11	3.0
Other parts	3	10	4	7	7	1	3	35	9.6
Total Parts Items	102	77	39	59	48	23	18	366	100.0

Source : *Juyo Sangyo kara mita Sokeizai no Genjo to kadai* (Present Condition of the Demand for Processed Materials from Assemblers and Their Future Direction), The Materials Process Technology Center of Japan

The table above shows that 58% of machine tool parts is composed of various kinds of casting products, 13% of forging products (both from steel ingot, and billet & bar) and another 13% of welded structural metal parts. It also shows that gray iron casting products occupy the major portion of casting parts, and that almost all kinds of casting products such as ductile iron casting parts, alloy casting parts, aluminum and other alloy die casting parts and precision casting parts are also used.

As another typical product of the machinery industry, reciprocating compressors for industrial use are selected, and their parts structure by production processes is investigated. The result is shown in Table 4-3-7.

Figure 4-3-1 Parts Structure of a Reciprocating Compressor

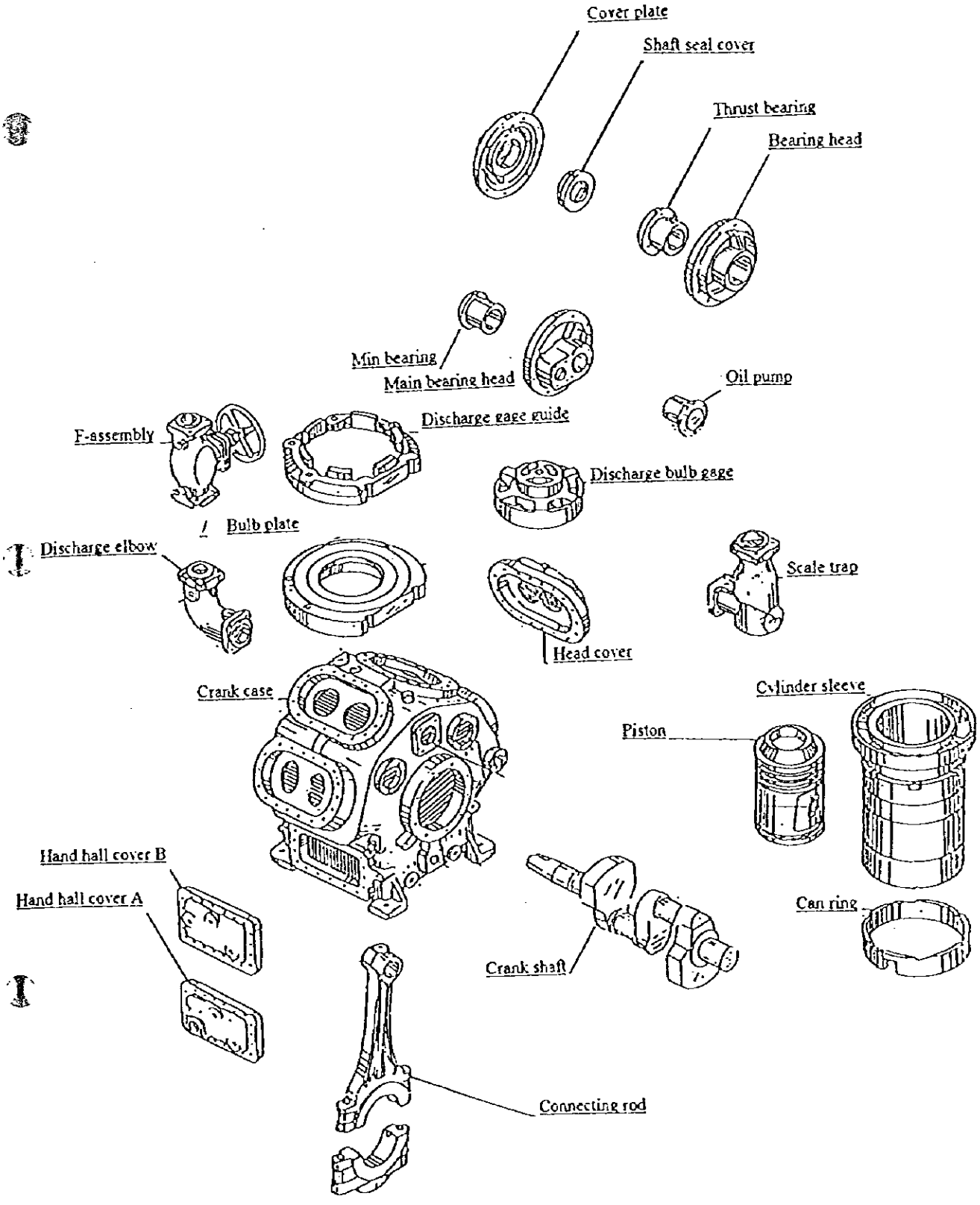

Table 4-3-7 Breakdown of Major Compressor Parts by Production Process

		Sand molding	Metal stamp	Die casting	Lost wax	Continuous casting	Hot stamp casting	Normal stamp	Cold stamp casting	Metal press	Sintering	Plastic molding	Soldering	Cutting & grinding	Total no of Parts	Share (%)
Main body	Gray iron casting	5				1								1	6	4.9
	Ductile casting	3													3	2,5
	Alloy casting	2													2	1.6
	Copper								1	3				5	8	6.6
	Alum. alloy casting		5											2	5	4.1
	Copper alloy casting	1													1	0 8
	Powder metallurgy										2			2	2	1.6
	Plastic											1			1	0.8
Supports	Gray iron casting	16	1												2	1.6
	Ductile casting	10	2		1				1	1	6			1	4	3.3
	Copper							1		1	1				7	5.7
	Alum. alloy casting		1	2						1					3	2.5
	Copper alloy casting		1												1	0.8
	Powder metallurgy											3			1	0.8
Housing	Gray iron casting	26	2											4	29	23.8
	Copper						1			8			3	2	11	9.0
	Alum. alloy casting			2											2	1.6
Total	Gray iron casting	47	3			1								7	52	42.6
	Ductile casting	13	2		1									4	16	13.1
	Alloy casting	2													2	1.6
	Copper						2	1	2	17			4	14	33	27.0
	Alum. alloy casting		6	4					1	1				5	12	9.8
	Copper alloy casting	1	1											1	2	1.6
	Powder metallurgy										5			3	5	4.1
	Plastic											1				
	Total Pats Items	63	12	4	1	1	2	1	3	18	5	1	4	34	122	100.0

Source : The Materials Process Technology Center of Japan

Not only in the parts and components of machine tools and compressors but also in those of most general machinery products, casting products occupy the major portion. Because many of these casting parts are large in size and heavy in weight, it is not advantageous for local assemblers to procure these by imports. Thus, in many of the countries, the development of the casting industry is closely linked with the development of the machinery industry. In Indonesia, it could be said that the delay of the development of the machinery industry hampered the progress of the casting industry on the one side, and that the lack of an established casting industry is currently one of the major constraints on the development of the machinery industry for the other.

From the results of the above analysis, the following elemental technologies are identified as the major essential technologies for future development in Indonesia:

(i) Casting technologies
- Gray iron castings
- Ductile castings
- Alloy castings

(ii) Forging technologies
- Hot stamp forging
- Cold stamp forging

(iii) Metal press technologies

(iv) Machining technologies
- Metal cutting
- Metal grinding

(v) Plastic molding technologies

(vi) Sintering technologies

3.2.3 Direction of the Machinery Industry in Indonesia

The machinery parts industry in Indonesia is still at the beginning stage of development, and many of their products are confined to maintenance parts. As has been stated, the major reason for the above is that the machinery industry is still at the infant stage. Under the circumstances, the direction of the development of the Indonesian machinery industry has to be examined in advance of the establishment of the development strategy of the machinery parts industry in Indonesia.

According to Large and Medium Scale Industrial Statistics (Statistik Industri Besar dan Sedang, 1993, BPS), the total number of establishments belonging to the general machinery industry in Indonesia was 247 in 1993, and the total annual production value of these establishments was Rp. 1.5 trillion. By production item, the weights of two items, combustion engines and construction machinery, are very high; the total production value of which occupies 55% of the total production value of all of the machinery industry. The production value per establishment was Rp. 2.7 billion in these two items, while that of all of other items was only Rp. 0.3 billion. This means that the scale of most of the machinery manufacturers in Indonesia is very small except for the manufacturers of the above two items. (Refer to Table 4-3-1.)

For comparison, the total number of establishments belonging to the Japanese general machinery industry in 1993 was 31,714, and the total annual production value of these establishments was ¥ 25.8 trillion (approx. Rp. 516.0 trillion), according to Industrial Statistics of Japan. By production items, they are diversified. The items cover from industrial use machinery and equipment such as engines for general purposes, agricultural machinery, construction machinery, metal working machinery, textile machinery, printing machinery, pumps, material handling equipment and chemical machinery to electronics related equipment such as office equipment, service equipment including computer game machines and industrial robots. The recent trend is that the weight of those mechatronics products in which mechanical technologies and electronics technologies are combined is increasing. (Refer to Table 4-3-8)

Based on the results of the comparison of machinery industry structures between Indonesia and Japan, the priority production items were investigated making use of such screening criteria as economic impact, technical impact, ease of market entry and international competitiveness. The results are shown in Table 4-3-9. Further, taking the factor of time needed for the enhancement of technical levels, the following priority product items were selected by group (the items which are included in the electric and electronics industry group in this survey are excluded.):

Group I : Product group which could be manufactured at the current technical level in Indonesia.

- Centrifugal pumps
- Valves and cocks, etc.
- Reciprocating air compressors
- Screw pumps

Group II : Product group which could easily be introduced at the current technical level in Indonesia.

- Pneumatic devices
- Universal metal working machines
- Jigs and fixtures (Tools and dies)
- Universal machine tools
- Diesel engines
- Gasoline engines

Group III : Product group which could rather easily be introduced at the current technical level in Indonesia.

- Bearings (Rolling)
- Precision dies and molds
- High grade tools (such as diamond, ceramic or CBN tools)
- Oil hydraulic pressure devices
- Servo-mechanisms
- CNC-machine tools(3 dimension)

Group IV: Product group which should be introduced in the near future in Indonesia.

- High grade servo-mechanisms
- Industrial robots (Multi-link systems)
- Precision metal working machines

Group V: Product group which should be introduced in Indonesia with a long-term perspective

- High grade CNC-machine tools (5 dimension)
- Super-precision machine tools

Table 4-3-8 General Machinery Industry in Japan (1993)

Industrial Classification	No. of Est ablishments		Total Annual Sales	
	Number	Share	¥ Billion	Share
Boilers	204	0.6%	469	1.8%
Stream engines and turbines	80	0.3%	442	1.7%
Internal combustion engines	163	0.5%	426	1.6%
Nuclear systems and others	48	0.2%	541	2.1%
Agriculture machinery and equipment	1,103	3.5%	745	2.9%
Construction and mining machinery & equipment	1,361	4.3%	1,680	6.5%
Tractors	214	0.7%	525	2.0%
Machine tools	1,093	3.4%	955	3.7%
Other metal working machinery	819	2.6%	630	2.4%
Parts for machine tools & metal working machinery	1,952	6.2%	508	2.0%
Jigs, fixtures and metal working tools	1,152	3.6%	759	2.9%
Yarn spinning machinery	117	0.4%	157	0.6%
Weaving machinery	106	0.3%	208	0.8%
Parts of textile machinery	608	1.9%	219	0.8%
Food processing machinery and equipment	844	2.7%	348	1.3%
Wood working machinery	309	1.0%	143	0.6%
Pulp, paper converting machinery	259	0.8%	100	0.4%
Printing and related machinery	713	2.2%	563	2.2%
Foundry machinery and equipment	167	0.5%	116	0.4%
Plastic processing machinery	501	1.6%	391	1.5%
Industrial machinery, n.e.c.	1,308	4.1%	970	3.8%
Pumps	526	1.7%	584	2.3%
Compressors, fans and blowers	457	1.4%	336	1.3%
Elevators and escalators	244	0.8%	434	1.7%
Cranes, conveyors and others	1,857	5.9%	1,166	4.5%
Gear and other power transmission	553	1.7%	536	2.1%
Industrial furnaces	171	0.5%	109	0.4%
Oil hydraulic and pneumatic equipment	1,003	3.2%	702	2.7%
Chemical machinery and equipment	1,946	6.1%	1,106	4.3%
Other industrial machinery	1,827	5.8%	974	3.8%
Office machines and equipment	1,145	3.6%	2,628	10.2%
Sawing machines	298	0.9%	308	1.2%
Woolen yarn knitting machines	24	0.1%	7	0.0%
Refrigerating machines and air conditioners	709	2.2%	1,098	4.2%
Other service and consumer appliances	945	3.0%	1,520	5.9%
Fire extinguishing equipment	122	0.4%	95	0.4%
Valves and cocks	333	1.1%	492	1.9%
Pipe fittings	227	0.7%	94	0.4%
Bearings	116	0.4%	424	1.6%
Piston rings	19	0.1%	67	0.3%
Dies and molds	3,934	12.4%	1,273	4.9%
Wrapping and packing machines	575	1.8%	344	1.3%
Robots	590	1.9%	400	1.5%
Other miscel. machinery and equipment	972	3.1%	249	1.0%
TOTAL	31,714	100.0%	25,841	100.0%

Source : *Census of Manufactures*, June 1995, MITI

Table 4-3-9 Priority Investigation by Product Group of Machinery Industry

	Economic Impact			Tech-nical Imp-act	Ease of Market Participation		International Competitiveness			
								Cost Competitiveness		
	Local Procurement Level	Market Size	Market Growth Potential	Contribution for Growth of Local Technical Level	Ease of Technology Acquirement	Minimum Economic Investment Scale	Development of Related Local Technologies	Cost Effect by Mass-Production	Local Material Availability	Labor Intensiveness for Production
Boilers	C	B	C	C	C	C	A	B	A	A
Steam engines and turbines	C	C	C	C	C	C	B	B	A	B
Internal combustion engines	C	B	C	C	B	B	B	A	A	B
Agricultural machinery	C	A	B	B	B	A	B	A	B	B
Construction machinery	C	A	A	B	B	A	B	A	B	B
Machine tools	A	A	A	A	A	A	C	A	C	B
Metal working machinery	A	A	A	A	A	A	C	A	C	B
Textile machinery	A	A	B	B	A	A	C	A	C	B
Food processing machinery	A	A	A	B	A	B	C	B	C	B
Wood working machinery	B	B	C	C	B	B	B	B	C	B
Pumps	C	C	C	C	C	C	A	B	B	C
Compressors and blowers	C	B	B	C	C	C	B	A	B	B
Cranes, conveyors, etc.	B	B	B	B	C	B	B	B	B	B
Office machines'equipment	A	A	A	A	A	A	C	A	C	B
Sawing machines	C	C	C	C	B	B	B	A	C	B
Refrigerators and ACs	C	A	B	B	B	A	B	A	B	B
Game machines, etc.	A	B	A	A	A	B	C	A	C	B
Jigs and fixtures	B	B	A	A	A	B	C	B	C	B
Dies and molds	B	B	A	A	A	B	C	B	C	B
Packaging machinery	A	B	A	B	B	B	C	A	C	B
Industrial robots	A	B	A	A	A	A	C	A	C	B

Source : Study Team

3.2.4 Development Stages of Priority Products and Essential Technologies in the Machinery and Machinery Parts Industry

For the development of the general machinery industry in Indonesia, the following approaches would be needed. As a short-term development target, the localization of parts and components of such products as engines for general purpose, compressors or construction machinery, which are currently manufactured in Indonesia, has to be enhanced. As a middle-term target, the development of such products as molds & dies or jigs & fixtures is essentially needed because the basic technologies and skills of these products are also required by most of the other manufacturing sector industries. Those products such as agricultural machinery, food processing machinery, universal machine tools or other general metal processing machinery could also be positioned as middle-term development target products because of their expected large domestic demand. Further, in the long run, the development of such mechatronics products as CNC-machine tools or industrial robots, which contribute to the industrial productivity improvement, would be highly required.

In line with the progress of the general machinery industry in Indonesia, the machinery parts industry should be developed and should support the overall development of the machinery industry. Taking parts and components of three representative machinery products of pumps, engines and machine tools as examples, the parts development stages are investigated in association with their essential technologies. The results are shown in Table 4-3-10. Further, Figure 4-3-2 shows the general picture of development stages of essential technologies in association with those of development target product groups.

Table 4-3-10 Development Target Products by Stages of Development and by Process Technologies

Essential Technologies	Short-term Development targets	Middle-term Development targets	Long-term Development targets
Iron Casting	Pump: casing, inlet port, priming cup Engine : Flywheel, cylinder block Machine tool : bed, column, pulley, fast head stock body	Engine : exhaust manifold, intake manifold, cylinder head, piston ring Machine tool : saddle, table, round table	
Ductile casting		Engine : crankshaft, camshaft Machine tool : fast head stock body, fast head housing	
Alloy casting	Engine : Radiator cap	Pump : impeller Engine : piston	
Forging	Machine tool : gear	Engine : drive sprocket, bulb, rocker arm Machine tool : main shaft	
Sintering		Engine : timing gear Machine tool : oilless bearing	Machine tool : timing belt, timing gear, belt pulley, spring clutch
Press work	Engine : air filter, fuel filter, oil pan, fan shroud	Pump : ball bearing liner Engine : servo-mechanism parts	CNC－machine tool : magazine case
(Other related) ■ Machining ■ Mold making ■ Heating ■ Surface treatment			

Source : Study Team

Figure 4-3-2 Development Stages of Essential Technologies in Association with Those of Development Target Product Groups