FINAL REPORT
FOR
THE STUDY
ON
THE RENOVATION OF
THE FOUR INDUSTRIAL PROJECTS
IN
THE UNION OF BURMA
(Volume I)

SUMMARY

April 1989

JAPAN INTERNATIONAL COOPERATION AGENCY
Tokyo, Japan

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PREFACE

In response to a request from the Union of Burma, the Japanese Government decided to conduct the study on the Renovation of the Four Industrial Projects and entrusted the survey to the Japan International Cooperation Agency (JICA).

JICA sent to Burma the study teams headed by Mr. Masayasu Sakanashi, Unico International Corporation from January 27 to February 26 and from May 22 to June 5, 1988.

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

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

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

April, 1989

Kensuke Yanagiya
President
Japan International Cooperation Agency

LIST OF VOLUMES

ABBREVIATIONS, ACRONYMS, AND SYMBOLS

"	inch
'	foot
@	(in a renovation plan) applied to plants of the same category
#	(in a renovation plan) a new shop
AM	agricultural machinery
AMD	Agricultural Mechanization Department
AME	agricultural machinery and equipment
assy or ass'y	assembly
B600 or B-600	350kg pickup truck
B600L or B-600L	350kg pickup truck with left side steering wheel
BM	25 passengers bus, BM600
BSK	ventilated drip-proof type generator
BX	33 passengers bus, BX402
C & ESTC	Construction and Electrical Stores Trade Corp.
CKD	complete knockdown
COOP	Central Cooperative Society
CP	component part
CPT or cpt	complete
d	diameter
DCI	ductile cast iron
Dept	department
DIN	Deutsche Normen
E & S	Electric & Services (Maintenance)
E/M	equipment and machinery
ECCOM	Economic Coordination Committee
EP	electric products
EPC	Electric Power Corporation
eqpt	equipment
FL	fluorescent lamp

GDP	Gross Domestic Product
GNP	Gross National Product
H or h	hour
HI	Heavy Industry
HIC	Heavy Industries Corporation
HV	heavy vehicle
IL	incandescent lamp
IWTC	Inland Water Transport Corporation
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
JP	yen
K	kyats
kg	kilogram
KM	3.5 ton truck, KM600
KND	horizontal water cooled, 4 cycle, 1 cyliner, diesel engine
kVA or KVA	kilovolt-ampere
kWh or KWH	kilowatt-hour
lb	pound (weight)
LH	left-hand
LP	local component parts
LPG	liquefied petroleum gas
LV	light vehicle
m	meter
mm or m/m	milimeter
M/C	machine
MOC	Myanma Oil Corporation
MW	metal working equipment
NG	natural gas
NIES	Newly Industrialized Economies
PM	preventive maintenance

QC	quality control
Qty or qty	quantity
R/D	research and development
RH	right-hand
RM	raw materials
RSM	rough shaped material
RTC	Road Transport Corporation
SEE	State Established Enterprises
SK	JIS4401 carbon tool steels
SKD	semi-complete knockdown
SKH	JIS4403 high speed tool steels
SKS	JIS4404 alloy tool steels
T2000 or T-2000	2 ton truck
T/G	timing gear
T/M	transmission
TC	Timber Corporation
TE	6.5 ton truck, TE21
V & ESTC	Vehicle and Machinery Stores Trade Corporation
WHM	Watt-hour meter
WTP	Whole Township Special High Yield Variety Production Program
X2000 or X-2000	1/4 ton crosscountry vehicle
X2000L or X-2000L	1/4 ton truck with left side steering wheel

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Chapter 1 BACKGROUND OF THE STUDY, AND THE SOCIAL AND ECONOMIC CONDITIONS OF BURMA

1-1 Background of the Study

1-1-1 Outline of HIC, and Background of the Four Industrial Projects

(1) Background of HIC

In 1962, the Heavy Industry Corporation (HIC) was formed as a state corporation succeeding the activities of the Home Utility Division established in 1960. Under Order No. 1 of the Ministry of Industry dated 16th March, 1972, HIC was reformed in 1972 to operate as a Holding and Operating Commercial Organization, and it was allowed to operate on a purely commercial basis since 1975/76.

The primary objectives of HIC were to promote industrialization of Burma through the following undertakings:

1. To establish metal-based precision industries, which involve comprehensive and complicated technology, such as the manufacturing of automobiles and agricultural machinery.

2. To establish machine tool industries that will form the basis and nuclei for the industrialization of Burma based on agricultural and natural resources.

3. To manufacture capital goods required for the development of electrical and petroleum energy, such as distribution transformers, oil pumping sets, electric motors, etc.

4. To develop casting and forging technology.

5. To develop electric and electronic technology.

6. To establish processing industries based on petrochemicals and rubber.

7. To develop technology for the designing, engineering and manufacturing of plants, machinery, equipment and machine tools.

8. To acquire technology from other countries and to promote transfer of technology in collaboration with those countries.

HIC's task was to establish the automobile and machinery industries which could ensure a stable supply of vehicles and agricultural machinery, such as vehicles for land transportation, light agricultural machinery and equipment required for promoting mechanized agriculture, and pumps for irrigation needed for the development of agriculture, while establishing electric and electronic industries which would supply electric appliances and electric/electronic apparatus needed for the development of electric power and the extention of utilization of electricity.

With the mandate of the Revolutionary Government, HIC launched in 1962, the implementation of the foregoing industrial projects under the technical assistance rendered by the following Japanese firms:

1.	Kubota Iron and Machinery Works Ltd. (predecessor of Kubota, Ltd.)	Agricultural Machinery and Equipment Manufacturing Project
2.	Toyo Kogyo Co., Ltd. (predecessor of Mazda Motor Corporation)	Light Vehicles Manufacturing Project
3.	Matsushita Electric Industry Co., Ltd.	Electric and Electronic Products Manufacturing Project
4.	Hino Motors Ltd.	Heavy Vehicles Manufacturing Project

HIC expanded its operation to achieve its corporate objectives. Following the accomplishment of the above projects, HIC launched the manufacturing of tractors and tyres with the technical assistance of Czechoslovakia and also the manufacturing of machine tools with the technical assistance of West Germany.

HIC has the headoffice in Rangoon and six factories located, respectively, in Rangoon, Malun, Sinde, Htonbo, Nyaunchidauk and Thaton. The number of employees was 15,306 persons as of January, 1988. In 1986/87, HIC gained 1,280 million Kyats of sales revenue, 290 million Kyats of gross profit and 70 million Kyats of net profit. (The location of the six factories is shown in Figure 1-1, and outline of these factories is summarized in Table 1-1.)

(2) Background of the Four Industrial Projects

The Four Industrial Projects refer to the four projects as listed below that HIC has undertaken since 1962 by utilizing the Reparations Funds of Japan and under the technical assistance provided by the aforesaid Japanese companies.

1. Heavy Vehicles Manufacturing Project

2. Light Vehicles Manufacturing Project

3. Agricultural Machinery and Equipment Manufacturing Project

4. Electric and Electronic Products Manufacturing Project

The Government of Japan has continuously extended economic assistance to the Four Industrial Projects since 1962. Following the 8th and 9th Reparations Funds utilized for the Projects, the Government of Japan provided the Economic and Technical Cooperation Agreement (ETCA) Funds and the OECF Yen Credit loans to finance the acquisition of additional machinery and equipment and also the procurement of imported raw materials, component parts and other materials required. The total of these funds and loans provided since 1962 amounts to 150 billion yen, including the commodity loans provided for financing the procurement of imported raw materials, component parts and spare parts for maintenance yearly since 1977.

(3) Position and Role of HIC in the Manufacturing Industry in Burma

HIC, as stated earlier, is the only manufacturer of precision machinery such as heavy and light vehicles, agricultural machinery, electric and electronic products, tractors and machine tools, but also the only manufacturer of tyres in Burma. HIC is one of the leading manufacturers in terms of business scale and the number of employees.

Figure 1-1 LOCATION OF HIs

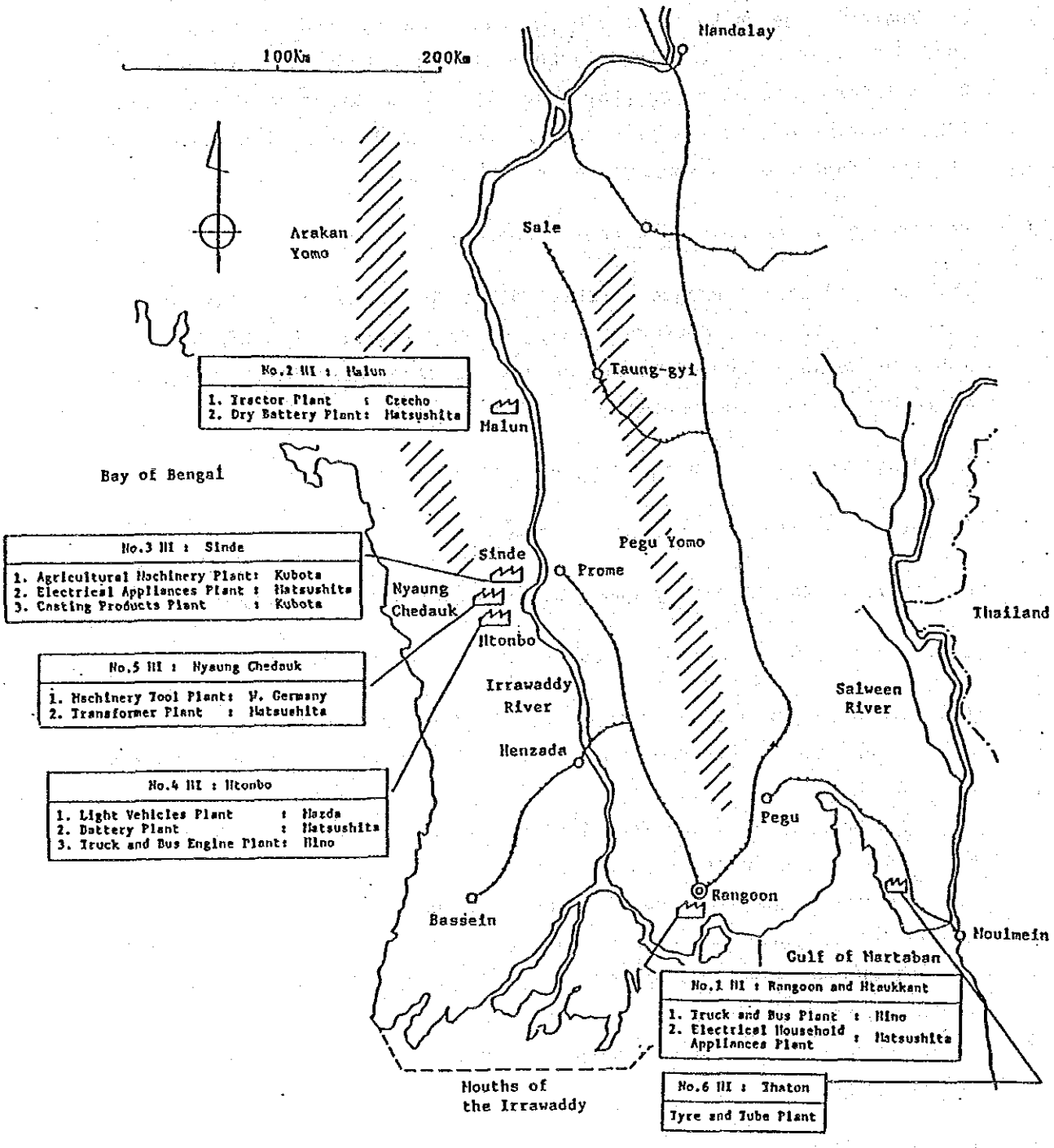

Table 1-1 OUTLINE OF HIC FACTORIES

Factory		No.1 HI	No.2 HI	No.3 HI	No.4 HI	No.5 HI	No.6 HI
Location		Rangoon	Malun	Sinde	Htonbo	Nyuang-chidauk	Thaton
Factory Site (acres)		69	155	280	248	277	40
Total Floor Area of Buildings (acres)		21.8	13.8	17.7	12.2	4.6	13.1
Year of Foundation		1960	1966	1965	1970	1974	1978
Number of Employees		3,107	2,010	2,507	1,737	641	3,800
Main Products		Incandes-cent Lamps, Fluores-cent Lamps, Dry Cell Batteries, Lighting Fixtures, Electric Accessories, Radio, Home Electrical Appliances, Heavy Vehicles (Trucks, Buses)	Dry Cell Batteries, Tractors, Trailers	Watt Hour Meters, Lamps & Lighting Fixtures, Motors, Fans, Pumps, Power Tillers, Thresher, Pesticide Equipment, Diesel Generators	Light Vehicle (Light Trucks, Light Vans, 2 Ton Trucks, Jeeps)	Trans-formers	Tyres, Tubes
Investment Amount	Buildings	73.76	229.2	115.0	140.4	67.1	395.8
	Machinery	409.59	979.3	471.6	616.6	256.3	1024.3
	Others	29.18	69.3	12.6	16.9	17.4	43.6
	Total	512.53	1277.9	599.2	773.9	338.1	1463.7

Notes: 1) Including those products outside the scope of the Four Industrial Projects.
2) Investment Unit: Million K
3) Investment Amount: As of March, 1987
4) Number of Employees: as of January, 1988

Source: HIC

In 1986/87 the total value of production in Burma was 104.09 billion Kyats in nominal terms, of which the production of the processing and manufacturing sector accounted for about 31%. In that year, the sales revenue of HIC was approximately 1.28 billion Kyats which was equivalent to about 4% of the value of production of the processing and manufacturing sector. The Gross Domestic Product (GDP) in that year was 58.5 billion Kyats, of which the value added of the processing and manufacturing sector accounted for about 10%. The gross profit (sales revenue less cost of good sold) of HIC was 0.29 billion Kyats, equivalent to about 5% of the value added of the processing and manufacturing sector. These figures demonstrate that HIC holds an important position in the manufacturing industry in Burma.
The Four Industrial Projects are the main stream of the HIC's operation occupying about 60% of the sales revenue.

The Projects produce capital goods such as vehicles, agricultural machinery and motors which other industries require for maintaining their production activities, while producing electric appliances needed for satisfying the peoples demands. HIC intends to expand the production of the Four Industrial Projects to meet the needs for those products, and the Four Industrial Projects therefore will play a more important role in the HIC's operation henceforth.

The activities of HIC centered on the Four Industrial Projects have substantial influences on other industries. As HIC produces capital goods which other industries require for maintaining and expanding their production activities, as stated above, should the production of HIC be reduced, it will adversely affect the activities of other industries.

As HIC is the manufacturer leading the machinery industry and the electric and electronic industries in Burma, its role should not be confined to the supply of the products but it should be extended to provide related industries with technical assistance as required by them for improving productivity and expanding operations by utilizing technology and experiences built up in HIC.

In fact, HIC has assisted other manufacturers with the supply of some equipment which HIC designed and manufactured for their import

substitution and also with technical services for the repair and improvement of the machinery and equipment which they operate.

(4) Current Situation of the Four Industrial Projects

Since the production facilities of the Four Industrial Projects have been set up about 20 years ago, there are a large number of worn out machinery and equipment, causing deterioration of productivity and product quality. As a result, the present production facilities are not capable of filling the initial installed capacities, and thus the current production has decreased while increasing losses in the consumption of raw materials and component parts. HIC is concerned that the wear and tear of machinery and equipment will become so serious that the production cannot be sustained, if no measures are taken to prevent it.

HIC has been devoted to the expansion of the local production of raw materials and component parts. So the localization of the raw materials and component parts has progressed to some extent. Nevertheless, there are many areas unlocalized yet due to constraints in manufacturing facilities and technology. The Government curtailed the imports of raw materials and parts to a substantial extent in order to cope with the current stringent foreign exchange situation, so that HIC was compelled to limit the production. In order to sustain and expand the production, it may be important for HIC to form the basis for self-sustaining operation by expanding the local production of raw materials and component parts so that the operation may not be affected by the availability of foreign exchange.

1-1-2 Background, Objective and Outline of the Execution of the Study

(1) Background of the Study

Against the foregoing background, the Government of Burma has made a request to the Government of Japan to provide technical assistance for conducting a study (the Study) for the renovation of the Four Industrial Projects. In response to this request, the Japan International Cooperation Agency (JICA) dispatched a contact team to Burma in early June, 1987, and the team preliminarily discussed with

HIC to define the scope and methodology of the Study in principle. Following the discussion of the contact team, in early October, 1987, JICA dispatched a preliminary survey team (the Preliminary Survey Team) to finalize the scope of work for the Study. The Scope of Work (S/W) and the Minutes of Meeting for the Study on the Renovation of the Four Industrial Projects were executed between the JICA's Preliminary Survey Team and HIC on October 14, 1988.

(2) Objective and Scope of the Study

The objective of the Study is to diagnose factories of the Four Industrial Projects and investigate the possibilities of their renovation from technical and economic points of view. The factories and sites as well as products and assembly lines to be covered by the Study are those as defined in the Minutes of Meeting attached to the S/W.

(3) Outline of the Execution of the Study

According to the aforesaid S/W, the JICA's survey team for the Study (the Survey Team) conducted a field survey in Burma for about one month from the latter part of January, 1988. An interim report was prepared on the basis of the findings made in the field survey and the first stage of the Study, which was presented to the Government of Burma in the middle of May, 1988. The representatives of the Survey Team visited Burma in early June, 1988 to discuss with HIC the interim report. Based on the comments made by HIC during the review meetings held in Burma, the Team succeeded with subsequent investigations and examination after the interim meetings. This draft final report presents the outcome of the Study thus made.

1-2 Present Social and Economic Situation of Burma, and the Tasks Imposed upon the Four Industrial Projects

(1) General Trends of the Burmese Economy

For the last 14 years the Government of Burma has pursued the economic development programs designed to promote "Industrialization Based on an Expanded Agriculture". This development strategy has been adopted in "the Twenty-Year Long-Term Plan*1) for the period of 1974/75 - 1993/94" launched in 1974/75*2) and has been implemented through specific measures set in the successive four year plans which have been formulated in the framework of the Twenty-Year Plan. (The key economic indicators in Burma is shown in Table 1-2).

Through the Second Four-Year Plan (FYP)*3) implemented for 1974/75 - 1977/78, the initial four years of the Twenty-Year Plan period, and the succeeding Third FYP for 1978/79 - 1981/82, Burma continued a steady growth of economy. The real GDP has grown at 4.7% per annum in average during the period of the Second FYP, despite the unstable external economic conditions affected by the first oil shock, and it achieved a substantially higher growth at an annual average of 6.5% during the Third FYP.

Notes:

*1) The Long-Term Twenty-Year Plan was originally started in 1972/73. However, this original plan was abolished and the presently enacted Long-Term Twenty-Year Plan, as amended, was started in 1974/75.

*2) Specified years are fiscal years beginning in April and ending at the end of March in succeeding years, except the years for consumer price index which are expressed by calendar years.

*3) The First Four-Year Plan was implemented in 1972/73 under the abolished original Twenty-Year Plan. However, it was abolished after its implementation for one and a half years, since the present Twenty-Year Plan was started in 1974/75.

Table 1-2 KEY ECONOMIC INDICATORS

Particulars	Second FYP				Third FYP				Fourth FYP				Fifth FYP
	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86 (Provisional Actual)	1986/87 (Provisional)
1. Population (Thousand)	29,778	30,389	31,009	31,642	32,284	32,939	33,608	34,287	34,976	35,680	36,392	37,115	37,850
(Growth Rate: %)	(2.05)	(2.05)	(2.04)	(2.04)	(2.03)	(2.03)	(2.03)	(2.02)	(2.01)	(2.01)	(2.00)	(1.99)	(1.98)
2. Gross Domestic Product (GDP)													
1) GDP in Nominal Term (Kyat. Million)	19,347.5	23,477.3	27,427.3	29,617.5	31,800.4	35,333.1	38,609.1	42,879.2	46,810.5	49,823.3	53,597.1	56,080.8	58,452.6
(Equiv. US$ Million)	(3,793.6)	(3,611.9)	(4,033.4)	(4,113.5)	(4,746.3)	(5,353.5)	(5,849.9)	(5,717.2)	(6,001.3)	(6,151.0)	(6,090.6)	(7,379.1)	(8,596.0)
2) GDP in Real Term (Kyat. Million)	11,101.1	11,561.7	12,265.3	12,995.7	13,843.3	14,562.3	15,717.6	16,717.0	17,653.6	18,429.3	19,454.5	20,295.3	21,038.0
3) Growth Rate of Real Term GDP (%)	2.7	4.1	6.1	6.0	6.5	5.2	7.9	6.4	5.6	4.4	5.6	4.3	3.7
3. Per-Capita GDP													
1) Nominal Term (Kyat)	650	773	884	936	985	1,073	1,149	1,251	1,338	1,396	1,473	1,511	1,544
(Equiv. US$)	(127)	(119)	(130)	(130)	(147)	(163)	(174)	(167)	(172)	(172)	(167)	(199)	(227)
2) Real Term (Kyat)	373	380	396	411	429	442	468	488	505	517	535	547	556
3) Growth Rate of Real Term Per-Capita GDP(%)	0.5	1.9	4.2	3.8	4.4	3.0	5.9	4.3	3.5	2.4	3.5	2.2	1.6
4. Balance of Trade (Kyat. Million)	-)90.0	-)120.7	+)87.8	-)329.6	-)1,371.0	-)1,613.5	-)1,409.9	-)2,158.5	-)3,277.3	-)1,777.8	-)1,846.7	-)2,148.1	-)1,587.8
1) Exports (Kyat. Million)	925.8	1,322.6	1,715.7	1,756.9	1,852.7	2,696.0	3,225.1	3,452.8	3,036.3	3,419.5	3,194.5	2,653.9	2,925.1
- Growth Rate (%)	-)4.3	+)42.9	+)29.7	+)2.4	+)5.5	+)45.5	+)19.6	+)7.1	-)12.1	+)12.6	-)6.6	-)16.9	+)10.2
- Percentage to GDP (%)	4.8	5.6	6.3	5.9	5.8	7.6	8.4	8.1	6.5	6.9	6.0	4.7	5.0
2) Imports (Kyat. Million)	1,015.8	1,443.3	1,627.9	2,086.5	3,223.7	4,309.5	4,635.0	5,611.3	6,313.6	5,197.3	5,041.2	4,802.0	4,512.9
- Growth Rate (%)	+)76.7	+)42.1	+)12.8	+)28.2	+)54.5	+)33.7	+)7.6	+)21.1	+)12.5	+)17.7	-)3.0	-)4.7	-)6.0
- Percentage to GDP (%)	5.3	6.1	5.9	7.0	10.1	12.2	12.0	13.1	13.5	10.4	9.4	8.6	7.7
5. Terms of Trade (1969/70=100)	113.7	93.4	83.6	88.0	87.0	92.5	104.2	106.7	86.3	86.5	89.7	77.1	63.2
6. Fixed Investment in Nominal Term (Kyat. Million)	1,524.5	1,680.7	2,320.4	3,752.6	5,363.6	7,388.8	7,228.3	8,634.8	10,043.7	9,057.1	8,476.8	8,642.5	9,921.4
Percentage to GDP (%)	7.9	7.2	8.5	12.7	16.9	20.9	18.7	20.1	21.5	18.2	15.8	15.4	17.0
7. Official Rate of Foreign Exchange (Kyat/US$)	5.1	6.5	6.8	7.2	6.7	6.6	6.6	7.5	7.8	8.1	8.8	7.6	6.8*

Note: * November in 1986

Source: Report to the Pyithu Hluttaw on the Financial, Economic and Social Conditions: 1986/87 and 1987/88

In recent years, however, the Burmese economy shows a stagnant tendency. During the Fourth FYP period of 1982/83 - 1985/86, the real GDP growth declined to an average annual rate of 5%. Particularly in 1985/86, the final year of the Fourth FYP, the growth rate remained at 4.3%, and in 1986/87 it further declined to 3.7%. The nominal GDP in 1986/87 was 58.5 billion Kyats (US$8.6 billion), so that the per capita GDP was 1,544 Kyats (US$227) with the population of 37.9 million.

The steady GDP growth achieved through the Second and Third FYPs was substantially attributed to a high growth of the agricultural sector*4) together with a growth of the processing and manufacturing, power, construction and transportation sectors supported by increases in the public sector investments (Table 1-3). The agricultural sector achieved a growth of value-added over 5% per annum in real terms from 1975/76 to 1977/78 and averaged 8.5% per annum in real terms from 1977/78 to 1981/82. The average growth of the processing and manufacturing sector was 7.1% per annum from 1973/74 to 1977/78 and 5.3% per annum from 1977/78 to 1981/82. The share of the agricultural sector in the real GDP in 1982/83 was 29.2% while the share of the processing and manufacturing sector was 10.2%.

After 1982/83, however, there was a stagnation in the agricultural production and also the production in the processing and manufacturing sector. The growth of real value-added in the agricultural sector declined to 3% in 1984/85, 2.6% in 1985/86 and further to 2.5% in 1986/87. A growth of real value-added in the processing and manufacturing sector, after attaining annual rates over 7% in 1980/81 and 1981/82, declined to 5.3% in 1982/83 and 3.3% in 1983/84, and after that recorded 8.2% in 1984/85, 4.5% in 1985/86 and 6.9% in 1986/87.

The exports reached 3.4 billion Kyats in 1981/82 with an increase by 4 times of the exports in 1974/75, while the imports also reached 5.6 billion Kyats in 1981/82 with a substantial increase. Consequently, in 1981/82 the external trade deficit expanded to 2.2 billion Kyats.

Note:

*4) The cultivated land occupies about 12% of the country's total land covering 676,581 km^2.

Table 1-3 SHARES OF GDP BY INDUSTRIAL ORIGIN, AND SECTORAL GROWTH RATES
(AT 1969/70 CONSTANT PRODUCERS' PRICES)

Particulars	Shares of GDP by Industrial Origin (%)				Sectoral Growth Rates (% per annum)						
					Average Growth Rates		Growth Rates Against Preceding Year				
	1974/75	1978/79	1982/83	1986/87	(1973/74 -1977/78)	(1977/78 -1981/82)	1982/83	1983/84	1984/85	1985/86	1986/87
1. Agriculture	26.7	27.1	29.2	27.9	3.6	8.5	6.8	4.9	3.0	2.6	2.5
2. Livestock & Fishery	7.1	6.9	6.4	6.7	2.8	5.2	3.5	7.0	9.7	1.9	4.2
3. Forestry	2.4	2.4	2.2	2.1	5.5	5.9	3.4	-)1.5	6.9	4.0	5.6
4. Mining	1.1	1.2	1.2	1.5	6.9	5.9	8.1	3.2	14.8	4.8	18.9
5. Process'g & Manufactur'g	9.9	10.2	10.2	10.7	7.1	5.3	5.3	3.3	8.2	4.5	6.9
6. Power	0.8	1.0	1.4	1.7	10.3	12.2	16.9	8.0	15.3	9.9	9.6
7. Construction	1.7	2.3	2.7	2.6	6.0	17.7	6.3	4.8	8.2	2.5	-)4.4
8. Transportation	5.2	4.8	5.3	5.3	3.1	7.8	9.5	5.8	6.0	3.5	4.5
9. Trade	24.9	23.5	20.9	20.4	4.0	3.4	3.5	4.1	4.9	3.4	2.7
10. Social & Administrative Services	10.3	10.5	10.1	10.6	7.7	4.6	6.8	1.9	5.6	12.6	3.6
11. Other Services	9.9	10.1	10.4	10.5	5.1	8.5	3.9	5.6	5.2	4.6	3.6
Total GDP	100.0	100.0	100.0	100.0	4.7	6.5	5.6	4.4	5.6	4.3	3.7

Source: Report to the Pyithu Hluttaw on the Financial, Economic and Social Conditions: 1986/87 and 1987/88

The exports of agricultural and forest products accounts for 79% of the country's total exports, in which the majority is the exports of rice. After 1981/82 the exports tended to decline due to the falling international rice prices and decrease in export volume of rice. In order to cope with the reduced export earnings, the Government curtailed the imports of the capital goods, raw materials and spares which accounted for about 90% of the total imports. With this measure, the imports steadily decreased, so that the external trade deficit remained in the range of 1.6 to 2.1 billion Kyats during 1983/84 - 1986/87.

The increased external trade deficit deteriorated the country's balance of payments (Table 1-4). Further, the repayment of official external debts increased in 1983/84 onward. Reflecting these conditions, the overall balance was situated in a deficit of 385 million Kyats in 1984/85, 59 million Kyats in 1985/86, and 110 million Kyats in 1986/87. The foreign exchange reserves also decreased from 1.9 billion Kyats (US$287 million) in 1980/81 to 0.4 billion Kyats (US$60 million) in 1986/87.

(2) Major Issues of the Burmese Economy in Recent Years

In recent years the Burmese economy has encountered several difficulties, including the deterioration of the balance of payments and the rise of consumer prices together with the stagnation of economic growth.

The economy, as reviewed in the preceding section, continued a steady growth up to the end of the Third FYP period (1978/79 - 1981/82). The growth, however, stagnated after that.

The balance of payments also rapidly deteriorated after 1980/81, and the Government tried to improve the imbalance by curtailing imports. In Burma, since there exist only a small number of industries producing raw materials and intermediates and the majority of the existing industries, therefore, is heavily dependent on the imported raw materials and intermediates, the restriction on imports, especially that on raw materials and intermediates, has hindered the production of the industries, weakening the basis of the country's

Table 1-4 RECENT TRENDS IN BALANCE OF PAYMENTS AND FOREIGN EXCHANGE RESERVES

(Unit: Million Kyats)

Particulars	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86 (Provisional Actual)	1986/87 (Provisional)
1. Exports of Goods	3,180.0	3,462.1	2,891.4	3,291.7	3,056.8	2,672.6	2,925.1
2. Imports of Goods	4,602.7	5,951.4	6,869.9	4,895.3	4,815.9	4,700.9	4,512.9
3. Balance of Trade (1-2)	-)1,422.7	-)2,489.3	-)3,978.5	-)1,603.6	-)1,759.1	-)2,028.3	-)1,587.8
(Equivalent to US$ Millions)*3)	(-215.6)	(-331.9)	(-510.1)	(-198.0)	(-199.9)	(-266.9)	(-233.5)
4. Net Payments of Interest	159.6	168.1	346.8	510.4	516.9	581.4	638.8
5. Income of Services and Transfer	47.0	-)55.5	78.2	248.0	359.4	213.8	277.0
- Receipts	447.2	437.5	579.3	726.7	743.4	718.7	694.0
- Payments	400.2	493.0	501.1	478.7	384.0	504.9	417.0
6. Current Balance (3-4+5)	-)1,535.3	-)2,712.9	-)4,247.1	-)1,866.0	-)1,916.6	-)2,395.9	-)1,949.6
(Equivalent to US$ Millions)*3)	(-232.6)	(-361.7)	(-544.5)	(-230.4)	(-217.8)	(-315.3)	(-286.7)
7. Grants	639.4	428.5	601.8	528.1	503.8	709.0	700.3
8. Loans	1,564.5	2,465.4	2,944.3	2,184.5	1,955.8	2,161.1	2,883.7
9. Repayment of Principal	456.4	622.6	545.2	723.3	795.3	959.6	1,081.6
10. Other Receipts	6.0	133.4	282.3	128.2	-)132.8	426.7	-)663.1
11. Overall Balance (6+7+8+10-9)	+)218.2	-)308.2	-)963.9	+)251.5	-)385.1	-)58.7	-)110.3
(Equivalent to US$ Millions)*3)	(+33.1)	(-41.1)	(-123.6)	(+31.0)	(-43.8)	(-7.7)	(-16.2)
Foreign Exchange Reserves (As at End of March)	1,894.7	1,586.5	622.6	874.1	489.0	430.3	407.9*1)
(Equivalent to US$ Millions)*3)	(287.1)	(211.5)	(79.8)	(107.9)	(55.6)	(56.6)	(60.0)
Debt Service Ratio (%)	20.5	24.5	27.2	31.3	35.2	45.6	47.7
Official Rate of Foreign Exchange (Kyat/US$)	6.6	7.5	7.8	8.1	8.8	7.6	6.8*2)

Notes: *1) End of September in 1986
*2) November in 1986
*3) Converted from the amounts in Kyat by applying the official rate of foreign exchange.

Source: Report to the Pyithu Hluttaw on the Financial, Economic and Social Conditions: 1986/87 and 1987/88.

economy and depressing the exports. Consequently, the foreign exchange reserves became tight and the debt-service ratio also deteriorated rapidly from 20.5% in 1980/81 to 47.7% in 1986/87, due partly to repayment of official external debts which had increased since 1983/84 onward.

At the same time, a rise in the consumer prices has been conspicuous after 1985. The consumer prices, as shown in Table 1-5, had tended to be stable until 1984 due to the effect of the Government policy to maintain low prices, except for that of 1979 affected by the second oil shock. After 1984, however, the consumer prices turned upward to increase by nearly 8% in 1986. When taking into account the facts that 34% of the commodities listed for the consumer price index, are those controlled by the Government, and that the official prices for those controlled commodities have been held at a nearly same level since the second half of the 1970s, it is surmised that the increase rate of the prices in an uncontrolled market should have been much higher than the above.

(3) Characteristics of the Economic Structure of Burma

The basic characteristics of the economy in Burma is that the principal part of the industries, except the agriculture, is undertaken mainly by the state sector consisting of State Economic Enterprises (SEEs) and the Government departments, and the private sector plays a very minor role in the industries. This is because the Government limits the business fields for the private sector under the Rights of Private Enterprise Law enacted in 1977, and gives priority to SEEs' investments. The Government also gives priority to SEEs in supplying raw materials, and thus, the private sector has difficulty in obtaining raw materials. The situation is similar in the marketing of products. Imports and exports are controlled by the Government, and the private sector has various kinds of limitation both in importing raw materials and exporting products.

When excluding the agricultural sector, the share of private sector in the real value-added of the rest of the economy was only 39.4% in 1986/87. Of the real value of production of the processing and manufacturing sector, 73% was occupied by the general consumer goods

Table 1-5 CONSUMER PRICE INDEX AT RANGOON (1978=100)

Year*	Consumer Price Index	Change in Percentage (%)
1977	106.4	
1978	100.0	-)6.0
1979	106.1	+)6.1
1980	107.2	+)1.0
1981	107.5	+)0.3
1982	112.0	+)4.2
1983	118.3	+)5.6
1984	124.0	+)4.8
1985	132.5	+)6.9
1986	143.0	+)7.9

Note: * Calendar year
Average annual increase rate during 1977-1984: 2.2%

Source: Report to the Pyithu Hluttaw on the Financial, Economic and Social Conditions: 1984/85 - 1987/88

including food, beverages, clothing and wearing apparel. The private sector accounted for about 69% of the production of general consumer goods, while the state sector accounted for about 90% of the production of the principal industries including the minerals, petroleum products, chemicals, machinery and equipment (Table 1-6).

Because of the industrial structure in Burma as stated above, except for agriculture, production activities of the state sector have substantial impacts on the Burmese economy. Hence, in the processing and manufacturing sector, as in other sectors, the state sector is required to sustain efficient production activities and further expansion in production so as to contribute to a steady growth of the Burmese economy. The SEEs, however, have been unable to accumulate capital due to marginal returns gained through their operations, because the sales prices of their products have been fixed at low levels under the control of the Government. Thus the SEEs have financial constraints in undertaking renovation, rationalization or expansion of their manufacturing facilities.

In general, in the countries where the private sector is allowed to operate business in all fields of industries, even if governments take measures giving priority to the industrial activities of the public sector, the private sector would undertake medium- and small-scale industries which are linked or relevant to the principal industries dominated by the public sector. This formulates and develops peripheral industries forming industrial clusters which function to support or supplement the production activities of the principal industries, leading to an increase in domestic demands and production which can induce reproduction on an expanded scale and thereby economic growth of the countries. Foreign capital investments may also be invited, as required, if the restrictions on foreign investment are eased and the investment climate is facilitated to attract foreign investors. However, such a pattern of economic development might not be applicable to Burma, because of the different type of social and economic institutions adopted in Burma. Therefore, in Burma it is necessary for the SEEs to sustain efficient operation so that they can accumulate capital for re-investment in order not only to expand the production capacity of main streams but also to undertake, by them-

Table 1-6 SUB-SECTORAL STURUCTURE BY OWNERSHIP OF VALUE OF PRODUCTION OF PROCESSING AND MANUFACTURING SECTOR (AT 1969/70 CONSTANT PRICES)

(Unit: %)

	1983/84				1984/85				1985/86			
	State	Co-operative	Private	Total	State	Co-operative	Private	Total	State	Co-operative	Private	Total
1. Food and beverages	16.1	1.8	43.4	61.3	14.8	2.0	45.0	61.8	13.4	2.3	46.7	62.4
2. Clothing and wearing apparel	3.2	1.1	4.9	9.2	2.8	0.9	4.6	8.3	2.5	1.1	4.8	8.4
3. Construction materials	3.2	0.2	2.2	5.6	3.1	0.3	2.1	5.5	3.3	0.2	1.9	5.4
4. Personal goods	1.9	(*)	0.3	2.2	1.8	(*)	0.3	2.1	1.7	(*)	0.3	2.0
5. Household goods	0.3	(*)	0.2	0.5	0.3	(*)	0.3	0.6	0.3	(*)	0.3	0.6
6. Printing and publishing	1.7	0.1	(*)	1.8	1.9	0.1	(*)	2.0	1.4	0.1	0.1	1.6
7. Industrial raw materials	5.8	(*)	1.4	7.2	5.5	(*)	1.7	7.2	5.7	(*)	1.4	7.1
8. Mineral and petroleum products	4.5	(*)	0.7	5.2	4.6	(*)	0.7	5.3	4.3	(*)	0.7	5.0
9. Agricultural equipment	0.3	-	-	0.3	0.3	-	-	0.3	0.3	-	-	0.3
10. Machinery and equipment	0.1	-	(*)	0.1	0.1	(*)	(*)	0.1	(*)	(*)	(*)	(*)
11. Transport vehicles	2.1	(*)	0.3	2.4	2.1	(*)	0.3	2.4	2.3	(*)	0.2	2.5
12. Electrical goods	0.6	-	(*)	0.6	0.6	-	(*)	0.6	1.0	-	(*)	1.0
13. Miscellaneous	2.6	0.1	0.9	3.6	2.8	0.1	0.9	3.8	2.7	0.2	0.8	3.7
Total	42.4	3.3	54.3	100.0	40.7	3.4	55.9	100.0	38.9	3.9	57.2	100.0

Note: (*) denotes percentage less than 0.1.

Source: Report to the Pyithu Hluttaw on the Financial, Economic and Social Conditions: 1987/88

selves or in other SEEs, the production activities supporting or relevant to the main streams which are to be undertaken by peripheral industries if such industries are established in future.

The basic industry being in a formative stage and the peripheral industries lagging behind, most of the SEEs are dependent largely on imports for raw materials and component parts as well as spare parts for maintenance, and their production activities therefore are adversely affected by the Government's measures taken to curtail imports coping with stringent foreign exchange situation such as prevails recently.

The Burmese industry situated in a limited scope of production is limited in the creation of intermediate demands as well as the creation of employment. Thus, the size of domestic demand remains small without expansion. Under these situations, the production of the domestic market oriented industries is limited to a fairly small scale so that the production facilities have to be used for prolonged periods without replacements, leaving the industry lagging behind in technological innovation. Hence, the industries in Burma lose export competitiveness in competition with the products exported from other countries where industrial development has progressed. Such a situation hinders the vigor of the industries in Burma.

(4) Major Issues to be Considered in Investigating Renovation of The Four Industrial Projects

A review of the economic structure and the present social and economic situation in Burma, as made in the foregoing sections, indicates the need to take the following three issues into consideration in investigating the renovation of the Four Industrial Projects (the Project). Firstly, the Project has to sustain and expand the production in a form that can contribute to foreign exchange savings or earnings. Secondly, the Project has to undertake the enhancement of the production lines with appropriate means that can contribute to the promotion of peripheral industries which are yet undeveloped. Thirdly, the Project should undertake the renovation and expansion of the production lines which can contribute to the activation of other sectors by providing the equipment and parts which are required.

Chapter 2 MARKET ASPECTS

2-1 Distribution Channels

2-1-1 Introduction

Ninety percent of the imports to Burma, as mentioned earlier, consist of capital goods including raw materials and supplies, parts, tools for industrial use, construction materials, machinery, and transportation equipment. As all imports are controlled by the Government, the specific item to be imported and its quantity are regulated at the stage of allocation of the foreign exchange. Consequently, regular imports of industrial products for the general consumers are virtually nil.

The imports of raw materials, component parts, tools, and capital goods also are subject to the approval of the Government. Imports of products that are produced domestically, such as vehicles, are not approved, except the imports related to the projects implemented under the economic aids provided by the World Bank, Asian Development Bank and foreign governments or the case in which an individual who has worked abroad and acquired foreign exchange brings into the country a vehicle that the individual has purchased with such foreign exchange, for his own personal use.

Despite the above conditions, industrial products for the general consumers such as electrical products manufactured in the neighboring countries including Thailand, China and India have penetrated the markets in Rangoon. These products entered the country from neighboring countries through the border trade, and as they do not enter through the regular channel, there is no statistics, but the amount is estimated to be substantial.

2-1-2 Distribution Channels for the Products of HIC

The distribution channels for HIC products can be largely divided into the following five types.

(1) Supply to the Government Organizations

1) Supply of Products to be Used by the Government Organizations

When the products to be used by the government organizations including government agencies and state corporations are supplied to them, direct transaction takes place between HIC and the particular organization.

2) Supply of Agricultural Machinery and Equipment

A major portion of the agricultural machinery and equipment is sold to the Agricultural Mechanization Department (AMD), but there is a small portion sold to the Agricultural Corporation.

(2) Sales to the Private Sector

There are three channels used for the sales to the private sector. These are the Central Cooperative Society (COOP) and two state-owned trade corporations, namely, the Construction and Electric Stores Trade Corporation (C & ESTC) and the Vehicles and Machinery Stores Trade Corporation (V & MSTC).

1) Sales through the Central Cooperative Society (COOP)

Majority of the supply of dry cell batteries, fluorescent lamps and incandescent lamps to the general consumers is realized through COOP.

2) Sales through the Trade

The trade corporatious that handle the products of HIC are the Construction and Electrical Stores Trade Corporation (C & ESTC) and the Vehicle and Machinery Stores Trade Corporation (V & MSTC).

3) Direct Sales by HIC

HIC has their own sales outlets in Rangoon and sells dry cell batteries, fluorescent lamps, incandescent lamps, tools and spare parts.

The supply of each product of HIC to the main dealers and users is shown in Table 2-1.

Table 2-1 DISTRIBUTOR/USER OF HIC PRODUCTS, AND DISTRIBUTION RATE BY CHANNEL

(Unit: %)

Distributor/ User / Products		Government Organizations	Cooperative Society	Construction & Electrical Stores Trade Corp.	Vehicle & Machinery Stores Trade Corp.	Electric Power Corp.	Road Transport Corp.	Timber Corp.	Agricultural Mechanization Dept.	Agricultural Corp
Electric Products	Dry Cell Batteries	10	75	15						
	Fluorescent Lamp	10	75	15						
	Incandescent Lamp	10	75	15						
	Lighting Fixture	60	30	10						
	Electric Accessories			100						
	Electric Fan	90		10						
	Electric Motor	60			40					
	Watt Hour Meter					100				
	Distribution Transformer					100				
Light Vehicle	600cc Vehicles	30			70		*			
	2000cc Vehicles	90	10							
Heavy Vehicle	6.5-ton Truck Series	#	20				#	#		
	33 Passenger Busses						100			
Agricultural Machinery	Power Tiller								90	10
	Thresher								100	
	Water Pumping Set	10			10				80	
	Portable Diesel Generator	70			30					

Notes: *: Negligibly small percent
#: 80%; Detail is not available.

Source: HIC

2-2 Price Mechanism of Manufactured Products

HIC is one of the SEEs, and operates as a self-supporting entity, based on the prices and budget approved by the Government. Up to 1972, there was almost no need for revision of the prices, but after 1972, fairly frequent revisions were necessary because of the fluctuation in the prices of the raw materials and the foreign exchange rate. The price revisions taken place in 1987, approved a price increase in the range of 10 to 15%. The total annual production cost arrived at by adding the raw material costs, labor costs, fixed costs, variable costs, administrative expenses and other expenses based on the annual planned production, is divided by the planned annual production which gives the unit manufacturing cost per product (referred to as Prime Cost). To the Prime Cost are added the regular HIC profit and margin and the excise tax, which results in the ex-factory price. HIC sells its products to the distribution organizations or the users at this ex-factory price as a rule. The distribution organizations that purchased from HIC formulates the selling price to the general consumers by adding the excise tax that is imposed on the distribution organizations, and the storage costs, freight, distribution service fees, other expenses and the regular profit and margin to the ex-factory price of HIC. Such price to the general consumers is also subject to the approval of the Government. The HIC's ex-factory prices of its main products and the official sales prices to the general consumers of those products set by the aforesaid trade corporations are shown in Table 2-2.

A portion of the electrical products sold by C & ESTC and the cooperatives pass into the hands of the private retailers and are sold on the general market. Also sold are the electrical products that entered the country from the neighboring countries through the border trade. For these products the findings of the survey conducted by HIC are shown in Table 2-3. The electrical products from the neighboring countries are sold at prices fairly higher than the official prices, but the products of HIC sold on the market are priced higher than the foreign products. The fact that these products sell even at these high general market prices implies how strong the demand of the general consumers is for these products.

Table 2-2 HIC'S EX-FACTORY PRICES AND OFFICIAL SALES PRICES FOR CONSUMERS OF HIC'S PRODUCTS

(Unit: Kyat)

Products	Ex-factory Prices (A)	Official Sales Prices for Consumers (B)	B/A
Dry Cell Batteries (UM-1)	3.15	3.55	1.13
Fluorescent Lamp (40W)	31.30	37.25	1.19
Incandescent Lamp (60W)	7.15	7.80	1.09
Lighting Fixture (LF-F41)	279.70	323.00	1.15
Electric Motor (EC-FB-4P)	1,126.45	1,658.40	1.47
Electric Accessories (W-1803)	5.00	6.10	1.22
Pump (4", SC4C)	3,512.20	9,184.15	2.61
Generator (BSK-140)	14,192.35	16,998.500	1.20
Electric Fan (40XP)	1,285.55		
Watt Hour Meter (TE-1)	653.85		
Transformer (6.6kV/0.4kV, 300kVA)	206,977.95		
600cc Pick-up (BEA-33L)	67,093.35		
2000cc Cross-country (XV-1)	172,651.70		
6.5-ton Truck (TE-21 AZ)	248,986.20		
33 Passenger Bus (BX-402)	809,223.35		
Power Tiller (KMB 200)	22,364.60		
Thresher (ATA 45)	9,364.30		

Notes: (A) HIC's ex-factory prices
(B) Official sales prices of C & ESTC and V & MSTC for consumers

Source: HIC

Table 2-3 COMPARISON BETWEEN HIC'S EX-FACTORY PRICES AND UNOFFICIAL PRICES PREVAILING IN MARKETS: HIC'S ELECTRICAL PRODUCTS

(Unit: Kyat)

Products	Share of HIC's Products in Total Supply (%)	HIC's Ex-factory Prices (A)	Unofficial Prices Prevailing in Markets (B)	Rate (B/A)
Dry Cell Batteries (UM-1)	50	3.15	5.5	1.75
Fluorescent Lamp (40W)	10	31.30	120.0	3.83
Incandescent Lamp (40W)	50	6.25	7.0	1.12
Electric Accessories (Sample)	5	4.00	20.0	5.00
Electric Fan (Stand Type)	3	1,286.55	3,600.0	2.80

Source: HIC

2-3 Demand and Distribution Conditions by Specific Products

The record of shipment of products of the Four Industrial Projects for 1984/85 through 1986/87 is shown in Table 2-4. Also, for the products supplied by HIC, the rate of HIC's supply to the demand and the potential demand as estimated by HIC and other related organizations are shown in Table 2-5.

(1) Agricultural Machinery

Despite the fact that the mechanization of agriculture is an essential factor in the development of agriculture in Burma, the agricultural machinery supplied now are inadequate in both type and number because of restricted production capacity and difficulty of importing.

(2) Light and Heavy Vehicles

There is no statistical data to analyze the total requirement of transportation for passengers and freight and the adequacy of the existing vehicles, but it is conjectured that a substantial shortage exists. It appears furthermore that provision of emergency vehicles such as ambulances and fire engines is inadequate.

Because of such a situation, HIC expects an expansion in the production of vehicles under the Four Industrial Projects.

Further, as there are many vehicles left inoperable because of a lack of spare parts, the shortage of vehicles is aggravated. In addition to the supply of new vehicles, HIC expects this project to supply the spare parts to repair the vehicles now in use in Burma.

(3) Electrical Products

Emphasis in development of the electric power is on industrial use, and the electrification of household sector is extremely tardy. Nevertheless, there is a general shortage for electrical products even for an essential item as sockets for household electric use.

Major portion of household electrical appliances are by nature sold to the private sector but lighting fixtures and electric fans are largely sold to government organizations for office use. The reason why the

Table 2-4 SHIPMENTS OF HIC'S PRODUCTS PRODUCED AT FOUR INDUSTRIAL PROJECTS

(Unit: units)

Products	Shipments				
	1984/85	1985/86	1986/87	Average for the Three Years	1987/88 *)
Dry Cell Batteries	18,913,768	19,641,449	14,221,704	17,592,307	11,279,800
Fluorescent Lamp	431,198	454,260	421,720	435,726	375,840
Incandescent Lamp	3,464,796	3,366,100	2,944,700	3,258,532	1,357,400
Watt Hour Meter	28,849	24,925	26,000	26,591	18,254
Lighting Fixture	72,889	78,550	72,800	74,746	200
Electric Motor	1,074	750	1,475	1,100	647
Distribution Transformer	60	193	340	198	189
Electric Accessories	848,056	887,248	840,620	858,641	549,150
Electric Fan	3,812	2,000	3,027	2,946	1,466
600cc Vehicle	335	400	433	389	350
2000cc Vehicle	398	530	576	501	283
6.5-ton Truck Series	615	755	552	641	335
33 Passenger Bus	-	-	14	5	20
Water Pumping Set	4,200	4,627	4,920	4,582	2,767
Power Tiller	393	190	270	284	250
Thresher	108	117	505	243	100
Portable Diesel Generator	234	170	331	245	227

Note: *) April through December only.

Sources: HIC

Table 2-5 SUPPLY AND ESTIMATED DEMAND OF HIC'S PRODUCTS

(Unit: Units)

Products	Average Yearly Production (1984-1986)	Supply Rate of HIC Estimated by:		Estimated Average Demand in 1984-1986	
		HIC	Distributors/ Users	Supply Rate Assumed by HIC for Estimating Planned	Estimated Demand
	(A)	(B)	(C)	(D)	(E)
Dry Cell Batteries	17,592,000	75%	34%/25%	50%	36,000,000
Fluorescent Lamp	436,000	25%	25%/ 5%	10%	4,400,000
Incandescent Lamp	3,259,000	50%	80%/50%	50%	6,600,000
Watt Hour Meter	26,600	60%	90%/ -	90%	30,000
Distribution Transformer	200	70%	57%/ -	57%	350
Lighting Fixture	74,700	60%	5%/ -	11%	670,000
Electric Motor	1,100	10%	10%/ -	10%	11,000
Electric Accessories	859,000	10%	5%/ -	5%	17,000,000
Electric Fan	2,950	50%	less than 1%/-	3%	100,000
600cc Vehicle	400	50%	-	50%	800
2000cc Vehicle	500	50%/70%	-	37%	1,350
6.5 ton Truck Series	640	50%	-	50%	1,300
33 Passenger Bus	(5)*	50%	-	(10%)	50
Water Pumping Set	4,600	80%	60%/10%	42%	11,000
Power Tiller	284	80%	80%/ -	80%	400
Thresher	243	50%	50%/ -	50%	500
Portable Diesel Generator	245	50%	10%/ -	23%	1,100

Note: * Started production in 1986.

Source: A: "Production Data for 3 Years" (HIC)
B: HIC
C: Interview with main distributors and users
D,E: Study estimate

demand for these two products being largely from the government organization is that, due to the limited supply, priority is given to the government organizations.

All of the electrical appliances, produced by HIC are short of the demand and the shortage is filled by similar products that entered the country from the neighboring countries through the border trade.

Of the electrical products for commercial use, the watt-hour meters and distribution transformers are indispensable in advancing the development of electric power and maintaining and expanding the power distribution system. Thus HIC is producing these products to adequately meet the requirements in accordance with the Power Development Program of the Electric Power Corporation. In the case of motors for agricultural and industrial uses, however, as the production is far below the requirements, for the supply priority is given to the government organizations with a limited supply to the private sector.

(4) Component Parts and Spare Parts

Industrial Corporations face short supply of component parts and spare parts.

These corporations sent HIC inquiries for manufacture of components and spare parts, in which cases HIC studied the technical aspects and responded to the orders if justified.

(5) Others

HIC has a record of large exports centered on pumps and its parts, but exports during the last 3 years have been slight. The only exports were in 1984 of 68,000 pieces of hose collars, and foot valves destined for Saudi Arabia amounting to 58,920 dollars.

Chapter 3 PRESENT SITUATION AND MAIN PROBLEMS OF THE FOUR INDUSTRIAL PROJECTS

3-1 Organization, Outline of Activities and Financial Status of HIC, and Current Situation of Production of the Four Industrial Projects

3-1-1 Organization and Outline of Activities of HIC

HIC has the headoffice in Rangoon and six factories which comprise No.1 HI located adjacent to the headoffice and five factories, No.2 HI to No.6 HI, located in several parts of the country. HIC is engaged in the manufacture of a wide variety of products including heavy and light vehicles, agricultural machinery and equipment, electric and electronic products, machine tools, tractors, tyres, and bicycles. All of these products are supplied to the domestic markets. The main products of HIC are listed below:

1) Light Vehicles: 600 cc pick-up trucks and light vans, 2,000 cc cross country vehicles and 2 ton light trucks

2) Heavy Vehicles: 6.5 ton diesel trucks, 3.5 ton diesel trucks, 25 and 35 passenger buses, rail buses* and special vehicles including tankers, logging trucks and fire engines, etc.

3) Agricultural Machinery and Equipment: tractors*, trailers*, diesel engine pump sets, power tillers, threshers, diesel generators, pesticide equipment, Burmese hoes, hand tools (spanners, screw drivers, hammers), shovels and axes.

4) Electrical and Electronic Products: incandescent lamps, fluorescent lamps, dry cell batteries, watt-hour meters, distribution transformers, storage batteries, electric motors and home electrical appliances (irons, heaters, cookers, refrigerators, air conditioners, electric fans, radios, TVs and various accessorie, etc.)

5) Others: machine tools*, bicycles* and welding rods*

Note: *Products not subject to the Four Industrial Projects.

The number of employees of HIC, as of January, 1988, is as follows:

Headoffice	1,504
No.1 Heavy Industry	3,107
No.2 Heavy Industry	2,010
No.3 Heavy Industry	2,507
No.4 Heavy Industry	1,737
No.5 Heavy Industry	641
No.6 Heavy Industry	3,800
Total:	15,306

The factories are dispersed in several places over a wide area covering from Rangoon to about 500 km north along the Irrawaddy River; No.1 HI in Rangoon, No.6 HI at Thaton, about 200 km east of Rangoon, No.3 HI at Sinde, about 300 km north of Rangoon, No.4 HI at Htonbo, about 50 km south of Sinde, No.5 HI at Nyuangchidauk in between Sinde and Htonbo, and No.2 HI at Malun, about 200 km north of Sinde. (Refer to Figure 1-1 and Table 1-1 given in Chapter 1.)

The factories excluding No.1 and No.6 HI are all located on the west bank of the Irrawaddy River. It was an undeveloped area where people lived in a peasant agriculture in the past, but nowadays the vicinity of the factories has substantially developed with the construction of infrastructure such as power supply system, roads, schools and hospitals as well as increase of immigrants induced by the general development of the area.

Outline of No.1 HI, No.3 HI, No.4 HI and No.5 HI which are subject to the diagnosis conducted in this study, among the factories related to the Four Industrial Projects, is summarized below.

1. No.1 HI is located in a fairly limited area within the city of Rangoon. So a number of shops are scattered in disorder within the site. As the site has no space for the expansion of facilities, HIC constructed a branch factory at Htauk Kyant, about 40 km from the site of No.1 HI, to which site the bus production plant was transferred. Another site located about 7 km from the No.1 HI site is under preparation for a new press shop.

2. No.5 HI comprises several shops each with adequate shop space and orderly layout. In contrast both No.3 and No.4 HI comprise a number of shops having small individual buildings scattered in the site, due to the fairly complicated topography of the site. The dispersed layout of the shops may have been based on security reasons. It is true, however, that this layout causes inconvenience or inefficiency in material movements, workers' job performance, operation control, and communication in the respective factory.

3. The electric and electronic products are produced at No.1 and No.3 HI, except the storage batteries manufactured at No.4 HI, distribution transformers at No.5 HI and dry cell batteries both at No.1 and No.2 HI. Most of the electric and electronic products presently produced are manufactured at individual shops equipped with specific manufacturing facilities designed for each product in an integrated process flow from raw materials preparation through finishing of the product.

4. The agricultural machinery and heavy and light vehicles are manufactured through several steps of manufacturing processes split into different factories. The final assembly is done, respectively, at No.3 HI for the agricultural machinery, at No.1 HI for the heavy vehicles and at No.4 HI for the light vehicles. The manufacturing of component parts do not correspond to the assembly of the final product, but is dispersed in the factories according to the craft used. Figure 3-1 demonstrates the inter-factory flow of cast and forged parts, light metal cast parts, pistons and piston rings, and pressed parts in the processes of manufacturing performed by these factories.

5. All of cast iron and forged parts to be used as intermediates for manufacturing the component parts of agricultural machinery and heavy/light vehicles are manufactured at the Foundry Shop and Forging Shop of No.3 HI. These intermediates for the parts of agricultural machinery are supplied to the AME (Agricultural Machinery and Equipment) Component Manufacturing Shop of No.3 HI for machining and subsequent processing, and then the thus manufactured parts are supplied to the AME Assembly Shop of No.3 HI.

The materials for the parts of light vehicles are supplied to the LV (Light Vehicles) Machine Shop of No.4 HI for machining and subsequent processing to manufacture the parts. The manufacturing of parts which involves mainly machining and heat treatment through assembly of the final products are all performed at No.3 HI for the agricultural machinery, while for the light vehicles the manufacturing of parts, the assembly of engines and transmissions, the assembly of bodies and the final assembly are performed at No.4 HI. In the case of heavy vehicles, the manufacturing of the parts for engines and the assembly of engines are performed at No.4 HI, while the manufacturing of transmissions and parts excluding those for the engines, and the assembly of transmissions and bodies are performed at No.1 HI Production Plant located at Htaukkyant. The engines for heavy vehicles assembled at No.4 HI are sent to No.1 HI.

6. The cast iron and forged products to be used for the parts of heavy vehicles are partly supplied to the HV (Heavy Vehicles) Diesel Engine Manufacturing Plant of No.4 HI for manufacturing the parts of engines and the remainder is supplied to the HV Component Shop of No.1 HI respectively for machining and subsequent processing.

7. The cast aluminium light alloy products to be used as intermediates for the parts of agricultural machinery and heavy/light vehicles are all manufactured at the Light Alloy Foundry Shop of No.4 HI. All of the pistons and piston rings required are manufactured at the Piston and Piston Ring Manufacturing Shop of No.4 HI. The thus manufactured casting aluminium light alloy products including pistons and piston rings are supplied, respectively to the AME Assembly Shop of No.3 HI for the diesel generator, and the HV Diesel Engine Manufacturing Shop of No.4 HI for the diesel engines for heavy vehicles and to the LV Assembly Shop of No.4 HI for the engines for light vehicles.

8. All of the pressed parts for the heavy/light vehicles are manufactured at the Press Shop of No.1 HI. The pressed parts for the heavy vehicles are sent to the HV Body Assembly Shop located within the same site and also to the Bus Production Plant at

Htauk Kyant, while the parts for the light vehicles are supplied to the LV Assembly Shop of No.4 HI.

3-1-2 Investments Made for the Four Industrial Projects

The total of investments made up to October, 1987 are as follows:

Name of Project	Investment Amount (in million Kyats)
1. Agricultural Machinery and Equipment	495
2. Heavy Vehicles	416
3. Light Vehicles	646
4. Electric and Electronic Products	350
Total Investments	1,907

Of the total investments, 977 million Kyats (46.47 billion yen) was financed with the Japanese aids including the Reparations Funds of Japan, 204 million Kyats (US$26.2 million) with HIC's reserved foreign exchange funds, and 726 million Kyats with the loan provided by the Government of Burma.

3-1-3 Financial Status of HIC

The financial status of HIC for the past three years (1984/85 to 1986/87) are summarized below.

	1984/85	1985/1986	1986/87
Profit/Loss (Million Kyats)			
a) Gross Income	939.2	982.9	1,289.7
(Total Sales)	(931.7)	(975.4)	(1,280.7)
b) Gross Profit*1)	252.1	270.8	294.2
c) Net Profit*2)	35.5	39.5	71.6
d) Net Profit after Contribution to State*3)	24.9	27.7	50.1
e) Accumulated Reserves (as of End of Year)	185.7	213.4	263.5

HIC is allowed to sell its products at the prices set for each product based on the standard production cost plus a certain rate of profit margin sanctioned by the Government. Under this system, HIC is assured to gain a certain range of profit as long as the production is realized at costs not exceeding the standard costs. As shown above, HIC steadily gained profit during the given three years. The rates pf return, however, were relatively low; the Return on Investment at about 5%, Return on Gross Capital at about 3%, and Return on Equity Capital at 4 to 8%. This is because of a low rate of return on sales tended at 3 to 5% due to a small profit margin sanctioned by the Government. The turnover of capital is also relatively low. Under these situations, the accumulation of capital is small.

Notes:

1) Gross income (total sales plus other income) less cost of goods sold.

2) Gross profit less administrative expenses, sales expenses, financial expenses and excise tax.

3) Contribution to the state at 30% of net profit; income tax being exempted.

The ratio of long-term liabilities is situated in a sound range at about 330%. Nevertheless, there is a possibility for the financial position to decline if a large amount of loans are borrowed to finance additional investments in the future, since the accumulated capital is very small to finance the investments. In view of the financial structure as mentioned above, it is recommended that HIC should consider stage-wise investments and also carefully examine the financing plan including the increase of corporate capital so that a sound equity - debt structure can be maintained.

3-1-4 Current Situation of Production and Production Costs of the Four Industrial Projects

(1) Production Capacity, Production Plan and Actual Production

A review is made on the past trend of the production in comparison with the production capacity (Refer to Table 3-1). The result is summarized below.

a) The production of the products, except for dry cell batteries, storage batteries and power tillers, maintained a steady or slightly upward trend for the last three years.

b) The production of dry cell batteries, storage batteries and power tillers recorded a declining trend. The decreases in the production of dry cell batteries in 1986/87 resulted from frequent stoppages of operation of the dry cell battery plant of No.2 due to shortage of fuel oil to be used for smelting zinc which is the raw material for dry cell batteries. The decreases in the production of storage batteries since 1985/86 onward were attributed to the deficiency of the supply of lead from the local supply source. The production of power tillers considerably decreased since 1985/86 onward. The production was compelled to reduce because the sales of this product currently decreased due to the present model being expensive and inconvenient to use for its heavy weight.

Table 3-1 PERCENTAGE OF ACTUAL PRODUCTION AGAINST PRODUCTION CAPACITY

(Unit: %)

	1984/85	1985/86	1986/87	Trend	Average (1984/85 -1986/87)
Heavy Vehicles	70	95	83	→	83
Light Vehicles	61	78	84	↗	72
Engines					
DS70	59	71	75	↗	68
B-600	32	21	40	↘↗	31
X/T-2000	69	93	109	↗	90
Pumps	58	64	68	→	63
Power Tiller	66	32	45	→	47
Thresher	22	23	101	↗	48
Diesel Generators	78	57	110	↗	82
Incandescent Lamps	144	140	123	→	135
Fluorescent Lamps	108	114	105	→	109
Dry Cell Batteries	60	63	45	↘	56
Watt Hour Meters	105	91	95	→	97
Transformers	17	54	94	↗	55
Motors	52	38	74	↘↗	54
Storage Batteries	60	33	37	↘→	43
Fans	191	100	151	↘↗	149

c) The production of 2000 cc engines, threshers, diesel power generators, incandescent lamps, flourescent lamps, watt-hour meters, distribution transformers and electric fans recorded a high capacity utilization of over 90% during the last three years in average, or even if less than 90% recorded an upturn to exceed 90% in 1985/86 or 1986/87. Of these the production of all the products except for watt-hour meters and distribution transformers recorded the production exceeding the capacity, either in average or in some of the past three years. This implies that effective efforts were made in some fields to guard the production from the operational contraints caused by the wear and deterioration of the manufacturing facilities.

d) The production of heavy and light vehicles, DS70 diesel engines, the engines for B-600, pumps, power tillers, dry cell batteries, motors and storage batteries remained at a comparatively low level of capacity utilization for the last three years. Of these the capacity utilization of heavy and light vehicles and DS-70 diesel engines was situated in an acceptable range, but the capacity utilization of other products was fairly low. The causes of the decreases in the production of dry cell batteries, storage batteries and power tillers have been stated above. The current production of other products will be more precisely reviewed by taking the production plans into consideration in the later part.

An analysis of the production of the products listed above as the low capacity utilization items is made by comparing it with the production plans. It is observed that there are three different cases resulting in the low capacity utilization, which are as follows:

a) Although the production was achieved at par or in excess of the plans, as the plans were set considerably lower than the capacity, it resulted in a low capacity utilization.

b) As the production failed to achieve the production plans set lower than the capacity, it resulted in a considerably low capacity utilization.

c) The production plans were set close to the capacity. As the production failed to achieve the plans, however, it resulted in the low capacity utilization.

HIC's annual production plan is subject to the sanction of the Government, and at the same time the allocation of foreign exchange required for the imports of raw materials and component parts is also made by the Government. There are cases where the production plan of some products is revised downward by the Government in the light of priority set in the annual national economic plan and also in consideration of foreign exchange situations. In recent years, HIC was compelled to reduce the production of some products due to stringent foreign exchange situations. When these conditions are taken into consideration, the case mentioned as a) above must be an admissible phenomenon. Careful attention must be paid to the causes of the cases mentioned as b) and c) above, because clarification is required in order to investigate appropriate measures for improvement.

(2) Present Situation of the Localization of Raw Materials and Component Parts

The Four Industrial Projects require numerous types of raw materials and component parts, because a wide variety of products are produced. HIC has been greatly devoted to the expansion of the local production of raw materials and component parts required. Nevertheless, there are a number of component parts still relying on imports due to the constraints in existing production facilities and technology and also to economic reason that the local production has to pay a high cost penalty for the comparatively small scale production. Almost all of the raw materials are imported, except for pig iron which is supplied from the local source for the manufacturing of ordinary cast iron.

(3) Production Costs of the Products

Though the rate of import duties varies from item to item, the average rate of import duties paid by HIC for the raw materials and component parts imported for manufacturing specific products, which was calculated as the percentage of total import duties paid to the total costs (i.e., FOB prices plus ocean freight and marine insurance pre-

mium) of raw materials and component parts imported for the respective product, ranged from 10 to 50% with a mean of 15%.

The excise tax is imposed on the standard production costs marked up with authorized profit margin varying from 0.4 to 10% of the production costs with an average of 3%. Although the applicable tax rate varies from product to product, the tax paid by HIC ranged from 10.3 to 37.5%, with a mean of 23%.

In view of the structure of the production costs, the costs of imported raw materials and component parts, taxes and levies, and depreciation account for the overwhelming majority of the costs for all the products. Given below are the percentages of these cost elements against the production costs marked up with profit margin, averaged from 28 product items.

	Cost Elements	Percentages to Total Costs (%)
1.	Costs of imported RM and CP	39.2
2.	Depreciation	8.1
3.	Taxes and levies (Import duties and excise tax)	36.4
4.	Other costs	16.3
	Total production costs (including Profit Margin)	100.0

The costs of imported raw materials and component parts and the taxes and levies account for about 75% of the total costs. When the depreciation is added, these three elements account for 83% of the total costs. The average cost percentages seem to indicate that the percentage of depreciation is comparatively small. However, the percentage of depreciation accounts for 10 to 15% of the costs of such products as vehicles manufactured through several steps of processing including machining and pressing, whereas it is only 1 to 2% in the case of dry cell batteries, incandescent lamps and fluorescent lamps which are manufactured in a comparatively large quantity. The high percentage of depreciation in the costs for vehicles is due to the heavy burden of the depreciation assumed by one unit of the products manufactured on a small scale.

As the Four Industrial Projects manufacture old models of vehicles, most of the component parts supplied from abroad are specially ordered items. Hence it is obvious that the prices of imported component parts would rise, and, as a consequence, the payments of import duties and excise tax would also increase. This situation implies that the production costs of those products will increase year after year. One of the countermeasures is to expand the local production of component parts so that the imports can be reduced. Depending on the type of parts, however, the local production may result in much higher costs because of the heavy burden of depreciation caused by a small scale production. Priority of the local production must be given to such parts that lend itself to volume production covering also the supply to the outside markets as spare parts. On the other hand, it is also important to improve the production efficiency so that the consumption of imported raw materials can be conserved to the maximum possible extent.

3-1-5 Fundamental Issues and Current Circumstances of the Four Industrial Projects

(1) Consideration of the Factors Affecting the Production of HIC

The annual production plan of HIC is submitted to the Ministry of Planning and Finance through the Ministry of Industry (2) directly controlling HIC. All the plans submitted by the state corporations, after the preparatory work of the Ministry of Planning and Finance, are submitted to the Economic Coordination Committee for their examination, and then finally sanctioned by the Cabinet with the approval of the People's Congress. The production plan prepared by HIC is revised in the course of the examination, in the light of the annual economic plan of the nation and the Government plan for the arrangement of the required foreign exchange. In recent years, the Government made downward revisions of the plans prepared by the corporations in order to curtail the imports of raw materials and component parts so as to cope with the stringent foreign exchange situation. HIC undertakes the production in accordance with the production plan thus sanctioned by the Government and within the amount of foreign exchange allocated for the imports of raw materials and component parts.

Under the above mentioned system, HIC is not allowed to perform any production in excess of the plan sanctioned by the Government, even if the production facilities have the capacities to produce more and also HIC has confidence to sell the products as produced. If the currently prevailing stringency of foreign exchange should continue and if, as a consequence, the Government should continue to enforce restriction on imports in the future, an immediate expansion of the production facilities would jeopardize the operation of HIC due to the heavy financial burden of investments which has to be assumed by lower capacity utilization of the expanded facilities.

The primary step should be concentrated on the rehabilitation of the existing facilities and the enhancement of institutional activities for the production control and facilities maintenance so as to improve the production efficiency while maintaining the capacity of the existing facilities, unless there is assurance that the imports of an adequate quantity of raw materials and component parts will be permitted so as to maintain the high capacity utilization of the production facilities.

At the same time, priority must be given to the local production of the component parts which can be manufactured by utilizing the existing facilities to a large extent in order to contribute to the savings of foreign exchange, while priority be given also to the production of any products which can contribute directly or indirectly to the promotion of exports.

In the long term the expansion of the production facilities will be required along with increasing demands in the domestic markets. Even in such cases, it would be necessary to adopt two or three shifts operation so that the expansion of the facilities can be minimized.

(2) Consideration of the Shortage of Fuel Supply

HIC used heavy oil as fuel for the factories. In recent yers, the operation was hampered by the supply shortage of heavy oil. In order to supplement the shortage of heavy oil, HIC adopted to use LPG and methanol for some facilities. It is likely that the supply of methanol will be stopped in the near future because the present supply is

provisional until the quantity of other uses already committed increases. On the other hand, the use of LPG causes a rise of production costs because of the high-priced LPG. Although natural gas is the most economical fuel, the installation of gas distribution pipelines is required for the use of the gas. It is recommended for HIC to make a comprehensive study on the economical and stable sources of fuel to be used.

(3) Consideration of Inefficiencies Affected by the Characteristics of Production and Site Conditions

Summarized below are the characteristics of the Four Industrial Projects:

a) The production of a wide variety of products each on a fairly small scale.

b) Manufacturing of some products completed with the involvement of several factories scattered in several areas and, as a consequence, the movement of materials among the factories in the flow of manufacturing processes.

c) Self-sustaining type of operation under an undeveloped state of the peripheral industries specializing in supplemental or supporting functions.

The above characteristics and site conditions hinder an efficient operation. Nevertheless, if a theoretic approach is excessively applied in drawing the rationalization plan, it may draw an unrealistic plan which requires huge amounts of investments and drastic transfer of employees. It may be necessary to draw an economical plan which is realistically applicable for resolving the above problems.

3-2 Present Conditions and Underlying Problems of Machinery and Equipment and Direction of Improvement

3-2-1 Worn-out Conditions of Machinery, Equipment and Facilities, and Shortage of Spare Parts - Need of Establishing Appropriate Maintenance Systems

Since most of the production facilities related to the Four Industrial Projects have been constructed more than 20 years ago, the machinery and equipment have been worn out. There are a number of worn-out machines either running in deteriorated conditions or out of operation, including those left unrepaired due to lack of spare parts. These conditions cause inefficiency of operation and inferior quality of products manufactured. It is likely that the deterioration of machines will be expanded to such an extent that it would seriously hinder the production in the near future if no measures are taken to prevent it.

Among the machines in service, there are a number of machines the operation of which has been often interrupted by mechanical troubles. They may be inoperable in the near future. Under these conditions, the present capacity of the facilities may be 20 to 30% lower than the initially installed capacity. The capacity may be further reduced with the deterioration of machines in the future.

It is obvious that the wear and deterioration of machines are more extended in older facilities. Nevertheless, even in the HV Diesel Engine Shop of No.4 HI which was constructed in 1970, later than other shops, the operation was stopped for 8% of the monthly working hours in average every month due to mechanical troubles.

In general, the performance, or the efficiency and precision of machines deteriorate with the age and wear of machines used for a long period of time. It is important to take appropriate measures for the maintenance of machines including preventive maintenance in order to eliminate the factors that cause the deterioration and also to prolong the life of machines.

HIC has performed preventive maintenance inadequately. It is one of the major causes which have led to the wear and deterioration of machines. Further, in recent years, many of the machines have been operated without timely replacement of parts and timely lubrication due to the shortage of

spare parts and lubricants. These factors have also caused the wear and deterioration. It is urgent to take preventive measures.

3-2-2 Deterioration of Equipment Accuracy - Need of Enhancing Facilities and Systems for Calibration of Measuring Equipment and Instruments

Long-use of machines has brought about the deterioration of machining accuracy which requires immediate repairs. There are some machines which require a long time for repairing. As these machines cannot be used during repair work, if a shutdown is not permitted by workload demand, a minimum number of stand-by equipment will have to be installed, in which case the repairing will be performed while the operation is continued with the newly installed equipment.

There are a number of worn-out jigs and dies which have caused production losses and inferior quality of products. The repair of jigs and dies is undertaken at No.3 HI, but it is limited to simple repairs because of poor equipment installed for repair work.

It is necessary to establish a shop specializing in the repair of jigs and dies, equipped with requisite inspection instruments.

Measuring equipment and instruments also are worn-out and deteriorated in accuracy, to the extent of being no longer capable of assuring requisite accuracies. It is urgent to make the repair or replacement of those equipment. Periodical check and calibration of measuring equipment and instruments cannot be performed because of absence of equipment for these activities. It is necessary to install the required equipment for calibration.

3-2-3 Improvement of Bottlenecks in Production Lines

Despite the present capacity utilization being lower than the maximum, bottlenecks in production lines are observed. The following are the main causes of the bottlenecks:

1. Bottlenecks caused by deterioration of machines, interruption of the operation of some processes or steps due to mechanical troubles of machines.

2. Bottlenecks caused by excessive time required for a subsequent step of machining because of intermediates manufactured in poor precision or accuracy with deteriorated machines.

3. Bottlenecks caused by excessive workload imposed the machinings in order to recover the progress of work disturbed due to delays in delivery of cast or forged intermediates.

The foregoing bottlenecks can be eliminated by taking measures for renovating the worn-out equipment as mentioned in Section 3-2-1, and for improving the production control system for the upstream parts as discussed in Section 3-4.

3-2-4 Rationalization of Production Lines

Most of the existing facilities related to the Four Industrial Projects have been operated without improvements or modifications after they have initially been constructed in accordance with the designs prepared by the four Japanese companies assisting the Projects. The following rationalization measures would be necessary along with the repair and replacement of worn-out machinery, equipment and facilities, including jigs, dies, molds, tools and transportation facilities as mentioned in the previous sections.

1. Integration of duplicated equipment and facilities

2. Utilization of idle machines

3-3 Present Conditions and Underlying Problems of the Local Production of Raw Materials and Component Parts, and Direction of Necessary Preparedness for Expansion of the Local Production

3-3-1 Present Situation of the Local Production of Component Parts

Ordinary iron castings and ductile iron castings are manufactured by using locally available pig iron at the HIC's foundry shop, while aluminum light alloy castings are manufacturerd by using imported aluminum ingot at the HIC's light alloy foundry shop. Steel for manufacturing forged products, except for mamootie (Burmese hoes), is imported, and steel plates for pressed parts also are imported. Some component parts are manufactured by machining imported rough products. Electrical components, auxiliary parts for engines and instruments for agricultural machinery and vehicles are all dependent on imports. Local materials are used for making seats and decorating the interior coach of vehicles, while window glass and other glass parts are imported.

Glass bulbs manufactured by the Ceramic Industry Corporation belonging to the Ministry of Industry (1) are used for incandescent lamps. The use of the locally made bulbs caused a large extent of rejects. The corporation has manufactured glass tubes for fluorescent lamps for the purpose of trial use by HIC. However, HIC still uses imported tubes because of the inferior quality of the locally made tubes. For manufacturing other items of electric products, HIC manufactures some metal parts or plastic parts by processing imported metal plates and synthetic resin pellets. Manganese dioxide and zinc used for dry cell batteries are imported.

Up to the present HIC has relied entirely on the four Japanese companies assisting the Projects for the product design of the Four Industrial Projects. The local production of component parts has also been expanded step by step in accordance with the designs and specifications provided by them together with their technical guidance for manufacturing. The component parts requiring a high level of technology or large-sized equipment and also those costly by local production on a small scale are still dependent on imports.

3-3-2 Quality of Parts Manufactured by HIC and Procured from Other Local Sources, and Other Problems Underlying in the Manufacturing of Products

(1) Quality of Raw Materials and Rough Products

The percentage of defectives found in ordinary iron castings and ductile iron castings is around 20% in average, although the defective rates vary depending on the products. Cast products for piston rings have defectives from 10 to 25%. The defectives of aluminium light alloy castings extensively varies from 3 to 50% depending on the products manufactured.

Steel materials for forged products are imported for the most part. Although the average defective rate of rough forged products is around 5%, the defectives of some machined products is as high as 20%. Poor precision control on the dies is largely responsible for the inferiority of the forged products.

In view of the defective rates as enumerated above, it is observed that the HIC's present level is still below the level that can ensure a stable supply of high quality of cast and forged products.

For incandescent lamps, HIC uses bulbs manufactured by the Ceramic Industry Corporation. The use of the bulbs, however, caused 40 to 50% of rejects of the incandescent lamps manufactured due to inferiority of the bulbs.

(2) Quality of Processed Products

1) Machined Products

Precision of the machine tools and press machines, as stated earlier, has been deteriorated due to the wear and tear. Similarly, jigs, dies, tools and gauges are also deteriorated. These conditions cause inferiority of the machined products.

The pressed parts are particularly rough in precision because of the wear and deterioration of press machines and dies, and also there are some parts made by manual shearing and bending due to lack of press dies. The use of these poor quality pressed parts results in the frequent occurrence of inferior products at the assembly shops.

The cutting work is better performed, but some of the produced parts are poor in precision. In addition, bad practices in the staring of finished parts and semi-finished parts have caused deterioration of the quality of parts.

2) Deterioration of Quality Caused by Damages in Transportation or Storage

Pressed parts for light vehicles are manufactured at No.1 HI and delivered to No.4 HI where the assembly of light vehicles is performed. Many of the delivered parts are those deformed during the transportation from No.1 HI to No.4 HI and also rusted during storage. The rough products of cast iron to be used for the parts of engines are manufactured at No.3 HI and delivered to No.4 HI where the machining and subsequent processing of the parts and the assembly of engines are performed. As preventive treatments for rusting are insufficient, many of the delivered rough products have rust, causing the deterioration of quality. The assembled engines and transmissions are stored in an inept manner, causing the performance of those engines and transmissions to deteriorate.

3) Welded Parts

The skill level of arc welding is generally low and the products have a rough finish. Apart from their poor appearance, these products have weakness against concentrated or repeated stress.

4) Assembly of Parts

There are some engines and transmissions assembled with the missing of some parts and the insufficient fitting of bolts and nuts.

(3) Quality Test and Inspection of Component Parts and Products

There are some testing facilities and measuring instruments which do not function because they are left unrepaired due to lack of spare parts of are used in a deteriorated condition. Under these conditions, the test and inspection for the precision and quality of the manufactured parts are insufficient. The inventory control of the parts is also inadequate. Some of the rejected parts are mixed in

with the passed ones and also are used with inadequate adjustment, resulting in inferiority of the products. There are some equipment for the final inspection and performance test which are out of services because of lack of spare parts for repairing. Such being the conditions, the final inspection and performance test are inadequate. This results in unreliable assurance on the durability and safety of the vehicles.

(4) Delay in Work Schedule

When a delay in work occurs in some process, no immediate reaction is taken to remedy it. Such a delay often affects the work in subsequent processing, and hampers the overall work schedule.

3-3-3 Measures for Immediate Improvement

Measures to be taken for immediate improvement are as follows:

1. Improvement of production facilities and enhancement of production control

2. Enhancement of functions to collaborate with other related entities to improve the quality of raw materials and parts supplied

The direction of institutional development in future is as follows:

1. Standardization of products

2. Development of product design capability

3. Establishment of systems for small model changes and product development

3-4 Present Systems and Underlying Problems of Production Control, and Direction of Improvement

The production plan originally prepared by HIC is often revised downward in the course of the Government's examination, in the light of the Government's annual economic plan and its plan for the arrangement of required foreign exchange. Hence, HIC is unable to increase the production due to the limitation of the foreign exchange available, even if the demand is large and the production facilities have a sufficient capacity to increase the production. On the other hand, there is a case that the production schedule is adversely affected by the delay in the arrival of imported raw materials and component parts.

In view of the production record for the last three years, there are several products of which the production failed to attain the production plan. It is observed that such lower achievement in production should be partly attributable to the delay in the arrival of raw materials and component parts, but also to the weakness of the production planning and control systems presently practiced. Further, as reviewed in the previous seciton, there are a number of problems on the quality of products and parts, which require improvement. Hence the enhancement of quality control is necessary.

In addition, the production will be more complicated with the expansion of the local production of component parts and the increase of the production of products. Hence, the production control is more important in order to maintain the production efficiency. At the same time, it is also necessary to enhance the facility control and maintenance systems for the production facilities.

3-4-1 Production Planning

After the production plan is sanctioned by the Government, a notice called the Manufacture Order (MO) which specifies the annual production volume and delivery time is issued by the Planning Department of the Headoffice to the factories and relevant departments of the Headoffice. On receipt of the MO, the Planning Department of the respective factory instructs the annual production plan by means of its own MO to the Production Department and other relevant sections in the factory.

The Planning Department of the Headoffice convenes the senior staff of the factories every month to make necessary coordination among the factories to solve the problems arising in relation with the work progress, delivery time and product quality. The respective factory also frequently has similar meetings to make coordination among the shops to solve the problems.

Nevertheless, it is observed that the presently practiced production planning and coordination manner has the problems of which the improvement is recommended as summarized below:

a) Abolish the practices that admit a certain extent of excess production, and change these to the manner best designed to grasp the actual record of production.

b) Take measure for the equalization of production plan.

c) Establish the system which enables the appropriate adjustment of the production plan and fast feedback

d) Improve the contents of monthly and annual reports so as to include the issues which should be reflected in the subsequent production plan.

3-4-2 Production Control

(1) Production Schedule Control and Procurement Control

It is necessary to establish the following systems:

a) Establishment of the specific unit master

b) Progress control

c) Delivery control of the materials and parts procured from outside sources and also of rough products and component parts internally manufactured

(2) Inventory Control

It is necessary to improve and enhance the following systems:

a) An appropriate inventory control

b) Inspection upon Receipt

c) Storage control

d) Improvement of movement flow in the factories

(3) Quality Control

Since no clear criteria on inferior products is provided, raw materials and component parts previously labelled as inferior are sometimes returned to production lines. The management's consciousness of quality control should be improved in order to produce reliable products which are competitive in export markets.

The prevailing attitude towards the quality control is that it is a subject only for the Inspection and Quality Control Sections. Little consideration is given to the introduction of measures to prevent the deterioration of quality; such as the proper storage of imported materials and parts, protection of products during the transportation, prevention of rust and prevention of dust at the engine assembly line. The consciousness of the quality control is generally low. The quality control should be performed at all stages from the receiving point of raw materials and component parts to the finishing process. The role and function of the Inspection and Quality Control Sections are to watch whether such activities are properly carried out or not.

The main points to be improved are as follows:

a) No proper utilization of statistics on inferior products

b) No implementation of measures to prevent recurrence of defects

c) Lack of work standards

d) Problems resulting from the provision of the 10% allowance of excess production to cover defective parts

e) Unclearness of the quality control policy

3-5 Present Conditions and Major Problems of Training and Personnel Control, and Direction of Improvement

3-5-1 Present Situations and Problems of Education and Training

One of the main training programs conducted by HIC is the training of technical skill for new employees who have just completed their secondary education. All the factories have the Technical Training Center and trainees are assigned to the work place after two years of theoretical and practical training at these centers. Apart from the Technical Training Center, the Industrial Training Center was established in the vicinity of No.3 HI at Sinde under the grant aid of the Government of West Germany. This center has three year courses for students who graduated the secondary school to give training on the technical skills of machinery, electric and other fields. The graduates of this center are also employed by HIC.

In general, the HIC's training activities are mainly on the training for the technical skill of workers, but little training for the managerial aspects of managers, senior staff and field supervisors.

The problems of the training provided by HIC can be summarized as follows:

1. While the training of managers and senior staff is often provided through the Off-the-Job Training programs, including those held outside HIC, there is no clearly defined system to apply the newly acquired knowledge or technology to the actual work and, therefore, the results of training are not fully utilized.

2. The staff who have received training overseas tend to keep the newly acquired knowledge or technology to themselves.

3. Although all the training programs are planned by the Headoffice, they tend to fall short of fully reflecting the factory characteristics in terms of products and component parts, speciality of job, production facilities and organizational structure. In this context, the training programs seem to be inadequate. In addition, the sections responsible for conducting the training programs in the factories seem to be somewhat lacking in positiveness.

4. The training curriculums of the Technical Training Centers are oriented towards theory and the inadequate provision of textbooks and equipment

makes it difficult to achieve the intended results. As only a few textbooks are available, only the teachers are provided with them, making the use of blackboards necessary. As a result, the teaching efficiency is poor and no sufficient preparatory or review work on the part of the trainees is possible.

5. In order to fully achieve the intended training results of the O.J.T. programs, the teaching side must have sufficient technical knowledge, training techniques and the ability to prepare proper training plans. However, these essential requirements are often lacking.

3-5-2 Present Conditions and Major Problems of Safety Control and Environmental Control

The responsibility for safety and environment control is assigned to the Administration Department of each factory. There are no uniform safety standards and those standards prepared by each factory or department and approved by the Administration Department of the respective factory are enforced. Although managers and supervisors are responsible for the maintenance and improvement of work safety and the working environment, there is no internal communication system nor workshop programs for the uniform application of safety and/or environment standards. There are no safety and health statistics which are available for the safety and environmental control. No safety education is provided.

Chapter 4 Renovation Plan

4-1 Major Tasks of the Four Industrial Projects

The tasks which the Four Industrial Projects should achieve in order to cope with the social and economic conditions of Burma and more specifically to meet the market requirements for their products, and also the technical difficulties or problems currently faced by the Projects on which remedial measures or improvement are needed, are summarized below:

1) The tasks which the social and economic conditions bring about are as follows:

   1. Measures for sustaining the production of HIC at the present level and possibly realizing expansion in future.

   2. Measures for increasing the effective use of resources which are squandered.

   3. Expansion of the domestic production of component parts.

   4. Formulation of nuclei which will eventually grow into the peripheral industries supporting the main industries in the field of machinery and engineering industry.

   5. Measures to assure the earning of foreign exchange at the effort of HIC.

2) The following measures should be taken to meet the domestic market requirements:

   1. Measures to ensure the continuation and expansion of production for the products presently manufactured by the Four Industrial Projects.

   2. Supply of the spare parts which are required for the vehicles, agricultural machinery, and electrical appliances supplied by HIC, and also of tools, jigs, and dies needed by other industrial entities.

3. Model changes of the HIC products to be considered as a strategic response.

3) Summarized below are the main issues of technical difficulties or problems currently faced by HIC, on which remedial measures are needed for improving the production of the Four Industrial Projects.

1. Measures for ensuring an adequate supply of required raw materials and component parts.

2. Repair or replacement of worn-out equipment.

3. Improvement of the maintenance system including the measure for securing the supply of required spare parts.

4. Repair or replace of worn-out measuring equipment and instruments, and also the enhancement of the system for checking and calibrating accuracy of the measuring instruments.

5. Improvement of bottlenecks in the production lines.

6. Rationalization of the production lines.

7. Assurance of an energy source which promises economy and stable supply on a long range.

8. Expansion of the local production of component parts.

9. Buildup of the HIC's capability of performing minor model changes and developing simple products.

10. Improvement of the production control system including quality control system.

11. Establishment of the personnel control system best suited under the Burmese conditions.

4-2 Targets of the Renovation Plan

(1) Contribution to Burmese Economic Activities

The production activities of HIC have contributed in a wide range of fields to the Burmese economy. In light of the importance of HIC's activities, the primary target to be pursued should be set on the continuation of HIC's production in order to ensure the supply of the products and the enhancement of the facilities and operation systems to respond to the increase in demands in the future.

Most of the industries in Burma suffer from a chronic lack of spare parts for repair and tools, hindering their production activities. Since HIC is the mainstay of the machinery industry in Burma, another task of HIC is to supply spare parts for repair and tools to other industries. On the other hand, it would be necessary to give consideration to avoid the monopolization by HIC of the supply of machinery and spare parts in order to leave some opportunities for the private sector to grow in the machinery and light engineering industry in the future.

From the above viewpoints, the renovation plan is investigated by paying special regards to the enhancement and expansion of the following areas:

1. Such sections as the modern casting facilities, large-scale pressing facilities, high quality machining facilities and other large-scale production lines which HIC should have to possess in order to function as the mainstay of the machinery industry in Burma and which the private sector may be unable to possess even in the future.

2. Given that the private sector may gradually undertake light engineering industry such as the manufacture of simple parts and the repair of machinery, such areas as the manufacture of precision parts which require built-up high technology and which the private sector may be unable to undertake even in the future.

3. The manufacture of the products and parts which are required for the production activities of other industries or the improvement of living standards, but presently being in a short supply.

(2) Correction of the Essential External Dependence

Many of the raw materials and component parts required for the HIC's production are dependent on imports. The spare parts and tools also are situated in similar conditions. The renovation plan will give attention to the following points which may facilitate the establishment of self-sustaining production.

1. Expand the local production of component parts and spare parts.

2. Establish the system which is capable of undertaking the repair and maintenance of machinery, equipment and facilities without reliance on outer supports.

3. Build up product development capability, so as to enable HIC to perform the design of products which can reduce the use of imported raw materials and component parts.

4. Endeavour for the development of human resources.

(3) Establishment of Production System Capable of Development

Since HIC was engaged in the production of products for the supply to the small-scale domestic market, the production had less competitiveness when compared to export-oriented industries established abroad. Hence, it was difficult for HIC to increase the production by the promotion of exports, even if the production facilities had surplus capacity. In the future, it is necessary for HIC to form the operational bases that enable the renewal of machinery, facilities and tools to meet the market needs in its own capacity and establish the production capability which can produce competitive products for exports. To this end it is important to take appropriate measures not only for the enhancement and expansion of the production facilities but also for the accumulation of appropriate technology and the establishment of production control system which enables efficient utilization of the facilities.

The present plan is to take measures to meet the above requirements for the establishment of the production system which is capable of development.

4-3 Framework for the Renovation Plan

4-3-1 General

In order to achieve the targets of the renovation plan as mentioned in the previous section, the plan places emphase on the following points (For the production plan, see Table 4-1 through 4-3):

1. Renovation and modernization of the production facilities.

2. Establishment of auxiliary sections which support the renovation and modernization of the facilities.

3. Enhancement and improvement of the systems for product development and production control for HIC's self-sustaining operation.

The primary activities for the renovation and modernization of the production facilities comprise the repair or replacement of worn-out machinery and facilities to recover the capacity of the existing facilities, the improvement of bottlenecks in the facilities, and the rationalization of production lines for responding to the expansion of the production in the future. The next activities are to prepare the expansion of the production both in a variety of products and volume based on the thus enhanced production bases so as to satisfy the market needs. In this connection, the type and capacity of new machinery and equipment to be introduced in the plan are investigated by taking into consideration not only the requirements for maintaining the present production but also the relationship with the machinery and equipment which may be additionally required in expanding the production in the future.

The existing machinery, equipment and facilities which have been thus renovated and modernized, together with the installation of new ones to some extent, may face difficulties in maintaining their performance capacities if inadequate measures are taken for maintenance. Hence, the establishment of adequate maintenance system is indispensable.

Some of the machinery and facilities may have certain excess capacity to cater to the increase in production in the future. In order to achieve the maximum utilization of their capacity, the establishment of the systems supporting efficient operation together with the acquisition of production

Table 4-1 PLANNED PRODUCTION OF AGRICULTURAL MACHINERY AND EQUIPMENT

Type of Product	Actual			Planned					
	1984	1985	1986	1988	1989	1990	1992	1995	1998
Pumping Set	4,200	4,627	4,920	5,475	5,530	5,920	7,340	9,520	9,670
4" Pump	3,700	4,000	4,260	4,500	4,500	4,500	4,500	4,500	4,500
4" Pump w M SC4C	0	1	10	250	250	350	500	850	1,000
4" Pump H H	500	625	600	600	600	700	900	1,000	1,000
4" Pump w M SVO-102	0	1	30	40	40	50	70	100	100
6" Pump	0	0	1	50	50	50	50	50	50
8" Pump	0	0	19	20	20	20	20	20	20
2" Self Priming	0	0	0	10	50	150	800	2,000	2,000
3" Self Priming	0	0	0	5	20	100	500	1,000	1,000
Light A M	551	357	845	1,000	1,000	1,100	1,200	1,350	3,000
P Tiller	393	190	270	500	500	550	600	600	0
P Thresher	108	117	505	500	500	550	600	750	1,000
Reaper	0	0	0	0	0	0	0	0	1,000
Power Tiller	0	0	0	0	0	0	0	0	1,000
Di Generating Set	234	170	331	300	300	350	450	600	600
2 KVA Generator	34	50	150	100	100	100	100	100	100
4 KVA Generator	200	120	181	200	200	250	350	500	500
Pesticide Eq	1,225	1,145	2,400	2,800	2,800	3,000	3,000	3,000	3,000
H P Sprayer	400	0	400	800	800	800	800	800	800
A K Sprayer	825	945	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Hand Push Duster	0	200	0	0	0	100	100	100	100
Power Mist	0	0	0	0	0	100	100	100	100
Implement	0	0	0	50	50	50	50	50	50
Rotary Device	0	0	0	50	50	50	50	50	50
Tools	549,180	534,235	499,642	621,000	621,000	630,000	654,000	684,000	685,000
Hand Tools	79,922	84,617	112,869	78,000	78,000	80,000	90,000	100,000	100,000
Mamooties	443,230	439,277	357,650	500,000	500,000	500,000	500,000	500,000	500,000
Shovel	10,355	6,064	20,383	20,000	20,000	25,000	35,000	50,000	50,000
Pick Axe	13,573	3,277	8,600	5,000	5,000	5,000	5,000	5,000	5,000
Axe	2,100	1,000	140	3,000	3,000	4,000	6,000	9,000	10,000
Cross Cut Saw	0	0	0	5,000	5,000	5,000	5,000	5,000	5,000
Hand Saw	0	0	0	10,000	10,000	11,000	13,000	15,000	15,000

Source: MIC

Table 4-2 PLANNED PRODUCTION OF VEHICLES AND PARTS

Type of Product	Actual			Planned					
	1984	1985	1986	1988	1989	1990	1992	1995	1998
Vehicles									
Light Vehicles	733	930	1,009	1,330	1,330	1,370	1,490	2,070	2,300
B-600 Pick Up	335	400	433	600	600	600	700	800	800
X-2000 C Country	200	233	236	430	430	450	450	700	800
T-2000 L Truck	198	297	340	300	300	300	300	500	600
Amb Car for H & C	0	0	0	0	0	20	40	70	100
Heavy Vehicles	775	1,040	912	930	980	1,275	1,310	2,050	2,200
6.5T Truck	615	755	552	670	670	915	930	940	950
5T 4WD Truck	0	47	52	50	50	50	50	50	50
3.5T Truck	91	164	219	100	150	150	150	150	150
25 Bus	69	74	75	60	60	100	100	100	100
33 Bus	0	0	14	50	50	60	80	110	150
FM Series Truck	0	0	0	0	0	0	0	300	300
H07 Engine	0	0	0	0	0	0	0	400	500
Engines	1,541	1,781	2,066	2,360	2,460	2,700	2,900	4,000	4,500
For HV	704	848	894	900	1,000	1,100	1,300	1,700	1,900
DS-70 Engine	704	848	894	900	1,000	1,100	1,200	1,300	1,400
Marine Appl. Engine	0	0	0	0	0	0	100	400	500
For LV	837	933	1,172	1,460	1,460	1,600	1,600	2,300	2,600
B-600 Engine	422	373	520	630	630	650	650	900	1,000
X-2000&T-2000 Engine	415	560	652	830	830	950	950	1,400	1,600
Parts									
Piston & P Ring/Pin	428,623	322,807	256,127	410,000	410,000	502,000	730,000	1,230,000	1,550,000
Piston	39,813	46,881	36,702	60,000	60,000	72,000	100,000	160,000	160,000
P Ring	388,810	275,926	219,425	350,000	350,000	420,000	600,000	1,000,000	1,300,000
Piston Pin	0	0	0	0	0	10,000	30,000	70,000	90,000
Cylinder liner	0	0	0	0	0	5,000	50,000	70,000	70,000
In & Ex Valve	0	0	0	0	0	0	0	20,000	100,000
Inlet Valve	0	0	0	0	0	0	0	10,000	50,000
Exhaust Valve	0	0	0	0	0	0	0	10,000	50,000
Rear Axle Shaft	0	0	0	0	0	0	0	3,000	9,000
Met & Oil Bearing	0	0	0	0	0	0	0	0	70,000
Metal Bearing	0	0	0	0	0	0	0	0	50,000
Oilless Bearing	0	0	0	0	0	0	0	0	20,000
Disc Wheel	0	0	0	0	0	0	0	15,000	25,000
Spring	0	0	0	110,000	110,000	120,000	145,000	194,000	200,000

Source: HIC

Table 4-3(1) PLANNED PRODUCTION OF ELECTRIC PRODUCTS

Type of Product	HI No.	Actual			Planned					
		1984	1985	1986	1988	1989	1990	1992	1995	1998
El Home Appliances *1		19,110	26,438	25,495	27,910	27,710	29,720	33,740	49,170	67,200
Air Conditioner	No.1	0	600	816	500	300	300	300	500	500
Refrigerator	No.1	200	200	327	200	200	300	300	500	500
Electric Iron	No.1	9,224	11,633	10,000	10,000	10,000	10,000	10,000	14,000	20,000
Electric Hot Plate	No.1	5,720	6,320	6,500	6,000	6,000	7,000	9,000	14,000	20,000
Rice Cooker	No.1	154	5,685	4,825	8,000	8,000	8,000	9,000	14,000	20,000
Electric Fan	No.3	3,812	2,000	3,027	3,100	3,100	4,000	5,000	6,000	6,000
Lighting Eq & Acc		5,181,766	5,163,104	4,606,246	4,623,200	4,642,200	5,469,000	5,840,000	7,541,500	10,133,000
Lamps		3,899,794	3,823,136	3,373,196	3,485,500	3,485,500	4,205,500	4,505,500	5,806,500	8,008,000
I Lamps	No.1	3,464,796	3,366,100	2,944,700	3,000,000	3,000,000	3,300,000	3,300,000	4,000,000	6,000,000
F Lamps	No.1	431,198	454,260	421,720	480,000	480,000	900,000	1,200,000	1,800,000	2,000,000
M Lamps	No.1	3,800	2,776	6,776	5,500	5,500	5,500	5,500	6,500	8,000
Fixtures		74,167	79,372	74,500	68,700	75,700	82,500	93,500	94,000	84,000
M Lamps Fix	No.1	1,278	822	1,700	1,700	1,700	2,500	3,500	4,000	4,000
L Lamps Fix		72,889	78,550	72,800	67,000	74,000	80,000	90,000	90,000	80,000
	No.1	33,889	44,950	39,795						
	No.3	39,000	33,600	33,005						
Ballast		76,649	91,528	73,200	80,000	80,000	86,000	96,000	96,000	96,000
Ballast	No.1	39,149	49,028	47,200						
M Lamps Bal	No.1	3,277	4,200	4,600						
F Lamps Bal	No.1	35,872	44,828	42,600						
Ballast	No.3	37,500	42,500	26,000						
Lamp Socket		160,800	175,700	135,500	138,000	150,000	165,000	185,000	185,000	185,000
	No.1	80,800	93,700	75,500						
	No.3	80,000	82,000	60,000						
Glow Starter Socket		82,300	74,700	76,000	75,000	75,000	90,000	100,000	100,000	100,000
	No.1	43,300	33,700	46,000						
	No.3	39,000	41,000	30,000						
S-Down Transfer	No.3	40,000	31,420	33,230	30,000	30,000	40,000	60,000	60,000	60,000
El Accessories	No.1	848,056	887,248	840,620	746,000	746,000	800,000	800,000	1,200,000	1,600,000

Table 4-3(2) PLANNED PRODUCTION OF ELECTRIC PRODUCTS

Type of Product	HI No.	Actual			Planned					
		1984	1985	1986	1988	1989	1990	1992	1995	1998
Radio & TV		1,897	4,100	2,314	8,000	8,000	9,000	11,000	15,000	15,000
Radio	No.1	760	451	28	5,000	5,000	5,000	7,000	10,000	10,000
C TV	No.1	1,137	3,649	2,286	3,000	3,000	4,000	4,000	5,000	5,000
Calculator	No.1	0	3,500	750	1,000	1,000	1,000	1,000	1,000	1,000
El Power Dist Eq		28,849	24,925	26,000	26,850	26,850	27,350	30,350	36,350	40,300
Power Dist Trans	No.5	60	193	340	350	350	350	350	350	300
Watt-Hour Meter	No.3	28,849	24,925	26,000	26,500	26,500	27,000	30,000	36,000	40,000
T Lamp & D Lamp		68,374	76,050	50,850	70,000	70,000	75,000	87,000	110,000	140,000
T Lamp	No.3	48,074	56,050	40,350	50,000	50,000	55,000	65,000	80,000	100,000
D Lamp	No.3	20,300	20,000	10,500	20,000	20,000	20,000	22,000	30,000	40,000
El Motor	No.3	1,074	750	1,475	1,250	1,350	1,600	2,500	4,000	5,000
Storage Battery	No.4	22,870	12,585	14,137	29,000	29,000	30,000	30,000	32,000	35,000
Dry Cell Battery		18,913,768	19,641,449	14,221,704	41,500,000	41,500,000	42,000,000	46,000,000	56,000,000	64,000,000
	No.1	13,832,964	13,449,504	12,199,646	20,750,000	20,750,000	21,000,000	23,000,000	28,000,000	32,000,000
	No.2	5,080,804	6,191,945	2,022,058	20,750,000	20,750,000	21,000,000	23,000,000	28,000,000	32,000,000

Note: *1 1988 through 1998: Including planned production of Water Cooler and Deep Freezer.
Source: HIC

technology are essential. Thus it is planned to establish the service sections which can well function to support the efficient operation of the main production lines.

In the meanwhile, as the basis for establishing the self-sustaining operation in future, it is planned to form the base for product development activities and also to introduce a presently applicable system for production control.

The framework of the renovation to be pursued on the specific subjects as stated above is described in more details in the subrequest sections.

4-3-2 Renovation and Modernization of Production Facilities

(1) Renovation of Existing Production Facilities and Enhancement of Production Bases for Future Development

The measures to be taken for this objective are as follows:

1) Repair or replacement of worn-out machinery and facilities, and improvement of bottlenecks

2) Rationalization of the production lines for future expansion of the production

3) Measures for assuring a stable supply of economical fuel

4) Recovery of waste materials for utilization

(2) Realization of Production Facilities Capable of Responding to the Tasks Imposed on the Four Industrial Projects

1) Enhancement of Capabilities for Product Supply

1-1) Enhancement and Expansion of Production Facilities and System for Agricultural Machinery to Meet Expansion of Mechanized Agriculture

It is planned to undertake the enhancement and expansion of production facilities and systems for agricultural machinery in the following directions, along with the promotion of the mechanization of agriculture now in progress chiefly through the efforts of the

Agricultural Mechanization Department. The measures to be taken for this end are as follows:

1. Enhance and expand the facilities in order to establish the capability of producing a wide variety of agricultural machinery required to promote mechanized agriculture.

2. Proceed with the testing and development research of agricultural machinery which is suited to the Burmese agriculture, in a view to building up HIC's capabilities of performing model changes and the development of new types of the machinery by themselves.

3. Expand the local production of component parts of the machinery which do not require model changes in the near future.

1-2) Expansion of Production of Vehicles and Spare Parts for Vehicles Responding to Expansion of Transportation Means

1. Aiming at the enhancement of facilities and systems for the production of the main models of vehicles such as the B-600 pick-up trucks and vans, X-2000 cross country, T-2000 light trucks, TE 6.5 ton truck series and BX 33-passenger buses so as to meet future demands, the following measures will be undertaken. (These measures should be undertaken in close conjunction with the plans for the expansion of the local production of component parts as described later.)

   a) Provision of the engine production system

   b) Provision of the bus production system

   c) Provision of the assembly lines

   d) Provision of the component parts processing facilities

   e) Improvements of the metal processing department

      The plan comprises the improvements of the foundry shop, forging shop and press shop.

2. Establishment of the supply system for spare parts is are made to serve mainly the vehicles already supplied by HIC.

3. It is planned to proceed with testing and development research required for necessary improvements. The direction of the testing and development research should be as follows:

   a) Put the emphasis on improvements in the existing model instead of introduction of new models in the case of products which already have a high proportion of locally produced parts.

   b) Undertake the unification of the engines mounted as far as possible.

   c) Arrange schedules to proceed with the experiment and development work so that model changes are undertaken at the time of changing the dies.

   To this end it is planned to establish the system for the experiment and development of products.

1-3) Provision of the Production Facilities and Systems for Electric Products

1. In general, it is judged that the production lines for electric products of HIC have surplus capacity to some extent in view of the initial capacity at the time of installation. The production currently tending to be on the low side is due to other factors than the limit of the production capacities. The first step of the present plan is the removal of these factors and the increase of production by adopting two shift operation and other measures for maximum utilization of the existing lines. After that an expansion of the facilities will be undertaken in order to meet the increasing demands.

2. The number of product items is large for the electric accessories, lighting fixtures and motors. The production system can be strengthened by a concentration of those product items.

3. There are some products (e.g., dry cell batteries, fluorescent lamps, watt-hour meters) for which the poduction has been con-

tinued according to the old models unchanged since the time of initial production. Inconveniences have arisen in the usage of these. Model changes or partial changes of specifications are required. Nevertheless, this should be realized at the best time for replacing equipment and dies in order to minimize cost increases incurred in the changes of models or specifications.

1-4) Provision of the Production System for Producing Electric Products Required for the Improvement of Living Standards

For the HIC products which are essential for the improvements of living standards, it is planned to enhance the production facilities and systems so as to meet the increase in demands in the future.

1. Improvements of living standards due to the extension of electrification; incandescent lamps, fluorescent lamps, electric accessories, dry cell batteries, watt-hour meters.

2. Improvements in the living standards of rural or remote areas; portable diesel electric generators.

3. Provision of fire engines and ambulances; modification of TE (Fire Engine), modification of X-2000 (Ambulance).

1-5) Provision for the Production Facilities and System for the Production of Spare Parts and Tools to be Supplied

1. Strengthen the facilities for the production of the various spare parts and tools.

2. Develop the capability of designing the various spare parts and tools.

2) Strengthening of the Self-Sustaining Production

2-1) Renovation and Expansion of the Metal Processing Sections

a) Renovation and Expansion of Foundry Shop

The importance of the foundry is to supply the cast products in quality and quantity as required and at the right time. The current production has been achieved fairly below the production plan. Further, problems of both belated delivery and defective quality of the cast products have arisen. Hence, it is planned to improve the foundry.

Along with the increase in the production of the products in the future, the enhancement and expansion of the production facilities for cast products are essentially required. For the products of cast iron, most of the raw materials including pig iron are locally available and the production of cast products greatly contributes to the foreign exchange savings. The products of cast iron may have possibility of supply to other state corporations and also great possibility of exports.

In order to provide the system for production increase, it is planned to perform the renovation and expansion of the foundry as a comprehensive renovation plan covering all facilities of the foundry shop.

b) Renovation and Expansion of the Press Section

In order to respond to the increases in vehicle production and the local production of currently imported component parts, the plan aims at a substantial expansion of the existing press section.

Machines of the Press Shop No.2 of No.1 HI which is the main press shop have been considerably worn out. The wear of the press machines causes the deterioration of mechanical performance, depressing the production capacity. This section is one of the main bottlenecks in vehicle manufacturing process. The present plan contemplates the repair and replacement of

deteriorated machines together with the introduction of die changer and trimming machines in order to solve the bottlenecks and ensure the full activation of the existing facilities.

However, for the local production of the thick plate parts and large panel parts such as the disk wheel, main frame, and rear axle housing, etc., the introduction of large-scale press machines considerably surpassing in capacity the existing machines is required, so that the existing press shop cannot meet such requirements. Therefore, it is necessary to construct a new press shop having production lines which perform the processing of the above-mentioned parts for completion. The machines of the new press shop would have a production capacity considerably exceeding that required for the production of vehicles to be supplied to the domestic market. However they would serve to strengthen the production capacity so as to cater to the supply of various spare parts for domestic use and vehicle parts for export.

c) Enhancement and Expansion of Forging Sections

The renovation of the existing facilities and the removing of bottlenecks are planned.

Further, the expansion of the forging capacity will be required for expanding the local production of component parts. As most of those component parts are comparatively larger sized ones, the existing forging machines are unalbe to produce them. Hence, it is planned to install the new forging equipment which meet the size of forged parts to be produced. The new forging machines would be of excessive capacity if they are used only for the vehicle production. However, this planning is to permit the production of forged products to meet the demand of other state corporations and furthermore possible exports of the forged products in the future. The present plan does not take into account the production of the larger-sized forged products such as the crankshaft to be used for the engines of heavy vehicles, and component parts of tractors and rail buses because of much larger-scale forging machines being required.

2-2) Enhancement of Machining Sections Responding to Expansion of Local Production of Metal Parts

In order to expand the local production of the component parts for vehicles, the enhancement and expansion of the facilities are required for the metal processing sections, but also for the machining sections. Most of the items to be taken up for the local production require the setup of exclusive machining lines. Hence the local production of small quantity items would be costly and thus uneconomical.

Nevertheless, among the uneconomical items for the local production, there are some having possibilities of the supply to the domestic market for vehicle spare parts and also possibility of exports. For the future development, it would be worthwhile to undertake the local production of the component parts having such possibilities of increasing the production in the future, even if the production should have to pay some extent of cost penalty at the initial stage. In this context, the plan includes the enhancement of machining sections by taking into account the local production of some components selected from the above viewpoints.

2-3) Component Parts and Raw Materials Required Besides Metal Parts

There are several items other than metal parts of which the localization could be considered. Among these, however, some items might create constraints that affect the main production lines due to several causes despite the fact that the local production would probably ensure the use of domestic resources. The items to be localized must be selected with deliberate examinations. On the other hand, there are some items having potential of supplying to other consumers. The production plan gives priority to such items having high potential for future development. Nevertheless, even in this event consideration would be given to appropriate measures to be taken for protecting the stable operation of the main production lines.

The present conditions of main component parts and raw materials which may be the subject of localization are summalized below:

1. The bulbs for the incandescent lamps: This is already locally produced by the Ceramic Industry Corporation. However, the quality of the local-made bulbs is poor, causing a considerable number of rejects on the manufactured lamps. This leads to a loss of production efficiency. In order to improve the quality of the bulbs, it is important to provide technical assistance to the Ceramic Industry Corporation, although such assistance is excluded from the scope of the Renovation Plan.

2. Plastic parts: Molding using phenolic resins already takes place in the production processes for electric accessories. The present plan is to manufacture plastic parts for electric fans by molding. In future there is a possibility to extend the manufacture of plastic parts to be used for other products. The layout of the molding shop is investigated by taking such future development into consideration.

3. Manganese dioxide: This is a raw material for dry cell batteries. HIC intends to manufacture the manganese dioxide by using locally available manganese ores. However, no conclusion has been reached yet as to whether the local manganese ores are definitely usable or not. Further tests and research are advised.

4. Rubber parts: HIC intends to manufacture rubber parts in a view to the utilization of locally available rubber. It is planned to manufacture rubber parts for vehicles, but in future there is a possibility to manufacture rubber parts to be used for other products. Nevertheless, as the manufacture of some items requires sophisticated technology and large investments, product items must be selected for manufacturing.

4-3-3 Establishment of the Auxiliary Departments Supporting the Renovation and Modernization of Facilities

(1) Establishment of Maintenance System

The initial step is planned to undertake the provision of the machinery and equipment urgently needed for the enhancement of maintenance system and also to commence necessary preparation for the establishment of preventive maintenance system. After that further expansion of the facilities and the system development are to be undertaken.

(2) Acquirement and Accumulation of Production and Engineering Technology

In order to effectively utilize the facilities which have been renovated, the acquirement of appropriate technology is important. Further, the future thrust of HIC should be directed to the development of new products and the improvement of the present products together with commercialization to be performed by its own efforts and subsequently the expansion of production and sales to be strived through the production of those new or improved products for the domestic markets and exports. To this end it is important for HIC to acquire and accumulate engineering technology including the technology for the followings:

1. Design of processes required for manufacturing new products.
2. Design of machine layout for new production facilities and modification of the layout adopted for the existing facilities.
3. Design and production of jigs and dies.
4. Modification of procured machines to meet particular operating conditions.

The above is only possible once the following technology has been acquired and accumulated:

1. Technology for the repair and improvement of jigs and dies.
2. Technology for drafting necessary drawings.
3. Expertise and know-how concerning the mechanism, quality and component parts of the products to be manufactured.

In view of the above requirement, it is planned that the primary acquirement and accumulation of technology be made at the maintenance

shops, and after that the production engineering center be established to perform engineering required for the development and improvement of products and also for commercialization of the developed or modified products.

(3) Enhancement of Calibration System for Measuring Equipment and Instruments

It is urgent that checks and calibration of the measuring equipment, instruments and tools for inspection be carried out. Since the equipment for the check and calibration is not currently available at HIC, it is planned to install those equipment. At the same time, the system for a periodic check and calibration of the measuring equipment and instruments will be established so as to ensure that the measuring equipment, instruments, gauges and tools for inspection are kept at the required accuracy level at all times.

4-3-4 Preparations for Self-sustaining Operation in Future

(1) Establishment of Capability for Improvement and Development of Products

Among the products of HIC, there are some products which cannot satisfy the market needs. Further, there are some products on which modifications may be effective for simplification of mechanical structure or utilization of domestic resources which result in cost reduction and foreign exchange savings. The steps for the improvement and development of products to be undertaken by HIC's own efforts should be firstly to get understanding of the characteristics of component parts through quality analysis of the materials of the component parts, and then proceed with trial manufacture of some component parts and with field tests of the machine assembled by the use of the above-mentioned component parts to check the performance of the machines. To this end it is planned to install the equipment to be used for various types of tests and also for trial manufacture of component parts. At the same time, it is proposed to establish an organization responsible to perform the planning and implementation of improvement and development of products in a systematic manner.

(2) Improvements and Modernization of Production Control

In order to entry the export market in future, it is necessary that efforts should be made to raise the competitiveness of the products of HIC in terms of quality and prices and also to establish other conditions which ensure reliable production. In order to realize these conditions it is planned to pursue the improvement and enhancement of production control placing emphasis on quality control, delivery control, and equipment maintenance. These measures are important for forming the basis for pursuing self-sustaining operation in the future. With future increases in the volume of required production, production control will also be more important as equipment capacity becomes strained. The present plan is to proceed with the improvement and enhancement of quanlity control, schedule and delivery control and facility control as an urgent task. At the same time, the first step for the introduction of a comprehensive production control system in line with future needs is commenced.