

THE STUDY ON HMT RESTRUCTURING AND DEVELOPMENT PROGRAM IN INDIA

EXECUTIVE SUMMARY

MARCH 1992

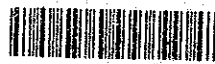
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EXECUTIVE SUMMARY REPORT
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I. INTRODUCTION

A. OUTLINE OF THE STUDY

This is the Executive Summary Report of the HMT Restructuring and Development Program. The study has been conducted based on the Scope of Work agreed between the Government of India and the Japan International Cooperation Agency (JICA) on November 22, 1990.

The report consists of the following three volumes:

Executive Summary

Main Report

Volume I : Diagnostic Overview and Corporate Plan

Volume II : Action Programs

B. OBJECTIVE OF THE STUDY

The objective of the study is to propose a comprehensive corporate strategic plan for physical and organizational restructuring and development of HMT's operations covering product mix, organization, management systems and prospective investment areas in order to improve its competitive position, profitability, export performance, domestic market shares and coverage, and based on the plan, to formulate investment plans and action programs for physical and organizational restructuring and improvement.

As a result, the restructuring of HMT would contribute to the development of the capital goods sector in India.

The study was divided into the following two phases:

Phase I: Corporate Strategy

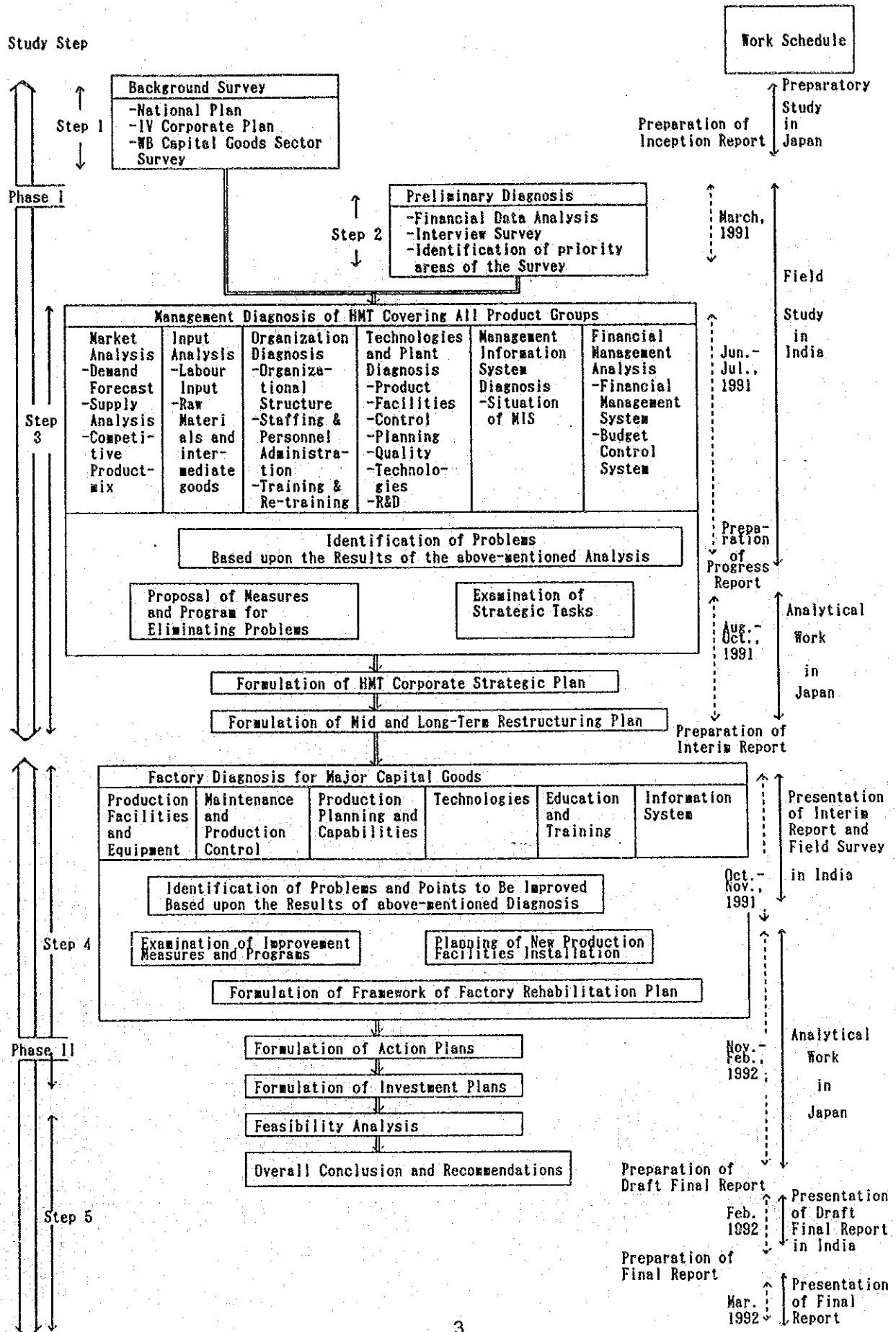
Based upon the results of diagnostic overview of the current business operations of HMT, a comprehensive corporate strategic plan for physical and organizational restructuring was proposed.

Phase II: Action Plan

Based on the corporate plan established in Phase I, for the major capital goods, viz. machine tools, tractors, press machines, printing machinery and castings and for the management system, viz. management information system, mechatronics training or productivity improvement activities, strategic action programs and investment plans were formulated and the pre-investment studies for these programs were conducted.

The overall framework of the study is shown in Fig. 1-1.

Fig. 1-1 Overall Framework of the Study



II. DIAGNOSTIC OVERVIEW

A. OUTLINE OF HMT OPERATIONS

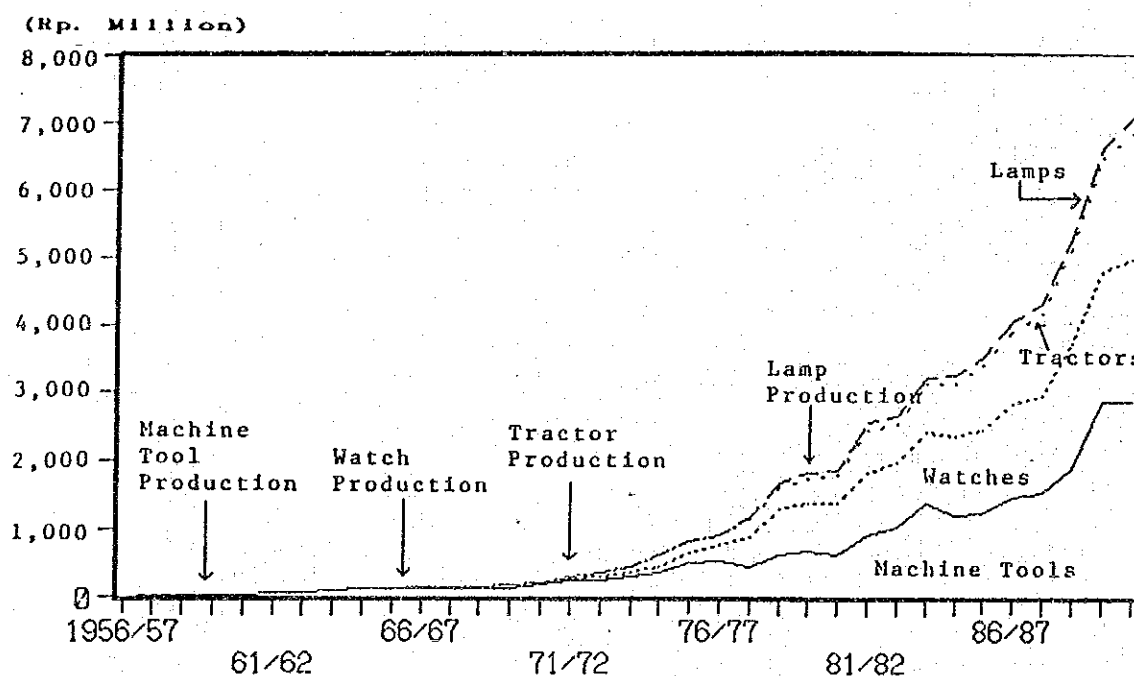
1. Sales Flow

Since being set up at Bangalore in 1953 with the objective of producing a limited range of machine tools of the value of Rs. 50 million per annum, HMT has grown into a giant, with 16 units (22 divisions) spread over ten states, producing goods worth nearly Rs. 7.5 billion (1990/91).

This rapid growth was mainly supported by the corporate strategy to diversify its product range. The years in which the major diversifications, away from machine tools, were undertaken are as follows:

1961/62	: Watches
1971/72	: Tractors
1972/73	: Printing machinery
1976/77	: Lamps
1980/81	: Dairy machinery

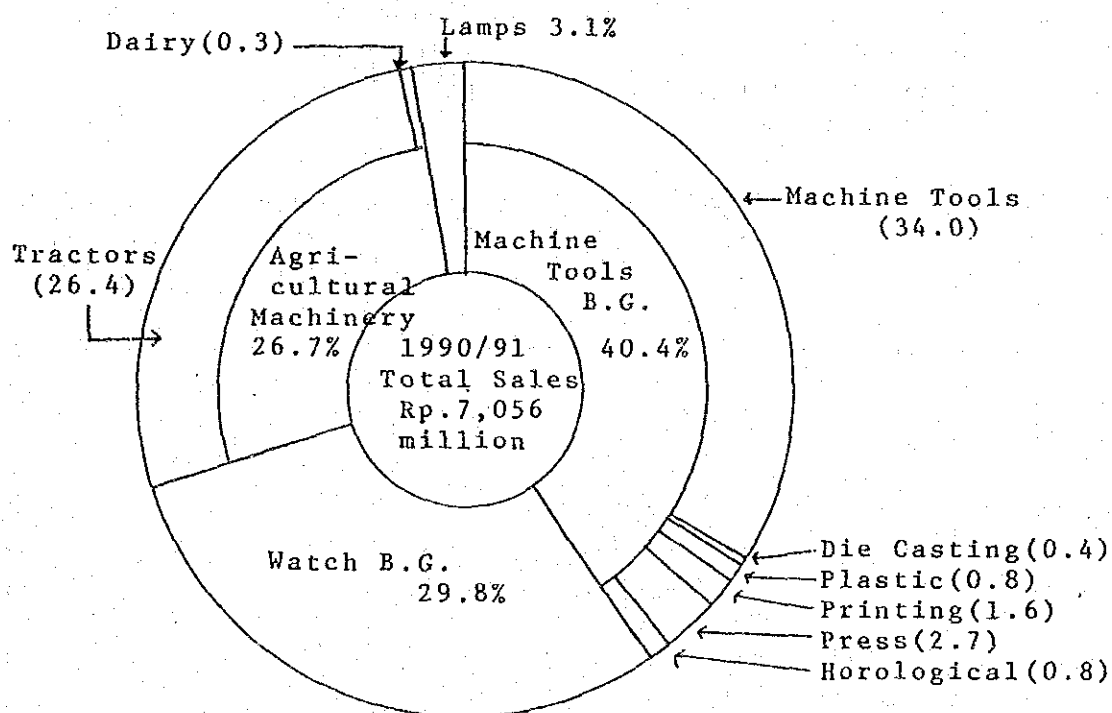
Fig. II-1 Flow of HMT Sales



2. Business Composition

Presently, HMT is producing a wide range of capital and consumer products, including a full spectrum of general purpose machine tools, sophisticated machine tools such as CNC turning centers, machining centers, CNC turret punch presses, etc., printing machinery, dairy machinery, tractors, watches (from handwound watches to top-line quartz analog watches) and lamps including fluorescent and sodium vapor lamps.

Fig. 11-2 HMT Business Composition in 1990/91



In addition, HMT has the following three subsidiaries:

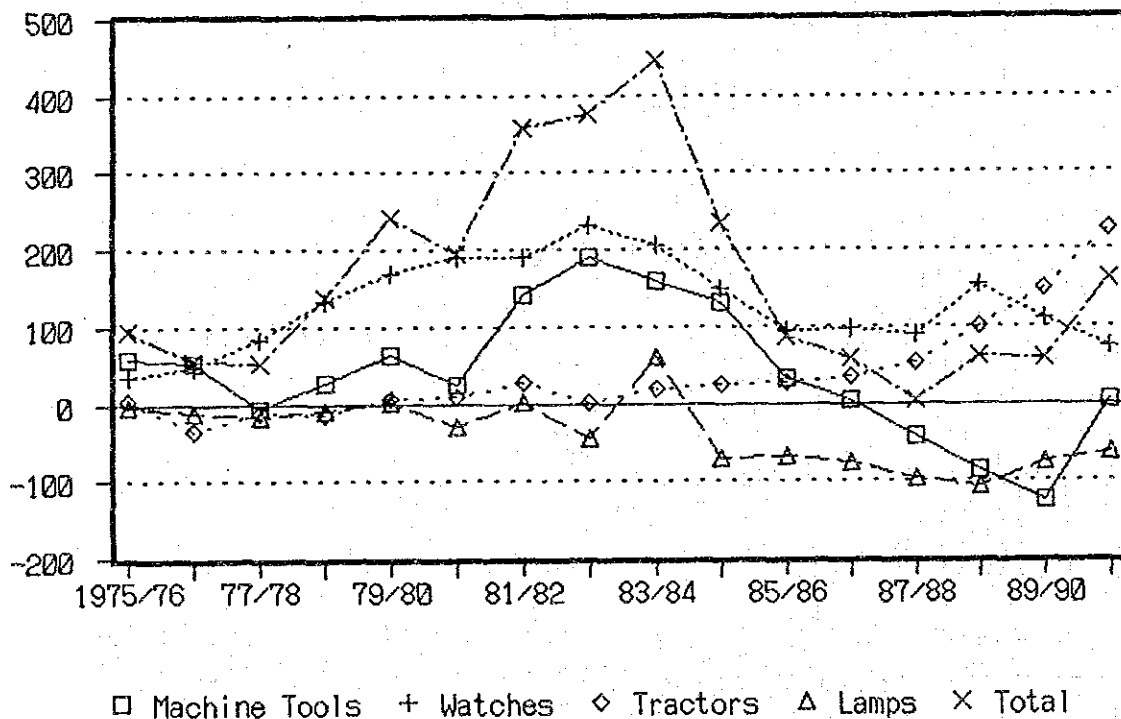
Company name	Sales(1990/91)	No. of Employees
HMT International Ltd.	Rs. 472 million	154
HMT Bearings Ltd.	Rs. 301 million	917
Praga Tools Ltd.	Rs. 467 million	2,249

3. Profitability

Table 11-3 shows the flow of profit (before tax) of HMT by business group. The general trends are as follows:

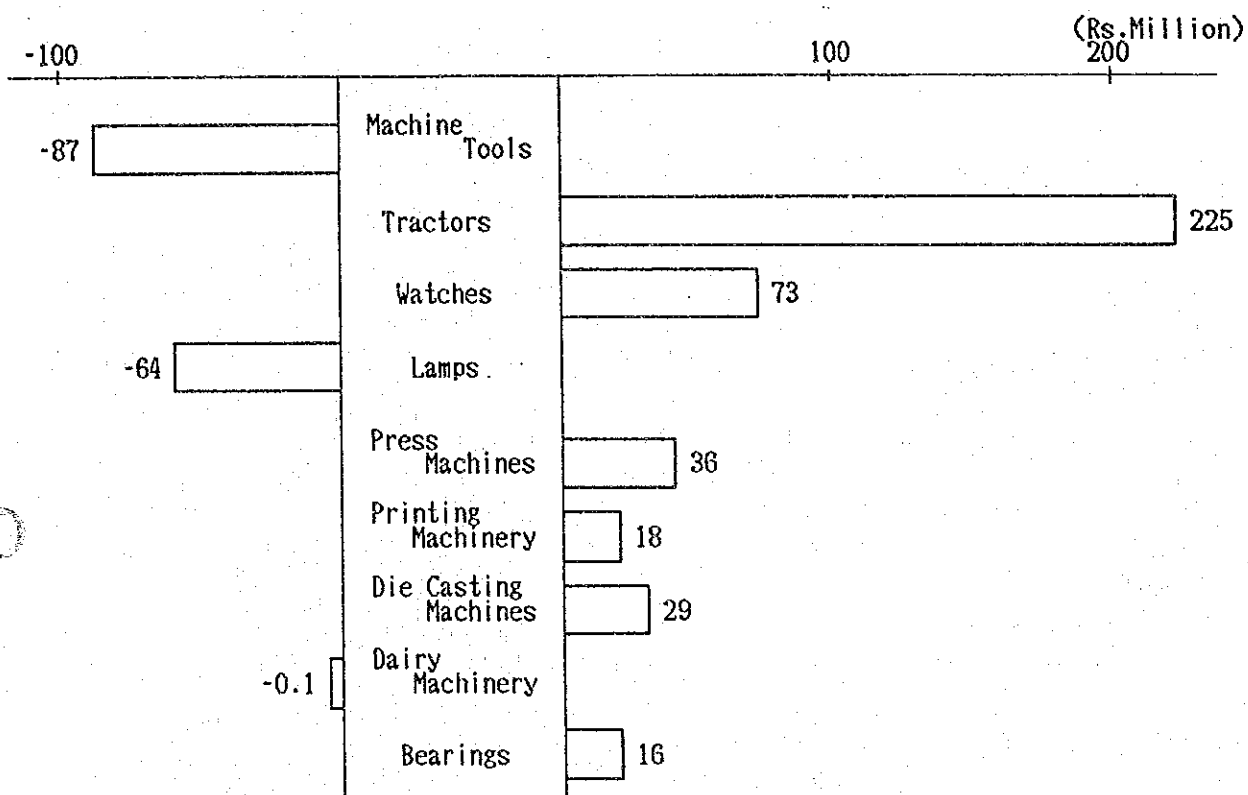
- (1) In spite of its sales volume, the profitability of the Machine Tool Business Group is low, and shows a declining tendency after 1983/84.
- (2) The profit of the Watch Business Group which supported the profitability of HMT as a whole in the past is decreasing.
- (3) The performance of the Tractor Division was excellent during the recent decade, and is currently supporting the total profitability of HMT.
- (4) The performance of the Lamp Division has been very bad and recorded a fairly large amount of losses since the initiation of the operation.

Fig. 11-3 Flow of HMT Profit before Tax by Business Group



The profitability by product group also varies quite largely.

Fig. II-4 Comparison of Profit (before Tax) by Product Group



4. Total Performance of HMT

Although the profitability of HMT has deteriorated considerably in the past decade, the financial position of HMT is still sound.

HMT INCOME STATEMENT

	1981/82		1990/91	
	Crores	%	Crores	%
Sales & Stock				
Accretion	27,190	100.0	78,063	100.0
Materials	13,964	51.4	39,724	50.9
Personnel	4,909	18.0	17,066	21.9
Other Costs	2,440	9.0	13,298	17.0
Depreciation	984	3.6	2,164	2.8
Earnings before				
Interest and Tax	4,893	18.0	5,811	7.4
Interest	1,335	4.9	4,253	5.4
Earnings before				
Tax	3,558	13.1	1,558	2.0
Taxation	1,100	4.0	150	0.2
Net Earnings	2,458	9.0	1,408	1.8

HMT BALANCE SHEET

	1981/82	1990/91	Change
Net Fixed Assets	8,955	16,177	+7,222
Current Assets	23,113	59,534	+36,421
Investments	246	1,548	+1,302
Total Assets	32,314	77,259	+44,945
Current Liabilities	10,209	22,857	+12,648
Borrowings	10,901	29,873	+18,972
Net Equity	11,204	24,529	+13,325
Total Liabilities	32,314	77,259	+44,945

B. BUSINESS ENVIRONMENT OF HMT

1. Liberalization of the Indian Economy

Until now, the operation of HMT has been largely affected by the following business environmental factors, which are unique from an international viewpoint:

- (1) The Indian economic structure is mainly based on a planned economy;
- (2) The Indian economy is still under-developed in general, and
- (3) There are a variety of socio-political requirements for HMT as a public sector enterprise.

Due to the inherent problems in the current structure affecting the Indian economy as a whole, the above basic factors are going to change swiftly. The key factor for these changes could be summarized in one phrase, "Liberalization of the Indian Economy."

The capital goods industry, especially, has been witnessing delicensing measures over a period of time on the ground that it is a priority area for development, that it plays a certain role in terms of technology acquisition and that the efficiency increasing effects of competition are even more important in capital goods industries than in others since inefficiencies in this sector rapidly propagate to the rest of the economy.

As a result of recent liberalization measures, the capital goods sector is already subject to competitive pressures arising from the greater relative ease of entry and expansion.

These changes inevitably require the improvement of the efficiency of HMT operations, and an increase of the international competitiveness of HMT products.

2. Privatization of Public Sector Enterprises (PSEs)

Recently in India, there has been a growing disenchantment with the public sector enterprises (PSEs) because of (1) the perceived inefficiencies of many PSEs, (2) the inability of the Government to meet the growing investment demand and (3) the emerging aggressive capital investments in the private sector.

Although the number of actual cases of privatization of PSEs under the control of the central government is still very limited, it has become evident that the pace of privatization of PSEs will pick up in the years to come.

Under the above circumstances, the following investigations were made by the Study Team:

- Recent Indian Government moves for privatization of PSEs.
- Pros and cons of the privatization of HMT
- Alternative structures and measures for privatization

From the results of the above investigations, the following basic strategies for the privatization of HMT have been drawn.

- (1) The privatization of HMT as one entity should be gradually promoted through the issue of new equity to the public making use of the stock capital market, and by the long-term target year of 2000 (at the latest) full privatization of HMT should be achieved.
- (2) In spite of the above, if the watch business activities are separated and a separate company were established, that company should also be privatized in the same way as the main HMT.
- (3) The establishment of joint ventures with foreign companies having advanced technology and international marketing capability should aggressively be promoted, for which the privatization of some units of HMT would be accomplished through the sale of assets or shares of minor units or subsidiaries of HMT to joint venture partners.

III. DIRECTION OF BUSINESS MIX

A. CURRENT PRODUCTS AND MARKETS

1. Major Indices

For the current product line of HMT, the market attractiveness and the market strength of HMT were evaluated making use of the following indices:

Market Attractiveness : Market Size
Market Potential (Sales Growth)
Profitability
Market Strength of HMT : HMT Market Share
Degree of Competition

The basic indices for evaluation are briefly summarized as follows:

Table III-1 Major Indices for Market Evaluation

Product Group	Market Size (Rs.Mil) (At Present)	HMT Sales (Rs.Mil) (1990/91)	HMT Sales Growth (85/86-90/91)	HMT Profit (Rs.Mil) (1990/91)	HMT Profit Turnover Ratio (%) (1990/91)	HMT Market Share (%) (1990/91)
Machine Tools	9,408	3,139	17%	-86.6	-2.8	33%
Die-Casting Mac'nes	30	28	-10%	21.9	22.9	90-95%
Plastic Molding Machines	960	68	80%			7%
Presses	390	175	18%	36.2	20.7	45%
Printing Machines	460	127	31%	16.0	12.6	28%
Tractors	17,000	2,061 *3	15%	224.9	10.9	12%
Dairy Machines	1,500 *1	35	3%	-0.1	-0.0	2%
Watches	10,000 *2	2,478	12%	72.8	2.9	25%
Lamps	5,600	237	13%	-83.9	-35.3	4%
Bearings	8,200	305	14%	15.8	5.2	4%

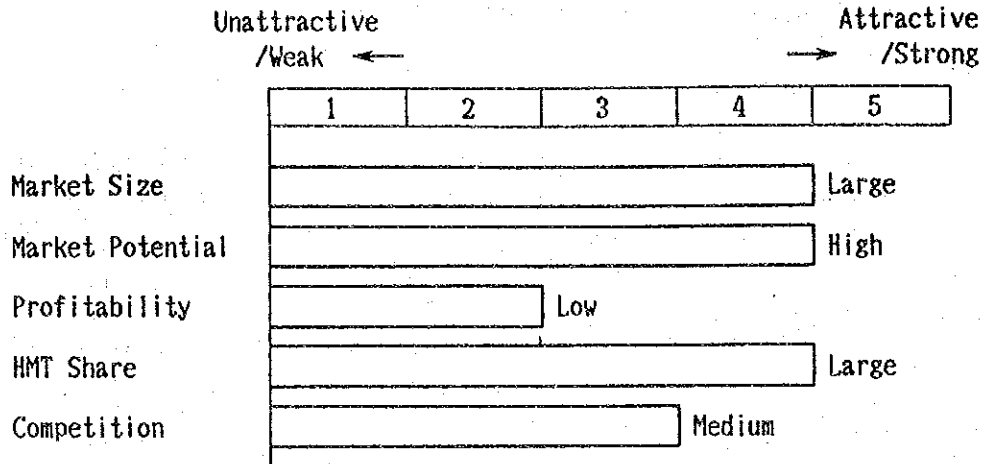
*1 Including unorganized sector production

*2 Including imports

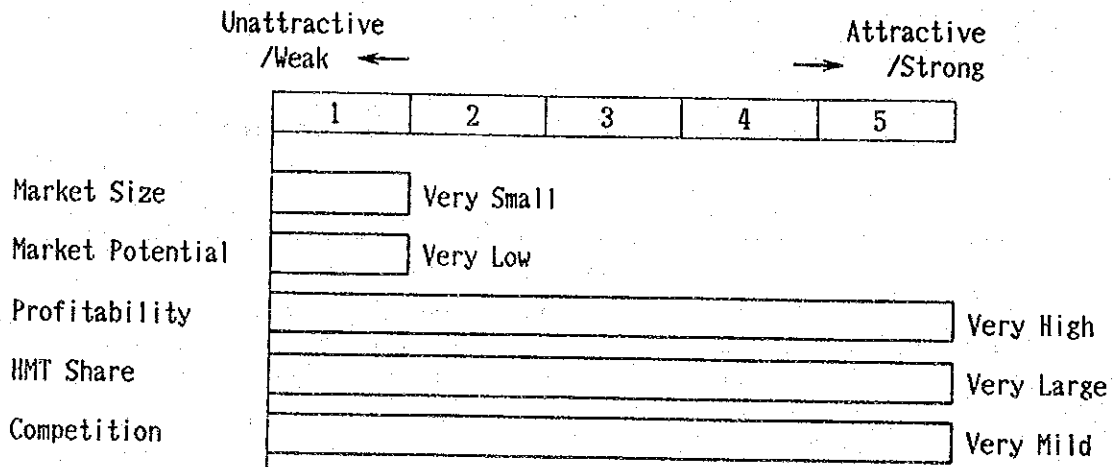
*3 Including sales tax

2. Results of Market Evaluation

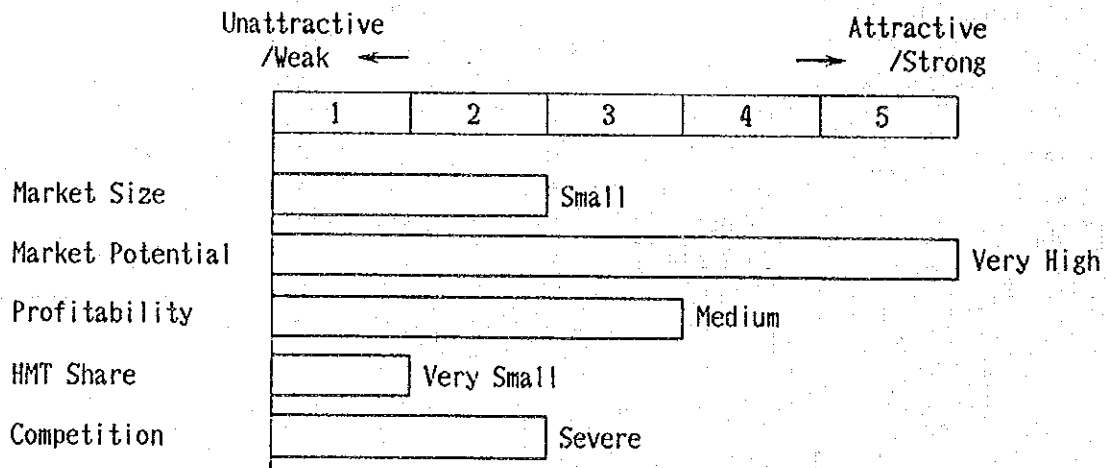
(1) Machine Tools



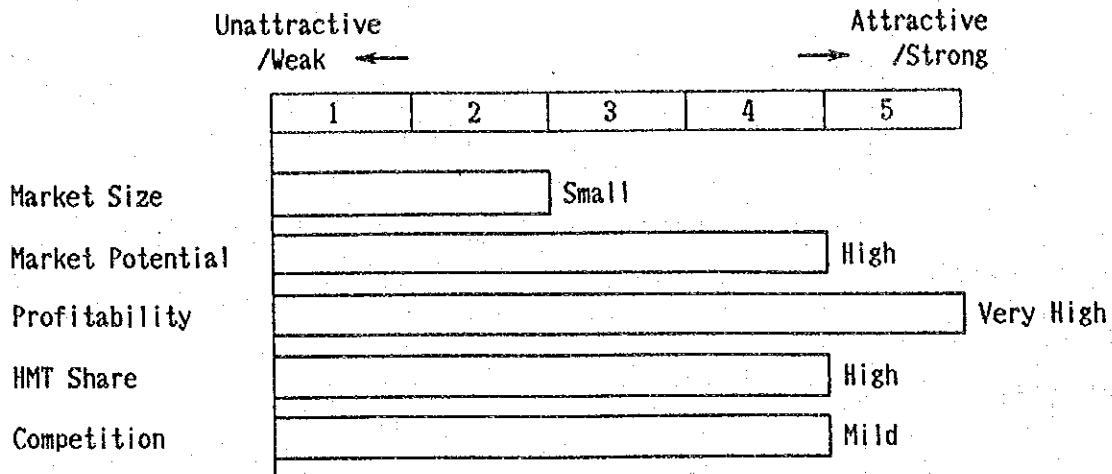
(2) Die Casting Machines



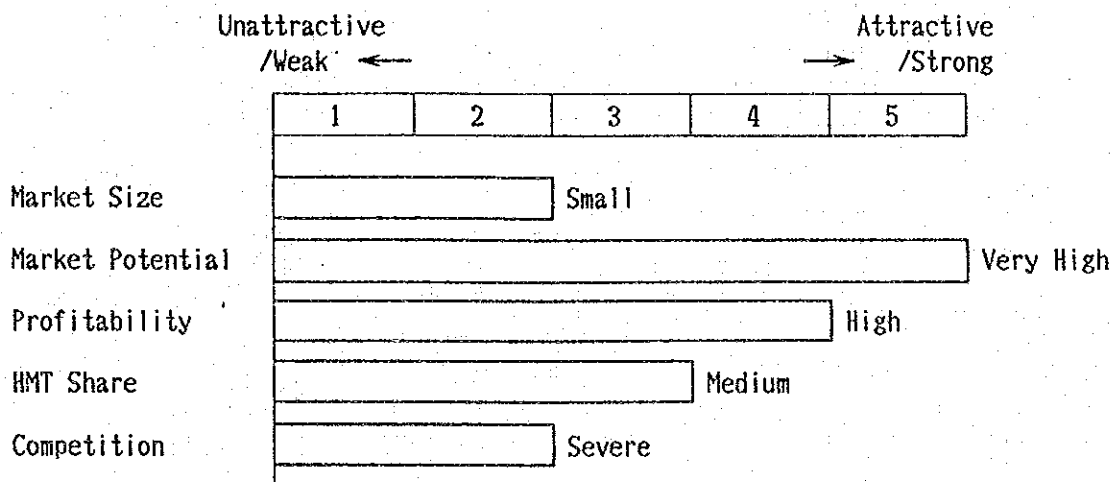
(3) Plastic Machines



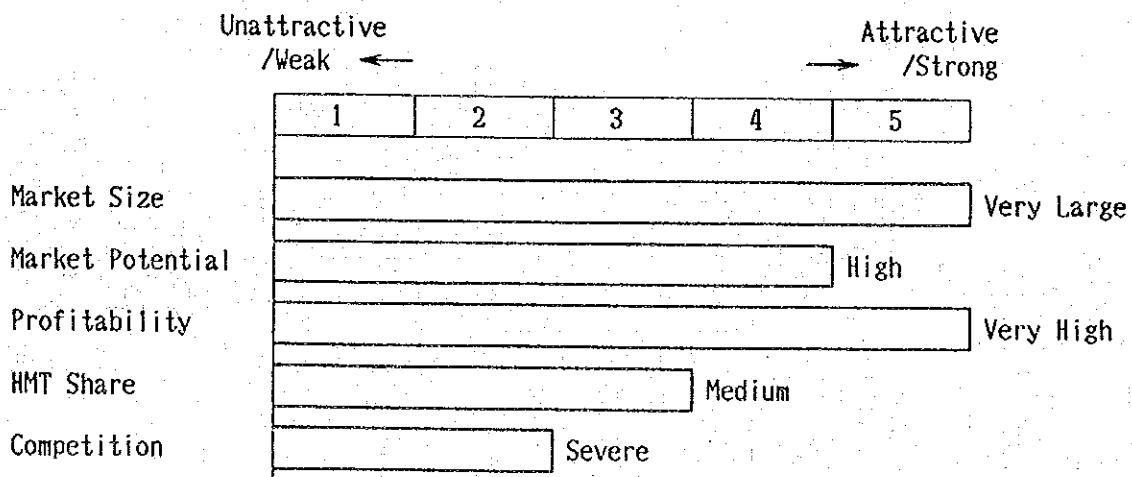
(4) Press Machines



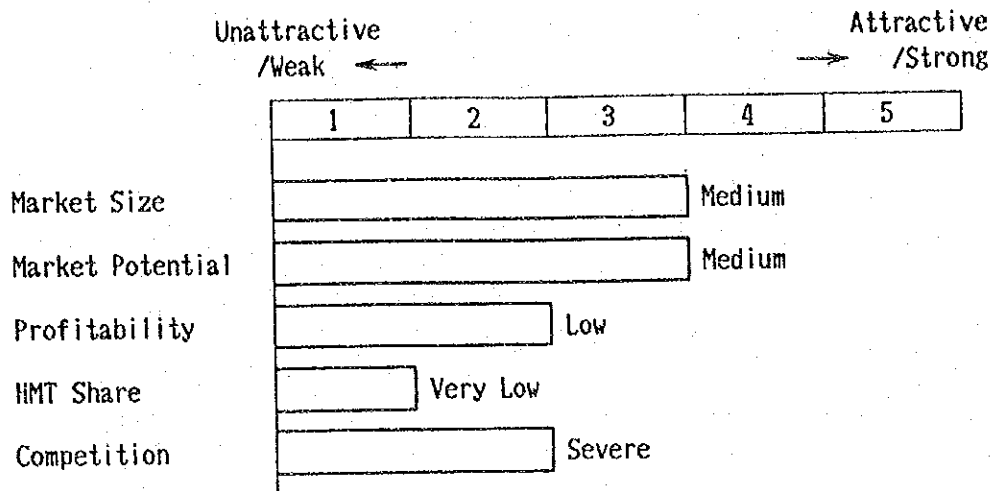
(5) Printing Machinery



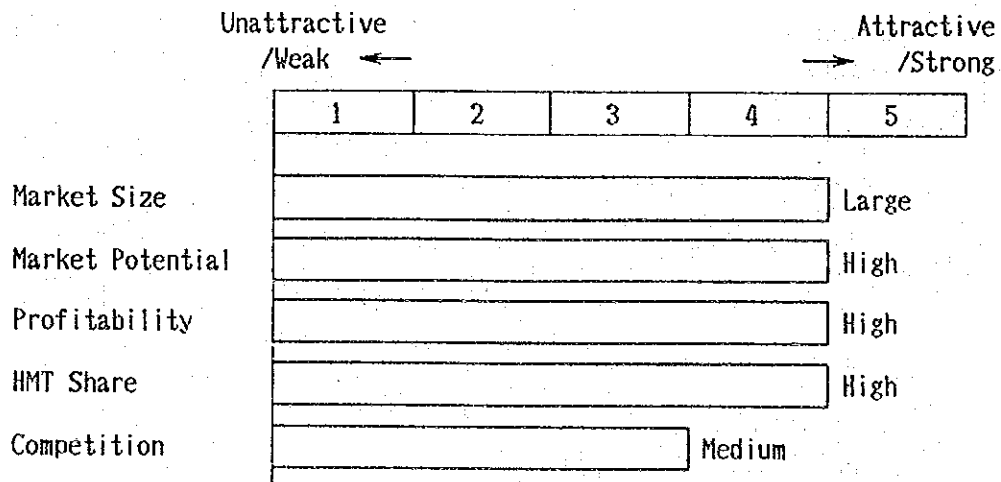
(6) Tractors



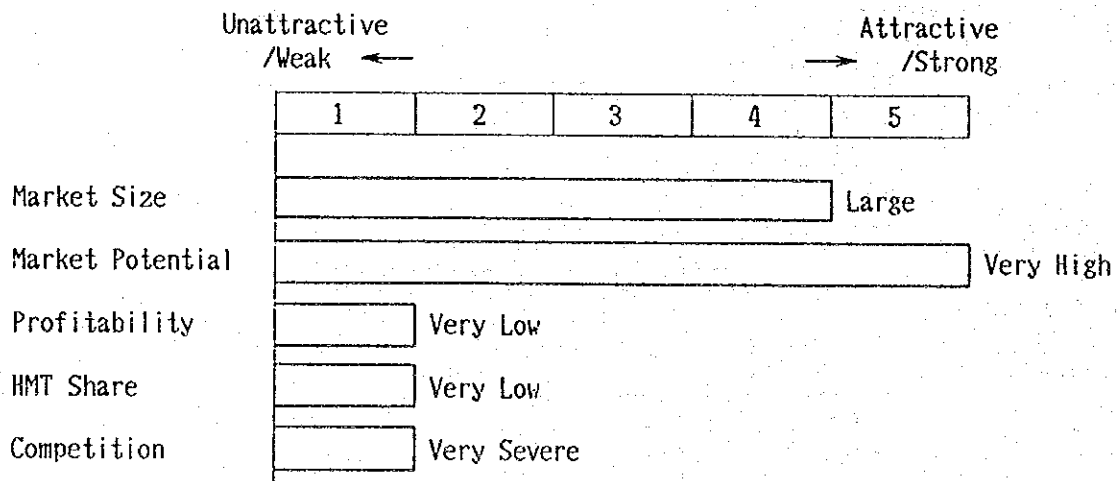
(7) Dairy Machinery



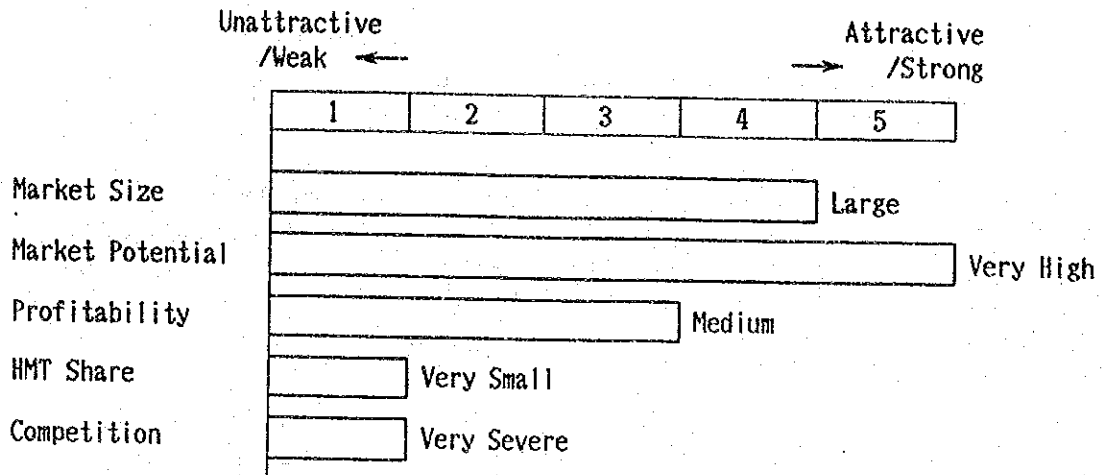
(8) Watches



(9) Lamps



(10) Bearings



B. DIRECTION OF FUTURE BUSINESS MIX

Based on the results of the review of current business operations of HMT and the market evaluation, the following guidelines are suggested for the future business mix of HMT.

- (1) Although the profitability is not very high, the machine tool business should be developed as the driving force of the company's growth and business diversification. The existing models have to be integrated into a smaller number of selected items, and the CNC ratio increased.
- (2) The development of such consumer products as watches and lamps should be achieved by giving higher autonomy and flexibility in order to meet to the rapid shift of market demand. The promotion of capital and technical tie-ups would also be needed in this area.
- (3) With the growing market demand and the shrinking market share of HMT products, the production capacity of tractors has to be expanded considerably.
- (4) Despite the current low market share of HMT products, those industrial machinery businesses such as printing machinery, press machines, plastic machines, food processing machinery or other industrial machinery have a large market potential. The development of these businesses as a group has to be achieved as a core business group for future business diversification of HMT. The most aggressive policy for the promotion of capital and technical tie-ups with foreign manufacturers having advanced technologies and marketing know-how is to be taken.
- (5) The outside sales of the engineering components such as castings, forgings or ball screws have to be expanded by separating the sections producing these products from Machine Tool Units.
- (6) In spite of its market attractiveness, those units which are producing lamps, bearings, plastic machinery or food processing machinery (which would be de-

veloped from dairy machinery) are not receiving sufficient fruits due to the weak competitiveness in technology, sales promotion capabilities and brand names. It would be urgently needed for these units to increase competitiveness by establishing both capital and technical tie-ups with prominent manufacturers in the fields.

Fig. III-1 Trends of HMT Business Mix

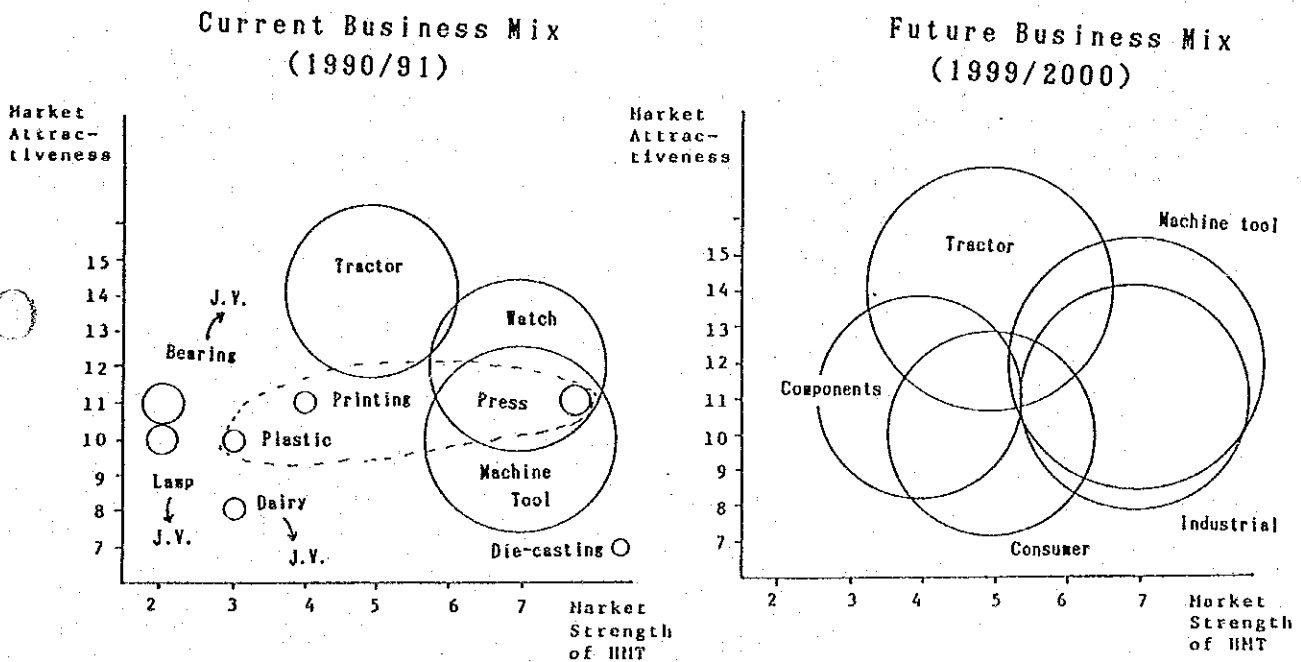
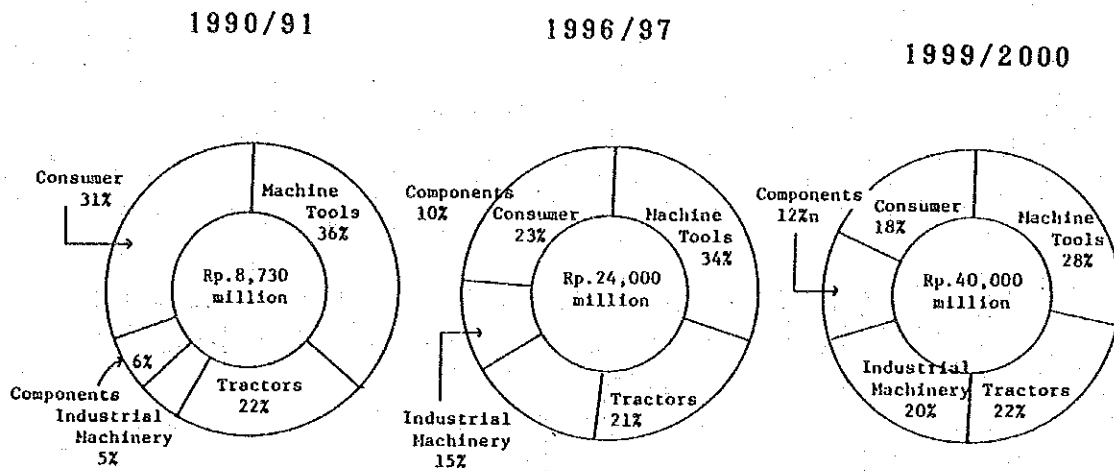


Fig. III-2 Flow of HMT Business Composition



IV. HMT'S CORPORATE PLAN

A. LONG-TERM CORPORATE VISION

1. Corporate Mission

CORPORATE MISSION OF THE NEW HMT INTO THE 21ST CENTURY :

- 1) To lead Indian industry in the establishment of and modernization into high-tech manufacturing areas;
- 2) To establish itself as one of the world's premier companies in the engineering field having strong international competitiveness; and
- 3) To present an active pleasant working environment.

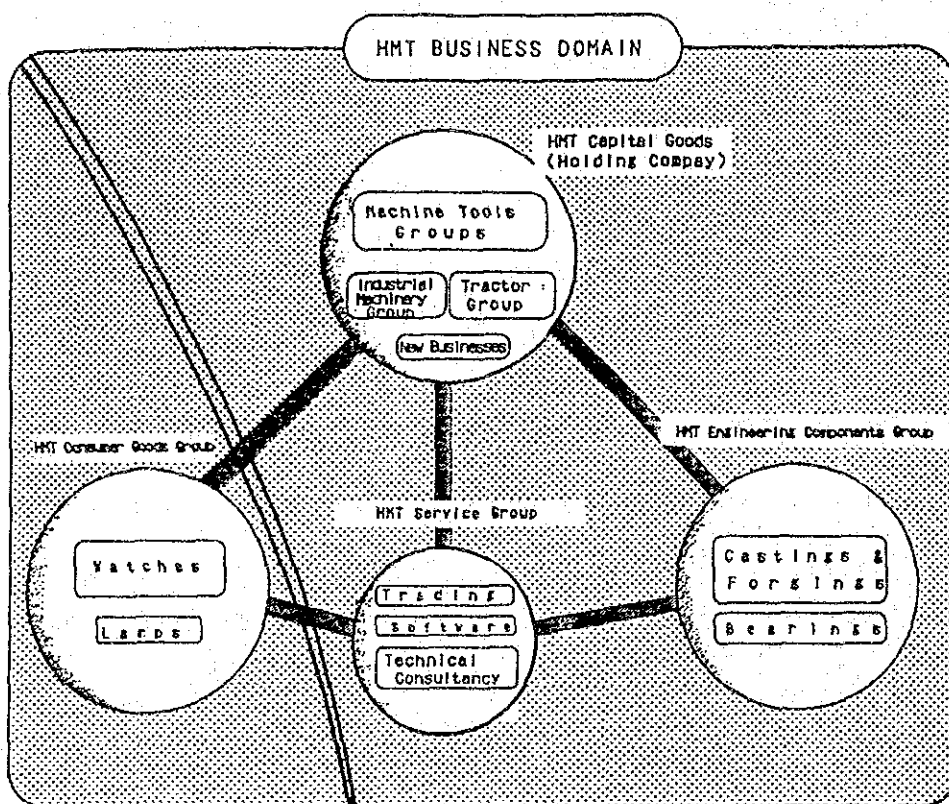
2. Corporate Goals

- 1) To achieve market leadership in India through ensuring customer satisfaction by supplying internationally competitive products and services;
- 2) To encourage the modernization of Indian industry through the supply of engineering goods and services of world class excellence;
- 3) To maintain technological leadership through continuous efforts to update product technology and manufacturing methods;
- 4) To globalize the company's operations by developing a mix of international markets and businesses;
- 5) To ensure a satisfactory return on capital employed to meet the growth needs and the aspirations of the Company's stockholders;
- 6) To improve and sustain the quality of worklife for employees through enhancement of human skills and working morale; and
- 7) To encourage the development of ancillaries and small industries and to improve the environment in the vicinity of the company's operations.

3. Business Domain

The Business Domain of the New HMT is an upgrading of the country's engineering production technology level, which is mainly based on mechatronics technology.

Fig. IV-1 Business Domain of HMT Group



4. Macro Target of HMT

Table IV-1 Macro Growth Target of HMT Group

(Unit: Rp. million)

	1990/91	1996/97	1999/2000
Annual turnover	8,730	24,000	40,000
No. of employees	30,870	28,500	26,500
Net profit	145	720	2,400
in target years			
Major business lines			
Machine tools	36%	30%	28%
Tractors	22%	21%	22%
Industrial Machinery	5%	15%	20%
Engineering Components	6%	10%	12%
Consumer Products	31%	24%	18%

B. BASIC STRATEGIES

In order to achieve the long-term corporate targets of HMT, the following 5 basic strategies are recommended:

- 1) Organizational Restructuring;
- 2) Modernization of Production Facilities;
- 3) Promotion of Productivity-improvement Activities;
- 4) Promotion of Mechatronics Technologies;
- and
- 5) Intensification of Export Promotion and Expansion of International Operations.

1. Organizational Restructuring

- (a) Listing of Stock of HMT on the Capital Market and the Gradual Privatization of HMT

The privatization of HMT should be promoted in steps through the issue of new equity to the public in the capital market, and, at least by the long-term target year of 1999/2000, full privatization (the majority share of the government would be transferred to the private sector) of HMT should be achieved.

- (b) Reform of the Organizational Structure of HMT

- 1) The current business groups should be recast into new Business Groups.
- 2) In the major Business Groups of machine tools, watches and tractors, the unit of the profit center should be shifted from the current unit (factory) to each business group.
- 3) The management structure of HMT in each section should be made simpler by reducing the number of management positions.

(c) Improvement of Personnel Management Systems

- 1) A more result-oriented personnel remuneration system should be introduced.
- 2) The present incentive scheme, mainly based on the standard hour output, should be changed into a genuine productivity-linked system.
- 3) A more result-oriented promotion system and bonus system should be established.

(d) Establishment of a Strategic Management Information System (MIS)

The establishment of a strategic MIS should be promoted with major emphasis on "standardization", "integration" and the introduction of "Electrodata Interchange (EDI)".

(e) Establishment of Joint Ventures with Foreign Companies

The establishment of joint ventures with foreign companies having advanced technology and international marketing capabilities should be aggressively promoted, for which the privatization of some units of HMT would proceed through the sale of shares or assets of minor units or subsidiaries of HMT to joint venture companies.

(f) Development of Ancillary and Other Related Industries

With the twin purpose of (1) extending the benefits of the expansion of HMT's businesses into its neighboring society, and (2) increasing HMT's product quality and cost competitiveness, support to ancillaries and other related subcontracting companies should be further promoted. The Worker Entrepreneur Tiny Ancillary Complex (WETAX) scheme which has already been launched by HMT should be further expanded. The support provided to other subcontracting companies in terms of technical know-how, management skills, procurement of critical raw materials, jigs and fixtures or in training should also be increased.

2. Modernization of Production Facilities

(a) Modernization of All Production Facilities of HMT in Phases

The production facilities of almost all units of HMT should be drastically modernized in phases with the aim of (1) raising efficiency, (2) expanding production capacities, and (3) making them "model factories of advanced manufacturing technologies."

(b) Urgent Modernization of Strategic Factories

Because of limited internal resources in HMT, certain strategic factories should be selected for modernization, focusing on efficiency improvement, production capacity expansion and setting a precedent for other factories. Investments for such modernization should be implemented immediately.

3. Promotion of Productivity-Improvement Activities

(a) Change of Work Culture of HMT

For building into the system steps which are necessary for continuous productivity improvement, a productivity improvement scheme should be developed in which all management elements are integrated. The scheme should be upgraded step by step from a basic improvement program to a complete change of work culture of HMT.

(b) Initiation of Productivity Improvement Program (PIP)

Making use of a basic program, an experimental introduction of a Productivity Improvement Program (PIP) should be implemented, and a complete PIP best suited for HMT should be established.

(c) Extension of PIP to All Units of HMT

The application of PIP should be extended to all units of HMT, and sustained up to the level that the improvement activity becomes routine and customary behavior throughout the organization.

4. Promotion of Mechatronics Technologies

(a) Establishment of a Mechatronics Center

A Mechatronics Center both for training and promotion of R & D in advanced mechatronics technologies should be established.

(b) Intensification of Training of HMT Employees in Mechatronics Technologies

Together with the modernization of HMT factories, an intensive training program should be implemented for HMT employees.

(c) Intensification of Customer Training in Mechatronics Technologies

Customer training in mechatronics should be intensified in order to increase sales of CNC machines, FMC, FMS and other factory-automation related engineering products.

(d) Promotion of Integrated R & D Activities within HMT

Centralized R & D activities in CNC (Mechatronics) technology should be promoted primarily with the aim of developing such technologies as basic design for CNC machines, FMS and FMC software, auxiliary equipment for FA, and software for CIM design preparation by the host computer.

5. Intensification of Export Promotion and Expansion of International Operations

(a) Export Promotion

Through the following measures, the export capability of HMT should be strengthened:

- 1) The development of exportable products based on the analysis of international market needs.

At the initial stage of development, higher emphasis will have to be placed on those cost-competitive products such as GPMs, mechanical and automatic watches, and castings. At the latter stages, the development of exportable high-tech products would be necessary.

- 2) The strengthening of marketing capabilities of HMT(I).

Together with the expansion of an exportable product range produced both by HMT and other Indian companies, the international marketing strength of HMT(I) would be increased.

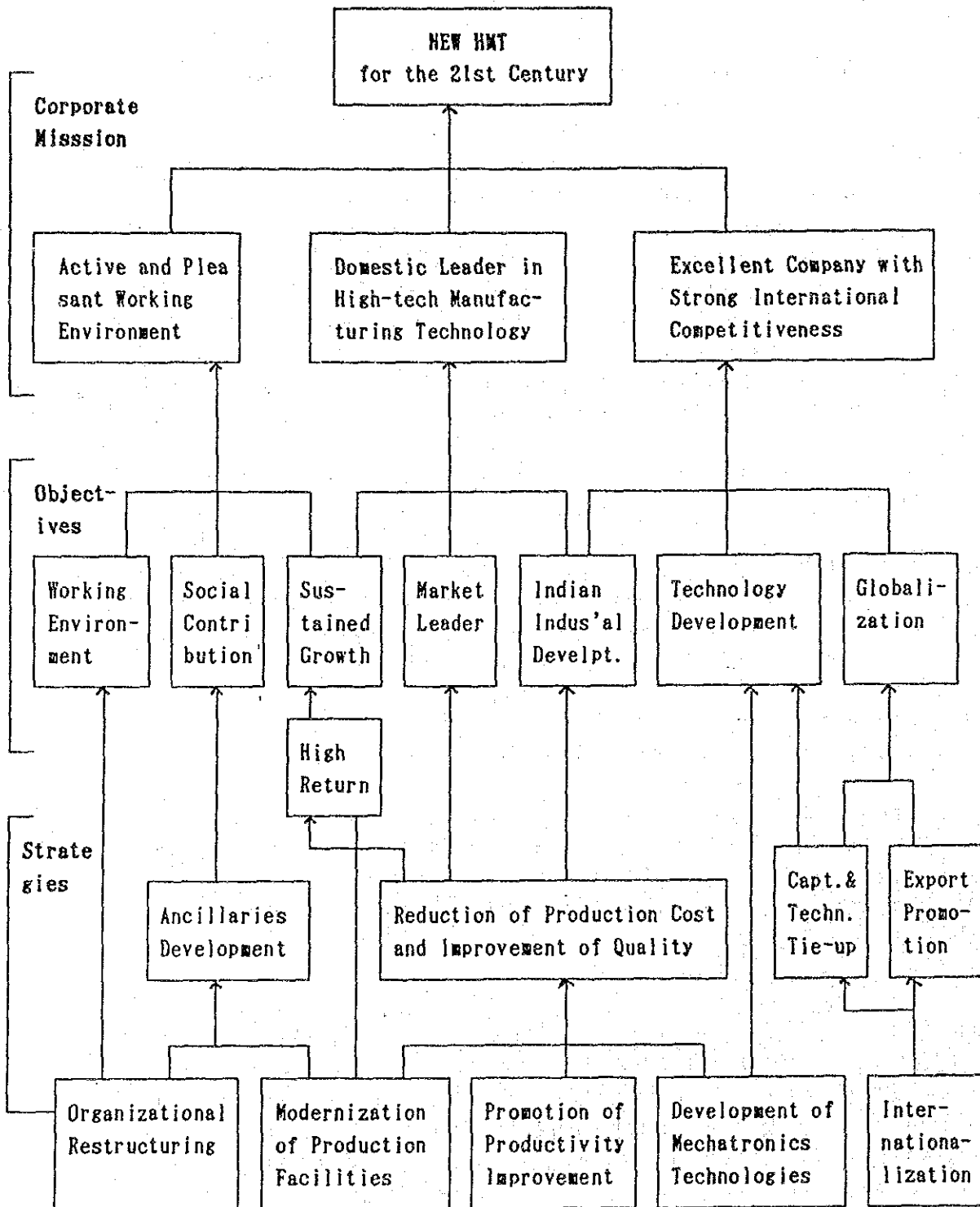
(b) Promotion of Capital and Technical Tie-ups and Strategic alliances with Foreign Companies

With the aim of acquiring the most advanced technologies and also international marketing skills, capital and technical tie-ups with leading international companies in respective fields should be aggressively sought.

(c) Increase of Overseas Investments

In order to achieve international cost competitiveness, the selection of production bases should be examined from a global perspective. Also, for the establishment of an international marketing network, it is necessary to establish sales or maintenance service companies in major overseas countries. Overseas investments should be made taking the economic viability for each project fully into consideration.

Fig. IV-2 HMT Corporate Mission, Objective and Strategies



C. UNIT-BASED STRATEGIES

1. Machine Tools

(a) Growth Target

	1990/91	1996/97	1999/2000
Sales Turnover (Rs. million)	3,139	7,370	11,500
Production Share	33%	54%	55%
Annual Growth Rate	17% (85-90)	15% (90-96)	16% (96-99)

(b) Basic Strategy

To maintain HMT's position as the leader in the machine tools industry in India by supplying high-technology products and enhancing its market share.

In order to achieve the objective, the following strategies should be adopted:

- To increase the production share of CNC machines to 60% by 1999/2000 by steps, in accordance with the shift of market demand;
- To integrate and reduce the number of GPM models in line with the introduction of new CNC models;
- To strengthen the competitiveness both in price and quality through the modernization of production facilities and processes;
- To acquire high-level technologies, especially in such high-tech products as CNC machines, FMC or FMS through technical collaborations;
- To merge the present operations of Praga Tools, which is currently one of the subsidiaries of HMT, into those of the machine tool business group of HMT.

(c) Necessary Measures by Function

i. Product Mix

- To rationalize (eliminate and integrate) the existing models and reinforce CNC models;
- To increase the CNC ratio to 40% in 1994/95 and to 60% in 1999/2000;
- To re-allocate products to units according to the product restructuring plan.

The following restructuring and re-allocation of products among units would be proposed.

Unit	Production Items		Positioning of Unit
	CNC	GPM	
MTB	Large machining centers, FMS, FMC, Auxiliary Equipment, etc.	Radial drilling machine RM series Gear Cutting, etc.	Center of technologies
MTP	Machining centers, CNC milling machines	Milling machine FN series, etc.	Specialize in MCs and CNC milling machines
MTK	CNC turning lathe (including vertical-type)	Turning lathe NH series	Specialize in CNC lathes
MTH	Large machining center, FTL, Planomillers, Auxiliary equipment, etc.	All types of horizontal boring machines, SPMs, etc.	Specialize in large machines and SPMs
MTA	CNC cylindrical grinder	Grinders (including tool and centerless)	Specialize in grinders
HMB	Precision Machine Tools	Automated precision press, etc.	Specialize in precision machine tools

ii. Marketing

- To make marketing activities more responsive to market forces;
- To capture as high a market share as possible for strategic products such as CNC machines.

For the above, the following should be carried out:

- To secure quicker and more firm deliveries;
- To give salesmen more authority in negotiations;
- To reinforce the market monitoring system in order to identify customer needs and find potential customers;
- To examine the use of authorized dealers ; and
- To integrate the operations of Praga Tools.

iii. R & D

- To promote R&D in basic CNC systems technology;
- To promote the design development of CNC machine tools;
- To establish a central technology research institute for the study of CNC technologies;
- To utilize large-scale computers for the modernization of design and for the management of information technologies.

iv. Production

- To modernize production technologies;
- To renovate existing production facilities of Machine Tools, Bangalore as a strategic factory for modernization;
- To renovate all other factories based on MTB expansion experience by the target year of 1999/2000.
- To set up large-scale computers for production control.

v. Others

- To hold periodic general managers' meetings for inter-unit communication and information exchange, especially in technical areas.

(d) Major Investment Plans

i. Plant modernization

The following modernization plans should be implemented in Phases and completed by the target year of 1999/2000.

Unit	Purpose	Content of Investment	Size of Investment*	Expected Effects
MTB	Technological foundation for the System Construction	First step of investment plan - Facility for stand-alone CNC machines	100	-Cost reduction -Development of software
MTP	Manufacturing facility of MCs and milling machines	- Existing three GPSs - One new CNC machine	40	-Expansion of production -Cost reduction
MTK	Manufacturing facility of TCs and lathes	Second step of investment plan -Facility of FMC -Existing 8 - 12 GPMs -One FMC	65	-Expansion of production -Cost reduction
MTH	Manufacturing facility of large-size machines and SPMs	Third step of investment plan -Establishment of FMS -Existing 25 - 50 GPMs -One FMS	40	-Flexible use of facilities -Cost reduction
MTA	Manufacturing facility of grinders		30	-Cost reduction
HMB	Manufacturing facility of Precision Machines		15	Technology in Precision Machining

*Relative size of Investment amount setting Investment in MTB at 100.

ii. Establishment of the Central Technology Research Institute

iii. Establishment of Computer Center

2. Industrial Machinery

(a) Growth Targets

	1990/91	1996/97	1999/2000
Total Sales Turnover (Rs. million)	423	3,690	8,070
- Printing Machinery	127	590	1,230
- Dairy Machinery	35	110	250
- Die Cast./Plastic M.	85	380	670
- Press Machines	175	600	1,100
- Other New Areas	0	2,010	4,820
Annual Growth Rate	-	43%	30%
	(85-90)	(90-96)	(96-99)

(b) Basic Strategy

1. Because most of the units in the group are in the stage of incubation in HMT, every effort should be made to explore their potential to the fullest extent and try to make each of them an autonomous major business group in HMT.
2. Each unit should be a core entity to achieve the future business diversification of HMT.
3. Each unit is required to examine the market trends constantly to try to flexibly adjust their product range accordingly.
4. Each unit should constitute a core group of HMT for strategic alliances with foreign manufacturers who have established technologies and marketing capabilities in the areas of HMT's business expansion.

(c) Major Actions to be Taken

(i) Printing Machinery

- With the growing market demand, HMT should achieve the position of the leading printing machinery manufacturer in India by both expanding its production capacity and developing new products which would be needed in the market.
- To expand and modernize the existing production facilities as soon as possible in order to achieve the above.
- To introduce the most advanced technology in the world for both the modernization of production facilities and the new product development of 4-color offset printing machines.
- To establish its distribution network in India.
- Based on the close examination of market demand in India, to diversify its product range into web offset printing machines or others, for which the capital and technical tie-up with leading international companies would become essential.
- To explore the export potential in international markets.

(ii) Dairy Machinery

- Compared with the competitors, HMT has a narrow range of products. The existing product line should be widened.
- Product diversification into areas such as food processing or food packaging machinery should be aggressively promoted, for which capital and technical tie-ups with leading international manufacturers in each area would be recommended.
- In order to make the future direction of diversification clear, the unit should be renamed as the Food Processing Machinery Unit.
- The direction of diversification would mainly be in the area of plant engineering of the food processing industry, in which HMT would have the advantage of backing from other engineering units.

(iii) Die Casting and Plastic Machinery

- Because the future potential of expansion is limited in die casting machines, the operation of die casting machine manufacturing should be concentrated in the machine tool group.
- In plastic machinery, HMT needs further state-of-the-art technology through capital or technical tie-ups with leading international manufacturers.
- In plastic machinery, HMT should develop new product lines such as extrusion machines, processing machines for pipes and films or blow molding machines, for which capital and technical tie-ups with foreign manufacturers should be obtained.

(iv) Press Machinery

- The production facilities should be expanded and upgraded so that HMT could increase market competitiveness in the heavy plant engineering field.
- For the above, the product range of HMT should be further widened, and designing capability upgraded.
- In line with the above, technical tie-ups or Joint Working Arrangements (JWA) with leading international manufacturers should be entered into.

(d) Major Investment Projects

Because many of the units are required to diversify their product range or to explore new business opportunities, a large amount of new investments would be needed. However, at this stage, the contents of these investments cannot not be precisely defined.

Some of the investment projects which are presently linked to the existing lines of business are as follows:

- i. Expansion and modernization of the printing machinery factory
- ii. Expansion and modernization of the press machine factory
- iii. Modernization of the plastic machinery factory

3. Watches

(a) Growth Target

(Unit: 1,000 pcs.)

	1995/96	1999/2000
Annual Sales		
Mechanical Watches	5,900	5,500
Quartz Watches	6,500	12,000
[TOTAL]	[12,400]	[17,500]
HMT's Share	25%	25%

(b) Basic Strategies

Basic strategies in each period are as follows:

Phase 1: Recovery of competitiveness and assumption of leadership in quartz watches and participation in the international market.

- (1) To enhance production capacity of quartz watches
- (2) To improve design and quality
- (3) To reduce manufacturing costs by the streamlining of production facilities and productivity improvement
- (4) To reorganize sales networks for more effective performance
- (5) To set up a 100% Export Oriented Unit (EOU) and open up an overseas sales network

Phase 2: Reinforcement of HMT's status as a top watch manufacturer and enlargement of its status as a leading watch supplier to the international market

- (1) To continue reinforcement and renewal of production facilities, including the 100% EOU.

- (2) To strengthen market research ability including consumer trends.
- (3) To build up more effective product development capabilities.
- (4) To set up an overseas product distribution system including overseas product depots.

(c) Necessary Measures by Function

i. Product Mix

- Phase 1:
 - To produce quartz watches with more fashionable designs.
 - To reinforce the product range by getting into the fields of high-value watches and quartz digital watches.
- Phase 2:
 - To widen the product range especially in the area of high and medium class watches
 - To increase the products which meet the consumers' needs in the international market.

ii. Marketing

- Phase 1:
 - To reorganize the domestic sales network to strengthen HMT's control over retailers.
 - To simplify the distribution channels for products, and spares.
 - To best allocate and distribute products by introducing POS.
 - To reinforce the direct approach to end-users by utilizing mass media.
 - To establish a more flexible pricing policy.
- Phase 2:
 - To adopt a joint marketing policy, based on joint market research, with other consumer goods such as apparel to anticipate and create consumer needs and new trends.
 - To reinforce the overseas sales channels by optimizing overseas product distribution

iii. R&D

- To improve design capability.
- To develop designs which meet consumers' preferences.
- To reduce the product development lead-time by introducing CAD.
- To improve package design.

iv. Production

- To establish a flexible manufacturing system suitable for catching up with the changing market trends.
- To reduce manufacturing costs considerably by automation of production facilities, productivity improvement activities, etc.
- To improve quality control.
- To improve product surface finishing such as plating, surface grinding, etc., while establishing and implementing the preventive methods to prevent surface scratches/cuts on final products.
- To monitor the committed deliveries carefully.

4. Tractors

(a) Growth Targets

	1990/91	1996/97	1999/2000
Annual Sales (Rs. million)	1,886	5,380	9,410
Market Share	12.5%	16%	20%
Average Annual Growth of Sales	15% (1985-90)	19% (1990-96)	20% (1996-99)

(b) Basic Strategies

1. To recover and further expand market share through the modernization and expansion of production facilities.
2. To improve the quality of products through the development of fuel efficient engines, the improvement of operational functions and the increase of running speed.
3. To proceed with the development of new products, which would supplement the sales of tractors, such as engines or attachments.

(c) Necessary Measures by Function

i. Product Mix

- To widen the assortment of tractors
- To increase the added-value of existing tractors
- To develop potential products which would meet the needs of the international market.

ii. Marketing

- To establish a more intensive sales network by setting up new dealers
- To strengthen the after-sales service function of the present dealers
- To improve the quality of existing products first, before the development of new products.
- To establish better communication among dealers, marketing people and production people.

iii. R & D

- To develop tractors with faster speed and better fuel efficiency,
- To conduct R&D activities from the ergonomics point of view.
- To develop synchromesh gears, 4-wheel drive tractors and cabins.
- To introduce advanced foreign technology as necessary.

iv. Production

- To begin the improvement in productivity with 5-S.
- To expand the present production capacity.
- To introduce CAD/CAM systems.
- To modernize the assembly shop and machining shop focusing on conveyors and transfer lines.

(d) Major Investment Plans

The following investment plans are tentatively envisaged.

Expansion and modernization of the Tractor Factory, Pinjore (TRP) aiming at both the increase of production capacity and the improvement of product quality.

5. Lamps

(a) Growth Targets

	1990/91	1996/97	1999/2000
Annual Sales (Rs. million)	237	990	1,220
Market Share	3.6%	7.2%	9.2%
Average Annual Growth of Sales	13% (1985-90)	27% (1990-96)	7% (1996-99)

(b) Basic Strategies

1. To rationalize the production processes with the aim of changing the present business structure of this loss-making unit.
2. To change the present product mix putting higher emphasis on FTL, the market of which is expected to grow faster.
3. To tie up with a company which has both advanced technology and a strong brand name in the market with the aim for HMT to survive as one of the major suppliers of lamps in India.

(c) Necessary Measures

i. Measures to rationalize production processes and increase profitability

- To rationalize the production system of GLS either by integrating the present 6 assembly lines of GLS into 3 or a smaller number of lines, or by subcontracting the assembly operations.

- To fully modernize the assembly line of FTL by introducing the latest technology through a tie-up with a leading foreign lamp manufacturer.
- To make a successful introduction of such new products as "Power Saver" or compact FTL into the domestic market.

ii. Measures to increase the market share

- To put higher emphasis on the production of FTL than GLS since the current product mix of HMT is heavily dependent on the latter while higher market growth is expected for the former.
- To introduce such new products as power savers or compact FTL into the market carefully after a thorough examination of product quality and the market needs, avoiding the damage of lowering the company image in the market by too hasty sales promotion.
- To expand its sales network firstly into the western part, then the eastern part and lastly the northern part of India.

iii. Measures for HMT to survive as one of the major lamp suppliers in India

- To increase the domestic market share of HMT up to the level of nearly 10%.
- To establish a strong tie-up with a manufacturer which has strong financial capability, advanced manufacturing technology and prominent brand names in the market, because the current capability of HMT is not sufficient for the achievement of the above market share with regard to either capital or technology.

6. Foundry

(a) Growth Target

	1990/91	1996/97	1999/2000
Production (Ton/Month)	975	1,550	2,650
Annual Growth Rate	-	8.0%	11.5%
	(85-90)	(90-96)	(96-99)
Outside Sales (Ton/Month)	0	150	750
Outside Sales Share	0	10%	30%

(b) Basic Strategy

To change the organization of foundry plants each of which is currently a part of the machine tool units to an independent business unit, to increase the production capacity by modernizing both production facilities and processes, and to expand casting product sales to outside users including those of overseas markets.

(c) Necessary Measures

- To integrate all of the foundry plants into an independent business unit.
- To establish a marketing section in the above unit in order to start outside sales.

(d) Major Investment Plan

- i. Establishment of a model foundry plant at Bangalore
 - To establish a model plant which is equipped with advanced facilities and technologies in Bangalore.
- ii. The modernization and expansion of the foundry plant at Pinjore.
- iii. The modernization of other foundry plants

7. Bearings

(a) Growth Targets

(Unit: 10,000pcs.)

	1990/91 (HMT Share)	1996/97 (HMT Share)	1999/2000 (HMT Share)
Ball Bearings	130 (1.9%)	333 (2.5%)	740 (4.0%)
Tapered R. Bearings	72 (6.9%)	175 (8.1%)	90 (9.1%)
Cylind. R. Bearings	27 (22.5%)	65 (23.2%)	100 (25.0%)
Total	229 (2.3%)	570 (3.7%)	1,130 (5.1%)

(b) Basic Strategies

Basic strategies proposed are as follows:

1. In order to compete in the very competitive markets, to strengthen the product competitiveness both in quality and price through rationalization of production processes.
2. Under the circumstances that the competition in tapered roller bearings which have been the major source of profits in HMT would become more severe, to put more emphasis on securing the present OEM contracts and to develop a replacement market.
3. To penetrate into the large and growing markets of small-size ball bearings, for which a strong capital and technical tie-up with a leading foreign manufacturer having advanced technology and prominent brand names is essential.

(c) Necessary Measures by Function

i. Product Mix

- To increase production for the OEM market by the establishment of more flexible manufacturing systems which could meet the demand for large varieties of small volumes of products.
- To produce more ball bearings to obtain a higher market share under the capital and technical tie-up with a leading international company.

ii. Production

- To rationalize the existing facilities with the aim of strengthening competitiveness both in quality and price.
- To establish a new mass-production plant which would produce small-size, general purpose ball bearings.

iii. Marketing

- To increase the sales to the after (replacement) markets.

(d) Major Investment Plans

i. Investments for the rationalization of existing manufacturing facilities.

ii. New plant establishment under the capital and technical tie-up with an international leading manufacturers.

V. ACTION PROGRAM FOR ORGANIZATION AND PERSONNEL MANagementsystem RESTRUCTURING

A. RE-ORGANIZATION OF BUSINESS GROUPS

1. Outline of the Reform

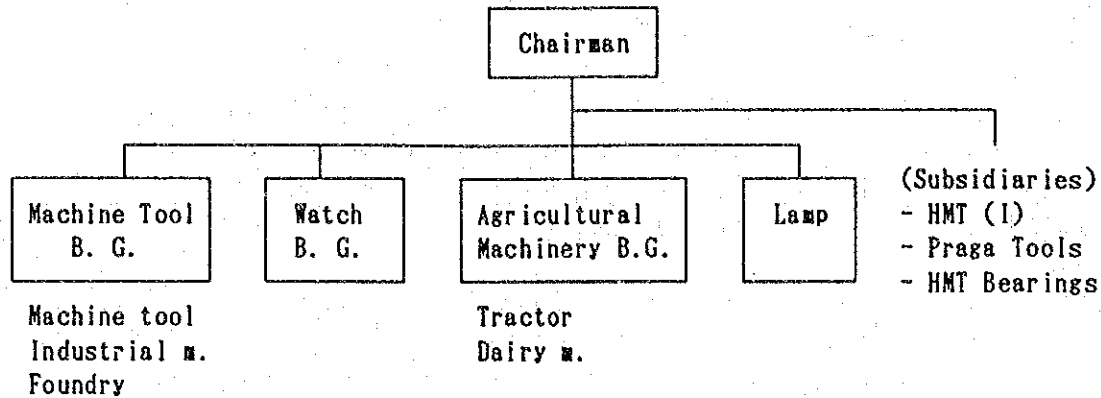
- (1) The proposed new organization structure is briefly summarized and shown in Fig. V-1.
- (2) Those divisions such as PMK, PRH and DCB in the Machine Tool B. G. or DMU in the Agricultural B. G. should be separated from their present Business Groups.
- (3) The casting factories attached to each machine tool factory should be consolidated and one independent unit should be established.
- (4) An independent business group, the Industrial Machinery Business Group, which consists of such units as die casting, printing machinery, press, horological machinery, plastic machinery and dairy machinery should be newly established.
- (5) The Watch Business Group and the Lamp Unit, which are both producing consumer products, should be separated from the main HMT as more autonomous subsidiary companies of HMT.

2. Major Aims of the Reform

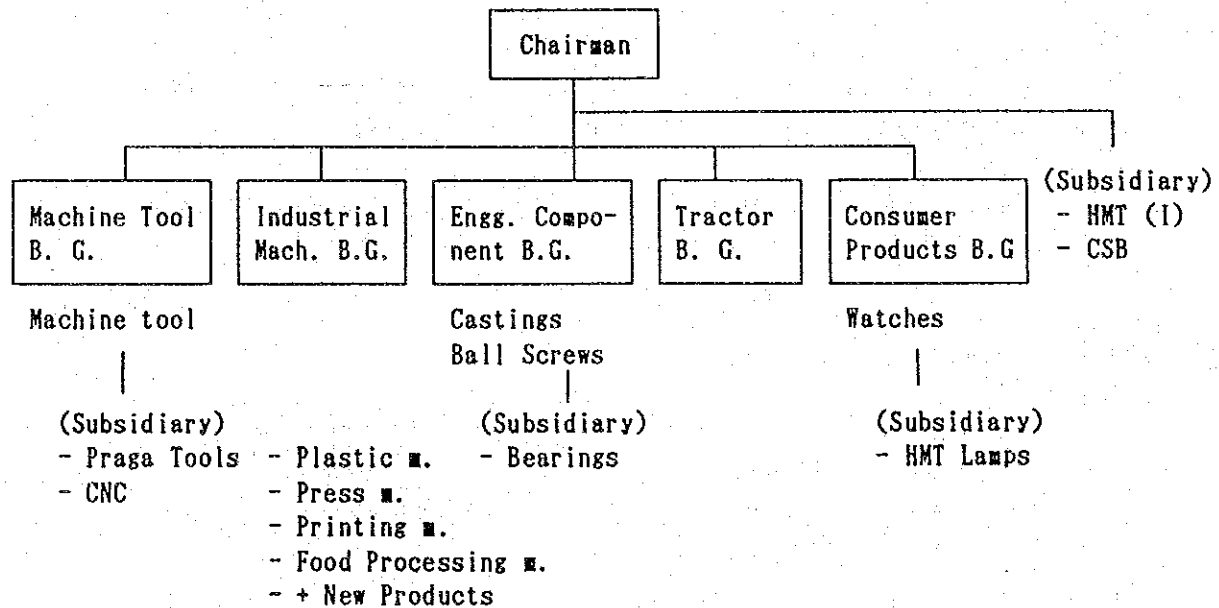
- 1) The above measures would establish major business groups concentrating on their own business operations, while enhancing the working morale of workers in other relatively small units by giving them higher autonomy.
- (2) The independence of the casting operations would make it easier for them to start production for outside sales.
- (3) By being given higher autonomy as an independent subsidiary company, each unit of consumer product manufacturing would be able to take more flexible marketing strategies.

Fig. V-1. Proposed Organization Chart of HMT

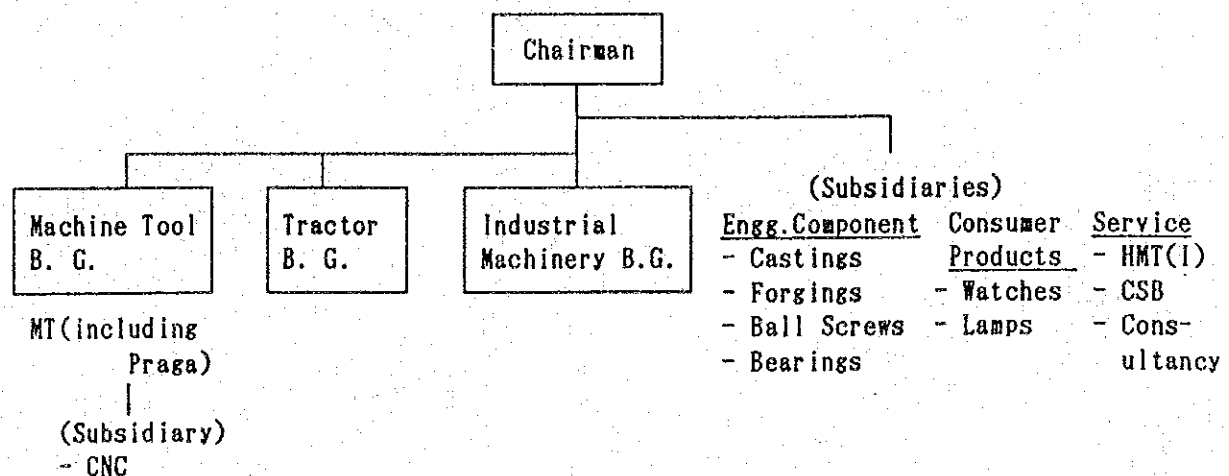
Present Structure



1st Phase (1991/92 - 1995/96)



2nd Phase (1995/96 - 1999/2000)



B. REFORM OF THE PROFIT CENTER UNIT

1. Outline of the Reform

- (1) The basic profit center unit should be shifted from the present unit (each factory) to the business groups. The marketing functions are all attached to the Directorates of the business groups.
- (2) Each unit under a business group should be a cost center, and their responsibilities should be confined to manufacturing products which are specified in quality, cost and delivery time.
- (3) Most of the management decision powers should be delegated from Corporate Headquarters(CHQ) to each business group, and the reporting obligations from business groups to CHQ should be minimized.
- (4) The function of the Directorates of the business groups should be strengthened.

2. Major Aim of the Reform

- (1) The above measures would strengthen the marketing function of each business group, and enable them to build-in market-oriented production planning, product development or after-sales services.
- (2) The above measures designed to increase the autonomy of each business group would motivate the workers of each group, and enable them to make quicker management decisions.

C. SIMPLE MANAGEMENT STRUCTURE AND DELEGATION OF POWER

1. Outline of the Reform

- (1) The total corporate hierarchy as well as that in CHQ, the Business groups and units should be redesigned according to their roles and functions.
- (2) The ranks of the people who are eligible for each post should be pre-determined. However, the relationship between the two should not be as rigid as the current system in HMT. The tentatively proposed relationship is shown in Fig. V-2.

2. Major Aims of the Reform

- (1) The above measures would make the functions and responsibilities of each manager clearer and make quicker decisions possible.
- (2) The delay of promotion due to the lack of a position, or being forced to create of new posts for qualified employees would be avoided.
- (3) By eliminating the one-to-one relationship between post and rank, the range of choices of employees for a specific post would be widened.

Fig.V-2. Relationship between Position and Rank

P o s i t i o n			Rank	P S
C H Q	Business Group	U n i t	Title	
Directorate Chief (D, X)	Business Group Chief (D, X)	Unit Chief (X, IX, VIII)	Director	-
			E D	X
Chief, Section (IX, VIII)	Cheif, Section (IX, VIII)		G M	IX
			J G M	VIII
Incharge, Team (VII, VI)	Incharge, Team (VII, VI)	Chief, Section (VII, VI)	D G M	VII
			A G M	VI
		Incharge, Team (VI, V)	M	V
			Leader, Group (IV, III, II)	D M
			Officer	III, II

D. MEASURES TO PROMOTE STRATEGIC MANAGEMENT

1. Outline of the Reform

- (1) Most of the CHQ functions related to the daily operations of each business group should be transferred to each business group.
- (2) The Planning Department at CHQ should be enlarged so that it could establish closer ties with each unit or business group and could coordinate all plans from each unit and business group.
- (3) A stronger monitoring system of the progress of business plans of each unit or business group should be established within the Planning Department and it should have stronger ties with MIS.
- (4) A new function emphasizing the continuous search for new business development areas should be attached to the Planning Department.
- (5) The functions to be added or expanded in CHQ or in each Directorate of a business group are summarized and shown in Table V-1.

2. Major Aims of the Reform

By delegating most of the powers to each business group, the staff members of CHQ could concentrate their efforts more on corporate strategic matters. The CHQ must control the central tenets strictly and provide flexibility to Business Groups and Units by relaxing the control to bring about more autonomy at the Business Group/Unit levels.

Table V-1. The Functions to be Added or Expanded in CHQ and Each Directorate of a Business Group

	CHQ	Directorate of BG
Planning	<ul style="list-style-type: none"> - Establishment of a basic guidelines for planning - Examination of each business group or unit corporate plan - Coordination and adjustment (Allocation of internal resources) - Review and control of the progress of the plan 	<ul style="list-style-type: none"> - Market research and market projections - Establishment of business group based corporate plan and basic strategy
HRD Management	<ul style="list-style-type: none"> - Total corporate manpower planning - Recruitment and HRD planning - IR strategies - Training and Development at macro levels 	<ul style="list-style-type: none"> - Manpower planning and HRD planning in BG - Guidance and training on personnel evaluation measures - IR matters of entire Business Group
Management Information System	<ul style="list-style-type: none"> - Planning of total systems - Integration of data-base - Guidance for systems planning 	<ul style="list-style-type: none"> - Guidance for each unit with the support of CSD and CHQ
Finance Management	<ul style="list-style-type: none"> - Total Financial Planning - External Resource Mobilization - Centralized Cash Management - Audit 	<ul style="list-style-type: none"> - Authorization of expenditure of each unit based on annual budget
Technology	<ul style="list-style-type: none"> - Centralized design technology development (CAD/CAM) - Training of technology (Mechatronics Center) - Promotion of technical tie-ups (Negotiation and evaluation) 	<ul style="list-style-type: none"> - Product development planning - Guidance of QC activities of each unit - Guidance for the development of production technology
Production and Procurement	<ul style="list-style-type: none"> - CHQ procurement coordination 	<ul style="list-style-type: none"> - Adjustment of production items among units - Capital expenditure planning - Annual production planning - Production schedule adjustment - Central procurement for BG
Marketing		<ul style="list-style-type: none"> - Sales price decision - Sales promotion planning - Support for sales offices and dealers - Distrib. and inventory control

E. REVIEW OF EVALUATION AND PROMOTION SYSTEM

1. Outline of the Reform

(1) It is noted that the following Performance Appraisal systems are in vogue:

- Performance Improvement and Development system (PIDS) for DGM and above;
- Performance Appraisal System (PAS) for PS I-IV;
- Merit Rating for indirect workers.

It is posed that in the evaluation criteria in the above, such items as team spirit, "kaizen" efforts or problem solving capabilities should be given higher weightage.

(2) In the present Career Growth Policy of the company, one year's benefit is provided for the high achievers. This benefit is confined to the promotions from PS I to PS VI only. It is recommended that it should be extended to all levels in PS cadre and the gap between high achievers and average-achievers should be enlarged to encourage the high achievers.

(3) It is noted that in rewarding the workers in terms of promotion or incentive, too much emphasis is given on standard hours. These systems should be recast in such a manner that emphasis should be on target achievement, multiplication of skills and mobility to accept the challenges in the new areas.

(4) Presently the promotion policy of PS cadre and workers is related to academic career by providing different channels. In addition to qualification base channels, some marks are also provided for qualification in the final evaluation for promotion, which should be avoided. The academic career should be considered for the purpose of recruitment and the emphasis should shift to the actual performance while rewarding the promotion. This can be organized in a phased manner by amending the Career Growth Policy.

(5) The macro level training and developmental needs of the executives should be organized by the Management

Development Institute (MDI), Bangalore and the technical training at the proposed Mechatronics Center. At the micro level, the technical training should be provided in each unit. The existing training centers in the units should be modernized and stream-lined. There should be a strong functional relationship between all the training centers of the units and the MDI/ Mechatronics Center.

- (6) A regular job-rotation scheme aimed at the multiplication of skills and experience should be established.

2. Major Aims of the Reform

The above measures would contribute not only to enhancing the morale of the workers but also to strengthening the control capability of supervisors over workers.

VI. ACTION PROGRAMS FOR INVESTMENTS

A. STRATEGIC INVESTMENT PROGRAMS FOR PLANT MODERNIZATION

Based upon the HMT long-term and mid-term corporate plan objectives, the following 5 strategic investment programs for plant modernization were identified by the Study Team :

1. Modernization of the Machine Tool Factory, Bangalore
2. Modernization and Expansion of the Press Machine Plant
3. Expansion and Modernization of the Tractor Factory, Pinjore
4. Expansion and Modernization of the Printing Machinery Factory
5. Modernization of Foundry Plants

The strategic investment projects are to be identified from all fields of HMT operation both at current and in future. However, the JICA Study has started under the umbrella of the capital goods survey of the World Bank and the team members are also selected according to this line. Thus, a limited number of strategic investment programs were identified by the Study Team mainly from the capital goods sector from the view that the projects would have a catalytic effects in achieving the long-term targets of HMT.

The major criteria used for the selection of the strategic investment projects are as follows:

1. Contribution for the development of capital goods sector in India;
2. Effects for other sector activities of HMT;
3. Contribution for the growth (investment effects for the growth of HMT sales);
4. Current technology level;
5. Current marketing capabilities or brand name establishment; and
6. Contribution for the future diversification of HMT.

The results of evaluation is shown in Table VI-1.

Table VI-1. Evaluation Summary of Investment Projects

	Capital Goods	Effects for HMT	Growth Support	Technology Level	Marketing & Brand	Diversi- fication	Total Points
MTB	5	5	4	4	4	4	26
Other machine tools	5	4	4	4	4	3	24
Tractors	3	4	3	5	4	3	22
Watches	1	2	3	4	4	3	17
Lamps	1	1	4	2	2	2	12
Press machines	5	4	5	2	3	5	24
Printing machinery	5	3	2	3	4	4	21
Die Casting Machine	5	2	1	4	3	2	17
Dairy machinery	4	2	3	2	2	4	17
New Industrial Mach.	2	2	5	1	1	5	16
Castings	4	5	3	4	4	3	23
Bearings	4	3	3	2	2	3	17
Ball screws	4	3	3	4	4	1	19

1. Modernization of the Machine Tool Factory Bangalore (MTB)

(a) Background

The Machine Tool Factory, Bangalore (MTB) is the oldest factory in HMT. MTB started as a single product manufacturing unit in 1955 (H22 lathes). It has since undergone a tremendous change and is currently manufacturing around 25 products with over 60 major variants.

With the widest product range compared to any of HMT's factories (which ultimately leads to splitting production into smaller, less efficient batch quantities), with old machines (of which over 80% are 25 - 30 years old) and a work force with an average age of about 50, MTB is now suffering from various problems and has become one of the most inefficient machine tool factories in HMT.

Table IV-2. Comparison of HMT Machine Tool Factories (1990/91)

	MTB	MTP	MTK	MTH	MTA
Sales (Rs.Mil.)	640	415	500	736	189
Added Value (Rs.Mil.)	389	213	274	320	123
Net Profit (Rs.Mil.)	-78	13	11	-25	-44
No. of Employees	3,140	2,317	2,482	2,562	1,415

(b) Basic Concept of Modernization

a) Objectives

Under the above circumstances, the urgent implementation of the modernization program of MTB, with the following major objectives, is proposed.

- 1) To integrate the production items into a smaller number of selected items in phases:

- 2) To increase the CNC ratio of manufactured products;
- 3) To develop and start production of such advanced machines as large-size Machining Centers (MC), Flexible Manufacturing Cells (FMC), Flexible Manufacturing Systems (FMS) and other related systems; and
- 4) To disseminate advanced machine tool manufacturing technologies to other machine tool units of HMT.

b) Approach

The production facilities of MTB are to be modernized through the following three steps:

Step I : Modernization of Small Parts Machine Shops

The aged GMPs are to be replaced with CNC lathes and machining centers, with one CNC machine replacing several GPMs.

Step II : Modernization of Medium and Small Parts Machine Shops

Establishment of manufacturing systems where eight or twelve GPMs are replaced with one machining center with a pallet changer or with one FMC (Flexible Manufacturing Cell).

Step III : Modernization of All Machine Shops

The following three FMS (Flexible Manufacturing Systems) are introduced;

- FMS 1 - For large-size cast iron parts
- FMS 2 - For medium-size cast iron parts
- FMS 3 - For round shaped parts

(c) Outline of Improvement Plans

a) Production Technology

The following improvement in production technology would be achieved:

- 1) Modern production technologies would be introduced by replacing obsolete GPMs with advanced CNC machines or such manufacturing systems as FMC or FMS.
- 2) Manufacturing cost reduction would be achieved through the following;
 - i. Minimizing work in process inventory
 - ii. Maximizing inventory turnover
 - iii. Minimizing machining costs
- 3) The production process would be streamlined with the introduction of Group Technology (GT) Systems.
- 4) The production capacity of HMT would be expanded by both the improvement of machining efficiencies and the shift of excessive manpower from machining sections to assembly sections.

b) Product Technology

The following new product development capabilities would be acquired:

- 1) FMC and FMS

The new manufacturing systems to be installed in HMT for modernization, such as FMC and FMS, should largely be developed by HMT themselves.

- 2) Specific types of Turning Machines

The following two types of turning machines which would not be produced in MTK should be developed in MTB;

- i. Improved HL series for large-size parts preferably having slant-type beds.
- ii. Improved MSA series for mass production items, multiple sets of which should be linked with loaders.

3) CNC-H400

This should be a modular machine for FMC, to which auto loaders or robots could be attached.

4) High-grade CNC Machines and their Accessories

The following high-grade CNC machines and accessories should be developed by MTB;

- i. Large-scale Machining Centers with bed-sizes of 800 x 800 and 1,000 x 1,000
- ii. Turning Centers having the functions of both CNC Lathes and Turret-type Tool Posts with ATC
- iii. Auxiliary Accessories for FMC or FMS such as follows;

- Cutting monitoring device
- Automatic gauging and compensation
- Auto-detection of tool breakout
- Tool-life calculation/cumulative
- Automatic loading and unloading
- Automatic chip removal

c) Technology Acquisition

The technical assistance from leading international manufacturers in the following fields would be desired for the quick acquisition of product technologies;

- i. Designing for FMC and FMS
- ii. Designing for developed MSA
- iii. Designing for CNC-H400
- iv. Designing for large-scale Machining Centers

(d) Investment Costs

Out of the total modernization project of MTB, the Step 1 and Step 2 investments were posed as a strategic action investment program, and the phase 3 as a future expansion project. The total project costs for the strategic investments are estimated to be Rs.1,321 million, of which Rs. 715 million is domestic currency costs, and Rs. 606 million is foreign exchange. In addition, the future expansion project (Step 3) after 1997/98 is estimated to require Rs. 1,445 million. A summary of project costs is presented in Table VI-3.

Table VI-3. MTB - Summary of Investment Costs
(Unit:Rs.million)

	Step I & II	Future Expansion	Total
1. Land & Building	0	0	0
2. Plant & Equipment	444	603	1,047
3. Initial Training	6	2	7
4. Other Initiation Costs	0	0	0
5. Technology Acquisition	130	40	170
Base Cost Estimate	580	644	1,224
6. Physical Contingency	58	64	122
7. Price Escalation	54	245	300
Installed Cost	692	955	1,647
8. Inc. Working Capital	275	192	467
9. Interest during Construction	354	298	652
Total Investment Costs	1,321	1,445	2,766
of which			
Local Currency	715	776	1,492
Foreign Exchange	606	669	1,275

(e) Expected Financial Results

Projected financial results of the project (Step I & II) are summarized in Table VI-4, and the results of the project including further investment after 1996/97 (Step III) are in Table VI-5.

Table VI-4. MTB (Step I & II)- Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	640	1,622	2,204
2. Materials	251	889	1,173
3. Value-Added	389	733	1,031
4. Personnel Expenses	264	268	373
5. Depreciation	24	71	60
6. Other Expenses	130	194	243
7. Operating Profit/Loss	-29	201	355
8. Interest	53	111	49
9. Non-Operating Expenses/Revenue	-4	-30	-30
10. Profit before Tax	-78	120	336
Number of Employees	3,140	2,300	2,090
Production/Employee (Rs. thousand)	204	705	1,055
Profit/Sales (%)	-12.2	7.4	15.2

Table VI-5. MTB (Step I, II & III) - Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	640	1,622	2,470
2. Materials	251	889	1,348
3. Value-Added	389	733	1,122
4. Personnel Expenses	264	268	373
5. Depreciation	24	71	83
6. Other Expenses	130	194	256
7. Operating Profit/Loss	-29	201	409
8. Interest	53	111	305
9. Non-Operating Expenses/Revenue	-4	-30	-30
10. Profit before Tax	-78	120	135
Number of Employees	3,140	2,300	2,090
Production/Employee (Rs. thousand)	204	705	1,182
Profit/Sales (%)	-12.2	7.4	5.5

2. Modernization and Expansion of the Press Machine Plant

(a) Background

Based on a technical agreement with M/s Verson Allsteel Press Co. (USA) which was concluded in May 1969 and provided standard designs of mechanical and hydraulic presses and engineering for special presses, the Press Division, Hyderabad (PRH) was established as a part of the HMT business diversification program. Since then, PRH has manufactured and sold mechanical and hydraulic presses through 20 years 1969 - 1989, of collaboration with M/s Verson Allsteel Press and Verson International (UK).

At present PRH does not have any effective collaboration, and the operation of the division is tending to deteriorate due to both the small and unstable market demand for presses in India, and the weakened competitiveness caused by outdated technology.

(b) Basic Concept of Modernization

a) Objectives

The major objectives of the project are as follows:

- 1) To improve PRH's technological competitiveness by acquiring an international level of technology;
- 2) To diversify the product range and evade the problems of market demand fluctuation;
- 3) To penetrate into the international market through technical collaboration and joint working agreements with leading world-class manufacturers;
- 4) To expand the range of joint working by modernizing the plant facility; and
- 5) To improve productivity and the quality of HMT products.

b) Approach

The production facilities of PRH should be modernized in the following 2 Phases, which are further divided into 5 Steps:

Phase I

Step 1: An independent steel fabrication shop for welding jobs of high productivity and quality will be established.

Step 2: A selected number of modern and large-scale machines are newly introduced into the machine shop. Some small-scale machines are relieved and transferred to ancillary companies. The machine layout in the machine shop will be re-arranged partly introducing the Group Technology (GT) concept.

Phase II

Step 3: In the steel fabrication shop, such new machines as bending rollers or press breaks will be newly installed, which will enable cylindrical shaped parts to be processed.

In the machine shop, additional CNC machines are to be introduced to replace the old machines.

Step 4: Another new bay in the building for steel fabrication will be added with the purpose of increasing efficiency in material stocking, marking and cutting jobs. In the building, a 100 ton overhead crane will be installed for the handling of large pieces.

An additional new building for machining and assembly will be constructed, and new large-scale machines for manufacturing large-size presses will be installed.

Step 5: Further expansion of machining capacity could be achieved by introducing additional large-scale machines in the new machine shop constructed in Step 4.

In order to reduce the financial risk associated with such a large investment amount, the implementation of the project should proceed cautiously by steps, reviewing both the trends of market demand and the levels of skill development in HMT.

As a part of the strategic investment programs of HMT, only the Phase I investments would be recommended. Phase II investments would be positioned as a future expansion plan.

(c) Outline of Improvement Plans

a) Production Technology

The improvement of production technology would be achieved in the following fields:

- 1) Design capability would be upgraded by the introduction of micro-filming of drawings, and the installation of dry-quick copying (expansion/reduction free) machines and word processors.
- 2) The production process would be upgraded by the separation of the welding section from the machining section, the replacement of obsolete machines with advanced CNC machines and the introduction of the Group Technology concept in the gear manufacturing section.
- 3) A higher level production control system would be introduced for each function of: Overall planning and control, Sub-contracting (In-house / Outsourcing), Procurement (materials and boughtouts), Material control (stock control) and Product control (finished goods, packing & shipment).

- 4) A higher level of quality control would be applied for in-house products, sub-contracted products and boughtouts through the introduction of QC circle activities, the establishment of a Management of Analysis of Defects system, the implementation of employee training for QC and the adoption of a Design Review Board (DRB) concept.

b) Product Technology

New product technologies mainly as indicated in the following should be acquired:

1) Advanced Technologies in the Existing Presses

- Double-action Mechanical Press
- Transfer Press (Dual/Tri-axis)
- Link-drive Press
- CNC Control Attachment
- Die-spotting/Tryout Press
- Press Automation/Feeding Attachment
- Cushion Lock & Stroke Adjustment
- Material Handling Equipment

2) Diversification of Press Machines

- Forging Press
- Small Ammunition Making Press
- Tube Extrusion Press
- High speed/Low tonnage Press with Feeding Equipment
- Presses for various types of bricks
- Punching Press
- U/D Press
- Tool Design

3) New Industrial Machinery

- Bending Roller
- Beam/Pipe Bender
- Shearing Machine
- Straightening Machine
- Auxiliary Equipment for the Rolling Mill

Plant; Roller Table, Pusher/Puller, various kinds of Steel Beds, Transfer Machines, etc.

- Large Steel Structures
- Fabricated Round Products; Reactor Vessels, Heat Exchangers, Pressure Vessels, etc.
- Transfer Cars and Buggies, etc.

c) Technology Acquisition

For the acquisition of the above mentioned product technologies, the establishment of long-term technical collaboration agreements with leading firms of the world is needed. Especially for the implementation of the Phase II investments, the establishment of such agreements which include not only the supply of product drawings or basic engineering know-how but also market and market development cooperation, the use of HMT facilities as a production-base, the constant supply of technical information or the dispatch of resident engineer(s) in India is essential.

d) Management System

Together with the implementation of the capital investments, the organizational structure within PRH would have to be slightly changed, and a considerable level of re-allocation of the workers among sections would have to be conducted.

(d) Investment Costs

The total project costs up to the year 1996/97 are estimated to be Rs. 799 million, of which Rs. 542 million is domestic currency costs, and Rs. 257 million is foreign exchange. After 1996/97, additional investment would be needed for the future expansion. These expansion costs (Phase II investments) are estimated at Rs. 1,183 million. A summary of project costs including the future expansion plan is presented in Table VI-6.

Table VI-6. PRH - Summary of Investment Costs

(Unit:Rs.million)

	Project (Phase I)	Expansion (Phase II)	Total
1. Land & Building	63	49	111
2. Plant & Equipment	293	449	742
3. Initial Training	12	18	30
4. Other Initiation Costs	28	32	60
5. Technology Acquisition	45	79	124
Base Cost Estimate	440	626	1,067
6. Physical Contingency	44	63	107
7. Price Escalation	67	210	228
Installed Cost	550	898	1,448
8. Inc. Working Capital	176	65	241
9. Interest during Construction	73	220	293
Total Investment Costs	799	1,183	1,982
of which			
Local Currency	542	459	1,001
Foreign Exchange	257	725	982

(e) Expected Financial Results

Projected financial results of the project (Phase I) are summarized in Table VI-7, and the results of the project including future expansion investments after 1996/97 (Step II) are in Table VI-8.

Table VI-7. PRH (Phase I)- Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	175	598	858
2. Materials	70	300	435
3. Value-Added	106	298	423
4. Personnel Expenses	33	56	69
5. Depreciation	2	49	35
6. Other Expenses	27	71	97
7. Operating Profit/Loss	44	122	223
8. Interest	4	58	-21
9. Non-Operating Expenses/Revenue	4	9	13
10. Profit before Tax	36	55	230
Number of Employees	498	562	596
Production/Employee (Rs. thousand)	351	1,064	1,440
Profit/Sales (%)	20.5	9.2	26.8

Table VI-8. PRH (Phase I & II) - Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	175	598	1,106
2. Materials	70	300	536
3. Value-Added	106	298	570
4. Personnel Expenses	33	56	71
5. Depreciation	2	75	117
6. Other Expenses	27	71	118
7. Operating Profit/Loss	44	96	264
8. Interest	4	73	157
9. Non-Operating Expenses/Revenue	4	9	17
10. Profit before Tax	36	13	90
Number of Employees	498	562	596
Production/Employee (Rs. thousand)	351	1,064	1,856
Profit/Sales (%)	20.5	2.2	8.1

3. Expansion and Modernization of the Tractor Factory

(a) Background

Starting with the production of low power 25 HP tractors in 1972 with the collaboration of M/s Motokov (a Czech manufacturer), the Tractor Factory Pinjore (TRP) has expanded its product range into higher horsepower tractors (35 and 58 HP) and currently has an installed annual production capacity of 17,000 tractors. Today, TRP is the largest unit in HMT, recording total turnover of Rs.1,860 million and net profit before taxes of Rs.245 million in 1990/91 with a total of 3,261 employees.

In spite of its significant expansion within HMT, the lack of investment in TRP for capacity augmentation has induced a significant decline in market share in the tractor industry. The written-down value of the plant and the machinery at TRP is also low, which indicates the urgent need for replacement and modernization investment.

(b) Basic Concept of Modernization

a) Objectives

Under the above circumstances, the expansion and modernization of TRP has been proposed with the following purposes:

- 1) To expand the tractor production capacity from the present about 17,000 per annum to 44,400 in 1999/2000;
- 2) To expand the engine production capacity from the present about 17,000 per annum to 54,400 in 1999/2000 including outside sales of about 10,000;
- 3) To increase the quality of the products;
- 4) To increase production efficiency; and
- 5) To increase the flexibility in production by shortening the production cycle time.

b) Approach

For the expansion of production facilities, the following two measures are to be taken:

- 1) Renovation of the existing plant targeting the increase of production capacity to tractors and 24,000 engines per annum; and
- 2) Construction of a new plant having the production capacity of 20,400 tractors and 30,400 engines.

The renovation of the existing plant has already been started, and it will be finalized along with the construction of a new plant.

In order to reduce the financial risk, the construction schedule would be divided into the following two phases:

Phase I : The completion of the renovation plan of the existing plant. In addition, a new plant is to be constructed having initial annual production capacity of about 10,500 tractors and 17,000 engines.

Phase II : The expansion of the annual production capacity of the new plant up to 20,400 tractors and 30,400 engines.

As a strategic investment project for tractors, only the Phase I investment is proposed, making the Phase II investment a future expansion plan.

(c) Outline of Improvement Plans

a) Production Technology

The following new production technologies would be introduced by the project:

- 1) Introduction of an FMS line for cylinder head processing
- 2) Introduction of CNC lines for crank case, gear box and main transmission housing processing
- 3) Start of in-house processing for main sheet metal processing
- 4) Introduction of electrophoretic dip technology for primer/surface coating of sheet metal parts
- 5) Introduction of conveyORIZED engine and tractor assembly lines
- 6) Extensive outsourcing in phases

b) Product Technology

For the implementation of the project, improvement in the following fields would have to be achieved:

- 1) Improvement of the quality of existing tractor products putting emphasis on the ease of operation and higher speed;
- 2) Development of fuel efficient engines;
- 3) Development of small size tractors with less than 20HP (18HP);
- 4) Development of large size tractors with more than 60HP (75HP); and
- 5) Development of higher power engines (45HP, 59HP and 75HP); and
- 6) Development of such new products as rice planters, rice combines or small size back-hoes.

c) Technology Acquisition

The in-house development of product technologies is most desired. For a quicker way of acquiring the product technologies, especially in the following, technical collaboration would be essential.

- Small size tractors
- Rice planters
- Rice combines
- Small size back-hoes

(d) Investment Costs

The total project cost is estimated at Rs.2,378 million, of which Rs. 1,577 million is domestic currency and Rs. 801 million is the foreign exchange cost. The cost for future expansion after 1997/98 is estimated at Rs. 1,200 million. A summary of the investment costs is presented in Table VI-9.

Table VI-9. TRP-Summary of Investment Costs

(Unit:Rs.million)

	Domestic	Foreign	Total
1. Land & Building	164	0	164
2. Plant & Equipment	839	406	1,245
3. Initial Training	0	0	0
4. Other Initiation Costs	0	0	0
5. Technology Acquisition	0	70	70
Base Cost Estimate	1,003	476	1,479
6. Physical Contingency	100	48	148
7. Price Escalation	214	42	256
Installed Cost	1,318	565	1,883
8. Inc. Working Capital	259	0	259
9. Interest during Construction	0	236	236
Total Investment Costs	1,577	801	2,378

(e) Expected Financial Results

Table VI-10. TRP - Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	1,886	5,384	9,412
2. Materials	1,365	4,063	7,093
3. Value-Added	522	1,320	2,318
4. Personnel Expenses	162	308	377
5. Depreciation	15	154	207
6. Other Expenses	100	294	514
7. Operating Profit/Loss	245	565	1,221
8. Interest	13	11	-298
9. Non-Operating Expenses/Revenue	7	31	66
10. Profit before Tax	225	523	1,452
Number of Employees	3,121	4,186	4,288
Production/Employee	604	1,286	2,195
(Rs. thousand)			
Profit/Sales (%)	11.9	9.7	15.4

4. Expansion and Modernization of the Printing Machinery Factory

(a) Background

Under a technical collaboration agreement with Societa Nebiolo SPA (Italy), the manufacturing division for printing machines at Kalamassery (PMK) was set up and started production of letter presses in 1972. Furthermore, HMT entered into technical collaboration with Koenig & Bauer AG. (W.Germany) for two-color offset printing machines in 1981. At present, PMK produces 4 types of single-color and two-color offset printing machines, achieving an annual turnover of Rs.114.5 million and net profit of Rs.16 million with 527 employees in 1990/91.

The present production constraints of PMK both in capacity and space, prevent the growth of PMK in line with the growing domestic market demand. Furthermore, the domestic competitors, Maschinenfabrik Polygraph (MPI) and Dominant Offset (DOPL), both of which have good foreign partners for technical collaboration, are launching programs for increasing production capacities and expanding product range to 4-color offset printing machines.

(b) Basic Concept of Modernization

a) Objectives

Under the above circumstances, the printing machinery factory modernization project is designed mainly with the following objectives:

- 1) To expand production capacity;
- 2) To improve competitiveness in the existing products both in cost and quality; and
- 3) To diversify into the production of 4-color offset printing machines.

b) Approach

Because the estimated total investment costs would become very high compared with the present sales volume of PMK, the expansion of production facilities is scheduled to be implemented step by step, which would make it easy for HMT to take a stop-and-go policy for the actual investment implementation in accordance with the trends of market demand.

Table VI-11. Plant Construction Schedule

Step (year)	1st Step 1993/94	2nd Step 1994/95	3rd Step 1995/96	4th Step 1996/97
Plant Space(m ²)				
-Existing	5,760	7,660	11,644	13,012
-Expansion	1,900	3,984	3,672	1,368
Total	7,660	11,644	13,012	14,380
Use of the building				
	-Cylinder assembly	-Inker feeder assembly	-Final assembly	-Storage
	-Material storage	-Sub-assembly	-Test Bench	
	-Washing & painting	-Technical center & administration	-Packing	

The installment of new machines and equipment and the changed plant layout would be made in accordance with the above expansion plan of buildings.

(c) Outline of Improvement Plans

a) Production Technology

The improvement of production technology in the following areas would be expected:

- 1) A tack-pitch production method would be applied for the assembly line. This has been designed to be shifted to a Fully Automatic Continuous Line production in the future.
- 2) For the machining of main frames, inkers, feeders and cylinders, a manufacturing system using FMC is used. For other parts, a Group Technology concept is applied.
- 3) A further improved manufacturing control system would be introduced.
- 4) Advanced process control and cost control systems would be established.

b) Product Technology

In order to meet the diversified user demand, the development of the following product technologies is needed.

- 1) Development of higher grade 2 color machines
- 2) Development of reversing technology
- 3) Development of 4 color machines
- 4) Development of large-size (40 inch) machines

c) Technology Acquisition

In order to absorb the most advanced international technologies quickly, the establishment of technical collaboration agreements with leading world-class manufacturers is essential.

d) Management System

Along with the implementation of the capital investment plans, the re-organization of PMK putting higher emphasis on the expansion of design development capabilities and marketing capabilities would be recommended.

(d) Investment Costs

The total project cost is estimated at Rs.1,105 million, of which Rs. 711 million is domestic currency and Rs. 394 million is the foreign exchange cost. An additional investment of about Rs. 544 million is considered necessary. A summary of the investment costs is presented in Table VI-12.

Table VI-12. PMK - Summary of Investment Costs

(Unit:Rs.million)

	Initial Investment (1992/93-96/97)	Additional Investment (1997/98-99/2000)	Total Investment Amount
1. Land & Building	96	0	96
2. Plant & Equipment	419	86	505
3. Initial Training	14	0	14
4. Other Initiation Costs	24	0	24
5. Technology Acquisition	30	0	30
Base Cost Estimate	584	86	669
6. Physical Contingency	58	9	67
7. Price Escalation	54	37	91
Installed Cost	695	132	828
8. Inc. Working Capital	89	140	229
9. Interest during Construction	321	271	593
Total Investment Costs	1,105	544	1,649

(e) Expected Financial Results

The expected financial results of the investment project is summarized and shown in Table VI-13.

Table VI-13. PMK - Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	127	590	1,234
2. Materials	52	256	552
3. Value-Added	76	335	682
4. Personnel Expenses	28	76	119
5. Depreciation	2	58	56
6. Other Expenses	17	53	95
7. Operating Profit/Loss	29	148	411
8. Interest	4	92	58
9. Non-Operating Expenses/Revenue	9	25	43
10. Profit before Tax	16	32	310
Number of Employees	569	738	851
Production/Employee (Rs. thousand)	223	799	1,450
Profit/Sales (%)	12.6	5.4	25.1

5. Modernization of Foundry Plants

(a) Objectives

HMT has five foundries attached to its principal machine tool units and one attached to its subsidiary (Praga Tools) in Hyderabad which also produces machine tools. These foundries require plant and technology modernization. However, the decision to go ahead with foundry modernization has been held over in HMT because, in machine tool manufacturing, the need for castings is going down with the increasing share of CNC machines, each of which takes away the demand for three or more GPMs.

There is one more foundry in the HMT family, which is the automotive foundry attached to the tractor plant in Pinjore. This foundry, which even now produces only a part of the requirement of castings for tractors, requires expansion, as well as further mechanization.

With the growing market demand for cost competitive and high quality castings both in domestic and international markets, the modernization of the foundry plants is expected to contribute to the upgrading of the quality of machine tools, to the start of exports as well as the outside sales of casting products in the Indian domestic market and for meeting the growing casting demand from TRP.

(b) Basic Concept of Modernization

a) Target Plants for Modernization

1. Foundry at Bangalore

A new model foundry plant would be established at Bangalore, with a monthly production capacity of 500 tons in its initial stage, and 1,000 tons in the final stage. The technology which would be

established in the plant should be disseminated to other foundries of HMT.

ii. Foundry at Pinjore

The foundry at Pinjore should be expanded and modernized in order mainly to meet the growing demand from the tractor factory and partly to supply higher quality of castings to MTP.

b) Approach

The existing production facility in the Bangalore foundry which was mostly installed in 1960/61 is already obsolete and showing considerable deterioration in production capacity due to frequent breakdowns. Thus, the construction of a new foundry building fully equipped with modernized facilities and machines is recommended.

The foundry of Pinjore is operated by two units of MTP and TRP. Although the facilities operated by MTP are mostly obsolete, those operated by TRP are relatively new (mostly installed in 1981). In line with the expansion plan of the foundry for TRP, the renovation of the foundry for MTP is also recommended.

(c) Outline of Improvement Plans

a) Production Technology

Due to the use of very obsolete facilities, the current level of production technology is very low, and a considerable level of improvement in production technology in all processes of casting would have to be achieved along with the introduction of modern facilities.

The major systems which would be newly introduced would be as follows:

- 1) Adoption of the Furan Sand Molding system
- 2) Introduction of an impact molding system for the

transfer molding line for tractor parts with automatic impact molding machines

3) Introduction of continuous shot blast machines

4) Establishment of a Quality Assurance system

b) Management System

With the aim of expanding outside sales, the organization structure of the Bangalore foundry has to be changed in form to put higher emphasis on sales and quality control. The shift of manpower would have to be associated on a massive scale with the reduction of the total number of workers.

Although the establishment of a new sales section is not required for the Pinjore Foundry, organizational reform similar to that in the Bangalore foundry would be needed also for the Pinjore Foundry.

(d) Investment Costs

The total project cost for the Bangalore foundry is estimated at Rs.641 million, of which Rs. 503 million is domestic currency and Rs. 137 million is the foreign exchange cost. The project cost for the Pinjore foundry is estimated at Rs.879 million, which consists of Rs. 485 million local currency and Rs. 394 million foreign currency. A summary of the investment costs is presented in Table VI-14.

Table VI-14. Foundry - Summary of Investment Costs

(Unit:Rs.million)

	Bangalore	Pinjore	Total
1. Land & Building	120	0	120
2. Plant & Equipment	288	494	782
3. Initial Training	3	0	3
4. Other Initiation Costs	1	0	1
5. Technology Acquisition	0	0	0
Base Cost Estimate	412	494	906
6. Physical Contingency	41	49	90
7. Price Escalation	48	54	102
Installed Cost	501	597	1,098
8. Inc. Working Capital	69	29	98
9. Interest during Construction	71	253	324
Total Investment Costs	641	879	1,520
of which			
Local Currency	503	485	988
Foreign Exchange	137	394	531

(e) Expected Financial Results

The expected financial results for the Bangalore foundry and those for the Pinjore foundry are shown in Table VI-15 and VI-16, respectively.

Table VI-15. Bangalore Foundry - Summary of Financial Results
(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	78	349	641
2. Materials	18	136	240
3. Value-Added	60	213	401
4. Personnel Expenses	25	24	31
5. Depreciation	7	30	30
6. Other Expenses	15	74	126
7. Operating Profit/Loss	0	85	214
8. Interest	0	88	56
9. Non-Operating Expenses/Revenue	0	0	0
10. Profit before Tax	0	-3	159
Number of Employees	421	270	270
Production/Employee (Rs. thousand)	185	1,400	2,578
Profit/Sales (%)	-	-0.9	24.8

Table VI-16. Pinjore Foundry - Summary of Financial Results
(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	91	407	643
2. Materials	59	214	336
3. Value-Added	32	193	308
4. Personnel Expenses	17	29	27
5. Depreciation	2	42	41
6. Other Expenses	18	54	129
7. Operating Profit/Loss	-6	0	58
8. Interest	3	98	83
9. Non-Operating Expenses/Revenue	0	0	0
10. Profit before Tax	-9	-44	46
Number of Employees	434	449	354
Production/Employee (Rs. thousand)	210	906	1,816
Profit/Sales (%)	-9.9	-10.8	7.2

B. STRATEGIC INVESTMENT PROGRAMS IN OTHER AREAS

In addition to the 5 strategic investment programs for plant modernization, the following programs are recommended as a part of the strategic investment programs for the restructuring of HMT.

1. Establishment of a Mechatronics Center
2. Development of a Management Information System (MIS)
3. Promotion of a Productivity Improvement Program (PIP)

Although the above projects do not necessarily increase the production capacity of HMT directly, they are expected to play a key role both for the attainment of HMT long-term corporate plan objectives and for the successful implementation of other capital investment projects.

1. Establishment of a Mechatronics Center

(a) Background

In view of recent rapid technological developments, automation technology combining both mechanics and electronics has become an integral part of every product and manufacturing technology of HMT.

In order that HMT can establish itself as a leader of high-tech manufacturing technology, the training in mechatronics technology for employees of both HMT and customer companies, as well as the intensification of R&D efforts for mechatronics technology, would be an urgent need.

(b) Outline of the Project

a) Objectives

The objectives of the establishment of the Mechatronics Center are as follows:

- 1) To promote, bring-up and diffuse the mechatronics technologies to the entire HMT;
- 2) To train the in-house human resources at all employee levels, providing a wide range of curriculum;
- 3) To accept customer engineer training and assist in sales promotion; and
- 4) To join in trouble-shooting and after-sales service for the customers; and
- 5) To add the centralized mechatronics R & D function (mainly in design capability) in the near future.

b) Facilities

Making use of the existing Machine Tool R & D Cutting Center building, one additional floor would be added. In the increased space of about 2,058 sq. meters, the following facilities would be installed:

- 1) Precision Measurement Laboratory
- 2) Control System Laboratory
- 3) Transducer & Sensor Laboratory
- 4) CAD/CAM Computer Laboratory
- 5) Mechatronics Laboratory
- 6) Development of Testing Laboratory
- 7) Audio Visual and Training Laboratory

(c) Investment Costs

The total project cost is estimated at Rs.70.6 million, of which Rs. 45.9 million is domestic currency and Rs.24.7 million is the foreign exchange cost. A summary of the investment costs is presented in Table VI-17.

Table VI-17. Mechatronics Center-Summary of Investment Costs

(Unit:Rs.million)

	Domestic	Foreign	Total
1.Land & Building	9.0		9.0
2.Plant & Equipment	27.9	19.0	46.9
3.Vehicle	0.6		0.6
4.Training	1.75	1.75	3.5
Base Cost Estimate	39.25	20.75	60.0
5.Physical Contingency	3.93	2.07	6.0
8.Price Escalation	2.75	1.89	4.64
Installed Cost	45.93	24.71	70.64
9.Incremental Working Capital	-	-	-
10.Interest during Construction	-	-	-
Total Investment Costs	45.93	24.71	70.64

(e) Expected Operating Results

a) Operating Costs

The annual operating costs of the center at January 1992 price is estimated as follows:

Fixed Cost

Depreciation Costs	-----	Rs. 6,004 thousand
Interest Charge	-----	Rs. 14,128 thousand

Sub-total	-----	Rs. 20,132 thousand
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Variable Cost

Maintenance Costs	-----	Rs. 475 thousand
Utility Costs	-----	Rs. 151 thousand
Personnel Costs	-----	Rs. 1,704 thousand
Others	-----	Rs. 769 thousand

Sub-total	-----	Rs. 3,099 thousand
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Total Operating Costs	----	Rs. 23,231 thousand
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b) Training Courses

The expected number of training courses per annum operated by the center would be as follows:

Training of HMT Workers ;

20 persons/course x 30 courses (10 days each)
= 600 persons;courses/year

Training of Customer Workers ;

30 - 100 persons;courses/year

c) Training Fees

Because the center is designed to provide various kinds of services to each unit such as the training of workers, technical services for product trouble-shooting or product or parts quality testing services, the receipt of various kinds of transfer revenue from each unit of HMT is expected.

If the training fee for a 10-day course is set above Rs.4,500, the revenue from training would cover all

of the variable costs of the center, and if it were above Rs. 33,000, it would cover all of the operating costs of the center.

2. Development of a Management Information System (MIS)

(a) Background

In 1986, the host computer UNISYS A3K was installed and a new division, the Computer System Division (CSB) was established. CSB currently provides (1) on-line processing services for 4 manufacturing units and the Corporate Head Office in Bangalore, (2) batch-processing services for other Bangalore-based units, and (3) technical services for selection of hardware and software facilities needed by HMT Units outside Bangalore.

Due to the inadequate capacity of the present A3K main-frame system, problems in networking the offices in the city and also the units outside Bangalore, and the lack of a master plan for a database information system covering all HMT activities, the present operation of CSB and the overall data base management information system of HMT is insufficient.

In consideration of the above, the Study Team has proposed to improve the total management information system (MIS) of HMT mainly based on the expansion of the capacities of CSB.

(b) Outline of the Project

a) Objectives

Because it would take a relatively long period for HMT to establish a complete MIS, it is proposed that the investment plan to be implemented in 3 stages. The investment project proposed as a part of strategic investments is positioned as the 1st stage of this whole project, which aims at the following objectives:

- To establish a better communication network of all the HMT systems making use of l-net;
- To construct a useful production and management information control model in MTB making use of a

LAN;

- To realize reduction of inventories and speedy money collection by establishing a factory MIS;
- To shorten the total lead time from orders received to dispatch by using a single source information system;
- To transplant the model systems developed in MTB to other units;
- To promote user-oriented office automation (OA) with downsized systems; and
- To train and educate information engineers.

b) Equipment and Facilities

The major equipment and facilities to be installed are as follows:

- Host Computer
 - Main memory : in the level of 48M bytes
 - Disc capacity : 15 gigabytes
 - Printers : 2 sets
 - Communication facilities
 - Basic software
- LAN and bar code technologies
 - Local area network : 1 system
 - Bar code terminal : 15 units
 - Bar code printer : 1 unit
- Educational and training equipment and software

(c) Investment Costs

The total investment cost for MIS development during the period of the action program is estimated at Rs. 153.4 million, of which Rs. 81.5 million is the domestic currency and Rs. 71.9 million the foreign exchange costs.

Table VI-18. MIS - Summary of Investment Costs

(Unit:Rs.million)

	Domestic	Foreign	Total
1.Land & Building			0.0
2.Plant & Equipment	52.6	63.3	115.9
3.Initial Training	13.4	0.4	13.8
Base Cost Estimate	66.0	63.7	129.7
5.Physical Contingency	6.6	6.4	13.0
8.Price Escalation	8.9	1.8	10.7
Installed Cost	81.5	71.9	153.4
9.Incremental Working Capital	-	-	-
10.Interest during Construction	-	-	-
Total Investment Costs	81.5	71.9	153.4

(e) Expected Operating Results

Table VI-19. Summary of the Financial Evaluation of MIS

(Unit : Rs.million)

	1990/91	1996/97	1999/2000
1. Revenue	21.7	51.6	81.5
- Service Revenue	21.2	50.4	80.3
- Other Revenue	0.5	1.2	1.2
2. Expenditure	21.6	67.9	58.3
- Personnel Expenses	3.2	13.1	17.4
- Leasing Fee	8.8	0	0
- Depreciation	1.4	18.8	19.3
- Other Expenses	4.9	8.8	11.7
- Interest	3.3	27.2	10.0
3. Balance	0.1	-16.3	23.2

3. Promotion of a Productivity Improvement Program (PIP)

(a) Background

Most of the units of HMT have a long history of manufacturing. In spite of this long experience, the technical level of each unit is not necessarily high from an international standard. One of the major reasons for this is considered to be the lack of an established system in HMT to improve the manufacturing processes step by step. In Japan, productivity improvement activities are considered to be an integral part of the daily operations of factories, and various kinds of measures are developed to give shopfloor workmen such training as identifying problems from daily operations and proposing improvement measures to solve these problems.

From the above, the Study Team positioned the introduction of a productivity improvement plan in HMT as one of the integral parts of the restructuring study. Along with the implementation of the study, the experimental introduction of a productivity improvement plan, which had been successfully implemented in Japan, to two selected factories in HMT was initiated.

(b) Outline of the Project

a) Objectives

The major objectives of the Productivity Improvement Program (PIP) are as follows:

- 1) Building up a positive work culture in HMT;
- 2) Building up the foundation for continuous productivity improvement activities throughout the company; and
- 3) Realizing a certain level of tangible results in productivity improvement.

b) Approach

The PIP for HMT is recommended to be introduced in the following 3 steps. However, the 1st Step would

mostly be completed by the end of this JICA Study.

Step 1 : Experimental Introduction of Basic PIP

Step 2 : Implementation of Basic PIP at All Units
of HMT

Step 3 : Further Expansion of PIP

(c) Project Costs

From the experience of the 1st Step program, the implementation costs of the PIP could be covered by the general administration costs of each unit, and no specific fund allocation is needed except for the following costs for expert services of outside consultants which would be needed at the 2nd Step program.

Estimated Expenses for 2 Experts per Year

a. Consulting fee	: US\$100,000 x 2 experts	= US\$200,000
b. Air fare	: 4,000 x 4 x 2	= 32,000
c. Accommodation & per diem	200 x 120 x 2	= 48,000
d. Other expenses		20,000

Total

US\$300,000
(Rp.7.76 million)

C. OTHER INVESTMENT PROGRAMS

There are some other programs which are equally important for the achievement of corporate targets of HMT but which were not included in the above strategic action programs due to the limited capabilities of the Study Team. For those programs, separate studies have been made by each unit of HMT keeping the Basic Unit-based long-term strategies in mind. The results of these studies have been reviewed by the Study Team, and the necessary adjustments were made from the view of the overall growth targets of HMT, limited resource allocations within HMT and their financial soundness.

Thus, each of these investment programs is not the result of detailed feasibility studies, but is regarded as one of the indicative figures for future actions of each unit which have to be upgraded by further detailed studies.

The major programs of these are the following:

- 1) Modernization of the machine tool units of HMT other than MTB;
- 2) Modernization of Praga Tools;
- 3) Modernization and expansion of the Watch Business Group;
- 4) Modernization and expansion of the Lamp Division;
- 5) Modernization and expansion of the Die Casting and Plastic Machinery unit (DCB);
- 6) Modernization and expansion of the Dairy Machinery Unit (DMU);
- 7) Modernization and expansion of the Bearing Factory;
- 8) Expansion of the Ball Screw Section; and
- 9) Diversification projects for new areas.

The financial results of above investments were also projected making use of a simple financial projection model.

1. Modernization of the Machine Tool Units of HMT Other than MTB

(a) Background and Objectives

The machine tool business units are considered to be the largest beneficiaries of the implementation of the strategic and other investment programs of HMT, because the majority of the machinery needed for plant modernization is considered to be supplied by these units. Further, the successful implementation of the modernization of MTB would also need the modernization of other machine tool units of HMT because many of the module machines for new manufacturing systems developed by MTB would have to be supplied from the other units.

Under the above circumstances, the modernization of each machine tool unit of MTP, MTK, MTH, MTA and HMB was planned basically with the following objectives.

- 1) To modify the product mix putting emphasis on the integration of the number of models and the increase of CNC and other high value-added items;
- 2) To increase the production capacity by productivity improvements in order to meet the market demand projected to grow at about 10% per annum;
- 3) To achieve the reduction targets of inventory costs; and
- 4) To reduce the total number of workers by replacing obsolete machines with modernized machines.

(b) Investment Costs

The total modernization costs of other machine tool factories except for MTB are estimated at Rs. 2,228.2 million, of which Rs. 1,223.6 million is the local currency and Rs. 1,004.7 million is the foreign currency portion.

The cost breakdown by unit is shown in Table VI-20.

Table VI-20. Other Machine Tool Units - Summary of Investment Costs

(Unit:Rp. million)

	MTP	MTK	MTH	MTA	MBB	Total
1. Land & Building	9.0					9.0
2. Plant & Equipment	352.5	555.4	357.5	252.2	123.6	1,641.2
3. Technology Acquisition		20.0			10.0	30.0
4. Initial Training		6.0			1.5	7.5
5. Physical Contingency	36.2	58.1	35.8	25.2	13.5	168.8
6. Price Escalation	61.0	134.6	67.6	78.8	29.8	371.8
Total Investment Costs	458.6	774.2	460.8	356.2	178.4	2,228.2
of which						
Local Currency	188.9	442.2	214.6	298.6	81.3	1,223.6
Foreign Exchange	269.7	332.0	246.3	59.6	97.1	1,004.7

(c) Expected Financial Results

Table VI-21. Other Machine Tool Units - Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	1,907	4,396	6,904
2. Materials	924	2,341	3,658
3. Value-Added	983	2,054	3,246
4. Personnel Expenses	587	757	866
5. Depreciation	42	122	153
6. Other Expenses	331	653	1,039
7. Operating Profit/Loss	24	522	1,188
8. Interest	126	465	386
9. Non-Operating Expenses/Revenue	-69	-39	-39
10. Profit before Tax	-33	97	841
Number of Employees	9,201	7,351	6,317
Production/Employee	207	598	1,093
(Rs. thousand)			
Profit/Sales (%)	-1.7	2.2	12.2

2. Modernization of Praga Tools

(a) Background and Objectives

Although it is desirable that the current subsidiary company, Praga Tools, be integrated into the total operation of HMT's machine tool business in the near future, the modernization of the production facility in advance of the integration is also important.

The major objectives of the modernization are as follows:

- 1) To increase the production capacity by productivity improvements in order to meet the market demand projected to grow at about 10% per annum;
- 2) To achieve the reduction targets of inventory costs; and
- 3) To reduce the total number of workers by replacing obsolete machines with modernized machines.

(b) Investment Costs

Table VI-22. Praga Tools - Summary of Investment Costs

(Unit:Rs. million)

	Local Currency	Foreign Exchange	Total
1. Land & Building	20.0		20.0
2. Plant & Machinery	154.5	154.5	309.0
3. Technology Acquisition		33.0	33.0
4. Initial Training	1.5	6.5	8.0
5. Physical Contingency	17.6	19.4	37.0
6. Price Escalation	64.9	37.9	102.9
Total Investment Costs	258.5	251.3	509.9

(c) Expected Financial Results

Table VI-23. Praga Tools - Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	506	1,111	1,771
2. Materials	234	514	820
3. Value-Added	272	596	951
4. Personnel Expenses	114	156	178
5. Depreciation	24	28	48
6. Other Expenses	125	302	482
7. Operating Profit/Loss	9	110	243
8. Interest	46	146	199
9. Non-Operating Expenses/Revenue	-20	-20	-20
10. Profit before Tax	17	-16	63
Number of Employees	2,249	1,740	1,492
Production/Employee (Rs. thousand)	225	639	1,187
Profit/Sales (%)	3.4	-1.4	3.6

3. Modernization and Expansion of the Watch Business Group

(a) Objectives

The capital expenditure in the Watch Business Group would be conducted with the following main objectives:

- 1) To modernize the existing production facilities in order to both increase production capacity and increase the ratio of quartz analog and digital watches;
- 2) To increase the Inter-Unit transfer of components by modernization of existing facilities which manufacture these components;
- 3) To augment the watch case manufacturing capabilities from current 4.2 million to 9.8 million cases per annum; and
- 4) To start the non-watch product production, such as timing systems or mini DC motors.

(b) Investment Costs

Table VI-24. Watch B.G.- Summary of Investment Costs
(Unit : Rp. million)

	Local	Foreign	Total
1. Land & Building	250.0	0	250.0
2. Plant & Equipment	1,028.5	638.0	1,666.7
3. Technology Acquisition	0	50.0	50.0
4. Initial Training	8.5	5.0	13.5
5. Physical Contingency	128.7	69.3	198.0
6. Price Escalation	318.3	80.7	389.0
Total Investment Costs	1,734.0	843.2	2,577.2

(c) Expected Financial Results

Table VI-25. Watch B.G. - Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	2,478	5,276	6,921
2. Materials	1,155	2,638	3,461
3. Value-Added	1,323	2,638	3,461
4. Personnel Expenses	413	623	850
5. Depreciation	109	185	216
6. Other Expenses	641	1,319	1,730
7. Operating Profit/Loss	160	512	665
8. Interest	183	459	577
9. Non-Operating Expenses/Revenue	-96	-96	-96
10. Profit before Tax	73	148	184
Number of Employees	7,300	6,210	6,370
Production/Employee (Rs. thousand)	339	850	1,086
Profit/Sales (%)	2.9	2.8	2.7

4. Modernization and Expansion of the Lamp Division

(a) Objectives

The modernization and expansion of lamp manufacturing facilities would be conducted with the following objectives:

- 1) To rehabilitate the obsolete existing facilities and improve productivity with the aim of reducing manufacturing costs both by reducing the number of workers and cycle times and by reducing the inventory costs;
- 2) To establish a new plant having two modernized FTL assembly lines with total production capacity of 10.8 million pieces of FTLs; and
- 3) To install new production facilities for the manufacture of 3.0 million pieces of Compact FTLs.

(b) Investment Costs

Table VI-26. Lamp Division - Summary of Investment Costs

(Unit : Rp. million)

	Existing	FTL/Expansion	Compact FTL	Total
1. Land & Building		24.0	24.0	48.0
2. Plant & Equipment	88.5	132.0	120.0	340.5
3. Technology Acquisition		15.0	20.0	35.0
4. Initial Training		1.5	2.5	4.0
5. Physical Contingency	8.9	17.3	16.7	42.8
6. Price Escalation	17.1	10.7	10.0	37.6
Total Investment Costs	114.4	200.4	193.1	507.9
of which				
Local Currency	88.0	56.9	54.4	199.3
Foreign Exchange	26.4	143.5	138.7	308.5

(c) Expected Financial Results

Table VI-27. Lamp Division - Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	237	991	1,217
2. Materials	101	415	510
3. Value-Added	136	576	707
4. Personnel Expenses	102	110	112
5. Depreciation	10	39	33
6. Other Expenses	73	304	374
7. Operating Profit/Loss	-49	122	189
8. Interest	14	160	149
9. Non-Operating Expenses/Revenue	1	1	1
10. Profit before Tax	-64	-39	39
Number of Employees	1,949	1,186	905
Production/Employee	122	836	1,345
(Rs. thousand)			
Profit/Sales (%)	-27.0	-3.9	3.2

5. Modernization and Expansion of the Die Casting and Plastic Machinery Unit

(a) Objectives

In DCB, the capital investments are needed with the following objectives in mind:

- 1) To modernize the existing facilities with the aim of expanding production capacity, and reducing cycle times, inventory costs, and the number of workers; and
- 2) To diversify the product range, especially in the plastic machinery area, and introduce new products with high competitiveness both in cost and quality.

(b) Investment Costs

Table VI-28. DCB - Summary of Investment Costs

(Unit : Rp. million)

	Existing	New Products	Total
1. Land & Building	12.0	22.0	34.0
2. Plant & Equipment	136.0	251.0	387.0
3. Technology Acquisition		5.5	5.5
4. Initial Training		1.0	1.0
5. Physical Contingency	14.8	27.9	42.7
6. Price Escalation	39.5	76.2	115.7
Total Investment Costs	202.3	383.6	585.9
of which			
Local Currency	169.9	328.2	498.1
Foreign Exchange	32.4	55.4	87.8

(c) Expected Financial Results

Table VI-29. DCB - Summary of Financial Results

(Unit:Rs. million)

	1990/91	1996/97	1999/2000
1. Sales Value of Production	96	376	672
2. Materials	48	215	384
3. Value-Added	48	161	288
4. Personnel Expenses	12	28	42
5. Depreciation	1	24	35
6. Other Expenses	13	51	91
7. Operating Profit/Loss	22	59	121
8. Interest	1	53	73
9. Non-Operating Expenses/Revenue	-2	-2	-2
10. Profit before Tax	22	8	50
Number of Employees	208	280	315
Production/Employee (Rs. thousand)	462	1,343	2,133
Profit/Sales (%)	22.9	2.1	7.4

6. Modernization and Expansion of the Dairy Machinery Unit

(a) Objectives

In DMU, the capital investments are needed to achieve the following primary objectives:

- 1) To modernize the existing facilities with the goal of improving the existing products and shifting the product mix in response to the change of market demand, the expanding production capacity, and reducing cycle times, inventory costs, and the number of workers; and
- 2) To diversify the product range, and introduce such new products as ice cream making machines, homogenizers or packaging machinery.

(b) Investment Costs

Table VI-30. Dairy Machinery Unit - Summary of Investment Costs
(Unit : Rp. million)

	Existing	New Products	Total
1. Land & Building		20.0	20.0
2. Plant & Equipment	35.0	80.0	115.0
3. Technology Acquisition		20.0	20.0
4. Initial Training		8.0	8.0
5. Physical Contingency	3.5	12.9	16.3
6. Price Escalation	6.3	17.5	23.8
Total Investment Costs	44.8	158.3	203.1
of which			
Local Currency	20.1	51.4	71.5
Foreign Exchange	24.7	106.9	131.5