F. Direction of Marketing Strategy

i. Strengthen sales force

More than 80 percent of HMT sales of major products were sold to NDDB between 81/82 and 90/91. The heavy dependence of HMT's sales on NDDB makes its operations unstable and thus it is imperative for HMT to promote sales to the private sector.

HMT's present sales force is, however, not adequate to meet the wide spectrum of customers, who are geographically spread to all corners of the country. HMT needs to increase service engineers to take care of technical support. These engineers may be concerned with the sales of machinery as well, and are required to correspond to customers technical enquiries. Not only establishment of new sales branches but also utilization of HMT Tractor's existing sales network is worth considering.

ii. Delegate authority to the sales force

The sales of dairy machinery involves repeated discussions over detailed specifications with customers, and without quick confirmation both in specifications and pricing, the order cannot be secured. It is desirable for HMT to delegate a wide range of authority to sales people so that flexible and quick decisions can be made.

iii. Widen the product range

Alfa Laval maintains a wide range of dairy machinery through introducing technology and designs from its overseas principal company. Compared with this company, HMT has a narrow range of products. This is evident in plate heat exchangers.

In the short run, HMT should improve the existing products by adding options so that the products can meet customers' requirements with minimum modification. In the long run, it is recommended that HMT develop food processing machinery and packaging machinery for various kinds of foods in addition to dairy machinery since the demand for such machinery, in general, has begun to grow. To do so, HMT may need to introduce advanced technology from overseas. In entering into the new fields, it is inevitable for HMT to carry out comprehen-

sive survey that include the trend of consumers' tastes, trends of food production , the size of market, the scope of HMT's existing technology, the possibility of technical collaboration, and the situation of competitiveness. Through the survey, HMT can determine the future product mix and the size of investment.

G. Necessary Measures Concerning Cost Reduction

Design involvement is vitally important for the improvement of the cost performance. Persistent VE activity as well as an increase in mass production would contribute directly to the cost reduction.

H. Necessary Measures Concerning R&D

There are 11 design staff and no R&D specialists, at this moment. When the final decision is taken, on restructuring integration of marketing, design and R&D would be envisaged.

Independent R&D efforts, after obtaining technology from outside, is important so that future success in new development is possible. It is important to create originality in the products.

IV-7. FOUNDRY

A. Market and Competition Analysis

A-1. Domestic Market

1. Market Size

(a) Total Market

Production of castings for sale (hereinafter saleable castings) by the medium-large sector during 1988-89 was estimated at 590 thousand tonnes. The production of the small scale sector (which is primarily for sale) is estimated at 885 thousand tonnes (estimated at 60% of the total saleable production). Estimates of production for in-house consumption vary from 20% to 50% of total saleable production. India's external trade in castings is negligible in comparison with domestic consumption. Therefore the current production and consumption of castings may be estimated at 1.8 - 2.2 million tonnes per annum.

Table IV-7-1 Estimated Size of Castings in India (1989/90)
Unit: '000 tonnes

Type of Suppliers	Annual Production
Production by medium-large units	
- Saleable castings	590
- Captive consumption	295-740
Production by small scale sector	885
Total	1,770-2,215

(b) Production Trends of Medium-Large Sector Units

Production trends of saleable castings by units in the medium-large sectors is shown in Table IV-7-2.

The production of saleable castings by the medium-large sector have increased at an average growth rate of 5% (in volume terms) during the 1980s. This growth appears low compared with a 8% - 12% growth in the user sectors. This stagnated growth is accounted for by the following reasons.

- The higher proportion of imports of components/ parts specially for new models introduced by the automobile sector, during the 1980s.

- The shift towards lighter/thinner walled castings (i.e., lower weight/unit).

- Increasing captive of producing on account of delicensing and broad-banding of the industry.

Table IV-7-2 Production of Saleable Castings by Medium-Large Sector Units

Unit: '000 Tonnes

Year	Production
1980	382
1981	432*
1982	419
1983	451
1984	470
1985	514
1986	522
1987	603
1988	764
1989	590

Source: Directorate General of Technical Development (DGTD) and Centre for Monitoring Indian Economy (CMIE) Reports.

* Trade Development Authority (TDA) - Guide to the Castings and Forgings Industry in India.

(c) Demand Projections

Table IV-7-3 shows projections for the major user sectors. The estimated growth rates vary from 8% to 12% per annum for these user sectors.

The demand on medium-large units producing saleable castings may increase at a higher rate considering the continued trend towards ancillarization of OEMs, if these units upgrade facilities significantly they will be able to exploit the potential presented to them.

Table IV-7-3 Demand Projections for User Industries

Sector	Projections (% CARG)	Source	Projection Period/Remarks
Automobile			
- Cars & Jeeps	10	Automobile Component Manufacturers Association	1990-1995
- Heavy Vehicles	5.7		
- Light Commercial Vehicles	13.2		
- Tractors	7.4		
Machine Tools			
	14.3	Report of the Sub-Committee set up by the Government of India	1990-1995
	15.4	Sectoral report prepared by MHT	1990-95 Average inflation of 10% has been considered
Capital Goods Sector	9.3	World Bank Report India : Capita Goods Sector - Update	1990-2000
- Electrical and Non Electrical Machinery	10.2		
- Transport Equipment	5.4		

2. Competitor Analysis

(a) Location

Most of the casting units in India are concentrated in four areas viz. Madras-Coimbatore region in the South, Calcutta and suburbs in the east, Delhi and surrounding areas in Punjab and Haryana in the north and Pune-Kolhapur belt in the West.

(b) Types of Suppliers

i. Medium-Large Casting Units

Three different types of casting units may be found in the medium-large sector in India.

(1) Independent/stand alone units

Independent casting units were set up only from late sixties onwards in order to fill in the gap arising as a result of overbooking of in-house facilities and the growing trend amongst the newly set up OEMs to depend on outside facilities for components.

(2) Captive units/subsidiaries catering primarily to the in-house requirements of a company

Equipment/automobile units (OEMs) set up in the fifties and sixties had in-house facilities for meeting their casting requirements. Some of the captive facilities were constantly upgraded and are now amongst the best in the country.

(3) Units originally set up to meet a company's in-house requirements but which have been subsequently expanded to market castings as an additional product line.

Some companies with captive foundries have diversified into supplying castings to outside parties responding to the increase in demand for castings.

At present an estimated 400 units produce castings for sale.

ii. Small-Scale Sector Casting Units

There are a large number of units in the small scale sector (SSI) supplying non-standard quality castings to nearby engineering units.

(c) Installed Capacity

The number of medium-large companies producing saleable castings has increased from 130 in 1970 to 362 in 1986 according to DGTD data. The installed capacity increased from 429 thousand tonnes to 1.06 million tonnes during the above period. The compound annual growth of capacity in the seventies was 5.4% while in the first six years of the eighties it was 6.5%.

The pattern of change, in number of casting units, by type of castings is presented in Table IV-7-4.

The distribution of casting units by capacity size is shown in Table IV-7-5.

Table IV-7-4 Number of Casting Units

	1970	1980	1986
Steel	43	61	70
SG Iron	13	17	59
Malleable Iron	14	16	40
Non-Ferrous	17	16	17
Cast Iron	43	17	176
Total	130	208	362

Source: Casting and Forgings : A Sectoral Study, EXIM Bank, October 1990.

Table IV-7-5 Casting Units by Size of Capacity in 1986

Capacity Class (tonnes per annum)	% of units	Avg. Capacity of Units (tonnes) in the class
Less than 1,000	14%	200
1,000 to 5,000	41%	2,967
5,000 to 10,000	23%	6,882
10,000 to 15,000	7%	13,600
15,000 and more	15%	26,363
	100%	7,767

(d) Major Casting Suppliers

Amongst the units producing saleable castings, only a handful have a national market. All these units specialize in making sophisticated castings for the automotive and machine tool industries. Brief profiles of the larger units in each of the three above mentioned categories is provided in Table IV-7-6.

Table IV-7-6 Major Castings Manufacturers in India

Name	Ennore Foundries	DCM Engineering Ltd.	Mysore Kirloskar Ltd	Mukand Ltd.
Establishment	1959	-	1941	1937
Location	Madras	Ropar in Punjab	Harihar in Karnataka	-
Annual Turnover	Rs.489.3 million (1988)	Rs.330 million(Unit) (1990/91)	Rs.385.5 million (1988)	Rs.3,030 million (1988)
Products and Other Remarks	Sister company of Ashok Leyland. It manufactues both ferrous and non-ferrous castings for group companies. It caters mainly to the requirement of the automobile sector. The plant has fully mechanised core-making and moulding facilities, continuous type mixers for cold set process and latest moulding unit. For final checks, it has specially designated inspection and spot facing jigs.	It manufactures ferrous castings mainly for the automobile sector.	Apart machine tools, and ball and roller bearings, it also manufactures SG iron and CI castings.	The various divisions are engaged in steel making, re-rolling, foundry machine building and engineering service. The steel foundry produces castings for automobile, ship building, sugar, cement industries, defence services and railways in India and abroad.

Table IV-7-6 Continued.

Name	Secals Lts.	TELCO	Hindustan Motors Ltd
Establishment	-	1945(Company)	1942 (Company)
Location	Ranipet in Tamil Nadu	Jamshedpur in Bihar Pune in Maharashtra	At five places
Annual Turnover	Rs.105 million (1989/90)	-	-
Products and Other Remarks	It is engaged in the manufacture of steel castings.	It manufactures truck and bus chassis and body, excavators, industrial and marine diesel engines, general and special purpose machines, various kings of electronic equipment weighing and testing equipment, etc.	It is engaged in the manufacture of automobiles, diesel and petro engines, excavators, steel structurals, earth moving equipment, power shift transmissions, etc. Apart from depending on in-house facilities, it procures castings from outside sources also.

A-2 International Market

1. World Production

The foundry production in the world is shown in Table IV-7-7 and IV-7-8.

The foundry production in advanced countries has been gradually decreasing.

In Japan, an increasing number of foundry suppliers have tended to close their factories. As a result, foundry users are faced with serious problem in procuring castings, especially hand moulded products of medium/large size. The delivery time required by suppliers has become extremely prolonged in Japan.

The increasing number of Japanese users purchase or plan to purchase castings from such countries as Korea, Taiwan, China, and Thailand to secure stable procurement of castings.

This is the trend commonly observed in advanced countries for the foundry supply.

Considering this trend, it is considered that there exists a great potential of Indian exports of castings to advanced countries.

Table IV-7-7 World Foundry Production

Unit: 1,000 tons

Year	1980	1985	1988
Japan	7,350	6,987	7,392
USA	13,705	11,480	10,515
Germany	4,392	3,999	4,017
UK	2,228	1,553	1,419
France	2,732	2,138	2,215
Italy	2,242	1,896	2,126
Korea	706	881	1,198
Taiwan	506	676	1,247
Canada	1,277	867	951
Mexico	939	634	405
Brazil	1,797	1,530	-
Turkey	265	414	557

Source: AFS Modern Casting
APO.JPC Seminar

Table IV-7-8 Foundry Production in the Asian Countries(1988)

Unit: 1,000 tons

Country	Production
China	11,000
Taiwan	1,235
Korea	1,198
Thailand	135
Malaysia	50
Philippines	130
Indonesia	75
Singapore	30
Sri Lanka	6
Nepal	3
Hong Kong	85

Source: APO-JPC Seminar

2. Exports of Indian Castings

Table IV-7-9 shows the trends of castings exports from India.

Exports of castings from India have been growing rapidly during the 1980s. However, in 1989-90, the export of industrial castings and forgings was a mere 3% of the total exports of engineering goods and about 2% of the total world trade in castings and forgings.

Table IV-7-9 Exports of Castings

Unit: Rs. Million

Year	Industrial Castings	Sanitary Castings
1980-81	10	255
1981-82	19	NA
1982-83	34	NA
1983-84	38	365
1984-85	82	NA
1985-86	72	268.6
1986-87	159	285
1987-88	140	NA
1988-89	180	NA
1989^90	580	NA

Source: Industrial Castings:
1980-81 to 1986-87 - Directorate General Commercial Intelligence and Statistics (DGCIS),
1887-88 to 1989-90 - Engineering Export Promotion Council (EEPC)

Sanitary Castings:
Trade Development Authority

Exports of castings by type of product are shown in Table IV-7-10.

Grey iron castings form the major portion of the castings that are exported. However, over the years the proportion of steel castings in the total has shown an increase. The realisation for grey iron castings is around Rs.10/-kg compared to Rs.50-60/-kg for steel

castings. Indian castings fetch prices lower than the world average as they cater to the lower end of the market.

USSR and EEC countries are the major buyers of steel castings exported from India, while exports of iron castings is mainly to the USA. Other major buyer are Saudi Arabia and Australia.

Table IV-7-10 Share of Exports of Iron and Steel Castings

	1982-83	1983-84	1984-85	1985-86	1986-87
Exports of all castings (Rs.million)	34.3	38	82.2	72.4	159.4
% of iron castings	82.8	79.7	50.4	60.0	65.98
% of steel castings	17.2	20.3	49.6	40.0	34.02

Source: EXIM Bank report

3. Necessary Conditions for Entry into the World Market

The requirements of foundry users in Japan in purchasing castings from abroad are as follows:

- quality level which satisfies the internationally acceptable standards;
- punctuality for the term of delivery; and
- stable prices.

The Indian foundry industry has fallen behind the level of advanced countries in terms of technologies. The following problems with which the Indian foundry industry has been confronted should be tackled when it begine to promote exports of their products to overseas markets.

(1) It can not produce high-quality castings, which are required a result of the rapid progress in designing and production technologies.

(2) As a whole, foundries in India use the machinery with the technologies of the 1960s applying the production technologies of that period.

(3) It is forecast that supplying capacity of the foundry industry will not be able to meet the increasing domestic demand in the near future .

(4) The production process adopted is obsolete and labour-intensive. Work conditions are very bad and heavy manual work is prevailing at most foundries.

B. Product Competitiveness Analysis

1. Price Competitiveness

Current inter-company trading prices of castings at HMT are as shown in Table IV-7-11.

Table IV-7-11 Grey Iron Castings Prices at HMT

Unit	Price Rs./kg	Price ¥/kg
MTB	24.8	149
MTK (For machine tools and printing machinery)	18.7	112
MTP (For machine tools)	24.0	144
MTP (For tractors)	26.0	156
MTH	18.0	108
PTH	18.0	108
MTA	23.5	141

Note: Ex-works basis.
Costs of proof cutting and primer coat are not included.
Rs. 1 = ¥6

The prices of foundry products manufactured in Japan for machine tools are as shown in Table IV-7-12. These prices include costs for a materials certificate, dimensional records, proof cutting, hardness check, and primer coating. Prices are actually decided according to such conditions as the shape of product, quality, volume, delivery, etc.

Table IV-7-13 shows the prices of imported foundry products in the Japanese market.

Table IV-7-12 Prices of Japanese Grey Iron Casting for Machine Tools in Japan (1990 price)

Unit: ¥/kg

Size	Price
Over 3,000kg	200 - 220
500kg - 3,000kg	180 - 200
Below 500kg	190 - 210

Note: Delivered basis.

Table IV-7-13 Prices of Imported Grey Iron Castings for Machine Tools in Japan (1990 price)

Unit: ¥/kg

Exporting Country	Price
Korea	150
Taiwan	160
China	140

Note: CIF basis at Yokohama/Kobe port.
Price of machine tool parts of 1,000-2,500kg/piece.

Prices of grey iron castings from various sources are compared in Table IV-7-14.

When the price of HMT's castings is compared with that of competing products, such expenses as proof cutting, method inspection/hardness inspection, inland freight, ocean freight, insurance, and custom clearance should be added to ex-works prices for HMT's castings. Freight from Indian port to Japanese port is roughly estimated at ¥21/kg.

It can be concluded that HMT's castings are nearly at the world competition level in terms of price even when these additional expenses are taken into consideration.

Table IV-7-14 Price Comparison of Grey Iron Castings for Machine Tools at the Japanese Market (1990 price)

Unit: ¥/kg

Source	Price	Trade Terms
Japan	180 - 220	Delivered basis
Korea	150	CIF basis
Taiwan	160	CIF basis
China	140	CIF basis
HMT (India) (Estimates)	129 - 177	C & F basis (Rs.1=¥6)
	111 - 151	C & F basis (Rs.1=¥5)
	147 - 203	C & F basis (Rs.1=¥7)

2. Product Quality Competitiveness

Due to its obsolete technologies and facilities, the quality level of HMT's castings is far behind the international level. The followings are pointed out as the major quality problems of HMT products.

(1) Inferior appearance
- Rough surface, especially at vertical surfaces, due to sand-burn and surface fold.
- The edge of sharp corner is not clearly shaped.
- Repair welding is done at critical parts.

(2) Deformation
- Deformation due to swelling is often observed at the center of products.

(3) Excess cutting margin
- Excess cutting margins are reserved because the deformation is adjusted by proof cutting.

(4) Dimensional dispersion
- Adjustment piece by piece is required for casting parts to be processed on specialised machines.
- NC processing requires table accuracy because adjustment process takes extra hands.

C. Production Facilities and Product Technology Assessment

HMT foundry shops have been accorded a positioning secondary to the main products (i.e., machine tools, printing machinery, and tractors). Without any significant investment and as a result, with old technologies and inferior working environment, workers' morale and productivity has been low.

1. Production Facilities

The present situation of production facilities can be summarised as follows:

- Superannuated facilities, especially sand plant, moulding facility, melting facility, and finishing facility.
- Operation by experience, without quantitative control.
- The Feasibility Report for Modernization of Foundry I&II was prepared in 1983, but it was practically not implemented.
- Diversified product mix from small components to large parts, from small quantities or lack of production of all items in each foundry shop.
- Extraordinarily large number of maintenance crew (about 15% of total).

(a) Sand Preparation Facility

(1) Native river sand is dried and processed in the foundry, while in Japan, the compacted silica-sand with determined grain size is available.

(2) Sand preparation is important for the casting quality. Sand test is carried out in each shop, but the data is not utilized for the quality improvement.

(3) Sand preparation is manually controlled and quantitative control insufficient.

(4) Sand delivery and recovery are carried out by an open-type process and core-knock-out machines of open-type are used. As a result, dust causes many of the problems.

(5) Dry sand is not available in medium/large quantities, so the drying furnace occupies precious moulding space.

(6) Various core making processes such as oil sand, CO2 sand, alkyl resin, cold-box mould, and shell mould are used.

(b) Melting Facility

(1) Low frequency induction furnaces of 1.5 - 5.0 tons capacity are used and rather long melting time necessary.

Initial melting time:	5.5 Hr.
Subsequent Charge :	1.0 Hr.

(2) Most shops are not equipped with instantaneous chemical analysis meters before discharge. The wet type chemical analysis takes time, which causes problems for the discharge temperature control.

(3) The wedge test used for the chemical analysis, gives only rough marks for macro-judgement.

(4) The conventional cupola still exists for use in an emergency, but is rarely used.

(5) Ladle preheating is not available.

(6) Raw material input is carried out by manual operations.

(7) Corroded scrap induces to much slag.

(c) Moulding Facility

(1) Jolt squeeze turn-over type for smaller size, and jolt squeeze pattern draw type (made by BMD) for medium size are applied. But BMD-made pattern draw type is not popular in Japan, because of fluctuations in hardness, mould-shift and sand inclusions.

Ramming is not applied with the jolt squeeze process, with the result that the sand burns, particularly at the vertical wall, are found.

(2) Thin flask thickness causes deformations.

(3) Flask clamping is weak and wooden wedges are insufficient.

(d) Finishing Facility

(1) Finishing facility such as shot blast/hydro blast for large-sized castings is not fully equipped. Most foundries are contracting fettling operation outside. But due to the insufficient facility, finishing work largely depends on manual work. Therefore a part which is difficult to reach remains unfinished.

(2) Castings with unfinished surface primer coating requires considerable touching-up after machining.

(3) The above are unacceptable conditions, if intended for sales outside.

(e) Mould Making Facility

(1) Moulds are totally made in-house. Materials with sufficient tolerance are used.

(2) Tolerance is checked by ruler. Without precision measuring apparatus which is necessary for larte-sized wooden moulds with severe allowances.

2. Product Technology

(1) Too much cutting margin. Cutting margin is almost double of Japanese standard, which requires more time for machining and pushes the cost up.

(2) Too much dimensional dispersions. Even the mass produced engine cylinder block needs individual adjustment before setting for the machining, which would be impossible for future NC-machining.

(3) Large distortions
Distortions appear on such long castings as beds. Swellings are also observed.

(4) Thick fins
Large amount (3-6 mm) of fins appear at the joining part of most products.

(5) Rough surface
Rough surface is mostly caused by irregular sand grain size and by the lack of ramming actions.

(6) No vent hole in moulds for CO2 moulding and cold box process.

(7) Unacceptable welding repairs

3. Production Technology

(a) Pattern Making

(1) Deodar is mostly used for wooden moulds. Poly styrene foam and urethane materials are also used for moulds but synthetic resins are not used.

(2) A drawing of a wooden mould is not drafted. Casting engineers direct the tolerance and the parting configurations on plans.

(3) Steel components are sometimes utilized for the manufacture of a core for large casting.

(4) Wooden boards of 40 - 50 mm thick are generally used for core moulds. Plywood is hardly used.

(5) Corner radius is not applied for some products.

(6) Inspection is made by the measuring scale and height gauge. No precision instruments and 3-dimensional measuring apparatus are used.

(b) Sand Control

(1) Sand preparation standard differs slightly in each factory.

(2) Sand preparation standard, not immediately updated with the defect reports on the casting quality.

(c) Moulding

i. Dry Sand Mould

(1) The corner radius not applied.

(2) The gating systems by experience and individual judgment.

(3) Defective core moulding.

(4) Core-shift due to inaccurate spacing between main and core mould.

(5) No heating sleeve and insulation sleeve.

(6) No vinyl exhaust tube.

(7) Smaller pouring box.

(8) No exhaust gas passage in main mould.

(9) No sealing material at the mould joints, instead of the clay.

(10) Weak swell preventive scheme by bolt clamping with wooden wedge.

(11) Defective mould, repaired with the dry sand, dried by way of gas burner.

(12) Unclean pattern shop.

(13) No high-temp. resistant paint (ex. ZrO2-base).

(14) Chiller plate directly attached to the mould.

ii. CO2 Moulding

(1) No vent holes in the mould, unable to confirm the CO2 gas filling.

(2) Defects caused by the pattern-draw, partially repaired by CO2 sand, but hardening is insufficient.

iii. Green Sand Moulding

(1) Manual transfer for the flask.

(2) Manual pendulum operation after the discharge.

(d) Mould Drying

Oil burning drying furnace, irregular temp. distributions causing distortions and cracking.

(e) Melting and Pouring

(1) Low frequency induction furnace; 1.5 - 5.0 tons capacity.

(2) 3 ton/Hr. Cold Blast Cupola rarely operated.

(3) Manual operation of raw material inputs based on experience without any measuring appliances.

(4) Instantaneous chemical analysis unavailable; too much time required to adjust the chemical composition due to wet analysis.

(5) Quality check by the Wedge Test only.

(6) Pouring temperature controlled by the optional or the immersion type pyrometer.

(7) Ladle pre-heat unavailable, causing rapid temp. decrease.

(f) Decomposing, Sand Shake-Out, and Fettling

(1) Shake-out machine available.

(2) Hanger blast, tumbler blast, table blast for small/medium sizes, but larger sizes must be done manually.

(3) Blast performance not good, burned sand still on the surface, no visible metallic lustre on the surface.

(4) Corner grinding and core grinding insufficient.

(5) Fins are too thick to grind. Incomplete finishing causes extra machining.

(6) Unacceptable Eutectic Weld repair on the surface.

(g) Testing and Inspection

(1) Wet analysis, C-S, Si meter. Ladle analysis by C-si, meter.

(2) Mechanical properties tested.

(3) Microscope inspection available.

(4) Dimensional check, appearance check by the individual inspector. But for the mass produced items, total inspection not available.

Visual inspection applied does not meeting with international standards.

4. Maintenance Control

(1) The maintenance works are carried out by the mechanical and the electrical group on a 24-hours -basis, which consist of

86 persons	at MTB,
35	at MTK,
29	at MTP,
30	at MTH,
13	at PTH, and
25	at MTA.

(2) Though preventive maintenance is attempted, there are occurances of breakdowns of more than 10 days, due to the excessive superannuation of the facilities.

5. Quality Control

(1) The quality control data at the stage of sand preparation, melting and pouring, and the data of chemical composition and the mechanical property tests are collected but not effectively analyzed and evaluated.

(2) The above data are not utilized for the non-conformity control and for the corrective actions on the defects encountered during the production.

(3) The number of staff in charge of quality control is small. The appearance inspection at the despatch and the occasional QC patrols in the machine tool shop are only conducted for the quality control activities.

D. Input Factor Analysis

1. Labour

HMT foundries are characterized by aged workers with longer service years.

	Mean Age	Averages Years of Service
MTB	49 years	28 - 30
MTK	46	22 - 24
MTP	46	23 - 24
MTH	42	20
PTH	42	20
MTA	42	20

The aged workers are concentrated in the pattern making, moudling and the melting shops.

Younger generation are desperately needed for the future, including in the electronic field.

2. Raw Material and Auxiliary Materials

Individual procurement is done at each local unit. The domestic procurement occurs without any problems, but the lead time varies from 2 weeks to 6 months.

(a) Melting Raw Material

i. Melting Raw Pig Iron

Two types of pig iron are available in India.

	C	Si	Mn	P	S	
A	3.6-4.0	1.25-1.75	0.5-1.0	<0.04	<0.05	(%)
B	3.5-4.0	1.75-3.25	1.0-1.5	<0.04	<0.05	

But open storage induces corrosion.
The procured unit weight of about 10 Kg is too big for the induction furnace; the resultant crushing operation in the HMT shops increases the extra cost.

ii. Return Scrap

The feeder, riser and gates used in the casting are returned to the foundry, as well as the unaccepted products.

iii. Return Steel Scrap

The forged scrap and the steel plate scraps are available.

iv. Alloyed Steel

Domestic alloyed ferrous steel is available; Fe-Si, Fe-Mn, Fe-Cr.
The inoculating Ca-Si is available domestically or can be obtained from France and Japan.

(b) Moulding Raw Material

(1) Domestic river sand available, quality; SiO2 98%, AFS No. 45-40. The Green Sand is dried in HMT foundry shops.

(2) Bentonite/Water Glass available in India.

(3) Self-hardening additives and the catalyst also are available in India.

(4) The wax-base gas-exhaust is applied but the synthetic tube is not applied.

(5) Heating and insulation sleeves are not used.

(6) Clay pipe is applied in the sprue.

(7) The mould seal material is not applied.

E. Identification of Prospective Product Groups and Product Mix

The future product mix of foundry group is proposed to consist of two groups, i.e., (1) supply of castings to HMT business groups, (2) sales of castings to outside users.

1. Supply to HMT Business Groups

In order to secure stable supply of castings to HMT businesses, foundry units should undertake necessary measures

- to expand production facilities in keeping with business growth of user business groups; and
- to improve product quality responding to the requirements of user business groups.
- Rearrangement of producing castings at individual foundry units should be examined from viewpoint of the integration of production of similar products at a unit and the specialisation by product type of individual units.

2. Sales to Outside Users

For the sales of castings, the following three product groups are identified as promising.

(1) Casting parts to be produced in a large quantity

Demands of the following casting parts are expected to expand in India.

Pump components:	Casing, Impeller, Pump Base, Bearing housing
Valve components:	Body, Bonnet, Gland, Handle
Blowers:	Casing, Bearing housing, Guide Vane

Compressors:	Cylinder, Guide Vane, Distance Peice
Marine Engines:	Cylinder Head, Jacket, Cylinder Cover

(2) Casting products to be produced based on the technologies at MTK

Based on the technologies of cylindrical casting:

Paper Roll, Rubber Roll, Roll Head, Roll Shell,

Steel Mill Chilled Roll

Based on the technologies of flat casting:

Paper Roll Frame, Cast Iron Gears

(3) Mass production of casting parts for automobile engines based on MTP's technology for diesel engine parts

F. Direction of Marketing Strategy

The following basic concepts is proposed for the foundry business.

(1) Separation of foundry business from existing business groups

It is proposed to make foundry divisions into an independent business unit under the name of the Foundry Business Unit separating them from the units, such as MTB, MTK, etc., to which they at present belong.

According to this direction, the foundry business unit should be attached a status of independent profit centre and the marketing and sales sections will be set up within the Group.

(2) Expansion of production capacity

It is proposed to undertake urgently the modernisation of production facilities and improvement of production control.

With this project, production capacity of foundry at HMT will be expanded over and above the company-wide requirements.

(3) Expansion of Sales to Users Outside

The foundry business units will sell surplus products to outside users.

HMT currently does not sell castings to outsiders. Therefore, the foundry business unit is required to take active measures for sales expansion.

Based on the basic strategy, the direction of marketing strategy of the foundry business unit will be as follows:

(1) To exploit the potential in the domestic market

(2) To establish a reputation for its internationally-acceptable level of quality

(3) To promote sales to overseas

Actions to be taken for this strategy are as follows:

(1) Sales division and marketing section should be rein forced.

Sales and marketing personnel with experience will be transferred from other business groups.

Market research will be undertaken to identify potential users and users' needs and requirements.

(2) First priority will be given to the domestic market. After the establishment of capability of supplying stable products within the delivery deadline, sales efforts will be directed to overseas markets.

(3) First of all, markets for medium-quality civic equipment such as man hole covers and cast iron pipes will be targeted. With that experience HMT will gradually extend its business to more sophisticated and value-added cast iron products.

(4) Marketing efforts should be assisted by the renovation of production side such as the modernisation of production technology and the expansion of manufacturing capacity.

G. Necessary Measured Concerning Cost Reduction

1. Productivity Improvement

The present levels of productivity at HMT foundries measured by the per capita yield are as follows:

Unit	Monthly Yield (tons/man)
MTB	0.50
MTK	0.57
MTP	0.73
MTH	0.45
PTH	0.80
MTA	0.44

In Japan, this figure is at least 6.0 tons/man at mechanical-mould and hand-mould factories.

In order to improve HMT's level of productivity to the Japanese standard, the following measures should be taken.

- Introduction of automated moulding
- Introduction of core shell moulding
- Introduction of the Furan moulding process

2. Quality Improvement

The present defect ratio of HMT foundries are high as follows:

Unit	Defect Ratio (%)
MTB	12.54
MTK	4.93
MTP	13.90
TRP	7.50
MTH	1.76
PTH	19.72
MTA	12.00

In addition, the ratio of defects found after the delivery to the machine shop are also high.

In order to decrease defective products, proof cutting of castings should be done at the foundries.

With the proof cutting, the loss of time because of defects after machining operation will decrease and the extra stocks of materials in anticipation of defects will be reduced.

This also facilitates the immediate feed-back of information on quality and the quick action for the improvement of quality.

3. Introduction of New Technology

Various items of new technology should be introduced for the cost reduction in the foundries.

(a) Reduction of cost of patterns

- Use of synthetic materials
- Use of aluminum die-cast metallic patterns
- Use of plastic patterns

(b) Adoption of the Furan sand moulding

The Furan sand moudling has several advantages such as the easier recycling of used sand and shortened production process.

(c) Adoption of static automatic moulding

(d) Adoption of shell moulding.

H. Necessary Measures Concerning R & D

Depending on the introduction of the new production technology, the processes of Furan moulding and shell moulding should be developed by R&D.

The improvement in quality to the internationally competitive level should be the pursuit for future R&D activities.

I. Necessary Measures Concerning Production Facilities and Technology

(1) Modernization of production technologies

a. The quality standard should be of an international level.

b. Efficiencies of labor, machine utilization, and energy should be upgraded to the level of advanced countries.

c. The improvement of working environment and pollution control should be promoted.

d. Elimination of heavy and dirty work should be achieved by the introduction of automated production.

(2) Modernization of production control

a. Establishment of the quality assurance system

b. Establishment of delivery control system to shorten manufacturing time and reduce stocks

(3) Expansion of production output

Production output should be targetted according to the following scale.

1995 Target	2 tons/man/month
2000 Target	4 tons/man/month

(4) Establishment of a model plant

Establishment of a model foundry plant is to be proposed with the objective of the pilot application of up-to-date technologies and the diffusion of technologies to the other HMT foundry shops. Quality, accuracy and strength should be analyzed at the model foundry.

IV-8. WATCHES

A. Market and Competition Analysis

1. Inland Market Analysis

(a) Market size and growth

The total consumption of watches in India grew by more than 4 times in the last decade but the share of indigenous production in the consumption decreased from 74.5% in 1980/81 to 44.6% in 1990/91. This is mainly because there is a big supply shortage and unauthorized imports covers the gap between supply and demand.

Table IV-8-1 Market Size of Watches in India

(Q'ty in million pcs)

	Total Consumption	Indigenous Production				Outside*1
		HMT	ALLWYN	TITAN	OTHERS	
1980/81	7.1	3.51	-	-	1.78	1.81
1985/86	14.2	4.53	0.83	-	1.17	7.67
1989/90	27.1	5.96	1.50	1.35	3.74	14.55
1990/91	30.7	6.30	1.10	2.00	4.30	17.00
1994/95*2	45.5	14.00	3.50	6.00	6.50	15.50

Note: *1) Unauthorized import and tourist personal import
*2) Tentative

Table IV-8-2 Indian Watch Production During 1990/91

(Q'ty in million pcs)

	Mechanical		Quartz		Total	(%) Share
	Handwound	ADD	Analog	Digital		
HMT	4.82	0.30	1.14	0.08	6.34	45.9
ALLWYN	0.50	0.25	0.35	-	1.10	8.00
TITAN	-	-	2.00	-	2.00	14.5
Other organized	1.18	-	0.23	-	1.41	10.2
Small Scale	0.60	0.06	0.80	1.50	2.96	21.4
Total	7.10	0.61	4.52	1.58	13.81	(100%)

Production of mechanical watches in the previous year (1989/90) was 8.13 million pcs and it decreased to 7.71 million pcs in 1990/91, whereas quartz watches increased from 3.4 million to over 6 million pcs. The share of Quartz watches in Indian production is around 44% in 1990/91 and is expected to keep increasing to nearly 70% in 5 years time, while stagnation is assumed for mechanical watch demand.

(b) Customer analysis

In rural areas, consumers still have a preference for mechanical watches because of their durability and low maintenance cost. Especially mechanical ladies watches are still in big demand. But in urban areas, there is a clear trend of demand towards Quartz watches.

Although demand in the medium price range of quartz watches is supposed to increase rapidly, demand in the lower price segment is also expected to be strong be-

cause in urban areas the younger generation seeks for quartz digital as well as quartz analog (at the lower price) as their first watches.

Regarding area by area consumption, east, south central, west and lower north are the areas with strong demand, with demand share estimated at 20%, 18%, 15% and 15.5%, respectively.

(c) Competitor analysis

i. TITAN

TITAN, which belongs to the Tata group, started marketing QAW in April 1987 and has so far sold over 4.3 million watches, being the leader in quartz analog. Because of their better design, higher level of product availability and effective advertisements, TITAN is expected to continue its an edge over other competitors. To enhance the brand image, they are planning to go into jewelry watch manufacturing in the price range of Rs. 25,000 to Rs.40,000.

Their sales plan for the current year 1991/92 is to market 3.5 million, up 75% from the previous year. They are very active in expanding in the lower price segment, introducing polyamide case watches and tying up with TIMEX, of U.S.A., with whom TITAN have set up a new joint venture company to produce 2 million quartz analog and ana-digi watches. TITAN is also setting up a 100% EOU (Export Oriented Unit) targeting the exports to the U.S.A. and Europe.

ii. ALLWYN

Provided with watch technology by SEIKO, ALLWYN has been the major competitor to HMT and their mechanical watches have been well accepted in the market. However, under increasing competition in quartz watches, ALLWYN's performance is getting worse, achieving less than 50% of the target in 1990/91.

Tabel IV-8-3 Allwyn's Sales Performance in 1990/91

(Q'ty in millions)

	PLAN	ACTUAL	%
Mechanical	0.95	0.57	60.0
QAW	0.85	0.27	31.8
Total	1.80	0.84	46.7

They are trying to increase the sales of QAW to 0.75 million, an increase of 18% in actual terms, in 1991/92.

iii. HMT's position

Although HMT's share was 45.9% of overall indigenous production last year, it fell to only 20% of the quartz watch production, placing them in second place after TITAN who holds 32.8%. TITAN dominates the market for quartz analog with a share of 44.2% whereas HMT has a 25.3% share.

To catch up with TITAN, HMT plans to increase the production capacity of quartz watches to 2.5 million this year and 6.5 million by 1995/96.

Table IV-8-4 Quartz Competition Between HMT & TITAN

(Q'ty in million)

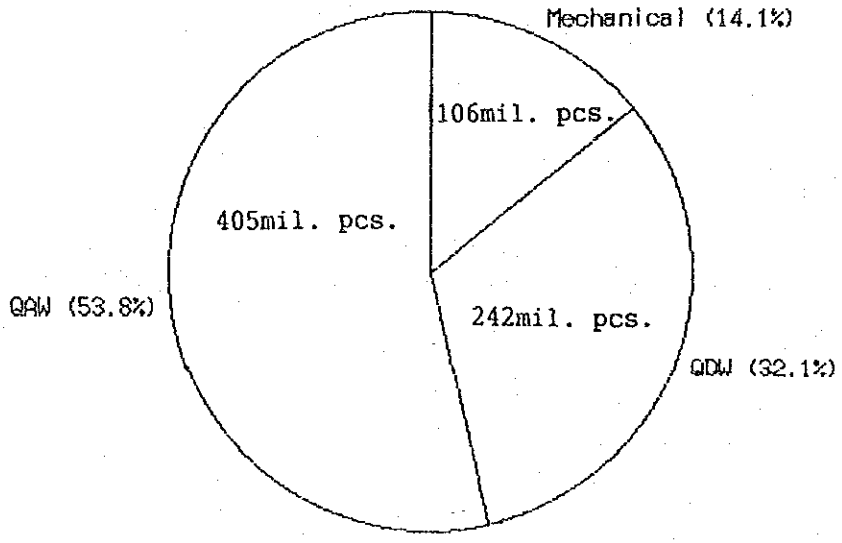
	1990/92	1991/92	1992/93
HMT	1.2	2.5	4.0
TITAN	2.0	3.5	5.0
(OWN)	(2.0)	(3.0)	(3.0)
(TIMEX)	(-)	(0.5)	(2.0)

2. International Market Analysis

(a) Market size and growth (Production)

The world watch production in 1990 was 753 million pieces of which 53.8% were QAW, 32.1% QDW and 14.1% mechanical as illustrated in Fig. IV-8-1.

Fig. IV-8-1 World Watch Production in 1990



The production of watches increased by 62% during 1985 and 1990 and this was attributed to the rapid increase of quartz analog watches.

Table IV-8-5 HMT's Watch Production

Unit: 10,000 pieces

	'85	'86	'87	'88	'89	'90	change(%) '85-'90	% of Total
MECH	143	133	128	122	114	106	- 25.9	14.1
QDW	149	225	230	320	227	242	+ 62.4	32.1
QAW	173	200	227	308	341	405	+134.1	53.8
Total	465	558	585	660	682	753	+ 61.9	100 %

The production of mechanical watches declined by 40.5% between 1980 and 1990, due to the increasing demand for QAW.

Welcomed widely in the early 1970's, quartz digital are giving way to quartz analog because of the former's cheaper image and less fashionable design. More than half of the total watch demand is from North America, Western Europe and Japan.

(b) Competition analysis

In 1990 Japan produced 43.2% of the world's watches followed by Hong Kong (23.9%) and Switzerland (10.3%) as illustrated in Fig. IV-8-2.

Fig. IV-8-2 World Watch Production in 1990 by Country

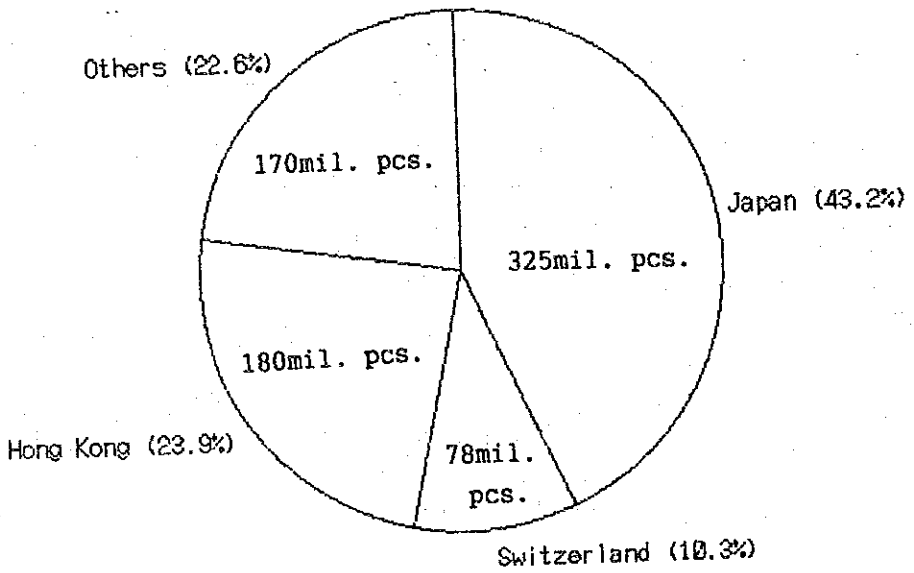


Table IV-8-6 World Watch Production

(Q'ty in million)

	1989	1990	% Growth	% of Total
Japan	285	325	14	43.2
Hong Kong	172	180	47	23.9
Switzerland	73	78	5.4	10.3
Others	152	170	11.8	22.6
Total	682	753	10.4	100

Japan and other areas excluding Hong Kong recorded growth of 14% and 11.8% respectively in 1990. As Japan exports increasing numbers of quartz analog movement assembly to Southeast Asian countries/regions like China, South Korea, Taiwan, Thailand etc., mainly through the Hong Kong market and sometimes directly, the production in those areas is expected to increase.

Hong Kong produced 180 million watches in 1990. Most of the all-digital watches were produced on commission in China. Switzerland enjoyed the favorable market for high-grade watches with growth of 5.4% over 1989. The former occupies the lower price range and the latter concentrates on the higher price range.

B. Product Competitiveness Analysis

1. Competitiveness in Inland Market

(a) Price competitiveness

Pricewise, HMT competes with most suppliers on an equal basis but TITAN provides dealers with an attractive dis count scheme that forced HMT to offer special discounts to its dealers. ALLWYN offered a direct discount to customers, though only for a limited period during last year; this was the first case of this type in India. HMT's major competitor, TITAN, increased prices twice in the last fiscal-year, but only after HMT increased prices. At the same time, they tried to rationalize their prices keeping in view their competitiveness in the market. HMT's present fixed price system and price decision process are in question as to their ability to meet such a competitive and fluctuating market as in consumer products.

HMT has four watch factories and 14 assembling units. Bangalore is old and has little automation while Srinagar is very inefficient. Components and final products have to be transferred from one place to another very often. Unless these inefficiencies are rationalized as soon as possible, price competitiveness may be lost sooner or later because TITAN has a modern and concentrated factory with less people.

(b) Product quality

According to HMT's self rating on customer's recognition, TITAN is superior to HMT in quality and aesthetics.

Table IV-8-7 Customers' Recognition of Major Watch Manufacturers

	(LOW) 1	2	3	4	5 (HIGH)
1. Technology					
HMT			X		
TITAN			X		
ALLWYN				X	
2. Quality					
HMT		X			
TITAN			X		
ALLWYN				X	
3. Aesthetics					
HMT		X			
TITAN				X	
ALLWYN		X			

Although HMT has a reputation for durable mechanical watches, it is not so in QAW where the appearance of a watch has an enormous influence over the expected quality. Since Citizen-made quartz movements are widely used throughout the world, watch functions themselves do not differ very much.

Design, including materials and colours to be used and finishing of visible parts, is very important for consumer goods and this may not be fully understood yet by HMT. Especially metal watch cases and straps must have improved design and surface finishing including gold gilt.

Cost reduction is not supposed to be attained only by cutting the purchase price from sub-contractors. It has to be a joint effort of HMT and the sub-contractors to reduce the manufacturing cost while keeping the high quality standards of products. There seems to be more room for HMT itself to improve in this area.

(c) Product availability

It is said that the model availability of TITAN watches required by customers at any given time is around 70%. On the other hand, it is claimed that HMT's is less than 50%. This difference creates the possible loss of sales in favor of competitor's products and also gives more credibility to the dealers of the other products.

Failure to match sales and production plans and an inflexible manufacturing system may be the reasons for these problems. Noticing that watches are more market-oriented products, all the systems, from production and material procurement to marketing have to be geared to meet market needs. It seems that this is what TITAN in particular is trying to achieve.

2. Competitiveness in International Markets

Indian watch production of 13.8 million pieces holds a negligible share of 1.8% in the world market of 753 million. In Japan, Citizen corporation alone produced 146.2 million pieces, more than 10 times the whole Indian indigenous production.

The production of medium priced watches is carried out in Hong Kong, South Korea and Taiwan, while lower priced watch manufacturing is concentrated in China and Thailand. High priced watches are produced in both Japan and Switzerland while multi-function high-tech watches are manufactured more in Japan. Thus East and South East Asia are becoming the supply centres for watches below the medium priced zone.

This area is closer to Japan who is the main supplier of quartz movements, and also to Hong Kong, which is a big market for them. In this context, India in general has certain disadvantages for procurement of the key parts (quartz movements).

But labor costs in the area, except for Thailand and China, are not cheap any more. South Korea has become the highest labor cost nation, followed by Taiwan, Hong Kong and Singapore in that order. For India, this opens

up real opportunity to enter into the world watch market in the lower and medium price zones.

The problems for HMT are its high production costs, poor design and rather rough finishing. According to independent research, the prices offered for export from Taiwan are in many cases cheaper than HMT watches by 10-25%. Since it is a general practice that the first quotation made before specifying the destination or customer name includes a 10-15% negotiation margin, the price difference will be even larger. Even if the explanation is acceptable that high import duties and the devaluated currency make the cost of imported parts more expensive, there still is a necessity for HMT to improve their productivity and squeeze down both administration costs and inventory costs because watch makers in other countries can still generate profit without being paid the export incentives. By succeeding in reducing the manufacturing cost, producing a more market-oriented design, and improving on meeting delivery commitments, HMT can improve their export potential.

C. Production Facilities and Product Technology Assessment

1. Production Facilities

The production facilities for the mechanical watches, which make up almost half of HMT watch production, are basically enterprises from the 1970s, and the assembly lines are entirely dependent on manual labor. The feeding lines which connect various production appliances are totally without automation. While the inspection systems are also manually processed, the products of the mechanical watches, which are composed of huge amounts of the components (about 250, plus about 50 of sub-assembly items), require vast manual labor participation.

On the other hand, for the quartz watches, which are expanding rapidly in the market, the number of components is relatively fewer (about 160) but more stringent quality control is required. The difficulty is that the main components depend entirely on imports from outside.

The world trend is to shift to mass production and mass sales, prerequisites on exports. In India, as long as the protected domestic market prevails, the current status may be tolerable for the time being. However, in the predictable near future, a policy of open market and free trade would permit higher quality and cheaper foreign products to come into the Indian market, and the watch maker cannot sustain this competition relying only on cheap labor; they would not be able to compete unless automated, unattended continuous production were introduced for the expansion of production and for the reduction of costs.

A watch changes according to the wearer's requirements, from conventional necessities of life to fashionable decorative requirements. Along with the superiority of the mechanical parts, the superiority of the appearance and the design becomes vitally important to overcome world-wide competition.

2. Product Technology

The level of technology for the mechanical watches is sufficiently advanced when compared to other mechanical watch manufacturers.

In the field of quartz watch production, PCB (printed circuit board) has been introduced but a modernized facility to allow further introduction of the high-tech automated technologies is needed for uniform quality and for mass production.

3. Production Technology

The watch industry of the world has become oligopolistic with giant enterprises successfully overcoming stringent world-wide competition.

The world demand is about 700 million units per year, in which Japan dominates at about 400 million units. The Citizen Co., Japan, the orginal collaborator of HMT, produces 150 million units per year (1990 output). HMT, on the other hand, currently produces 6 million units per year but this will soon grow to 10 million units. This is still far below the production of expected competitors in the future export market.

To sustain the competition, even with the handicap in the production volume, HMT should naturally aim to acquire a reputation for quality, segregation in fashionable design and a large assortment of the product mix, which inevitably would lead to the flexible manufacturing system.

The domestic competitors already have modern technology; HMT should hastily prepare for the modernization of their production technology with the introduction of CAM/CAD, CNC and robotizing. This would enable 24 hour unattended operation.

Also improvement in design, which includes more modulization in the mechanical parts, and change in the appearance and orientation of the case parts are needed.

D. Input Factor Analysis

1. An overview

The Watch Business Group (BGW) now has five units which has been producing different products and/or components. A summary is presented below:

Table IV-8-8 Comparison of Five Units

Unit	Products	No. of employees
Watch Factory I & II (Bangalore)	Hand Wound, Automatic, Quartz Analog (CKD) Analog-Digital	2,665
Watch Factory III (Srinagar)	Hand Wound	963
Watch Factory IV (Tumkur)	Hand Wound Quartz Analog (Manufacturing)	1,995
Watch Factory V (Ranibagh)	Hand Wound Quartz Analog (Trading)	1,419
Specialized Watch Case Division (Bangalore)	Watch Cases	175 (1990)
Miniature Battery Unit (Guwahati)	Miniature Power Cell	28 (1990)

In addition to the above units, BGW has 14 watch assembly units which are established by local governments with assistance from HMT. These units assemble mechanical and quartz watches using parts exclusively supplied by HMT. HMT pays these units assembly charges on a per watch basis. HMT uses a limited number of movements for both mechanical and quartz watches, while a wide range exists for appearance parts, especially cases, and here significant cost differences arise. .Cost of a movement

for a mechanical watch approximates Rs.125, and quartz Rs.185, while cases together with straps range from Rs.100 to over Rs.1,000.

Other expenses included in outgoings rose sharply from 1988-89. As indicated in the schedule below, significant increases are noted in rate and taxes, excise duty and advertising and publicity. Increased advertising and publicity is a result of HMT's intensive effort to increase market share in the quartz watch market where Titan has the dominant share.

(Rs. in Millions)

	1990-91	1988-89
Power and fuel	26	21
Rates and taxes	22	13
Excise duty	129	30
Advertising and publicity	81	20
Other agents commission	210	161
Others	173	130
	640	374

One factor which requires attention is that Watch Factory III Srinagar has not been properly operating due to social unrest in the area. The number of employees decreased by 230 to 963 from 1989-90. During the same period, sale value of production of this factory decreased to Rs.7 million in 1990-91 from Rs.1,051 million in 1989-90.

Selected key figures for the 3 years ended March 31, 1991 are presented in Table IV-8-9, and a cost summary of selected types of watches manufactured in Watch Factory I & II (Bangalore) and Watch Factory IV (Tumkur) for the year ended March 31, 1990 is shown in Table IV-8-10. Cost information for March 31, 1991 was not available in time for analysis.

2. Materials

There has been a constant increase of material cost over

the 3 year period ended March 31, 1991. The causes of the increase include, increased raw materials costs such as steel and brass, increased use of precious metals such as gold for plating, etc., and increased cost of imported materials caused by the weakening exchange rate of the rupee. Cost of imported materials approximates 15 to 20% of the total cost of production and the ratio is higher in quartz watches.

3. Personnel

In spite of the decreasing number of employees in BGW from 8,007 in 1988-89 to 7,871 in 1990-91, the total personnel expenses increased by approximately 20%. Personnel expenses per employee increased from Rs.42 thousand to Rs.52 thousand, an increase of 23% during the same period.

Table IV-8-9 Key Figures for Input Factor Analysis

(Rs. in Millions)

	1990-91		1989-90		1988-89	
	Q'ty	Rs.	Q'ty	Rs.	Q'ty	Rs.
Sales:						
Mechanical	5125000 326	1670	5203000 299	1555	5573000 293	1633
Quartz	817000 540	441	611000 597	365	339 584	198
Others		103		97		
		2214		2017		1864
Accretion (decretion) to inventory		264		102		89
Sales value of production		2381		2119		1953
Outgoings:						
Materials		1155		915		877
Personnel		409		386		338
Depreciation		109		78		92
Other expenses		640		508		374
		2313		1887		1681
Production:						
Mechanical	5215000 322	1680	5334000 303	1617	5601000 297	1622
Quartz	1128000 529	597	605000 585	354	436000 583	254
	6343000	2277	5939000	1971	6037000	1876
Components consumed						
Watches CKD sets	N/A	N/A	83713		310099	75
Total number of employees	7871		8012		8007	
Personnel expense per employee (Rupee)		51962		48178		42213

Table IV-8-10 Analysis of Production Costs for Watches

(Rs. in Thousands)

	1989-90									
	Hand Wound				Automatic Day Date		Quartz Analogue		Quartz Analogue	
	Bangalore	%	Tumkur	%	Bangalore	%	Bangalore	%	Tumkur	%
Direct Cost										
Materials										
- Indigin	57109		174900		17494		2859			
- Importe	41894		0		12833		2097		57700	
Others	2038		48000		624		102		7200	83
	101041	39	247200	65	30951	40	5058	42	223900	
Conversion Cost										
- Manufac	77839		0		23844		3896		0	
- Assembl	16390		0		4335		245		0	
	94229	36	107200	28	28179	36	4141	34	44800	17
Overheads										
- Materia	39348		0		12053		1970			0
- Admin.	24621		24900		7542		1232			0
	63969	25	24900	7	19595	25	3202	26		0
Total cost	259239	100	379300	100	77476	100	12197	100	268700	100
Total produ	1151000		2032176		235700		13300		594461	
Production (Rupee)	225		186		329		917		452	

E. Identification of Prospective Product Group and Product Mix

1. Promising Products

Looking at market trends both in India and the world, there will be more and more demand for accurate, care-free, easy-to-handle and fashionable watches and only QAW can satisfy these requirements. For the cheaper price segment, QDW may have strong demand in India for some time but, because of its price rigidity, QDW will not be a major contributor to profits.

On the other hand, mechanical watches may enjoy steady demand mainly in rural areas in India because of the scarcity of cell batteries. Since many of the manufacturing facilities are already beyond the write-off period, unless there is a sudden surge in labor costs, mechanical watches may bring a comfortable profit to HMT for some time to come.

Automatic day date (ADD), for which demand is going to give way to quartz watches, may be left out of the market, but still the movements only can be supplied to watch markers outside of India.

2. Product Mix in 1995/96 and 1999/2000

Actual performance, current year plans and forecasts for 1995/96 are as follows:

Table IV-8-11 Sales Forecast of HMT Watches

(Q'ty in million)

	1990/91			1991/92			1995/96		
	Market size	HMT sale	HMT share (%)	Market size	HMT sale	HMT share (%)	Market size	HMT sale	HMT share (%)
Mechanical	NA	5.1		16.0	5.2	32.5	16.0	5.9	36.9
(HWW)		(4.8)		(13.1)	(4.9)	37.4	(13.1)	(4.4)	33.6
(ADD)		(0.3)		(2.9)	(0.3)	10.3	(2.9)	(1.5)	51.7
Quartz	NA	1.2		18.1	2.5	13.8	33.6	6.5	19.3
(QAW)		(1.14)		(9.3)	(2.2)	23.7	(15.4)	(4.5)	29.2
(QDW)		(0.08)		(8.8)	(0.3)	3.4	(18.2)	(2.0)	11.0
Total	30.7	6.3	20.5	34.1	7.7	22.6	49.6	12.4	25.0

Although HMT plans to increase ADD production to 1.5 million by 1995/96, unless they find a long-term contract buyer at a reasonable selling price, it should proceed cautiously.

According to the market survey carried out for HMT by IMRB during 1989 - 90, it was predicted that QDW would increase at a faster rate than QAW, and at this projected rate of growth, the QDW market may reach 31.2 million by 1999/2000 from 8.8 million in 1991/92 and 18.2 million in 1995/96. This might have been predicted because of the strong preference of Indians for cheaper watches. Even so, it may not be realistic to say that 45.5% of total demand will go to QDW given that the Indian economy is expected to continue to grow and population continues to flow to urban areas.

Table IV-8-12 Demand Forecast in India

Unit: Nos in million

	1995/96	1999/2000	% Growth
Mechanical	16.0	16.0	-
Quartz	33.6	52.6	56.5
(QAW)	(55.4)	(21.4)	39.0
(QDW)	(18.29	(31.2)	71.4
Total	49.6	68.6	38.3

Taking the world trends of product preference into consideration, it may be advisable to take careful steps with regard to the increase of QDW production during 1995/96 and 1999/2000. Only if it is proven that HMT's selling price of QDW is able to compete with that of Taiwan, China, Thailand or any other country, then active steps can be taken.

F. Direction of Marketing Strategy

Flexibility in pricing and determination of commercial terms have to be allowed to the marketing division.

Stronger control of dealers must be attained to improve the presence of HMT watches at selling counters and tagether with timely and suitable distribution of goods.

Continuous and steady advertisement has to be implemented in the field of mass media to strengthen the product image sence to the end users.

Market strategy has to be made up not according to the production condition but to the user's needs.

More active sales promotion towards retailers has to be developed.

Any marketing plan should not be based on the experiences drawn from the other business groups of HMT; more autonomy in marketing must be given to the Watch Business group. Watches are the only high value-added consumer goods HMT produces and a completely different approach to users is needed.

To improve the product availability at the sales end, the marketing group has to guide the whole business group, including the factories, and all the necessary production and inventory information has to be centrally controlled by the marketing group.

Price resistance can be neutralized only through reduction of manufacturing costs. This is most vital under head-on competition.

G. Necessary Measures Concerning Cost Reduction

(a) Shortening the production period

During the recent past, production lead time became longer partly due to a fairly complex flow of parts and sub-assembled parts. Use of HMT assisted assembling units also extended the process. Current statistics indicate the following:

Material / Consumption (Days)-------134
Work in process / SVOP (Days)---------71

By reviewing and optimizing the physical flow of parts and assembled watches, the production lead time can be reduced resulting in a reduction in the levels of raw materials and work-in-process.

(b) Better interface between production and marketing

As the watch market becomes more competitive, quick response by production to supply watches needed in market becomes essential. Better interface of production with marketing will enable BGW to reduce the level of stock-in-trade as well as reduce the slow-moving or un-usable parts and work-in-process. This will help decrease interest expenses as well as production costs.

In order to establish the better interface between production with marketing, it is recommended that BGW consider change of organization structure so as to achieve more market-oriented operations. The basic profit center should be shifted from the units to BGW, and the marketing functions are all attached to the directorate of BGW. Each unit under BGW should be a cost center, and their responsibilities should be confined to manufacturing products.

H. Necessary Measures Concerning R&D

As for the mechanical watches, there is a possibility for survival only in a part of the future market for ornamental and antique watches, but its domain will be limited only to the should renowned luxury mechanical watch makers. HMT, therefore, should only go into the quartz watch market. Reduction in the number of components by modulization and increase in the assortment of the products are necessary. Effort should be made in case design and total appearance, including the watch band, to establish the distinctiveness of the watches.

R&D might necessitate the industrial designer and artist capability. The production technology R&D will include FMS, program control and 24 hour unattended operation.

IV-9. LAMPS

A. Market and Competition Analysis

1. Inland Market Analysis

(a) Demand for lamps in India

Fig. IV-9-1 illustrates the production trend of lamps in India by the organized sector, which was compiled by the Electric Lamps and Components Manufacturers Association. According to the Association, production of lamps in 1990 was 238 million pieces for general lighting service lamps (GLS), 66.4 million pieces for fluorescent lamps (FTL), and 960 thousand pieces for mercury vapor lamps (MVL). In India, there are about 200 small-scale lamp manufacturers, which are in the unorganized sector, and another 25 medium-to-large-scale manufacturers in the organized sector. They are usually engaged in the assembly of GLS and FTL lamps, procuring parts from the organized sector. Including the lamps produced by the unorganized sector, the total production of lamps in India was estimated to be 420 million pieces for GLS, 80 million pieces for FTL, one million pieces for MVL, 300 thousand pieces for SVL, and 400 thousand pieces for blended light lamps (BLL). In addition, approximately four million pieces of SW ballasts are produced.

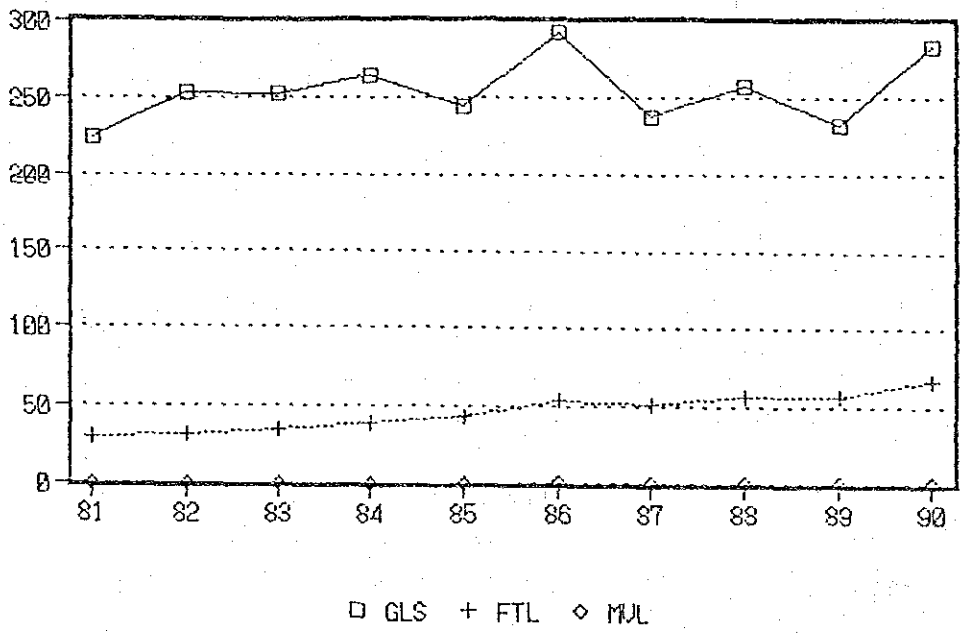
Table IV-9-1 Production Trend of Lamps in India (million pcs)

	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90
GLS	224.5	253.2	252.6	264.4	244.8	292.8	238.2	257.6	233.0	283.0
FTL	30.0	31.2	34.5	39.0	43.5	53.2	51.1	56.8	57.0	66.4
MVL	0.49	0.45	0.46	0.50	0.46	0.59	0.63	0.78	0.80	0.96

Demand for lamps in India is estimated to be 500 million pieces as shown above. Of these a little less than 84 percent is taken by GLS and a little less than 16 percent by FTL. Thus these two products jointly occupy approximately 99 percent of the total market in volume terms. In terms of market growth rates, according to the Electric Lamps and Components Manufacturers Association, GLS recorded 2.6 percent compound annual rate of growth

between 1981 and 1990. Those for FTL and MVL were 9.2 percent and 7.8 percent, respectively. From the data, it can be said that the annual market growth ratio of FTL and MVL is much higher than that of GLS. In 1990 alone, however, GLS, FTL and MVL all showed very high growth: a 21.5 percent increase for GLS, 16.5 percent for FTL, and 20.5 percent for MVL over the previous year. Some of the most important factors used to determine the demand for lamps in India include the volume of electric power generation, the rate of rural electrification, the degree of urbanization, and the size of population. Considering that these factors continue to grow steadily, the demand for lamps in the country will continue to grow at a healthy rate.

Fig.IV-9-1 Production Trend of Lamps in India (million pcs.)



The composition of the Indian lamp market is shown in Table IV-9-2 below. In value terms, the share of each product differs from that in volume terms thanks to wide differences of unit prices. GLS, which occupies 84 percent in volume, accounts for 54 percent of the market in value. On the other hand, FTL, whose market share in volume is 16 percent, has a value share of approximately 40 percent. Both products jointly occupy 94 percent of the total market in value. By product, market share in both value and volume is shown in Figures IV-9-2 and IV-9-3.

Table IV-9-2 Composition of the Indian Lamp Market

Product	Market Size(million Rs.)		HMT Sales(million Rs.)		HMT Market Share
GLS	3000	(54%)	120.8	(60.3%)	4.0%
FTL	2250	(40%)	40.3	(20.1%)	1.8%
MVL/SVL/BLL	350	(6%)	39.1	(19.5%)	11.2%
Total:	5600		200.2	(100.0%)	3.6%

Users of lamps are broadly divided into two groups. The first comprises of general households, and the other is comprised of companies and the public sector, such as central, state and municipal governments. A rough percentage breakdown of lamps usage by user segment and the kind of lamp is as follows:

Table IV-9-3 Breakdown of Lamps Usage by User Segment

	Household	Companies & Public Sector	Breakdown of HMT Sales
GLS	90%	10%	60.3%
FTL	50%	50%	20.1%
MVL/BLL	-	100%	14.5%
HPSVL	-	100%	5.1%

As shown above, major customers of GLS are households, while FTL are purchased by both sectors evenly. For MVL, BLL and HPSVL, almost all of the products are purchased and consumed by companies and the public sector. HMT is

considered to have a competitive edge in these products since the public sector is obligated to purchase from public corporations if all the conditions including specifications and prices are the same. HMT may take advantage of this regulation to secure higher market share.

It is forecast that FTL, thanks to its energy savings can increase its market share among lamps. On the other hand, in offices, factories, and public utilities such as highways and stations, increased demand for MVL,SVL, BLL is foreseen.

Fig. IV-9-2 Market Share by Volume

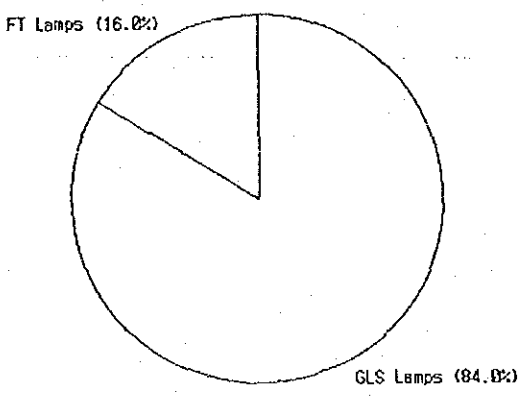
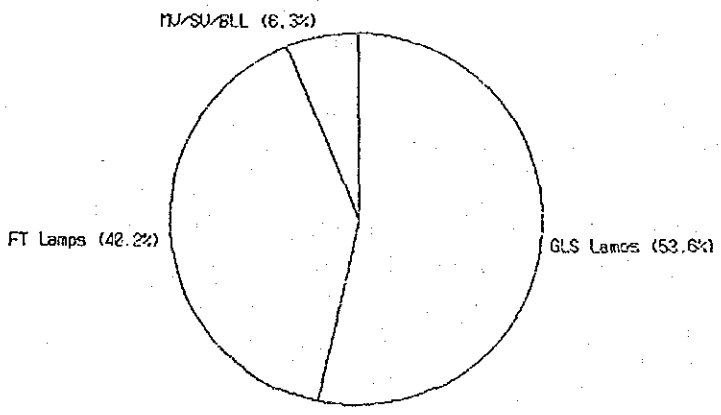


Fig. IV-9-3 Market Share by Value



(b) Competitiveness

The product range of the major lamp manufacturers in India is summarized as below. None of them produce a complete line-up of products. Sixteen out of 22 companies produce GLS, while 17 produce FTL. The same companies produce both GLS and FTL, except for Hyderabad Lamps who produces FTL only. As for high pressure lamps, although the size of the market is small, 13 companies have already entered in MVL production, and 10 in SVL production. The market for high pressure lamps is thus regarded to be fiercely competitive. Only four companies presently produce halogen lamps and/or automobile lamps. The market for these lamps is small and considered to be unique in its usage.

Table IV-9-4 Product Range of the Major Lamp Manufacturers

	Incandescent Lamps			Gas Discharge Lamps		
Manufacturers	GLS	Halogen	Auto.	FTL	MVL	SVL
Ajay Lamp Ind.	X			X		
Apar Ind.	X	X		X	X	X
Autolite Ind.			X			
Bajaj Elect.	X			X	X	X
Bengal Lamps	X			X		
ECE Ltd.	X			X	X	
ELMI	X			X	X	
Halonix		X	X			
Hind Lamps	X			X	X	X
HMT	X			X	X	X
Hyderabad Lamps				X		
JMA Ind.			X			
Kalpana Lamps	X			X	X	
kerala Lamps	X			X	X	
LITEX		X				
LUMAX			X			
Mysore Lamps	X			X	X	X
PEICO (Philips)	X	X		X	X	X
Surya Roshni Ltd.	X			X	X	X
Punjab Anand	X			X	X	X
Sylvania Laxman	X			X	X	X
Twinkle Lamps	X			X		X

Regarding the production of GLS and FTL, which jointly constitute most of the lamp production, the market shares for each company in '90 are shown below, and illustrated in Figures IV-9-4 and IV-9-5.

Table IV-9-5 Market Shares for Each Company

Company	GLS	FTL
PHILIPS	29.0	17.3
SYLVANIA	12.5	7.5
MYSORE	11.5	6.9
BAJAJ	10.5	7.5
SURYA ROSHNI	7.0	15.7
HMT	4.0	2.7
OTHERS	25.5	42.3
	100.0%	100.0%

As indicated above, Philips is ranked first in GLS with substantial market share of 29.0 percent. Behind Philips, Sylvania, Mysore and Bajaj are competing with one another, then Surya and HMT follow. In FTL, too, Philips has the largest market share, but since the lead over the second place company is small, the market is regarded to be relatively competitive. The differences in market share for each company between GLS and FTL are considered to be the result of differences in strategies taken by each company. For example, Surya accounts for a 15.7 percent market share in FTL and is second to Philips, but the company holds a marginal share of 7 percent in GLS. The company may have shifted its limited resources stragically into the field of FTL, which is growing faster than GLS. In the case of HMT, it is far behind the other competitors in FTL. Since FTL is projected to occupy a much bigger market in the future because of its characteristic advantages such as energy savings and long life, it is recommended that HMT take prompt measures to increase their market share in the FTL market.

Fig. IV-9-4 Market Share by Company (GLS)

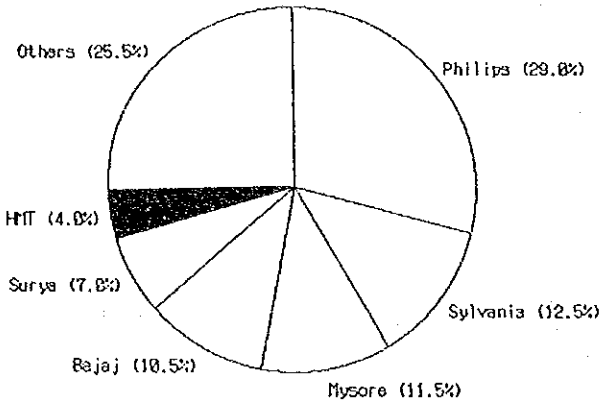
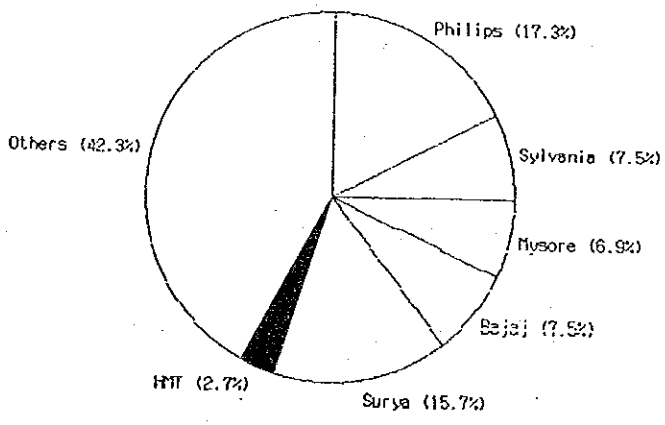


Fig. IV-9-5 Market Share by Company (FTL)



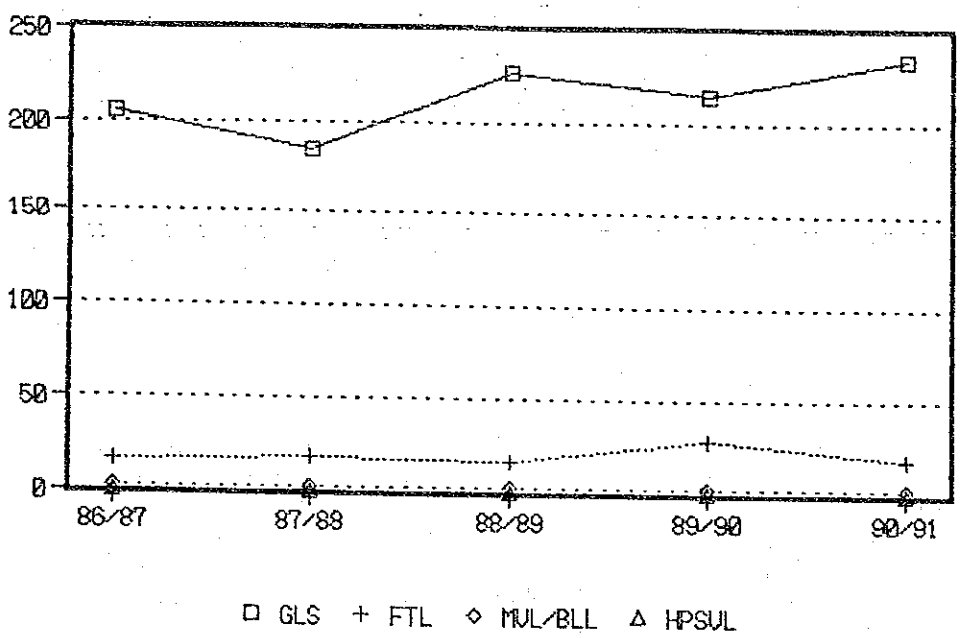
HMT's production volume of lamps for the past five years is given below, and is illustrated in Fig. IV-9-6.

Table IV-9-6 HMT's Production Trend of Lamps (100,000 pcs)

Product	86/87	87/88	88/89	89/90	90/91
GLS	205.87	185.24	227.02	215.13	234.44
FTL	16.67	18.68	16.84	28.30	18.16
MVL/BLL	2.76	2.55	2.49	2.56	2.70
HPSVL	-	-	-	0.05	0.19

For the four years between 86/87 and 90/91, HMT increased production of GLS and FTL at annual rates of 3.3 percent and 2.2 percent, respectively. For MVL and BLL, HMT's production decreased at 0.5 percent annually during the same period. As stated above, HMT's production increased a little for GLS and FTL, but the overall level of production almost stayed the same. HMT's growth is, compared with the growth of lamps in India on the whole, substantially low. It would be a serious problem if HMT's production were to stagnate in FTL, MVL, and BLL since they are expected to grow faster and they are more profitable than GLS. If the problem of the HMT's stagnating sales of lamps stems primarily from the poor production performance, it should evaluate the present production processes and facilities, and then take appropriate measures.

Fig. IV-9-6 Production Flow of HMT's Lamps by Product (10,000 pcs.)



B. Product Competitiveness Analysis

1. Price Competitiveness

Absenteeism in HMT's Lamp Division is so pervasive that every day 30 to 40 percent of the employees are absent. Employees' work ethics are very low. The attitude of the employees brings about a very poor capacity utilization ratio, which is as low as 50 percent, and a very high labor cost, which accounts for approximately 40 percent of the total production cost. Furthermore, the production yield of HMT lamps is estimated to be 75 to 84 percent which is much lower than the Indian average of 90 percent or one of the leading Japanese lamp manufacturer's 99.5 percent. Better utilization of the employees and improvement in the yield ratio would make substantially increased production possible as well as increased profitability and price competitiveness.

As one of the methods to evaluate HMT's price competitiveness, a comparison of production costs is made between HMT and Japanese lamp manufacturers. The data for the Japanese firms is an average of 22 small-to-medium size manufacturers. The total of production, sales, and administrative costs in Japan is a little more than 1 billion Yen, which is considered to be close to HMT's 216.8 million Rupees, and thus the comparison is regarded as meaningful. Although some details of cost breakdown differ, HMT and the average Japanese manufacturer are roughly compared as shown below.

Table IV-9-7 Cost Comparison between HMT and an Average of 22 Japanese Lamp Manufacturers (1990)

	HMT	Japanese
Material Cost	56.8%	57.9%
Conversion Cost	23.8	26.3
(Production Cost)	(80.6)	(84.2)
Selling and Dist. Overhead	15.0	5.5
Admin. Overhead	4.4	10.4
(Overhead Cost)	(19.4)	(15.8)
Total Cost	100.0%	100.0%

Firstly, from the comparison with the Japanese average, HMT's material cost over the total production cost is smaller. In Japanese manufacturers, the material cost tends to be low because of comparatively higher labor costs. Since the employment costs per person is much lower and the yield ratio is very small in HMT's production, the material cost usually becomes higher. Despite that, HMT's material cost as a percentage of total production cost is lower than that of the Japanese. It results from high labor costs, which are brought about from high absenteeism of employees as well as high administrative costs, and selling and distribution overhead. Secondly, the comparison of the breakdown of overhead indicates that, at HMT, selling and distribution overhead is more than four times the administrative overhead, while in the Japanese average, administrative overhead is about one and one half times the selling and distribution overhead. As a result, HMT's selling and distribution overhead amounts to nearly 20 percent of the total production cost, and weakens the price competitiveness.

2. Competitiveness in Product Quality

In India, the Indian Industrial Standard is set for the quality of lamps, and the ISI mark is given to the products that meet the standard. Basically, all the Indian lamp manufacturers produce products based on the standard, thus all the lamps are regarded to suffice for the minimum qualifications. The quality of the finished products, however, varies from manufacturer to manufacturer, mostly because of differences in quality control. HMT's quality control, judged from its low yield ratio of 75 to 84 percent, is regarded to be poor. There seem to be two major reasons for the poor quality control. One is that production facilities at most of HMT's facilities are obsolete. The other is that employees' work ethics are very low and they pay little attention to quality in the production of lamps. Some of the measures to be taken include improvement of the production yield through strengthening of quality control, improvement of the work ethic and reduction of absenteeism by introduction of an appropriate incentive system, and periodical maintenance of production facilities and the rehabilitation of obsolete facilities.

C. Production Facility and Product Technology Assessment

1. Production Facility

HMT's productions facilities which were introduced in the 1970s are obsolete: the mechanical transfer line activated by the cam-mechanism and by the limit switches induces lots of defaults during the production process due to the shock of impacts. The current defect rate of 16 to 25 percent is exceptionally high. which adds to the material cost and the labor cost, as well as the indirect cost performance.

While the domestic demand is expanding in the Indian market, HMT's share of 4 percent in GLS and 1.8 percent in FTL indicates that HMT has no decisive role in price determination. Therefore, the survival of HMT Lamp Division depends on the ability to exercise extraordinary endeavors to lower costs and expand production.

2. Product Technology

According to the diagnostic survey by HITACHI, Japan, in 1987, the product quality of both the GLS and FTL are nearly comparable to similar products of other Indian lamp makers, but it cites the necessity for quality stabilization in various stages of production.

The improvement of FTL would include a fluorescent coating added to the water based system plus a significant investment for renovation, necessary for maintaining the accuracy of the products and the maintenance control both in GLS and in FTL.

3. Production Technology

For the time being, a certain amount of profitability improvement could be achieved within the current production system by intensified maintenance control and by upgrading the morale of the workers. But, remarkable improvement hardly seems to be possible. New renovation investment is necessary to install the automated modern production line which incorporates sensor devices and relieves shock impacts throughout the transfer line.

The reduction of cost and the increase in production are to be the immediate targets for securing a profit and keeping up with the competition. To avoid dispersion due to human involvement and to achieve uniform quality, a fully automated production line which would enable unattended operations is essential.

D. Input Factor Analysis

1. An overview

The Lamp Division at Hyderabad has long been a loss making unit. For the year 1990-91, the unit loss of Rs62 million comprises 28 percent of the total sales.

Production of GLS accounts for slightly over 50 percent of the total production, FTL 20 percent, MVL 10 percent, and others, including lamp components, 20 percent of total production.

During the two year period ended March 31, 1990, average unit production costs of GLS, FTL and MVL all exceeded the average unit selling price, while in the year 1990-91, the selling prices of GLS and MVL slightly exceeded the production cost mainly due to increases in selling prices.

Utilization of production capability, which is defined as the ratio of actual production to target production fixed for the year, was approximately 84 percent for GLS 76 percent for FTL and 76 percent for MVL for the year 1990-91.

Although production fluctuates year to year, the production quantities, have generally increased over the period.

Certain selected key figures for HMT Lamp Division are summarized in Table IV-9-8.

One particular factor noted in the HMT Lamp Division Hyderabad is the high ratio of wastage during the production process as summarized below:

Product	Wastage
GLS	20%
FTL	25%
MVL	16%

Although various measures, including an HRD program to increase the awareness of workers, early and preventive maintenance and others, have been conducted, wastage continues to remain very high.

Modernization of the whole production process adopting the latest technology might be required if HMT wants to be competitive in this industry segment.

2. Materials

In the year 1989-90 one of the glass furnaces was repaired, which required the Lamp Division to seek a supplier for glass shells, which distorts the comparison. In general, material cost accounts for 35 to 40 percent of the total outgoings. Imports generally account for 25 percent to 30 percent of the total material cost and include tungsten and moly wire, glass shells for large size MVP and other special components. Cost of raw materials during the 3 years ended March 31, 1991 stayed relatively stable. Fluctuations in the percentage of the total material cost have been noted in Table IV-9-9. Analysis of production costs for lamps is considered due to changes in the wastage ratio.

3. Personnel

Personnel costs also account for approximately 35 percent of the total outgoings. As shown in Table IV-9-8, there was a slight increase in the number of employees in this division during the 3 year period.

Also the retrospective increase in employee remuneration as determined by the government went into effect in 1990-91 which significantly increased personnel costs per employee, from Rs.40.7 thousand in 1989-90 to Rs.54.2 thousand in 1990-91, an increase of 33 percent.

4. Other expenses

Other expenses included in outgoings include the following major items:

(Rs. in Thousand)

	1990-91
Power & Fuel	11,241
Excise duty	20,241
Other agents commission	16,014
Others	25,427
	72,923

Table IV-9-8 Key Figures for Input Factor Analysis

(Rs. in Thousands)

	1990-91			1989-90			1988-89		
	Q'ty		Rs.	Q'ty		Rs.	Q'ty		Rs.
Sales:									
GLS lamps	24,000,000	5	126,920	20,500,000	5	96,742	23,400,000	4	91,185
Fluorescent lamps	1,899,000	24	45,985	1,900,000	20	37,062	1,780,000	20	35,670
Mercury vapor lamps	240,000	105	25,290	260,000	99	25,815	250,000	92	23,062
Lamps components			28,765	0		6,969	0		10,557
Others			12,166			3,720			500
Total sales			239,126			170,328			161,054
Outgoings:			%			%			%
Materials			101,194	36		84,287	41		74,155	39
Personnel			100,450	35		76,230	37		69,895	37
Depreciation			10,317	4		11,486	6		12,168	6
Other expenses			72,923	26		35,212	17		34,859	18
			284,884			207,215			191,077
Intercompany charges - net			5,867			26,887			13,380
Production cost:									
GLS lamps	23,310,000	5	104,765	21,592,000	5	103,632	22,686,000	4	96,935
Fluorescent lamps	1,825,000	25	45,410	1,841,000	26	47,215	1,684,000	25	42,432
Mercury vapor lamps	267,000	105	27,992	268,000	96	25,799	243,000	107	25,969
Cost of selected materials:									
Tungusten rod & wire	1,125	2	2,538	1,015	2	2,274	993	2	2,293
Moly wire	1,738	1	2,484	1,597	1	2,019	1,850	1	2,380
Glass shell	5,641,659	2	9,109	8,990,323	2	13,918	105,970	5	488
No. of employees	1,852			1,873			1,772		
Personnel expense per employee			54			41			39

Table IV-9-9 Analysis of Production Costs for Lamps

(Rs. in Thousands)

	GLS Lamps						Flourescent Lamps					
	1990-91		1989-90		1988-89		1990-91		1989-90		1988-89	
		%		%		%		%		%		%
Raw materials	60,319		68,407		66,011		23,777		26,710		24,290	
Fuel & gases	4,392		3,940		3,898		1,638		1,342		1,255	
Packing	6,284		4,814		4,493		3,037		2,728		2,292	
Others (including W/P)	1,519		(155)		298		40		668		574	
Total material costs	72,434	69	77,006	74	74,700	77	28,492	63	31,448	67	28,411	67
Salaries & wages	17,020		14,559		12,443		6,825		5,886		5,049	
Depreciation	1,556		1,914		2,055		1,503		1,553		1,576	
Power	1,392		1,184		1,483		2,017		2,203		2,262	
Service dept charges	3,333		3,163		2,750		3,006		2,498		2,676	
Others	4,660		2,229		1,131		1,066		1,398		939	
Total conversion costs	27,961	27	23,119	22	19,862	21	14,417	31	13,538	29	12,502	29
Admin. overhead	4,370	4	3,507	3	2,373	2	2,501	6	2,229	5	1,569	4
Total production cost	104,765		103,632		96,935		45,410		47,215		42,482	
Production quantity	##########		##########		##########		1,825,000		1,841,000		1,684,000	

	Mercury Vapor Lamps					
	1990-91		1989-90		1988-89	
		%		%		%
	16,733		14,786		14,187	
	1,455		1,165		822	
	660		589		682	
	(124)		163		1,287	
	18,724	67	16,712	65	16,818	65
	3,371		3,097		3,080	
	1,072		1,230		1,758	
	1,007		954		1,065	
	1,232		1,216		1,114	
	363		795		518	
	7,045	25	7,292	28	7,535	29
	2,223	8	1,805	7	1,616	6
	27,992		25,799		25,969	
	267,000		269,000		243,000	

E. Identification of Prospective Product Groups and Product Mix

In the short run, adjustment of the present product mix, and, in the long run, development of new products will be the focus of HMT's product development.

The market for GLS, from where 60 percent of HMT's sales are generated, is considered to be the most competitive and least profitable because there are many competitors. On the other hand, the market for FTL is growing fast and is profitable. Therefore it is critical for HMT not to lag behind its competitors in the market. Should HMT's lagging output of FTL be caused by production problems, it should evaluate the present production process thoroughly and take quick action aimed at increased production. For fiscal year 90/91, 91.8 percent of HMT's production in volume terms was in GLS, while production of FTL, and MVL, BLL and SVL accounted for 7.0 percent and 1.2 percent, respectively. HMT is over dependent on GLS, and thus, for stable production, it should reduce the production share of GLS to 70 to 80 percent, and increase that of FTL to 15 to 20 percent.

At the same time, it is necessary for HMT to try to increase market share in HPSVL, MVL and BLL since these are products with prospects in the future. Because of the different usages, higher durability and reliability are required in these lamps than in GLS or FTL. Thus, HMT has to pay strict attention to quality.

There may be three directions for HMT to develop new products. The first one is to expand the present product range, and the recent development of HPSVL, BLL, CFTL, special spectrum lamps, and quartz halogen lamps are examples. The second one is to develop high value-added products by adopting the present production technology of lamps. Some examples include fiber glass for telecommunication, and fiber scopes for various medical and industrial applications. The third one is to diversify into a new product category that is not directly connected to the technology of lamp production. Solar cells may be an example.

Among these three possible directions, the third one, which is unrelated to HMT's present technology, is far from realistic because HMT has not accumulated the necessary technology inhouse nor has it maintained internal resources suitable for it. As a result, it is highly doubtful whether HMT could succeed. The second direction, in which HMT aims to produce high value-added products relating to its present technology, is also not easy since such products as fiber

glass and fiber scopes need very high technology, which is considered to be almost completely different from the present technology HMT possesses. In addition, the know-how for these products is strictly protected by a number of patents, which restrict other companies from entering the market. If HMT were to attempt to enter these fields, it may adopt strategies such as OEM production through the introduction of related technology and design from patent owners. Consequently, HMT's strategy, for the time being, should be limited to the expansion of the present product range through streamlining of the production facilities and improvement of quality and price competitiveness.

HMT recently introduced a new product, "Power Saver." It plans to launch another new one in a couple of years, a compact FTL. From the experience of some other overseas countries where similar products have already been introduced, it is felt that there is little possibility for them to find a big demand. HMT may get a fraction of the sales from them, but may not expect big sales as much as the present sales of all the lamps combined.

F. Direction of Marketing Strategy

(a) Change of product mix

HMT's current product mix is heavily dependent on GLS lamps, which account for more than 90 percent of the total production of lamps. This condition where most of the sales are dependent on a single product tends to cause HMT's sales and profitability to be unstable. It should therefore be changed, so as to have a wider product range, and in particular, to increase the production of FTL. For GLS, HMT should try to keep at least their present market share, and for that purpose, rehabilitation of the present production may be considered. Solution of the present problems on production would make GLS's very profitable, and thus, GLS would remain one of HMT's major products in the future. Once the profitability of the product is improved, HMT can take a strategy to cut down the price of its GLS products so that greater market share can be obtained, assuming that the products are price sensitive.

HPSVL, MVL, and BLL have quite a different demand structure compared to GLS. The criteria for purchase is first put on durability and reliability, then on price. Marketing activities for the products, therefore, must be changed accordingly. HMT must let customers perceive that HMT's products are of good quality, while at the same time improving the quality of the products through strict quality control.

(b) Expansion of dealer network

HMT has not been eager to expand its dealer network throughout India. It is undoubtedly true that the limited dealer network has restricted the sales of HMT lamps. It is vital for HMT to expand the present dealer network through the establishment of new dealers, and HMT is strongly requested to support the dealers in various activities such as management of optimum inventory, production of advertising materials, and training of personnel. Present sales for HMT are geographically concentrated in the southern part of India, thus HMT may first attempt to expand into the western part, then the eastern part, and lastly the northern part of India.

On the other hand, for HPSVL, MVL and BLL, HMT may consider a new distribution network for efficient distribution since the present direct selling to final

customers has limited prospects for sales expansion.

(c) Export

Recently two contracts for export of HMT products have been secured. One is for lamp components to be exported to Botswana, and the other is for repair parts from GLS production facilities to be exported to Tanzania. HMT also has received several enquiries for GLS from advanced countries and is proceeding with the negotiations.

Ratios of imported parts in lamps are high in FTL, BLL and HPSV, but low in GLS; for the latter, almost all of the parts are available in the country. From the viewpoint of international competitiveness, GLS is considered to be highly competitive because of the high ratio of local content as well as relatively low technology. In addition, the recent devaluation of the Indian Rupee by more than 20 percent will allow international competitiveness to be stronger. As a result, the export possibility for GLS increases. FTL, MVL, BLL, and HPSVL, are regarded to be less competitive in the international market both in price and technology, and further elaboration of technology and improvement of production processes by streamlining are required.

G. Necessary Measures Concerning Cost Reduction

HMT's lamp division has been unprofitable every year since its establishment in 1976, except in 1981/82. In 1990/91, it recorded a huge loss of 62.3 million rupees against total revenue of 222.9 million rupees.

The major cause of the loss is estimated to be the increase in the cost of production. The cost increase was mostly brought about by three factors. The first one is that the number of factory workers is extremely large considering the production size, and the low work ethic. The second one is obsolete production facilities and their inadequate maintenance, which makes the utilization ratio for production facilities as low as 50 percent. The third one is its small size of production where it is difficult to achieve economies of scale. By dealing with these problems, HMT can improve its profitability drastically.

The present level of employees around 1,800 workers, is about twice the size of competitors for the same level of production. HMT must cut down the labor cost, but HMT, as a government owned public company, may not simply lay off the excessive workers but must find job opportunities for them. One of the most appropriate measures is to expand further consignment jobs at HMT's other divisions. Fortunately, both the tractor division and watch division are doing well enough that they may give the lamp division more opportunities. The other problem concerning personnel, the low work ethic, could be resolved by introducing an appropriate incentive system since it is believed that the present low work ethic is a result of insufficient application of the present incentive system. The new system should reflect performance or productivity rather than the standard hour presently used by most HMT divisions. This kind of incentive system can work in combination with worker participation activities such as the TQC circle activity.

It is not recommended to invest in new production facilities without thorough planning or a feasibility study. Considering the present HMT sales force as well as return on investment, a large investment involves high risks. Strengthening and expansion of product facilities should be conducted in accordance with the long term strategy. The following is one of the possible plans to be considered.

For the production of GLS, the basic policy should be to use the present facilities, but the present six production lines should be integrated into three. And, the production facilities should receive overall rehabilitation. The rehabilitation should be focused on the present mechanical transfer lines aimed at high production yield. In addition, it should be aimed at increasing production through a high degree of automated production.

For the production of FTL, the present production line should be replaced with a new one because the former is too obsolete to be fixed. The new line, which would be a single production line, shall be highly automated and thus eliminate the unstable quality which is usually caused by manual production. Increased production is sure to bring HMT costs down for production with thorough quality control..lml

H. Necessary Measures Concerning R&D Issue

Philips dominates the Indian domestic market both in GLS and FTL, and small scale competitors are struggling in the market. The survival of the HMT Lamp Division might be possible only by concentrating on the higher value-added field of MVL and of SVL and CFTL.

HMT, fortunately, is leading in MVL and SVL but CFTL, which is scheduled to be marketed in 1993, still is in the laboratory under development.

From the technology seeds of the lamp production, the fiber glass/optical fiber glass are envisaged as one possible future diversification but the technology (quartz glass) is distinctly different from current magnesium glass and since the raw materials would be entirely dependent on imports, there might be great difficulty in the R&D.

So that, the R&D should be investigated in the comprehensive viewpoint of the total HMT technology assessment, for instance, the possibility in laser beam machines or the solar energy utilization projects.

IV-10 BEARINGS

A. Market and Competition Analysis

1. Market size and growth

Presently, the whole inland market for bearings in India is approximately 100 million pieces, of which 81.6 million pcs are manufactured by 10 major companies (Organized Sector).

The whole market size is predicted to double, and the production of organized sectors to more than double, to 175.5 million pcs in five years time.

The demand trend for ball bearings (BB), tapered roller bearings (TRB) and cylindrical roller bearings (CRB) are as follows:

Table IV-10-1 Bearing Market in India

Unit: million pcs

	1991/92	1995/96
BB Demand	92.87	130.6
	(84.8%)	(84.2%)
TRB Demand	14.67	21.7
	(13.4%)	(14.0%)
CRB Demand	1.96	2.8
	(1.8%)	(1.8%)
Total	109.5	155.1

2. Customer Analysis

The tractor and automobile industries are major customers of HMT.

Table IV-10-2 HMT's Sector by Sector Sales in 1990/91

(%)

	Cars	2&3 wheelers	Tractors	Electric Fans	Electric	Others	Replacements
BB	8	2	24	4	2	10	50
TRB	22	-	52	-	-	4	22
CRB	32	9	27	-	2	-	30
Total	21	4	34	1	1	5	34

More than 60% of HMT's sales are on OEM basis with tractors, and 2/3-wheeler manufacturers.
This brought to HMT very stable sales and made it possible to manufacture on a pre-planned schedule.

3. Competitor analysis

Production records in 1990/91 and production plan of major companies are as follows:

Table IV-10-3 Bearing Production in India

Unit: million pcs

	SKF	NBC	FAG	TATA	SBL	OTHERS	TOTAL
Total 99/91	35.5	16.3	7.9	4.6	3.9	13.3	81.5
BB	32.0	14.5	7.7	3.9	3.9	7.9	69.9
TRB	3.5	1.8	-	0.7	-	4.4	10.4
CRB	-	-	0.2	-	-	1.0	1.2

HMT produced 2.29 million pcs of bearings last year and accounts for a 2.8% share in the organized sector production and a 2.3% share in the whole market of 97.8 million pcs including imports and unorganized sectors.

Table IV-10-4 HMT's Market Share

Unit: million pcs

	Total ORG	HMT	HMT Share
Total	81.5	2.29	2.8 %
BB	69.9	1.30	1.9 %
TRB	10.4	0.72	6.9 %
CRB	1.2	0.27	22.5 %

Only four companies including HMT manufacture CRB and HMT holds the share of 65% in tractors, 20% in 2/3-wheelers and 10% in cars. As it is not likely for newcomers to enter this field due to a limited market, HMT's business may remain stable in the future.

For TRB, a joint venture of Tata and Timken is expected to commence production of 2 million pcs per year in the next year. Although HMT has a stronghold in the tractor industry establishing share of more than 50%, the new company's entry will certainly affect HMT's market because Timken has such a reputable name. As competition with ABC (who concentrates on TRB) and TATA Timken seems to be severe, HMT has to put more emphasis on securing the present OEM contracts and developing a replacement market.

BB is the hardest competition field and it is also where HMT has the smallest share. At present half of the BB produced by HMT are being sold in a replacement market which seems unstable for the future. HMT sales activities have to be focussed on acquiring more OEM contracts by strategic thought.

B. Product Competitiveness Analysis

Ball bearings occupy the largest product segment in volume in the Indian market, accounting for as high as 85%. In this segment, HMT occupies only 1.9%. This marginal market share of HMT in connection with rather old production facilities makes HMT's products less competitive both price-wise and quality-wise in the domestic market.

Prices of HMT's bearings in the Indian market are nearly the same level as those of Japanese bearings, which are sold in Japan. The Japanese bearings, however, sell at much cheaper prices in the international market as a result of severe competition. If HMT compete with foreign bearing manufacturers including Japanese, it should lower the prices more than competitors since HMT's products are not so popular in the international market comparing with such popular brands as SKF, TIMKEN, Koyo, and NSK.

Quality-wise, HMT's bearing are considered to be inferior to those of competitors judging from its high defect ratio of 3.6% as well as the production process which are mostly performed manually.

C. Production Facilities and Product Technology Assessment

1. Production Facilities

About 64% of facilities were installed in 1970 and those had been shifted from Koyo at the beginning as second-hand single-functional machines.

The plant has a congested layout and auto-material handling devices have not been employed in the line of individual GPMs arranged in the order of process sequences.

As almost all facilities are aged, breakdown of facilities is frequent in spite of scheduled preventive maintenance.

Assembly and inspection of bearings are carried out manually and visually.

Heat treatment is processed in batch type furnaces, and automated continuous H.T.furnaces have not been introduced.

2. Product Engineering

In the period of 1968-78 Koyo and the state of Andhra Pradesh collaborated to establish Indo-Nippon Precision Bearing Ltd., and in 1980 it was taken over by HMT.

Three kinds of bearings, BB, CRB and TRB, are being manufactured, and the diameter range is smaller than 95mm ID international standard types.

3. Production Technology

The production technology was introduced under the technical support of Koyo.

However, the production facilities are almost obsolete as they have been employed without renovation since first installation.

Quality control is not sufficient and the defect ratio is high, mainly due to manual production and visual inspection.

D. Input Factor Analysis

1. Labour

The Manpower Committee's Report by HMT Bangalore issued in 1988 shows a surplus of PS-5, WG-56 in the year 1990-1991. Total personnel in the plant is 915 of which 210 personnel are for the grinding job. These jobs would be saved by automatizing the facilities. Also, 153 assembling and inspecting jobs are subject to be saved by mechanizing the said jobs. Engineers for streamlining and renovation of facilities should be reinforced as there seems to be only five now in the plant.

Low morale of workers has led to a low utilization ratio of facilities, low quality of products and a low yield of materials. The management is now trying to arrange a chance for communication with workers to motivate their participation in the plant's operation aimed at the improvement of productivity and quality.

2. Materials

The price of indigenous bearing steel is 2.5 times as high as that in Japan, and that of imported steel is 3.5 times.

3. Parts

In HMT, all parts are manufactured inhouse, while in Japan steel balls and cages are manufactured outside of the company, i.e. they are boughtout materials.

E. Direction of Marketing Strategy

Although HMT has an excellent share in the tractor sector, all necessary measures have to be taken to protect it. TRB may be the product most affected by increasing competition. Delivery terms should be the focus for improvement.

The replacement market is also growing and HMT has to improve its share by more promotional activities and constant supplies of the product.

Shares of BB and TRB in the automobile industry have to be protected from other suppliers. Also adherence to committed delivery terms will be a key factor.

Cost reduction has to be attempted in preparation for future fierce competition.

F. Necessary Measures Concerning Cost Reduction

The largest cost factor in the total production costs is materials which accounts for 47 to 51%, followed by personnel, 21 to 25%.

Major raw materials used for manufacturer of bearings are steel pipes, bars and sheets. Cost of imported material occupies approximately 30% of the total material costs. Some of them are imported from Sweden, Germany and other countries, and further increase of the materials caused by the recent devaluation of Rupees is anticipated. HMT may take expensive imported materials for granted unless it may take an advantage of a large quantity of purchasing which is made possible through expansion of production. It is also worth considering for HMT to have ancillary manufacturers produce parts of bearings on commission.

In spite of decrease number of employees from 967 in '86 to about 930 in 90/91, the total personnel costs has doubled from 28 million rupees to 57 million rupees. During the same period, the number of bearings produced by HMT has increased by 50%. From the above, it is said that the rate of increase of personnel costs is far beyond that of productivity. HMT should utilize its employees more efficiently through adopting various productivity improvement skills such as TQC, VA, and VE, while at the same time, old production facilities are necessary to be rehabilitated or replaced with modern ones.

V. MANAGEMENT SYSTEM DIAGNOSIS

V-1. RESULTS OF ORGANIZATION DIAGNOSIS

A. Current Status of HMT's Organization and Major Problem Areas

1. Units as Profit Centers

(a) Current Status

i. At present, each Unit (factory) of HMT is supposed to be an independent profit center. Due to the nature of each unit as a factory, however, there is a tendency to put higher emphasis on production. Thus, it is difficult for the marketing section to take the initiative. It is necessary to have more of market-oriented production planning and flexible adjustment to changing market needs (for example, product development appropriate to market needs, quick response to market claims, development of promotion measures and speedy delivery).

ii. The marketing section is operated mainly on a sales commission basis paid by each unit. They do not have any decisive powers to set such sales promotion measures as the dealers' commissions or incentives.

iii. The above conditions cause low morale among HMT salesmen or lead to dealers' complaints to HMT.

(b) Results of the Questionnaire Survey of HMT Managers

i. A majority of HMT managers feel that HMT's products and processes are not fully in tune with changing customer needs and do not fully satisfy those needs.

ii. A majority of HMT managers feel that the initiative in the areas of new product development or of price negotiation should be taken more strongly by the mar-

keting section. The staff members of the marketing section also feel that they should be given higher authority in marketing aspects.

iii. Many of the managers recognize the necessity to strengthen inter-personal and inter-departmental cooperation among units in order to carry out joint production or joint product development.

(c) Actions to be Taken

i. To establish within HMT more market-oriented business operations.

ii. To increase the authority of the marketing section.

iii. To promote co-operation amongst units in the same business group.

2. Business Groups

(a) Current Status

i. The current Machine Tool Business Group includes various kinds of industrial machinery units or sub-units.

ii. The responsibility of the managers of such big business groups as machine tools or even each unit within such groups is too wide to be covered by one man.

iii. The morale of workers in such sub-units as foundries is generally low, due to both the lack of autonomy and the delay in modernization investments.

(b) Results of the Questionnaire Survey of HMT Managers

i. The majority of managers consider that the present HMT organization structure consisting of business groups and units should be revised.

ii. Many small units of HMT have complaints about the present resource allocations and their lack of autonomy.

iii. Many people consider that broader delegation of powers from CHQ to business groups should be given, and that CHQ should concentrate on the development of overall strategies of HMT.

iv. The majority of managers recognize the necessity of CHQ for coordinating the business operations of all the units.

(c) Future Actions to be Taken

i. To investigate the possibility of revising the present business group structure.

ii. To investigate measures to give greater autonomy to such small units or sub-units as printing machinery unit or foundries.

iii. To reallocate the functions between CHQ and business groups. Specifically to identify clearly the functions to be handled internally within CHQ.

3. Management Hierarchy

(a) Current Status

i. The current complex management hierarchy in HMT creates the following problems:

- The morale of middle managers tends to be low;
- The responsibility of each manager is unclear; and
- There are too many managers involved in each management decision, and too much effort is expended for meetings or coordinating, which leads to slow decision making.

ii. The range of responsibilities of the top manager of each unit or CHQ is too wide, which prevents them from concentrating on the truly important key management decisions.

(b) Results of the Questionnaire Survey of HMT Managers

i. The majority of managers consider that decision making has to be faster at all levels than it currently is.

ii. Around 70% of Joint General Mangers (JGM) and Deputy General Managers (DGM) consider that an adequate level of delegation of powers to middle management is needed, and that the number of managers should be reduced.

iii. As for the implementation of matters that have been decided on, many managers feel that it is usually slow.

(c) Actions to be Taken

i. To simplify the management hierarchy of HMT by reallocating functions among each level of managers.

ii. To establish a system to separate the management positions from persons' ranks.

iii. To promote the delegation of powers aiming at improving middle managers' morale and attaining quicker management decisions.

4. Corporate Planning

(a) Current Status

i. The linkage between the current mid-term (5 years, rolling) plan and the annual operational plan is not sufficient.

ii. The current capability of the Planning Department in CHQ is not adequate to promote the strategic management of HMT.

(b) Results of the Questionnaire Survey of HMT Managers

i. The majority of HMT managers consider that the current planning system in HMT is not satisfactory.

ii. Nearly 50% of managers consider that the targets set in the current corporate plan are too diversified and that concentration of efforts in certain areas is difficult.

(c) Actions to be Taken

i. By delegating powers for operational matters to business groups, the top executives in CHQ should be able to put higher emphasis on decisions regarding planning and strategic matters for HMT as a whole.

ii. The functions and organization of the planning section in CHQ should be expanded and enlarged.

B. Current Status of Human Resource Management and Major Problem Areas

1. New recruitment and Job Assignment

(a) Current Status

i. Manpower planning (by discipline, age or unit) is not closely linked with the corporate plan.

ii. In some sections, the lack of engineers seems to cause delay in new product development.

(b) Results of the Questionnaire Survey of HMT Managers

i. The majority of managers consider that the guidelines for manpower allocation among the departments should be clearly established and updated more often.

ii. The majority of managers consider it necessary to take some measures to maintain a balance of young and old.

(c) Future Actions to be Taken

i. A long-term manpower plan, which is closely linked with the corporate plan and fit for the strategies, should be established.

ii. It is necessary to promote a policy to recruit and keep strategically needed staff members by creating an amiable work environment and a new personnel management system in HMT.

2. Human Resource Development

(a) Current Status

i. The training centers attached to units are mostly obsolete and lack facilities. Further, there are no training facilities in units other than those in the Machine Tool Business Group.

ii. There are no in-house training facilities which can provide training in advanced technologies, which is indispensable for such a high-tech company like HMT.

iii. There are growing needs in HMT to train and re-train workers for the operation of CNC machines or other mechatronics equipment, for the creation of multi-skilled workers or for the establishment of flexible job assignment schemes.

(b) Results of the Questionnaire Survey of HMT Managers

i. The majority of managers consider that the present training programs for top and middle managers in HMT are not sufficient and should be expanded. Further, they consider that the criteria for decision making in HMT are presently not clear.

ii. The majority of managers consider that a new training facility for specialists should be established, and that the training facilities for workers should be further expanded.

iii. The necessity for the development of multi-skilled workers differs largely from unit to unit.

(c) Future Actions to be Taken

i. Training programs and training facilities at all levels of workers, specialists and managers are to be expanded or newly established.

3. Personnel Appraisal System

(a) Current Status

i. A system to evaluate each employee's capability and achievement has only recently been formulated.

ii. The results of the above evaluation are used only for the promotion of PS class managers.

iii. The annual bonus and incentive bonus of indirect workers and managers are not directly linked to their achievement. Thus, their incentives for working harder are generally low.

iv. Because supervisors are not given the right to evaluate their subordinate workers, their control on workers is weak. This prevents the establishment of the total process control system at the shop floor level in each factory.

(b) Results of the Questionnaire Survey of HMT Managers

i. The majority of managers consider that the rewards, promotion or responsibility of each employee should be determined by the individual's capability and achievement. However, about half of the managers feel that the present appraisal system in HMT does not exactly reflect each employee's achievements or efforts.

ii. The majority of managers consider that a more open appraisal system in HMT is required and that the system should be consented to by all employees.

iii. Nearly one half of the managers feel that HMT's employees do not have a sufficiently challenging spirit to accomplish goals and provide new ideas.

iv. Some of the managers point out the problem that the present job assignments in HMT do not fully fit each employee's capabilities, and that the promotion criteria are too loose.

(c) Future actions to be Taken

i. The establishment of a more elaborate personnel evaluation system, which is closely linked with each employee's training, job assignment, promotion, incentives or annual bonus, is needed.

ii. The evaluation criteria should be further elaborated and should be known completely by all employees. The intensive training of appraisers is needed.

4. Answers Concerning Wage, Salary and Bonus

(a) Current Status

i. With regard to the bonus system, the same rate is applied to all the people belonging to the same department. Thus, an individual's performance and capability are ignored.

In addition, those who a receive monthly wage beyond 2,500 rupees (most managers) are not eligible for a bonus. The bonus cannot be paid under different titles that is commonly observed in private companies.

Finally, regardless of the performance of the division, HMT is obliged to pay 8.33% of the sum of basic pay and DA (If the annual bonus is a kind of supplement, pay the payment is justified, but if it is a part of profit distribution, it is unreasonable.)

ii. With regard to the worker-incentive system, the same rule, which was set years ago, is still in use regardless of the periodic wage hike. The standards for the incentive system do not reflect any increases in productivity which may have been achieved by the learning curve effect or other improvements in production. Also, monthly payment is based on standard hours which are the conversion of an accumulated number of working hours per month. This system does not consider certain important matters such as productivity on the whole, delivery, or production yields.

iii. The rates of worker-incentives over annual income are from 3 to 8%, which are considered to be small, and to have little effect on encouraging workers and motivation. Because the standard of payment lacks attractiveness, there is little impetus for employees to try new assignments. The present system is similar to a system which attempts to secure minimum working hours (to discourage absenteeism, early leaving, and work refusal) rather than one which increases the efficiency of production. Further, it is not reasonable that managers and office workers receive an allowance which is calculated by multiplying an average incentive of

direct workers by a certain rate.

iv. The worker-incentive system brings about a certain degree of confusion in production and an additional burden in office work.

- Too many inspections, beyond those necessary tend to cause delivery delays.
- Workers choose work themselves. As a result, easier work, which can be done within a set amount of time, is selectively chosen, and this causes delivery delays and excessive inventory.
- There are increases in administrative costs, such as gathering of necessary data for the worker-incentive system, input of the data to computers, and the transaction by computers.
- Only information necessary for the worker-incentive system is gathered. The limited amount of information obtained through job cards is not sufficient to achieve production control.

(b) Results of the Questionnaire Survey of HMT Managers

i. Approximately 50% of managers are not satisfied with the wage levels. Regarding the benefits given at retirement, approximately 70% of them feel that those of other companies are better. Approximately 90% of managers think retirement benefits should be improved

ii. An overwhelming majority of managers support the reform of the worker-incentive system. Some of the problems pointed out by managers are that the system is based on standard hours, managers and office personnel use the same system, and the system is not linked with productivity.

(c) Actions to be Taken

i. Complete reform of the worker-incentive system should be determined considering the cost performance, difficulties of setting up the standards, and distribution based on an appraisal system. It is forecast that the present worker-incentive system will loose its rationale when CNC facilities are widely used in the near future.

ii. Incentive systems for managers and clerical staff members should be based on the achievement of objectives, or bonus systems based on an appraisal system. In this case, it is desirable that the same incentive system be applied to direct workers from the viewpoint of fairness.

iii. In Japan, wages stop increasing or go down when employees reach a stipulated age, which is usually in the 50s, since employees are no longer good at the operation of machines, or as efficient at office work. On the other hand, in India, it seems that wage increases accelerate as a worker's age goes up till the retirement age. To prepare for the increase in the number of older workers, HMT should reform the present wage system. Under the new system, workers in their 30s and 40s, who are well experienced, should be best compensated to be able to make a good living.

5. Answers Concerning Promotion

(a) Current Status

i. Problems arise because of the existing system where the position in the hierarchy corresponds one-to-one to the salary/wage grade. The increased number of grades, as a result of the increased number of managers, bring inefficiency to the organization, such as delayed decision making, unclear fixation of responsibilities, and decrease of authority.

Regardless of qualification, it is hard to be promoted because there are fewer posts at the higher levels of the organization. Insufficient job rotation is practiced for promotion. Accordingly, regardless of capability, employees need to wait for a certain period to be promoted to higher positions. This tends to cause them to quit their jobs or weakens work ethics.

ii. Difficulties are caused by the system in which an employee's education directly affects his promotion potential. For instance, employees in the PS grade gain 15 points out of 100 automatically at the time of promotion assessments. This is considered to be an unfair practice in that it does not assess the capability of employees, and hampers healthy internal competition.

Graduates from universities with bachelor degrees start at a grade of WG-II, and can not become PS-III until after at least 24 years, while those who have MBA degrees start at PS-III. Under this system, it may be that the best use of outstanding university graduates may not be achieved. As to workers, their career promotion steps are set in accordance with the qualifications they have when they start work for HMT, and there is little room for improvement under the existing promotion system. Also HMT does not give any educational support to them, such as sending them to universities in order to obtain degrees.

(b) Results of the Questionnaire Survey of HMT Managers

i. An overwhelming number of managers support the introduction of a more objective appraisal system. Some managers state that the conditions of appraisals differ unit by unit and that appraisals are made based on the preference of appraisers. Some managers responded that promotions are made semi-automatically without strict appraisal.

ii. About one half of DGMs, JGMs, and GMs have been in their present positions beyond the standard period of eligibility for promotion, i.e., 3 years. They are waiting for higher positions to become vacant. The

average delay in getting a promotion is now about 5 to 6 years. This is quite different from the standards of promotion originally envisaged in the appraisal system. it is felt that excessive specialization of job duties brings about narrow promotional steps.

(c) Actions to be Taken

i. HMT needs to distinguish the position in the hierarchy from the salary/wage grade, and to consider a new system where multiple grades correspond to each position. In Japan, many companies have such adopted systems where the employees are divided into grades based on their work capability, and the payments are made corresponding to the grades, while managers are chosen from several grades.

ii. HMT needs to discuss advantages and disadvantages of the present appraisal system, where promotions are heavily dependent on education. In particular, the comparison should be made from the viewpoint of an objective promotion policy, which makes it possible to secure outstanding people, to revitalize university graduates, and to provide incentive for those who enter at the PS-III grade.

iii. HMT needs to consider a promotion system where managers could be chosen from a wide range of candidates including other units or departments. For this, it is necessary for HMT to consider the education and training to create generalists.

iv. HMT therefore needs to develop a new appraisal policy based on the above. Also, in implementation of the new system, HMT should standardize the application of the rules and make sure that every employee understands the system and its application thoroughly.

6. Answers Concerning Rotation, Transfer and CDP

(a) Current Status

i. Since a rotation rule which considers an individual career development plan (CDP) has not yet been established, many managers show a strong dissatisfaction over the present system.

ii. Transfer is rare in HMT at present. It is, however, useful from the CDP point of view for people with specialized skills to be rotated so that they can get an overall experience of other related functional areas. Those who are in their 20s or early 30s may be the target of such transfers in order to find out their aptitude and to allow them to get more experience.

(b) Results of the Questionnaire Survey of HMT Managers

i. Sixty-five percent of managers answered that more frequent job rotations should be introduced. Supported by approximately 90% of GM's, high ranked managers tend to support the idea strongly.

ii. An overwhelming number of managers recognized the necessity to revise the present CDP system. They suggest that the present system be revised to make it more discerning in identifying internal entrepreneurs.

iii. It was pointed out by an overwhelming number of questionnaire respondents that the criteria for manpower allocation, transfer and rotation in HMT were not clear. Some comments obtained through the questionnaire survey regarding this issue were: "The present rotation is used as a punishment," and "Most of the rotations do not have clear objectives."

iv. Some managers stated that there is a need for a system that would facilitate the change of residence in connection with transfers. It is necessary for HMT, to consider a system which allows outstanding specialists who cannot change their residence for clear reasons, to be suitably promoted.

(c) Actions to be Taken

i. Most of the high ranking managers recognized the importance of a CDP system associated with rotation. Thus, HMT needs to prepare a definite career path plan.

ii. In planning its career development system, HMT should consider ways to find out about the aptitude and capability of individual personnel. The system should also consider changes in the direction of corporate culture.

iii. HMT needs to develop a system to make change of residence associated with rotation, easier, focussing on the timing of transfers and the development of corporate housing.

iv. HMT needs to consider the transfer of excessive people, especially in administrative sections, to other sections where additional manpower is needed, after reeducating them.

v. HMT needs to consider the adoption of a self-appraisal system as well as an internal recruitment system to supplement transfers and CDP effectively.

V-2. Financial Analysis

A. Financial Analysis

1. Profitability

HMT's sales continued to increase without exception for the last 10 years. Sales amounting to Rs.2,579 million in 1981-81 have grown to Rs.7,600 million in 1990-91, an increase of 195%.

Along with the increase of sales, cost of production similarly increased. The total production cost net of accretion to stocks amounting to Rs.2,164 million in 1981-82 increased to Rs.7,350 million in 1990-91, an increase of 240%.

At the same time, interest expenses increased to Rs.425 million from Rs.133 million, registering an increase of 220%, while other income also increased by 319% to Rs.331 million from Rs.79 million in the 10 years period.

The change in the ratio of operating cost to sales values of production (sales plus stock accretion) between 1981-81 and 1990-91 with additional details are as follows:

Table V-2-1 Ratio of Operating Cost to Sales Value of Production

	1981-82			1990-91		
	Rs. Million		(%)	Rs. Million		(%)
Sale value of production	2,718		100.0	7,806		100.0
Materials	1,412	61.3	52.0	3,999	52.9	51.2
Personnel	491	21.3	18.1	1,707	22.6	21.9
Depreciation	112	4.9	4.1	216	2.9	2.8
Other expenses	289	12.5	10.6	1,634	21.6	20.9
Total operating costs	2,304	100.0	84.8	7,556	100.0	96.8
Net	414		15.2	250		3.2

During the 10 year period, the average cost of ferrous castings consumed by HMT increased from Rs.10,393 to Rs.20,075 per ton, an increase of 93%. During the same period, annual personnel cost per employee went up from Rs.18,428 to Rs.57,206 (excluding Rs.3,125 representing prior year portion), an increase of 210%, with advancement of average age of employees from 34 years to 41 years.

As a result of the higher growth in expenses compared to the growth in revenue, HMT has been suffering from a sharp decline in profitability which started in 1983-84.

In 1982-83, HMT registered a record profit before tax (PBT) and profit after tax (PAT) of Rs.375 million and Rs.265 million, respectively. Their ratios to sales were 13.9% and 9.7%, respectively, and are also record highs for the last 10 years. After this peak year, PBT and PAT as well as their ratios to sales continued to decline, reaching a low point in 1987-88, when PBT and PAT were only Rs.3 million with the ratios to sales being 0.06%.

For the latest fiscal year 1990-91, PBT and PAT increased to Rs.156 million and Rs.141 million, respectively, representing 2.1% and 1.9% of the sales, which would not be sufficient for HMT. TBT and PAT for 1981-82 to 1990-91 are illustrated in Fig. V-2-2.

It is also noted that more effective utilization of assets may be necessary. High inventory levels and long collection periods affect the profitability of HMT. The inventory holding ratios and average collection period as at March 31, 1991 are as follows:

	Days		Days
Materials	144	Collection period	51
Work-in-process	54		
Stock-in-trade	33		

From the above, it can be seen that it takes on average 230 days for HMT to convert materials purchased into sales. Thereafter another 50 days are required to realize the proceeds.

Table V-2-2 Summarized Profit and Loss Account For The 10 Years Ended March 31, 1991

(Rs. in Millions)
Source: Annual Reports

	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982
Earnings:										
Sales	7,600	6,558	5,676	4,628	4,335	3,744	3,542	3,320	2,644	2,579
Stock accretion	206	99	83	107	38	216	157	(115)	283	139
Other income (decretion)	331	242	245	244	201	159	167	163	119	79
	8,137	6,899	5,004	4,979	4,574	4,119	3,866	3,278	3,045	2,797
Out-goings:										
Materials	3,999	3,343	2,858	2,404	2,217	1,906	1,733	1,568	1,499	1,412
Personnel	1,766	1,527	1,293	1,107	967	904	777	686	573	491
Depreciation	216	183	192	199	193	207	168	148	127	112
Other expenses	1,634	1,408	1,222	906	799	730	731	392	322	289
Interest	425	380	378	360	340	286	222	159	149	133
	7,981	6,841	5,943	4,976	4,517	4,033	3,631	2,953	2,670	2,438
Profit before tax	156	58	61	3	58	86	235	325	375	359
Provisions for taxation	15	10	15	0	5	10	35	90	110	110
	141	48	46	3	53	76	200	235	265	249
Profit before tax/sales(%)	2.1	0.9	1.1	0.06	1.3	2.3	6.6	10.1	14.3	13.9
Profit after tax/sales (%)	1.9	0.7	0.8	0.06	1.2	2	5.6	7.3	10.1	9.7

Summarized profit and loss accounts for the 10 years ended March 31, 1991 (1990-91) together with certain key profitability ratios are presented in Table V-2-2.

Further analysis of profitability in terms of business group is presented below.

Sales and profit (loss) before tax by business group for the latest two years and 1982-83, the best year during the 10 years ended March 31, 1991, are as follows:

Table V-2-3 Sales and Profit Before Tax by Business Group
(Rs. in Million)

	Sales			Profit (loss) Before Tax		
Business Group	1982-83	1989-90	1990-91	1982-83	1989-90	1990-91
Machine Tool	1,027	2,524	3,066	203	(98)	3
Watches	961	2,017	2,211	241	148	77
Agricultural Machinery	540	1,847	2,063	3	147	225
Lamps	116	170	239	(46)	(75)	(62)
Unallocated Expenses	-	-	-	(26)	(64)	(82)
Total HMT	2,644	6,558	7,600	375	58	161

The sales of the Machine Tool Business Group (BGM) amounts to approximately one third of the total sales of HMT. BGM contributed to HMT's PBT Rs.203 million or 54% in 1982-83. Thereafter the profitability continuously declined resulting in losses in the years 1987-88 to and 1989-90 and then marginally recovered in 1990-91 (Contribution of BGM to PBT in 1990-91 was Rs.3 million and accounted for 1.9% of HMT's total PBT). The declining profitability of BGM in the last few years is due to high losses reported by Machine Tools Bangalore (MTB), Hyderabad (MTH), Ajmer (MTA), Kalamassery (MTK) and Printing Machinery, Kalamassery (PMK). Substantial improvement in the performances of MTK and PMK, which reported profits in 1990-91, was offset by higher losses at MTB, MTH and MTA. Increasing competition, inadequate

improvements in productivity, delayed execution of orders due to lack of adequate production and material management, and very old machinery, together with increasing input costs and interect burden are important reasons for the decline in BGM profitability.

The Watch Business Group (BGW) whose sales also constitutes nearly one third of the total HMT sales contributed Rs.241 million or 64% of the total PBT in 1982-83. However, the profitability gradually declined to the level of Rs.77 million or 48% of the total PBT in 1990-91, due to increasing competition, high losses at the Watch Factory, Srinagar (WFS) and the Watch Factory, Ranibagh (WFR) which were due to under utilization of production capacity, the reasons for which vary from the remoteness of factory locations, to the lack of skilled workers to political or civil disturbances. The Watch Ancillaries Unit (W.ANC), which assembles imported knock-down watches, incurred a loss of Rs.10 million in 1990-91 while its contribution to PBT in 1981-82 was Rs.53 million. Cost increases due to wage increases coupled with devaluation of Rupee, account for the decline.

The Agricultural Machinery Business Group (BGA) whose sales also constitute nearly one-third of the total HMT sales, contributed Rs.1.5 million to PBT in 1982-83. Thereafter, the profitability of BGA significantly improved and surpassed PBT generated by BGM in 1986 and BGW in 1989-90 and thereafter. In 1990-91 contribution of BAG to HMT's total PBT was Rs.225 million. The increasing profitability of the Tractor Unit resulted in continuous increases in the profitability of BGA over the 10 year period.

The turnover of the General Engineering Products Business Group (GEP) (now called Lamp Division since 1988-89) accounts for less than 10% of the total sales of HMT. GEP reduced the overall profitability of the Company by a loss amounting to Rs.4.6 million in 1982-83. Thereafter the loss gradually increased to Rs.108 million in 1988-89 while marginal improvement was observed in 1990-91. The increasing loss of the Lamp Division which caused the above decline can be attribut-

ed to low production capacity utilization, the reasons for which vary from high rejection rates, rising input costs to increasing competition from small scale manufacturers.

Key figures by business group for 1981-82 to 1990-91 are summarized in Table V-2-4. Sales and loss before tax of loss making units in 1989-90 are shown in Table V-2-5.

Table V-2-6 shows comparisons of the Machine Tool Business Group (BGM), the Watch Business Group (BGW) and the Agricultural Machinery Business Group (BGA) with corresponding Japanese industry/companies' averages for the year 1988-89 and 1989-90.

Value Added Per Employee for Japanese industry/companies is generally 10.9 to 23.3 times higher than those of HMT. The difference is the largest in Machine tool where value added by a HMT employee in 1989-91 was Rs.0.08 million while for a Japanese employee the amount was Rs.1.86 million.

A comparison of inventory turnover also highlights the overall superiority of Japanese industries. For BGM 1990 inventory turnover is 1.81 while for Japanese industry it is 6.36. BGW also indicates similar results, 2.58 for HMT against 10.1 for Citizen. Further improvement in employee productivity and inventory/production management would be required for HMT to be internationally competitive.

Although receivables in number of days turnover is lower than the Japanese average this is attributable to differences in trading practices.

2. Stability

HMT maintained good financial stability during the 10 years ended March 31, 1991.

As of March 31, 1991, the current ratio (Current assets/ Current liability) was 2.9; Fixed assets/Invested capital ratio (Fixed assets/Stockholder's equity + long-term

Table V-2-4 Key Figures by Business Group 1981-82 To 1990-91

(Rs. in Millions)

Business Group	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Machine Tool										
Sales value of production	1,043	1,294	1,350	1,404	1,451	1,556	1,679	1,944	2,318	2,843
Sales	925	1,027	1,378	1,124	1,246	1,470	1,537	1,889	2,860	2,849
Operating profit	190	261	235	243	164	121	59	19	(31)	75
Profit before tax	140	203	173	154	46	19	(33)	(68)	(98)	3
No. of employees	15,671	15,872	16,046	16,183	16,197	16,010	15,765	15,465	15,147	14,622
Watches										
Sales value of production	928	991	1,026	1,135	1,232	1,375	1,496	1,910	2,021	2,367
Sales	908	961	1,034	1,124	1,210	1,363	1,421	1,820	1,919	2,100
Operating profit	226	275	244	231	216					
Profit before tax	109	241	217	203	166	171	159	216	147	77
No. of employees	6,328	6,486	6,842	7,282	7,856	7,969	8,080	8,007	8,012	7,871
Agriculture										
Sales value of production	634	570	704	784	970	1,082	1,221	1,432	1,696	1,920
Sales	612	547	709	787	934	1,058	1,217	1,422	1,684	1,884
Operating profit	44	22	34	45	51	58	79	123	180	260
Profit before tax	65	2	22	33	38	42	65	111	168	245
No. of employees	2,530	2,625	2,698	2,879	3,029	3,040	3,118	3,181	3,258	3,409
General Engineering										
Sales value of production	137	117	108	120	126	132	126	151	171	221
Sales	135	109	108	113	123	132	132	148	1546	223
Operating profit	14	(31)	(42)	(50)	(43)	(49)	(67)	(93)	(63)	(49)
Profit before tax	1	(46)	(57)	(69)	(60)	(64)	(82)	(108)	(75)	(62)
No. of employees	1,917	2,035	1,938	1,968	1,922	1,841	1,819	1,772	1,873	1,852

Table V-2-5 Loss Making Units-Sales, SVOP and Profit(Loss)
(1989/90 and 1990/91)

(RS. MILLION)

	1990			1991		
Unit	Sales	SVOP	Profit (Loss)	Sales	SVOP	Profit (Loss)
MTB	592	561	(61)	584	587	(69)
MTK	412	392	(24)	467	476	12
PMK	91	81	(4)	115	116	16
MTH	390	489	(8)	728	696	(24)
MTA	131	115	(70)	160	175	(44)
WFS	105	104	(24)	57	54	0
WFR	426	440	(36)	457	522	(64)
WANC	44	44	(4)	11	7	(10)
LMH	156	171	(75)	223	221	(62)

Table V-2-6 Comparison of HMT'S Business Groups with Corresponding Japanese Industry/Company

	MTBG		Japanese Industry		Watches		Citizen		Tractors		Kubota	
	1989	1990	1989	1990	1989	1990	1989	1990	1989	1990	1989	1990
1. Current ratio	2.88	2.12	1.86	2.03	5.63	4.68	2.08	1.96	1.81	1.63	1.55	1.55
2. Operating income/ Sales (%)	0.99	(1.32)	7.53	10.51	13.9	9.67	7.05	6.03	8.56	10.78	5.101	4.78
3. Ordinary income (PBT)/Sales (%)	(3.47)	(1.32)	7.46	10.51	13.90	7.33	8.59	7.75	7.89	10.07	5.51	5.47
4. Return on capital employed (%)	0.94	(1.57)	3.92	4.72	15.06	9.9	3.43	3.901	45.06	64.08	2.72	2.68
5. Material cost/Sales	44.65	45.87	45.65	44.03	45.93	45.30	50.46	54.92	76.06	45.39	53.95	52.67
6. Labour expenses/ Sales	37.91	38.46	16.07	14.96	17.69	19.11	11.17	10.17	8.67	8.34	15.04	14.28
7. Sales growth (%)	22.89	21.00	26.00	19.50	28.09	5.40	12.69	6.87	16.46	18.83	2.93	5.00
8. Ordinary income (PBT) growth (%)	(107.50)	(45.26)	693.57	70.78	35.46	(31.33)	100.32	3.50	70.24	50.90	8.58	4.85
9. Operating income growth (%)	(67.00)	253.55	153.20	49.95	(21.12)	(26.37)	54.09	3.83	56.60	48.80	(1.05)	2.71
10. Value added/Sales (%)	55.35	54.13	29.13	31.18	54.70	56.72	24.79	22.56	24.16	23.94	24.51	23.52
11. Value added/ Employee Rs. Mill.	0.07	0.08	1.50	1.86	0.13	0.14	1.97	1.92	0.11	0.13	1.45	1.42
12. Total asset turnover	0.94	1.19	0.87	0.85	1.08	1.02	1.04	0.99	5.26	6.01	0.97	0.94
13. Fixed asset turnover	3.53	4.40	2.95	2.99	3.45	4.00	3.81	3.83	18.66	13.91	2.18	2.14
14. Current asset turnover	1.43	1.72	1.24	1.19	1.53	1.29	1.44	1.33	8.43	9.98	1.76	1.68
15. Inventories turnover	1.53	1.81	6.24	6.36	2.76	2.50	11.14	10.01	5.67	5.97	7.21	6.97
16. Receivables (Days)	79	105	161	169	11	32	108	114	11	12	139	149

liabilities) was 0.3 and debt equity ratio (Total liabilities/Stockholders' equity) was 2.1, all of which are considered appropriate.

A survey of 417 Indian companies in various industries carried out by the Industrial Credit & Investment Corporation of India Limited (ICICI) revealed the following debt/equity ratio:

Debt Equity Ratio

Total Companies		0.32 & below		Between 0.33 & 0.99		Between 1.00 & 2.32		2.33 & above	
87-88	88-89	87-88	88-89	87-88	88-89	87-88	88-89	87-88	88-89
409	402	65	63	88	88	170	170	86	81

As of March 31, 1991, HMT did not borrow funds directly from the Central Government. Summarized balance sheet as of March 31, 1991 and 1991 together with certain key ratios are presented in Table V-2-7.

3. Growth

During the ten years ended March 31, 1991, HMT's sales grew from Rs.2,579 million to Rs.7,600 million, registering an increase of 19% or an annual compound average growth rate of 12.7%. During the same period, sales value of production (SVOP) rose from Rs.2,718 million to Rs.7,806 million, representing an increase of 187%.

Net worth, defined as net assets less deferred expenses, showed an increase of 121% from Rs.1,120 million to Rs.2,480 million from 1982-82 to 1990-91.

However, India has undergone significant inflation during the 10 year period. The wholesale price index during the period increased by 180%. Discounting for inflation, the sales of 1990-91 would be Rs.4,222 mil-

Table V-2-7 summarized Balance Sheet Yeatrs Ended March 31, 1991 & 1990

	March 31			March 31	
	1990	1991		1990	1991
Current assets:			Current liabilities	2,083	2,074
Cash and bank balances	771	861			
Sundry debtors	945	1,004	Provisions	179	212
Loans and advances	732	703			
Inventories	2,539	2,963			
Other current assets	397	423	Loan funds:		
	5,384	5,953	Secured loans	928	1,171
			Unsecured loan	1,432	1,816
				2,360	2,987
Fixed assets:			Shareholders funds:		
Gross block	3,332	3,674	Capital	741	786
Accumulated depreciation	(2,019)	(2,233)	Reserves and surplus	1,612	1,737
	1,313	1,441		2,353	2,523
Capital work-in-progress and others	96	177			
	1,409	1,618			
Investments	97	155			
Deferred expenses	68	70			
	6,975	7,796		6,975	7,796

	March 31	
	1990	1991
Current ratio	2.5	2.9
Fixed assets/invested capital	0.3	0.3
Debt equity ratio	2.0	2.1

lion, resulting in a real growth of 63% and annual compound growth rate of 5.6% during the 10 years, which can be considered as moderate growth.

In contrast to the increase in sales and net worth, the number of employees stayed relatively stable, i.e., 26,637 for 1981-82 and 28,145 for 1990-91 with a peak in 1985-86 of 29,417. HMT is currently attempting to avoid any increase in the number of employees.

4. Productivity and Value-added Analysis

(a) Trend of Productivity for HMT as a whole

The trend of productivity for HMT as a whole for the past ten years is shown below.

Table V-2-8 TREND OF PRODUCTIVITY IN HMT

	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	
VALUE-ADD.	9742	13394	14790	16220	20069	21127	22361	24431	28554	33779	38729	Lahks
NO.of Empl	25159	26117	26938	27572	28311	29067	29397	29294	29034	28724	28339	
V-A/Employ	0.387	0.513	0.549	0.588	0.709	0.727	0.761	0.834	0.983	1.176	1.367	Lahks
Ann.Growth		32.6	7.0	7.1	20.6	2.5	4.7	9.6	17.9	19.6	16.2	AV13.5%
L Competit	2.51	2.73	2.58	2.36	2.58	2.34	2.31	2.21	2.21	2.21	2.28	

This table shows that HMT has made a big effort to improve productivity through restraining the increase of manpower since 1988. However, if the effects of inflation or the annual increase of product prices at 10 to 15% are taken into consideration, this table reveals that only little improvement in the net productivity has been realized during this ten year period.

The rate of wage increases has been exceeding that of the value-added productivity increases, and thus the labor cost competitiveness (Value-added/Personnel Expenses) is declining. This trend is very crucial for maintaining cost competitiveness in the international market.

(b) Productivity of the Business Groups and Units.

The productivity analysis of this area is made, based on the recent three year data, and the inter-group and inter-unit comparisons of productivity are shown in the Fig. V-2-1 to Fig. V-2-5.

The results of the analysis are as follows:

i. In general, value-added productivity in the Business Groups and Units has been increasing for these three years. As mentioned before, however, this does not mean an improvement in net productivity because of the effect of the marking-up of the product price.

ii. There are big difference in productivity among the Business Groups. Value-added per head in the Machine Tool BG is low, 50% of that of the Agricultural Machine BG, and 70% of the Watch BG, respectively. Productivity in the Lamp Group has been improved, but still its value-added can cover only 70% of its personnel expenses.

iii. There are also differences in productivity among the Units within the same Business Group. These differences come from such factors as types of product, variety of products, conditions and utilization of production facilities, levels of management and supervision, and so on.

iv. In the Machine Tool Business Group, a tendency of declining productivity appears in HMB, MTB and MTP. Corrective measures are very crucial there. In HMB, especially, productivity is declining due to the low utilization of machines and equipment, in spite of the increasing value-added ratio.

Fig. V-2-1 Trend of Productivity in BGM (Unit-wise) - 1

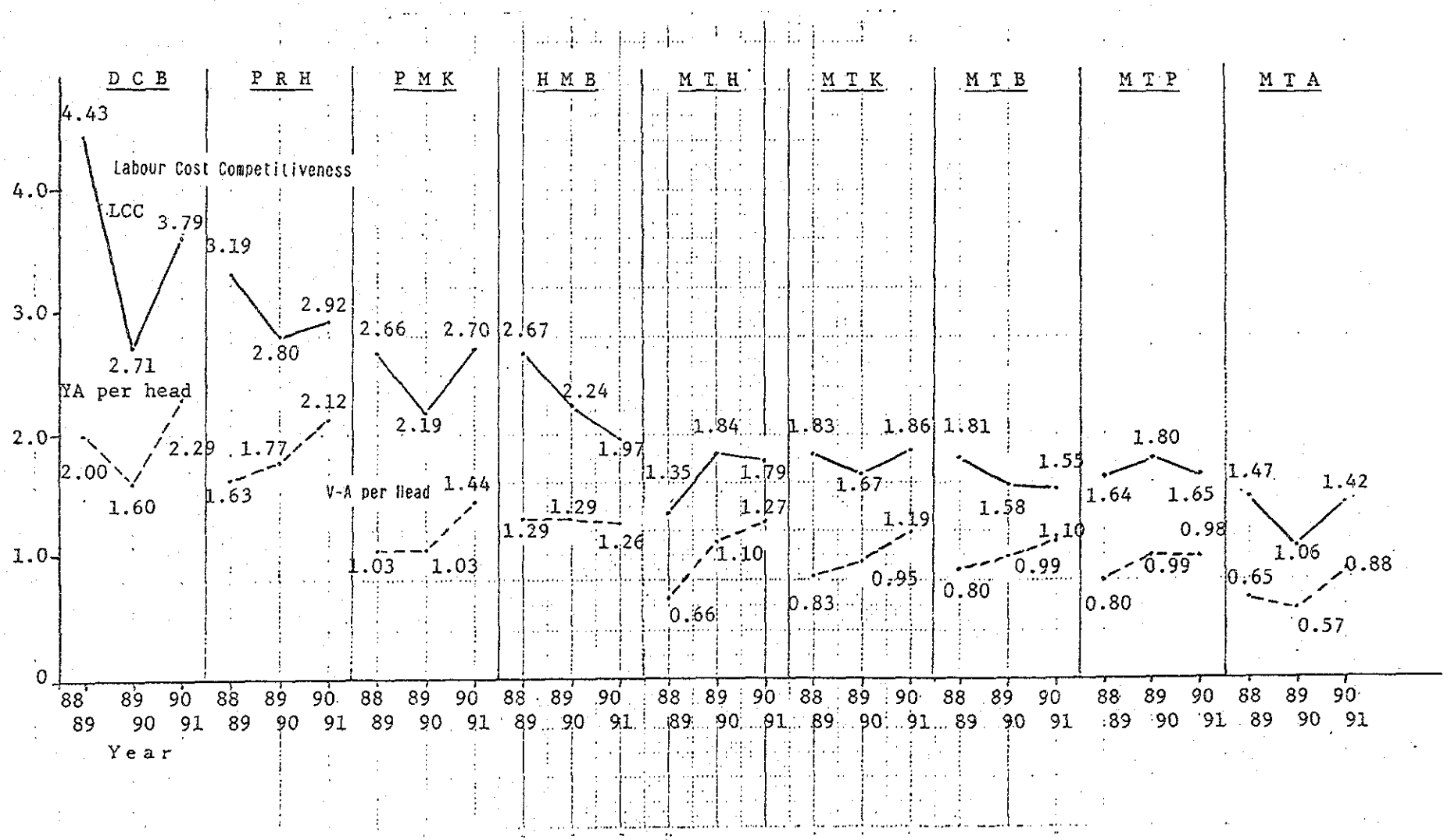


Fig. V-2-2 Trend of Productivity in BGM (Unit by Unit) - 2

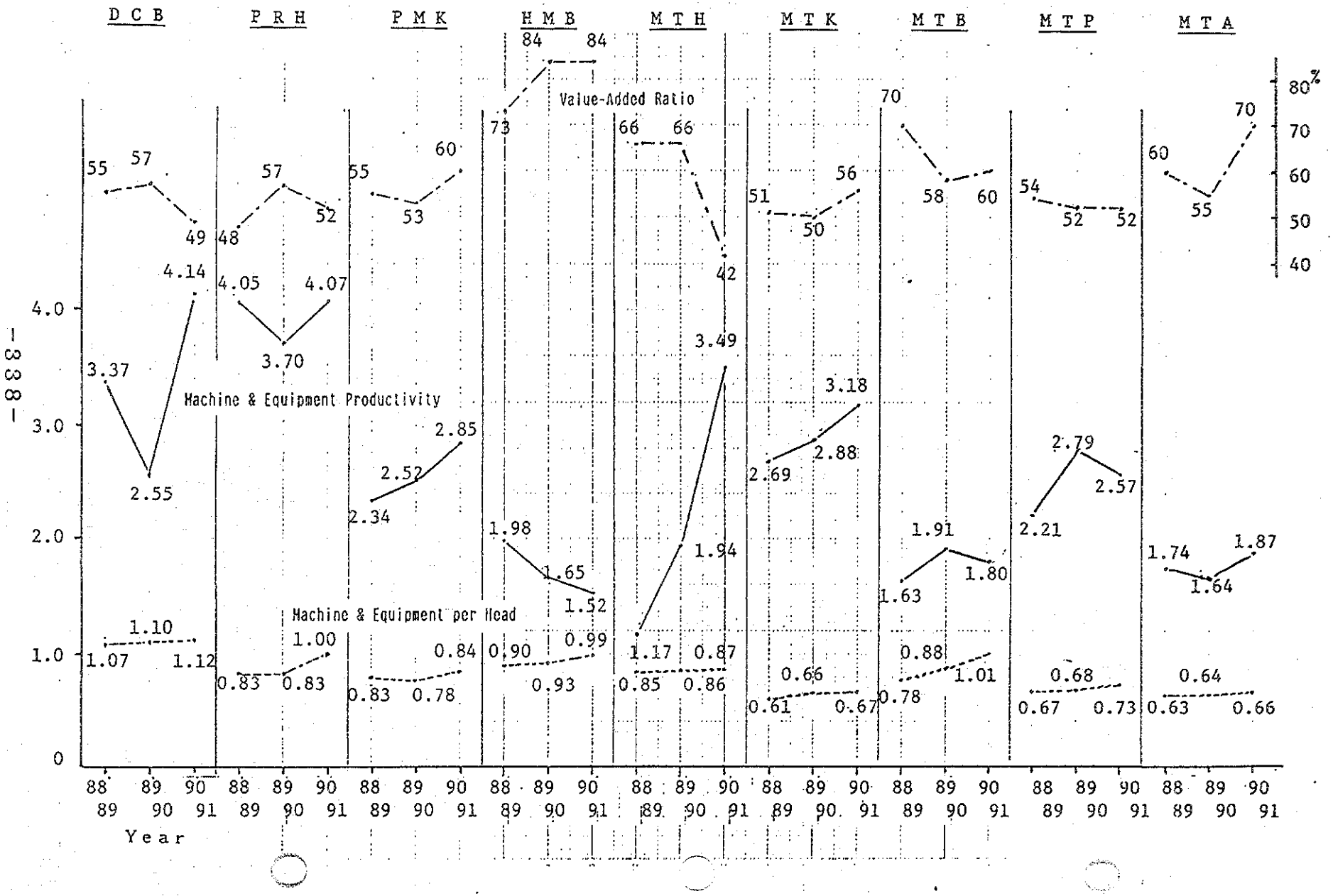


Fig. V-2-3 Trend of Productivity in BGM (Unit by Unit) -3

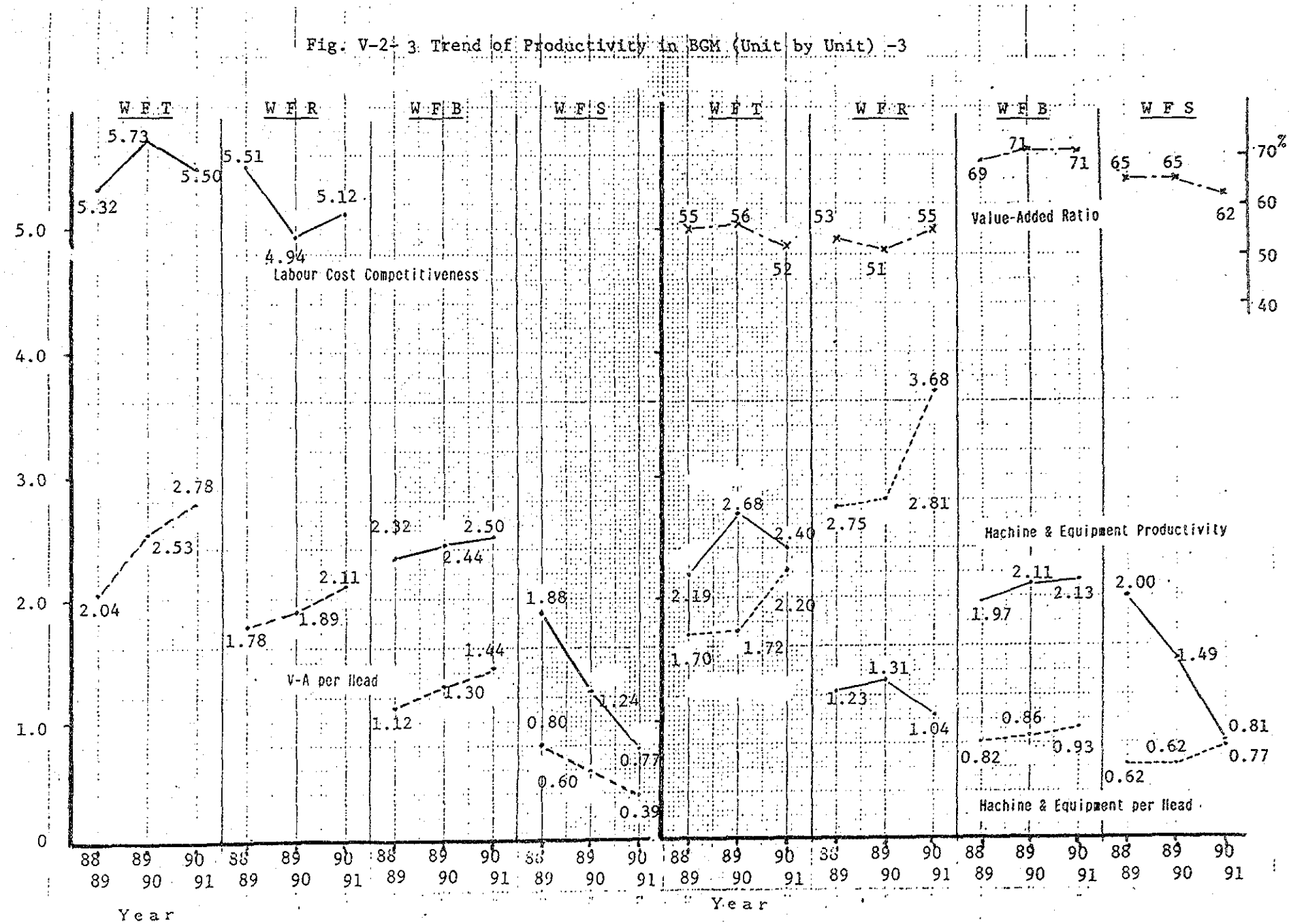


Fig. V-2-4 Trend of Productivity in HMT

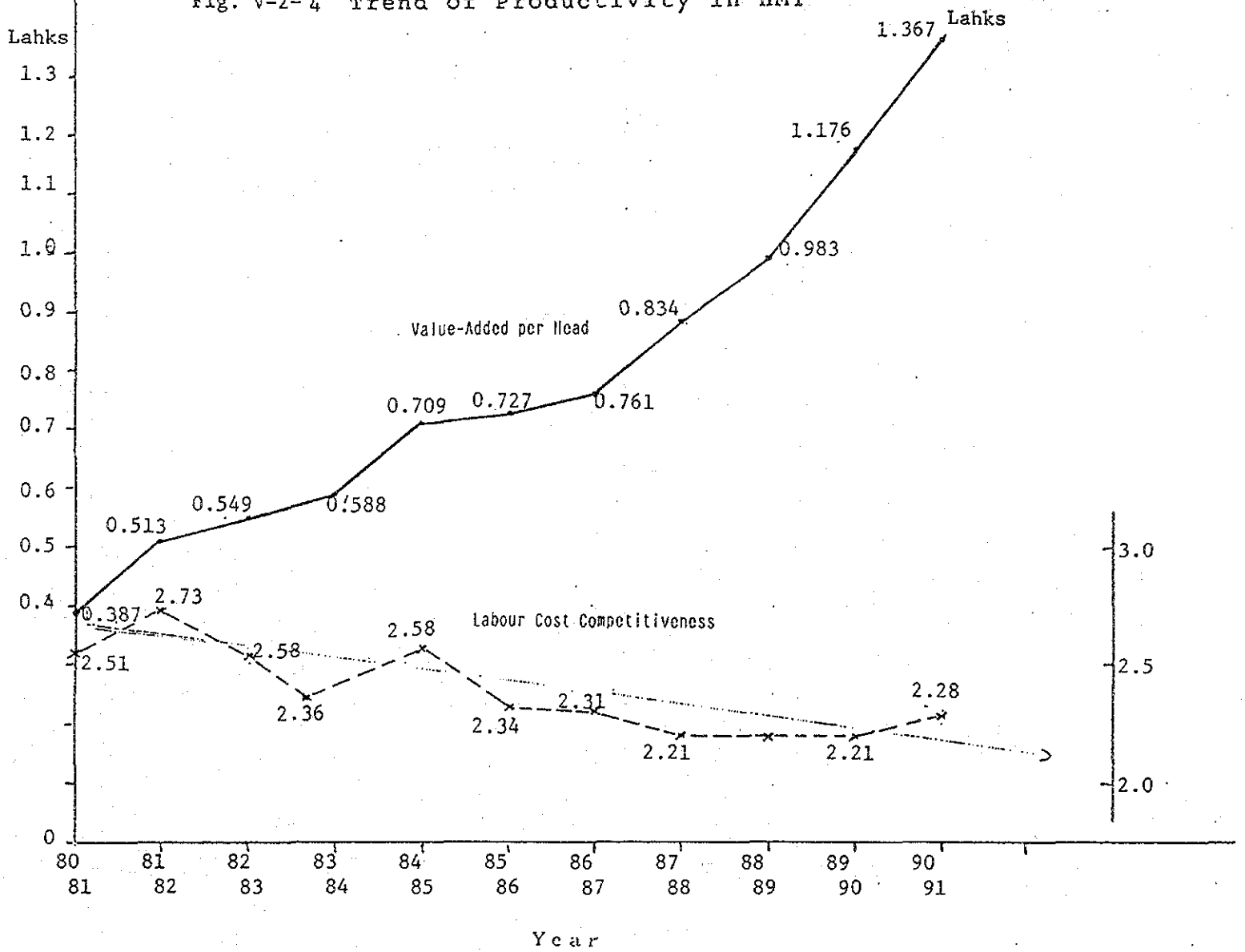
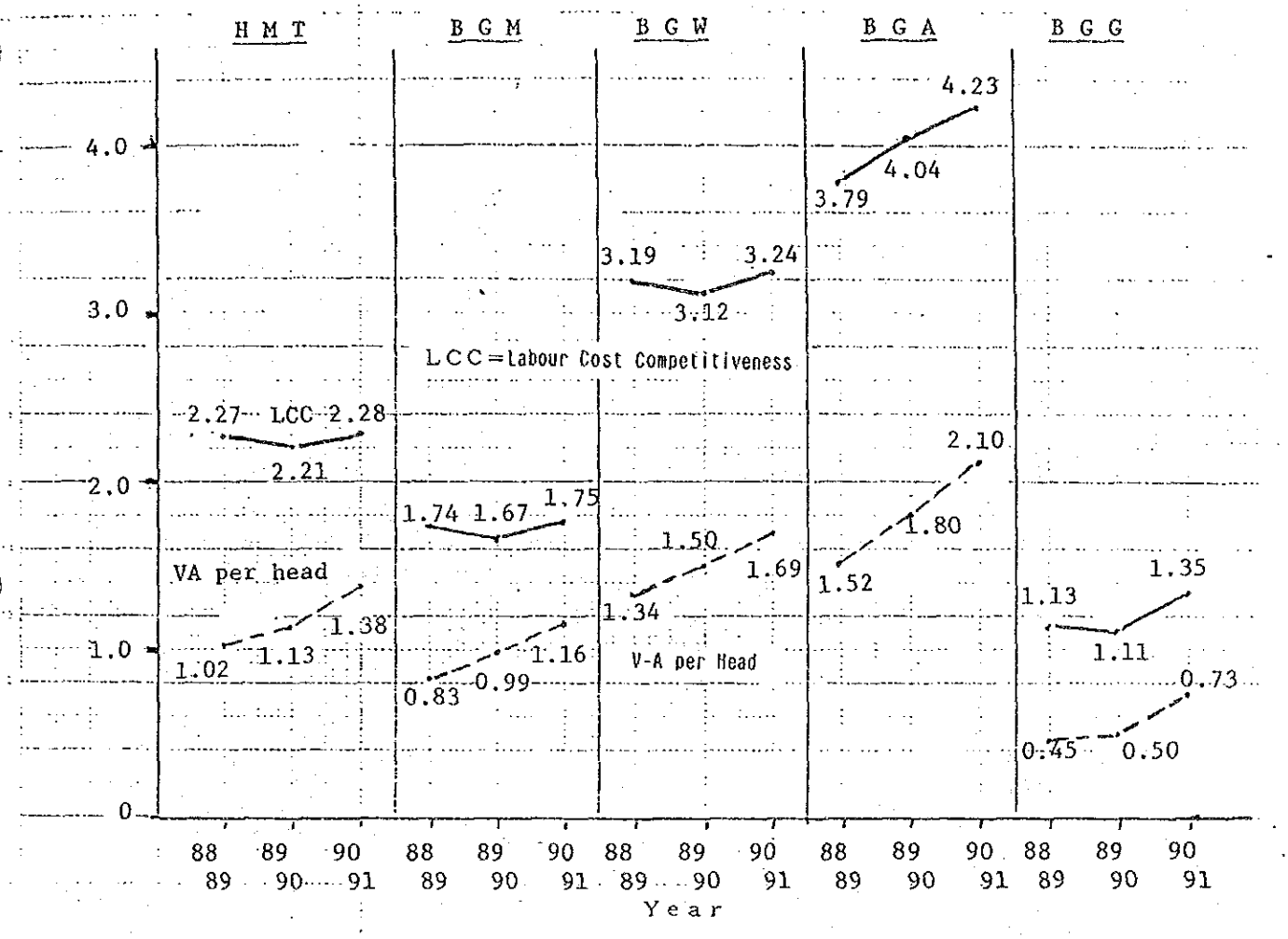


Fig. V-2-5 Trend of Productivity (Business Group-by Business Group)



v. In the Watch Business Group, growth of the value-added productivity is low in every Unit. If the increases in product price at 10 to 11% are taken into consideration, net productivity must be decreasing. Among them WFS is declining the most rapidly.

(c) Productivity based on the standard hour output

Value-added productivity does not accurately reflect the real productivity, because there is no appropriate parameter for adjustment. On the hypothesis that the standard hour is not changed for the same product, the real productivity can be induced from an analysis of data for performance control in the various units. The analysis has been made for only the Machine Tool BG, and more in depth for MTB this time.

The Performance Index(PI) is one of the productivity indicators based on time. Fig. V-2-6 shows the trend of PI in the various units of the Machine Tool BG in which large differences can be seen unit by unit, similar to the value-added productivity.

The PI is broken down into two factors, i.e., utilization and efficiency, and the trend of these factors in MTB is shown in Fig. V-2-7. Productivity of MTB is dependent on the utilization of machines and equipment, and among the constraints against utilization, absenteeism, lack of proper job assignment, and repair and maintenance are the major elements, which reach almost 80% of non-utilized hours. Therefore it is very important to take managerial actions to improve the utilization ratio.

Also the unit by unit profitability is co-related in some extent with the PI. This proves that productivity is the most critical factor for profitability, although other factors are involved.

Fig. V-2-6 Performance Index in Units og BGM

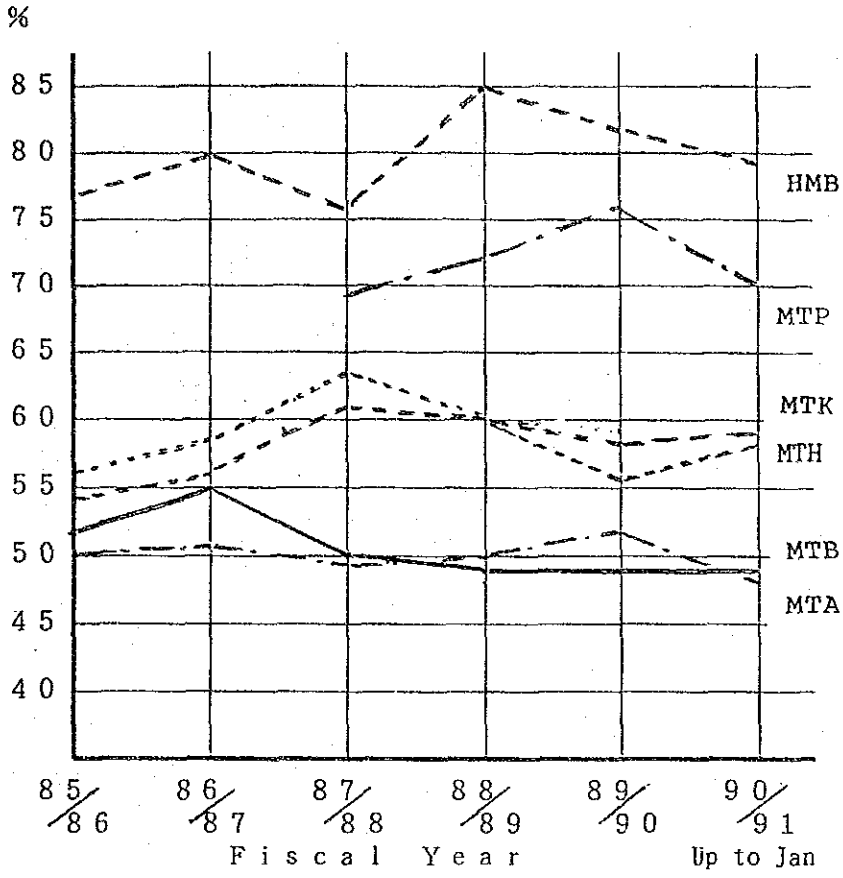
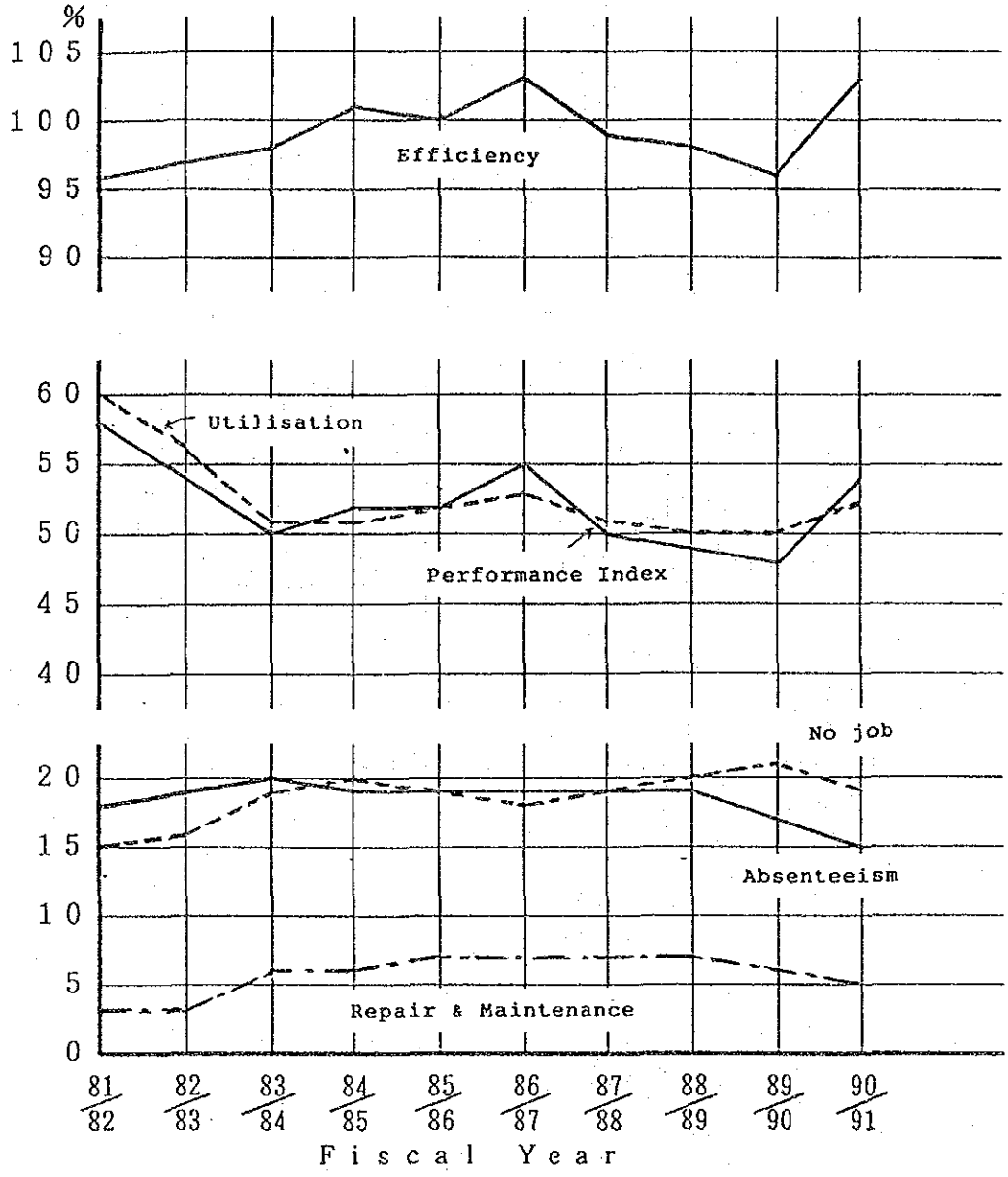


Fig. V-2- 7 Performance Index, Utilisation, & Efficiency in MTB



(d) Productivity comparison with Japanese industry

The related productivity data of HMT are compared with comparable figures for similar Japanese industry in the following table for the purpose of reference.

Table V-2-9 Productivity Data Comparison

	HMT Total	BGM	MTB	MTK	Japanese M/T industry
Net Value-Added	100	100	100	100	100
Profit B T	5.2	0.2	-24.4	5.4	11.6
Personnel	54.8	71.6	89.2	68.5	64.0
Fin. cost	13.7	5.3	6.0	5.3	6.6
Rent	0.3	0.2	-	-	1.0
Tax & Rates	19.0	17.1	20.7	16.5	2.3
Depreciation	7.0	5.6	8.5	4.4	14.5
	Rp.Lahks				¥ Mill.
Net VA/Employee	1.10	0.93	0.79	0.93	8.04
Per'nnel/Empl.	0.60	0.67	0.71	0.64	5.11
L.cost compet	1.83	1.40	1.11	1.45	1.57
Value-A ratio	40.6	43.7	43.6	43.7	25.6

(e) Effects of productivity improvement to cost reduction

In HMT, the effects of productivity improvement to the cost reduction vary unit by unit due to their characteristics, and it is difficult to estimate the effects because there is no system of actual cost accounting by product. However the rough estimation of the effects of labor productivity will be made as shown below. If material and other costs are able to be reduced through implementation of productivity improvement programs, more prominent effects can be expected. In order to realize such effects by keeping the existing work force, the results of productivity improvement should be absorbed by increased production or the creation of new jobs.

i. Labor cost competitiveness is proportionate to labor productivity.

ii. The effects of productivity improvements to the reduction of production costs are realized according to the

ratio of conversion cost to the total cost. Assuming the ratio of conversion cost is 30%, a 10% productivity improvement will result in a 2.7% cost reduction -- 30x(1-1/1.1), and a 20% productivity improvement will result in a 5.0% cost reduction --- 30x(1-1/1.2).

5. Summary of Financial Analysis

One of the most alarming results of this financial analysis for the 10 years ended March 31, 1991 is that HMT has been experiencing a continued decline in profit, although a slight recovery is noted in the last 3 year period. It is clear that HMT has not been able to absorb increased costs through higher productivity, nor able to pass them on to the customers due to increased competition in the market. Under the circumstances, increases in productivity require first priority.

In terms of HMT's business groups, a clear change in profit contribution was noted during the 10 year period. BGW, which used to be the top earner has experienced decreasing profit and was surpassed by BGA in 1989-90. BGM has been suffering an even shaper drop in profit and registered a loss for the 3 consecutive years ended March 31, 1990.

BGG (Lamp) has been a consistent loser all through the period except for 1981-82, and adversely affected the profit of HMT.

In view of the above, concentrated effort needs to be made to improve BGM, which has been and is the core of HMT. For BGW it is also necessary to make a combined effort to reduce costs through improved productivity and to improve marketing to attract consumers, especially in the competitive digital watch market, to recover higher profitability.

The top earning business group, BGA, will be able to further increase profit through expansion of production capabilities subject to the results of market forecasts. As indicated in the comparison of selected business groups of HMT against Japanese industry/ companies, more

effective utilization of assets will further enhance profitability of HMT. As to BGG (Lamp), appropriate actions, including divesture, need to be considered as the extended period of loss can be considered as an indication that this industry segment may not be profitable for HMT.

B. Financial and Management Accounting System

1. Financial Accounting

(a) Uniformity of accounts

HMT currently has 16 units and 22 divisions operating in varying industries such as machine tool, watch, agricultural machinery and Lamps, and are located in 10 states.

Because of the diversity of the products, production process and social background of locations, quite diversified accounting practices have been followed in the past. For the purpose of uniformalization of accounts, accounting code manual are published and uniformally adopted.

Furthermore, in October 1990, a memorandum titled "Costing System to be followed in Machine Tool and Watch Units" was issued to all unit finance chiefs by Director Finance. The purpose of this memorandum is to maintain uniformity among machine tool units and among watch units.

(b) Computerization of financial accounting system

Similar to the account classification and costing discussed above, computerization has been left with the discretion of unit management. Therefore, it is observed that degree of computerization significantly differ from one unit to another. It is also noted that systems and application software adopted are different among units. To date, no efforts have been made to keep certain uniformity among units, business groups or HMT as a whole.

In terms of application, while significant number of units have computerized accounting system. However, in most units accounting entries are manually developed and manually entered into the accounting reporting system or general ledge system. On the other hand, the units which has implemented computerized accounting system still require manual supplements, as "total system

concept" has not been applied.
It is, therefore, considered necessary to further computerize the accounting system based on "total system concept" where all transactions are input processed and recorded under a single system so that output will become accurate, consistent and efficient. Coordination with Computer System Division, Bangalore should be considered to further computerized the financial accounting system. This will help to avoid duplication of efforts and to reduce the development cost, while achieving certain level of uniformity among the units' systems.

(c) Cost accounting system

i. Integration of cost accounting system with financial accounting system

Production cost system and financial accounting system are not integrated. Once a year, physical inventory is taken to determine the inventory quantities as well as the progress of work-in-process, and based on this inventory taking, inventory value, production cost as well as cost of goods sold are determined, and posted to accounting books.

During the period, production costs are monitored based on standard costs. As a result, at the yearend, significant adjustments arising especially from material costs (quantity as well as price) and efficiency variance are recorded.

In order to cope with increasingly competitive market integration of the both systems is considered essential. In order to attain this integration, improvement or establishment of systems and procedures concerning material consumption and unit cost calculation, labor and other cost calculation as well as systems monitoring the progress of work-in-process may be required.