Machine Tool
Business Operation

June 6, 2011
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1. Overview of Headquarters: Product Portfolio
(FY2010 Net Sales)

- **Precision cutting tools**
- **Engine valves**
- **Power transmissions**
- **Gear cutting machines**
- **Room temperature wafer bonding machines**
- **μV1 micro milling machines**
- **Large machines**

**Machine tools** 69%
- 31% Precision Machinery Products
- 35% Machine tools

**Special purpose machines**

**Technical Features**
- Power transmissions
- Precision cutting tools
- Engine valves
- Gear cutting machines
- Room temperature wafer bonding machines
- μV1 micro milling machines
- Large machines
1. Overview of Headquarters: Worldwide Locations

- **MHI-Europe**
  - Services

- **MHI Shanghai (in Beijing)**
  - Sales and services

- **MHI Korea**
  - Sales and services

- **MHI-AMTD**
  - Sales and services

- **MHI-India**
  - Sales and services

- **MHI-Thailand**
  - Sales and services

- **MMH/MHI Machine Tool (H.K.)**
  - Sales and services

- **Ritto Machinery Works**
  - Ritto, Shiga prefecture
  - Sales, development and manufacturing for all products
  - Employees: 900 persons

- **MHI-IpT**
  - Acquired in May 2005
  - Ranipet, India
  - Manufactures and sells precision cutting tools
  - Employees: 500 persons

**MHI-CM**
- Operating as of March 2011
- Changshu, Jiangsu province, China
- Manufactures gear cutting machines
- Employees: 10 persons
  - (Affiliated with Machine Tools only)

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2. FY2010 Summary: State of Orders and Sales (consolidated)

1. Orders

- Captured several major orders related to construction, energy and automotive overseas, resulting in large rise in exports.

- Investment in automotive, construction is recovering rapidly also in Japan

2. Sales

- Large rise in exports due to buoyant overseas demand focused on Asia

- In Japan, the slow recovery from the recession resulted in year-on-year decrease

- Despite a large year-on-year rise in orders, growth stopped at a slight year on year increase as sales have been delayed to the following year due to numerous orders for large machinery with long delivery terms and orders converging on the second half of the term.

Japan Machinery Tool Builders’ Association (JMTBA) Forecast

- For the first time in 3 years, demand expected to exceed 1 trillion yen to 1.1 trillion in 2011.
  (In 2010, year-on-year recovery was rapid at 2.4 times.)
2. FY2010 Summary by Product (consolidated)

1. Gear Cutting Machines

In addition to brisk overseas demand, we also successfully expanded the product line-up of gear grinding machines, and orders from the domestic automotive and construction machinery sectors rose with the rapid increase in capital investment. A near return to levels before the collapse of Lehman Brothers.

2. Large Machines

Despite capturing major orders for the construction machinery sector both in Japan and overseas, the increase was slight due to a lull in investment in other industries.

3. Special-Purpose Machines

In addition to automotive equipment for overseas customers, we saw an increase due to capturing major order for the aircraft sector.

4. Precision Machinery Products

Rebound following a recovery in the automotive sector, which is the mainstay for both precision cutting tools and engine valves.

* Shipments of precision cutting tools and engine valves have slumped due to the stagnation in automobile production following the Great East Japan Earthquake, but the overall impact is slight.
2. FY2010 Summary: 2010 Business Plan Progress
(consolidated)

Orders
- Growth exceeded plans by more than 10%
- FY2011 as initially planned due to accumulation of major orders

Sales
- Did not achieve sales target since major orders with long delivery terms accumulated in second half of year
- Issues with processing work due to numerous orders for FY2011

Operating profit
- Successfully reduced both costs and compensation claims to achieve target
- Planning large-scale profit increase for FY2011 by factoring in sales expansion and results of cost reduction

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3. FY2011 Initiatives: (1) Basic Policy

Realize highly profitable structure through globalization and developing high added value

◆ **Accelerating global expansion**
  - Expand overseas sales network and promote local development
  - Expand functionality at new manufacturing plants in China
  - Expand business at MHI-IPT in India

◆ **Focus management resources on growth products**
  - Boost line-up with focus on products for priority enhancement
  - Initiatives to gain world No. 1 market share in gears and large machines
  - Promote hollow engine valve business

◆ **Support enhancement of in-house manufacturing through process Technology Centers**
  - MHI in-house business connections and identity
  - Future directions and external expansion
3. (2) Accelerating Global Expansion (i)

- Expand overseas sales network and promote local development

Expand proportion of orders for emerging countries including China, India, SE Asia from 60% to 70%.

Local Development Progress

<table>
<thead>
<tr>
<th>Target</th>
<th>Policy</th>
<th>Present situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerging markets</td>
<td>China, India, SE Asia</td>
<td>Expand, boost independent organization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>China: Running OJT for local employees hired in country</td>
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<td></td>
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<td>India: Local service staff undergoing long-term training at Ritto</td>
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<td>SE Asia: Reinforce Hong Kong as general base</td>
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<tr>
<td>Stable markets</td>
<td>North America</td>
<td>Maintain current organization</td>
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<tr>
<td></td>
<td></td>
<td>Local employees already pulling together to expand business for gear</td>
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<tr>
<td></td>
<td></td>
<td>cutting machines</td>
</tr>
<tr>
<td>Peripheral markets</td>
<td>Europe, Latin America</td>
<td>Sales cooperation with other companies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Promote sales cooperation in Brazil</td>
</tr>
</tbody>
</table>
3. (2) Accelerating Global Expansion (ii)

**Expand functionality at new manufacturing plants in China**

No. 2 plant at Mitsubishi Heavy Industries (Changshu) Machinery Co., Ltd. (MHI-CM)
- Produce gear cutting machines at No. 2 plant of existing company, which manufactures rubber tire production machinery
- **Operations started in March 2011**
- In May first shipment of two machines were made to local customers
- 10 staff affiliated with the Machine Tools Division including 4 temporary workers
- MHI Shanghai handles sales and have already captured orders until the fall

![Image of manufacturing plant](image1)

- **The GE15A gear cutting machinery is the top selling product**

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- **(1) Expand production models**
  Develop other models in addition to the best-selling GE15A gear cutting machine

- **(2) Boost showroom functionality**
  Start trial shaving, processing guidance

- **(3) Strengthen procurement functions**
  Lateral development to other models and models produced in Japan after securing product quality for the GE15A

- **(4) Boost functionality at service locations**
  Develop inventory of service parts

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Consider expansion to the Indian market as the next step
3. (2) Accelerating Global Expansion (iii)

- **Expand business at MHI-IPT in India**

(1) **Further expand production capacity to maintain top share**
- Continue 2007 capacity expansion by investing in production increase
- Implement productivity on a level with the Ritto plant

(2) **Strengthen collaboration with the Ritto plant**
- Jointly develop design software, processing programs, processing equipment
- Set up production plant for global expansion under Ritto leadership

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**Actual vs. Planned**

- India, No. of 2-wheeled vehicles (10,000 units)
  - '04: 2.2
  - '05: 2.6
  - '06: 3.6
  - '07: 3.9
  - '08: 3.4
  - '09: 3.5
  - '10: 5.3
  - '11: 6.0
  - '12: 10

- India, No. of 4-wheeled vehicles (10,000 units)
  - '04: 156
  - '05: 170
  - '06: 160
  - '07: 232
  - '08: 226
  - '09: 292
  - Acquired in May 2005
  - (1 billion yen)
  - 2007 capacity expansion

**Business scale**

- '04: 2.2
- '05: 2.6
- '06: 3.6
- '07: 3.9
- '08: 3.4
- '09: 3.5
- '10: 5.3
- '11: 6.0
- '12: 10
3. (3) Focus Management Resources on Growth Products (i)

◆ Boost line-up with focus on products for priority enhancement

- Gear cutting machines
- Large-size gear grinding machine
- Horizontal boring mill
- Double column machines (Five-face milling machine)
- Large-size special-purpose machine
- New field
- Hollow engine valves
- Finishing tools
- New products with high added value

Machine Tools

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3. (3) Focus Management Resources on Growth Products (ii)

◆ Initiatives to gain world No. 1 market share for machine tools: Gear cutting machines

(1) Priority strategy sector: Gear grinding machines

<Background>
- Increase in gear grinding due to demand for low fuel consumption and muffling in automobiles

<Course of action>
- Boost lineup by introducing new products (Complete introduction with the ZE15A/B, ZE40A, ZGA2000)
- At first, lateral expansion by grabbing overwhelming market share with Japanese customers.

(2) Sector for maintaining and improving competitiveness: Gear cutting machines

- More Modular Design (MD), cost price reductions
- Multifaceted deployment in wake of plant in China

(3) Also investigate alliances

**Gear grinding machines:** Complete line-up, expand from Japanese customers to US and Europe as well as emerging markets

**Gear cutting machines:** Expand market share by improving competitiveness, and secure solid position
3. (3) Focus Management Resources on Growth Products (iii)

◆ Initiatives to gain world No. 1 market share for machine tools: Large Machines

(1) Priority strategy sector: Horizontal boring mills

<Background>
- In Europe, the focus is lateral regardless of size of workpiece
- The same trend is strong also among European-minded emerging countries

<Course of action>
- Boost product appeal by introducing new products (Introduce MAF-C to match Europe)

(2) Sector for maintaining and improving competitiveness: Double column machines

- More Modular Design (MD), cost price reductions
- Develop model for processing free-form surface, long objects

(3) Also investigate alliances

- Horizontal boring mill: Expand business in emerging countries by introducing machine to rival Europe
- Double column machine: Expand market share by improving competitiveness, and secure solid position
3. (3) Focus Management Resources on Growth Products (iv)

◆ Pioneer new fields as mainstay for the future

(1) Ultra-micro milling machines μV1
- Allows ultra-micro milling at the submicron level
- Automatic correction of tool wear and automation of operator technique by means of CCD camera

(2) Room temperature wafer bonding machines
- High yield as there is no distortion due to heat
- Broad area of application at it is possible to bond wide-ranging materials

(3) CFRP processing equipment
- Expand to automotive sector etc. to respond to in-house needs (process Technology Center)
- Position as growth sector, accumulate processing knowhow that differs from metals

Combine μV1 and the wafer bonding machine to promote expansion to the ultra-micro processing field
In process of incorporating CFRP processing as important theme at the process Technology Center
3. (3) Focus Management Resources on Growth Products (v)

◆ Promote hollow engine valve business

Breakdown of valve business

<table>
<thead>
<tr>
<th>Year</th>
<th>Conventional valves</th>
<th>Hollow valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,011</td>
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<td>2,013</td>
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<tr>
<td>2,014</td>
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</tbody>
</table>

(1) Evaluation testing underway at customers

- Installed in engines at several domestic companies and undergoing performance and endurance testing

(2) Further exploitation of prospective customers

- Not only in Japan, but also inquiries from overseas manufacturers

Advantages of the hollow structure

- Lightweight for improved fuel consumption
  - Max. 20% lighter than the conventional model
- CO₂ reduction effect due to high-efficiency combustion in engine
  - Improve thermal conductivity by filling with sodium
  - High-temperature combustion of fuel gas is possible by improving heat resistance of exhaust valve

* Domestic patent approved, overseas patent pending
3. (4) Support Enhancement of In-House Manufacturing through Process Technology Centers (i)

◆ MHI in-house business connections and identity

Processing of mainstay products is carried out at the production facilities of the relevant business headquarters.
3. (4) Support Enhancement of In-House Manufacturing through Process Technology Centers (ii)

Future directions and external expansion

STEP (i)

- In-house facilities

Manufacturing innovation

Collaboration

STEP (ii)

- Machine Tools Process Technology Center

External customers
(Domestic, overseas)

MHI overseas plants

STEP (1): Already in force

- Consolidate knowhow, in-house lateral communication

Raise level of manufacturing
(Support enhancement of company-wide processing technology)

- Aircraft main wing processing facility under development

STEP (2): Future development

- Apply technology for proposals to external customers → Reap benefits as a business

- Support startups and support production technology at MHI overseas plants

E.g. Processing facilities for turbine components

Apply in-house advanced processing technologies to other products and expand into business mainstay (large-size special purpose machines)
4. Summary

We are continuing initiatives with

Creating a highly profitable structure through globalization and developing added value

as the main policy.

Aiming for a 100 billion yen business, we will continue in the steadfast pursuit of the strategies listed in the 2010 Business plan.

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