

General Machinery & Special Vehicle Business Operation

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General Machinery & Special Vehicle Headquarters

General Machinery & Special Vehicle (GM&SV) Headquarters: Business Outline


1. Principal business domains





Turbochargers


Variable Capacity Turbochargers for diesel vehicles Variable Capacity Turbochargers for gasoline vehicles






Forklift Trucks (Material Handling Equipment)


FD25 Forklift Truck ESR15N Electric Reach Truck




Engines & Equipment

Small-sized Diesel Engine S4S Marine Diesel Engine S6RG M1203-G Diesel Generator Set

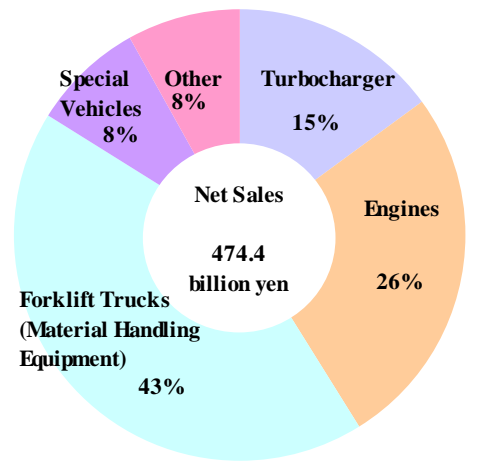


Special Vehicles

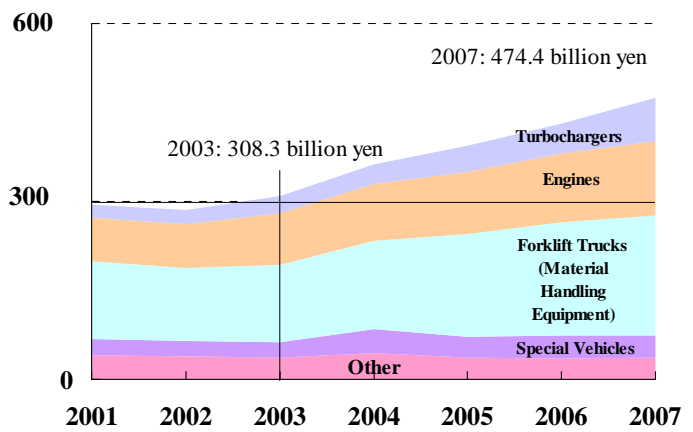


Type 90 Tank

Breakdown of sales for FY2007 (consolidated)



2. Past performance (consolidated results)











[Key features]

- (1) Business rapidly growing in scale, particularly private sector products, on the back strong market demand
(FY2003: 308.3 billion yen → FY2007: 474.4 billion yen = + 166.1 billion yen)
- (2) Noticeable growth in turbocharger and engine products in particular, revolving largely around component operations
- (3) Excellent consolidated/non-consolidated ratio thanks to expansion of global operations through active development of overseas production bases (x 1.7 compared to MHI average of x 1.3)







Global GM&SV Operations

We are in the process of setting up production, sales and service bases in locations the world over as we continue to expand our global operations across the board















Europe

-  **MHI Equipment Europe (MEE)** 
-  **MHI Equipment Alsace (MEA)** 
-  **Mitsubishi Caterpillar Forklift Europe (MCFE)** 
-  **Rocla** 

North America, Central & South America

-  **Mitsubishi Engine North America (MENA)** 
-  **Mitsubishi Caterpillar Forklift America (MCFA)** 
-  **MHI Sul Americana Distribuidora de Motores (MSA)** 

Asia, China

-  **MHI-VST Diesel Engines (MVDE)** 
-  **MHI Pornchai Machinery (MPM)** 
-  **Mitsubishi Turbocharger Asia (MTA)** 
-  **Mitsubishi Caterpillar Forklift Asia (MCFS)** 
-  **MHI Engine System Asia (MHIES-A)**
(MHIES-H/MHIES-SZ/MHIES-P/MHIES-V/MHIES-I) 
-  **MCF Forklift (Shanghai) Co., Ltd. (MCFC)** 
-  **Shanghai MHI Turbocharger Co., Ltd. (SMTC)** 

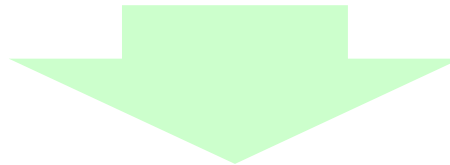
Market Environment

Creation of a multi-polar global market due to the rise of emerging markets in addition to the existing three core markets in Japan, Europe and the United States

Increasing trend towards tightening of regulations as a result of growing levels of environmental awareness on a global scale

Business-specific market trends

- (1) Growth in demand for vehicular engines and turbochargers for passenger vehicles on the back of tighter regulations on emissions and CO₂, primarily in advanced nations
- (2) Growth in demand for generators in spite of soaring oil prices, primarily in emerging countries struggling to cope with power supplies
- (3) Divergence and growth in demand for forklift trucks, with advanced nations favoring indoor logistics equipment and emerging markets preferring engine-powered vehicles



Concern regarding North American market, but sustained growth in demand across the global market as a whole

Business Challenges and Direction

Promoting flexible business operations resilient to changes in the market environment, based around global management via our Sagamihara Plant in its role as “Control Tower” (Mother Factory/Design Center)

1. Expanding, improving and maintaining production capabilities

(Achieving optimum global production and procurement)

Expanding production capabilities at Sagamihara Plant

(Leading the way towards increased global production in role as Mother Factory)

Increasing mass production and procurement at overseas bases and increasing production in low-cost countries

2. Stepping up product strategies in response to diversification

Increasing revenue and avoiding exchange rate/economic fluctuation risks through active expansion into emerging markets

Increasing market share through highly profitable products with anticipated growth potential

3. Stepping up technology and quality strategies

(Promoting product differentiation and strengthening operating base)

Improving product reliability

Value chain improvement measures

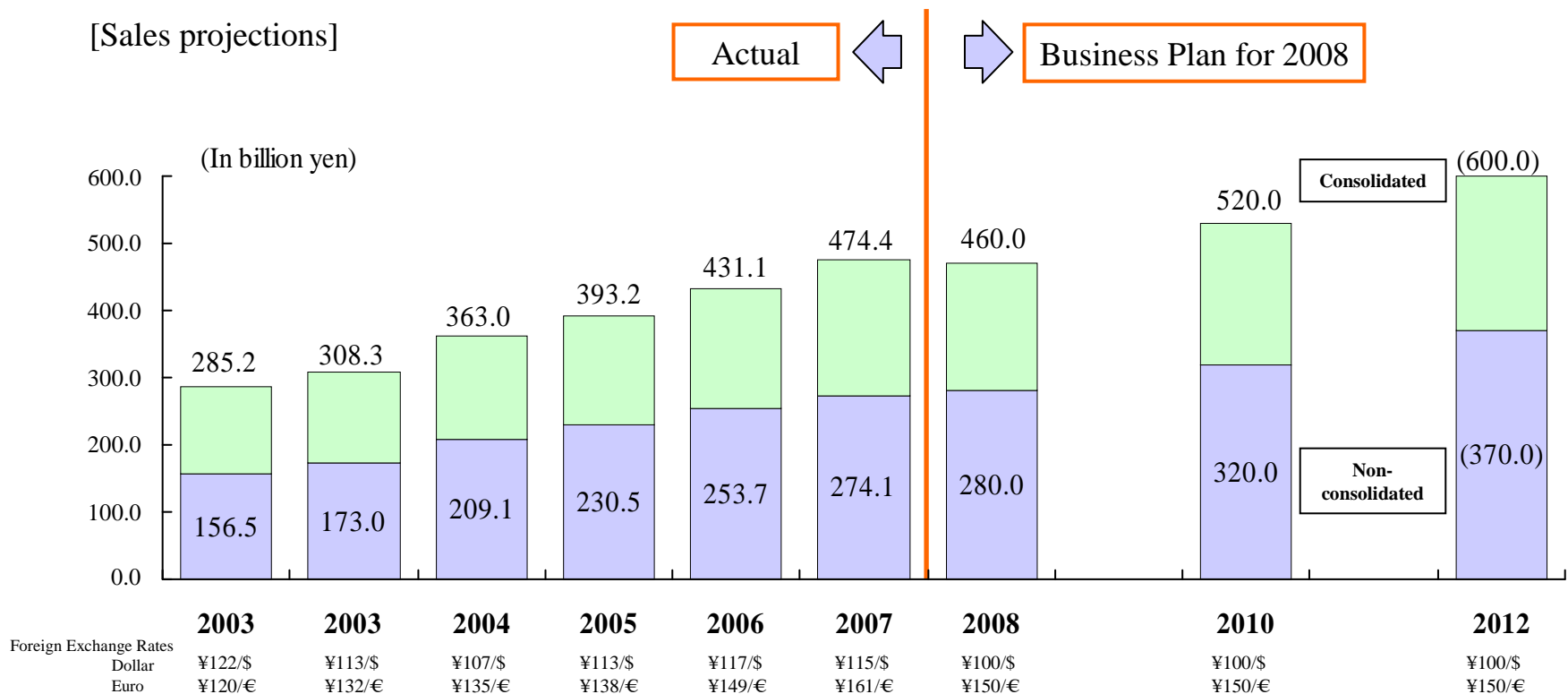
Developing next generation technology and launching new products

GM&SV Headquarters 2008 Business Plan

“Expanding, improving and maintaining our production structure in anticipation of business growth and promoting global operations”

1. Establishing optimum value chains and improving manufacturing capabilities in order to increase revenue
2. Generating customer value in line with changing market environments and manufacturing highly reliable products
3. Working with affiliated companies and suppliers to establish a business entity capable of achieving an optimum strategic supply chain

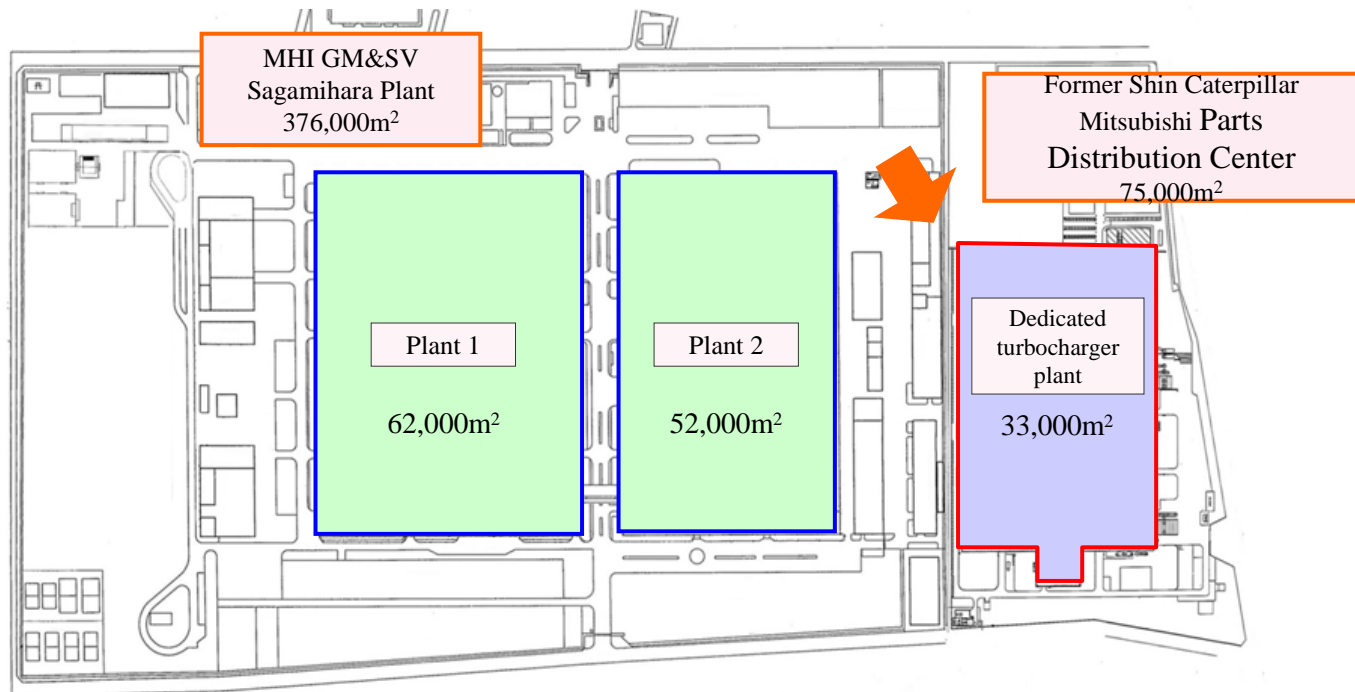
[Sales projections]



Expanding, Improving and Maintaining Production Capabilities (1)

Steps to expand production capabilities at the Sagamihara Plant

1. Acquiring former Shin Caterpillar Mitsubishi Parts Distribution Center (land and buildings) and setting up a dedicated turbocharger plant in order to establish an enhanced production structure (investment of 18 billion yen)
2. Creating more space due to the transfer of existing turbocharger production facilities (establishing a three-plant structure)
3. Changing the layout of engine, vehicular and other facilities and investing in increased capacity
4. Streamlining logistics between plants and increasing capacity in order to restructure plants to make them more profitable



Expanding, Improving and Maintaining Production Capabilities (2)

Improving production capabilities at overseas bases to enhance flexibility and improving functional capabilities in order to achieve optimum production and procurement

Basic Position

1. Although business expansion has enabled us to secure a large enough volume of orders to enjoy the benefits of mass production, we can only increase production capacity in Japan up to a certain point. Efforts to increase production over the medium to long term will therefore be focused overseas.
2. In addition to minimizing distribution costs based on market proximity and reducing exchange rate and other risks wherever possible, we intend to actively promote increased local production overseas, including production in low-cost countries.

**Absorbing exchange rate/
economic fluctuation risks**

Improving production flexibility to suit multiple markets via existing bases
Starting production for South American markets at MCFA (USA), etc.

**Catering to growing
overseas demand**

Expanding production capabilities at existing overseas bases in order to provide support for production at Sagamihara
Increasing engine production at MEA (France), etc.

**Spreading risks through
specialized production and
increasing production**

Specialized production of core parts at new plant in Thailand (MTA) which has been produced at Sagamihara intensively
Spreading risks such as cost fluctuations and operational problems

**Catering to demand
in emerging markets**

Increasing production and stepping up activities at overseas bases responsible for emerging markets
Stepping up activities at MHIES-A (Asia), MVDE (India) and MSA (Brasil)

**Achieving stable procurement
on a group-wide basis**

Establishing an overseas procurement network aimed at achieving optimum worldwide procurement
Improving local procurement capabilities at overseas bases and establishing a global supply chain

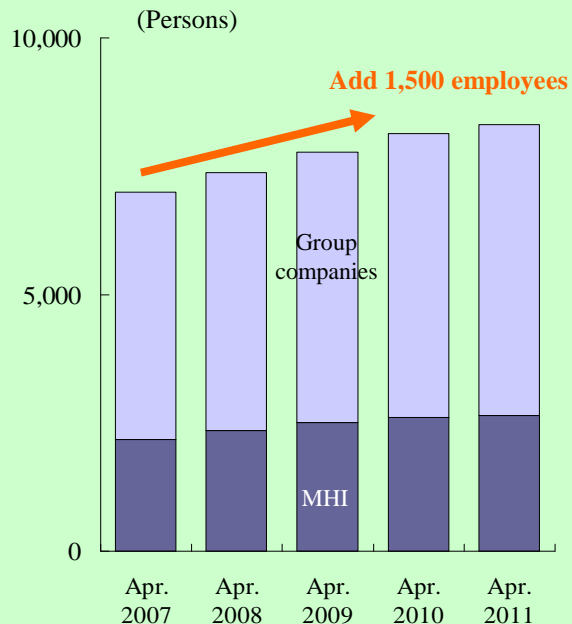
Securing Resources

Securing resources appropriate for the growth strategy and establishing a strong business constitution

Securing Human Resources

Bolster the ability to pursue business that will deliver growth.

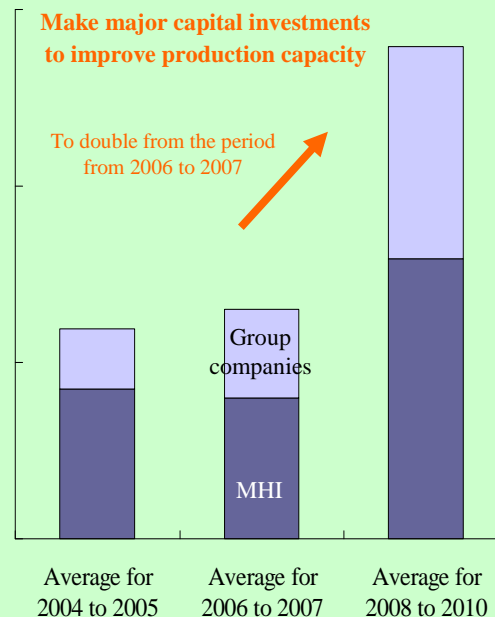
1. Recruit the people needed for expansion, and actively train core personnel.
2. Overseas group companies will also recruit new workers in step with production growth.



Capital Expenditure

Proactively investigate growth businesses, including turbochargers.

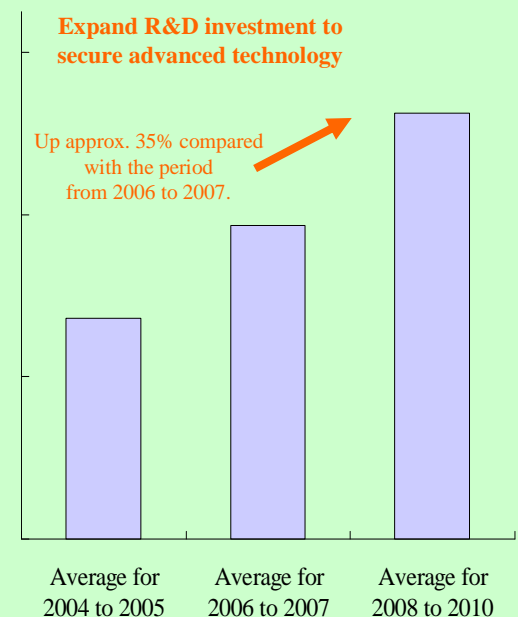
1. Strengthen the capabilities of Sagami-hara factory by acquiring an adjacent SCM site and establishing a three-factory system.
2. Construct a global production system, bolstering the production capabilities of overseas bases by establishing a Thai MTA factory etc.



Investment in R&D

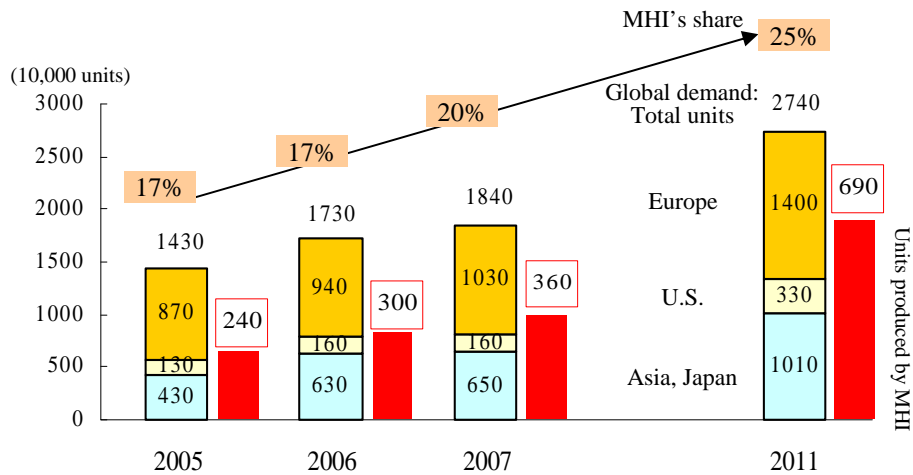
Secure a technological edge and strengthen product development capabilities.

1. Develop products and strengthen environmental technology to meet market needs.
2. Accelerate the development of next-generation products.
3. Improve the design process and promote standardization and sharing.



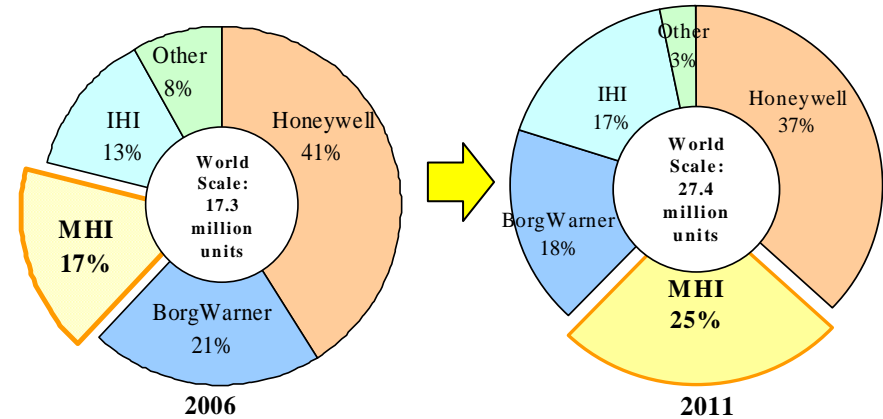
[Product strategy (1)] The Turbocharger Business Environment

Trends in Demand



Market Share

Securing major projects for auto manufacturers in Europe and Asia and establishing MHI as the number two manufacturer in the market



Market Trends

Increase in diesel engine sales due to tighter environmental regulations and the growth of the auto market

- Increase in the percentage of diesel vehicles and a surge in demand for vehicles fitted with turbochargers due to tighter environmental regulations on emissions and CO₂ in the European and US markets
- Trend towards increased demand in Asian markets too due to increased auto production

Growing trend towards downsizing of gasoline engines

- Increase in manufacturers fitting turbochargers in order to downsize gasoline engines, thereby reducing fuel consumption and increasing efficiency

Shift in customer requirements towards production capabilities

- Number one quality that customers look for in a manufacturer increasingly shifting towards “production capabilities” in line with growing demand

MHI Initiatives

Increasing orders for diesel turbochargers, and harnessing advanced high-temperature compatible technology to further increase orders for gasoline turbochargers (a field that MHI already leads) in an effort to secure the number one share of the turbocharger market

Main Turbocharger Business Strategy

Increasing scale of business through improved production capabilities and product superiority

Improving Production Capabilities

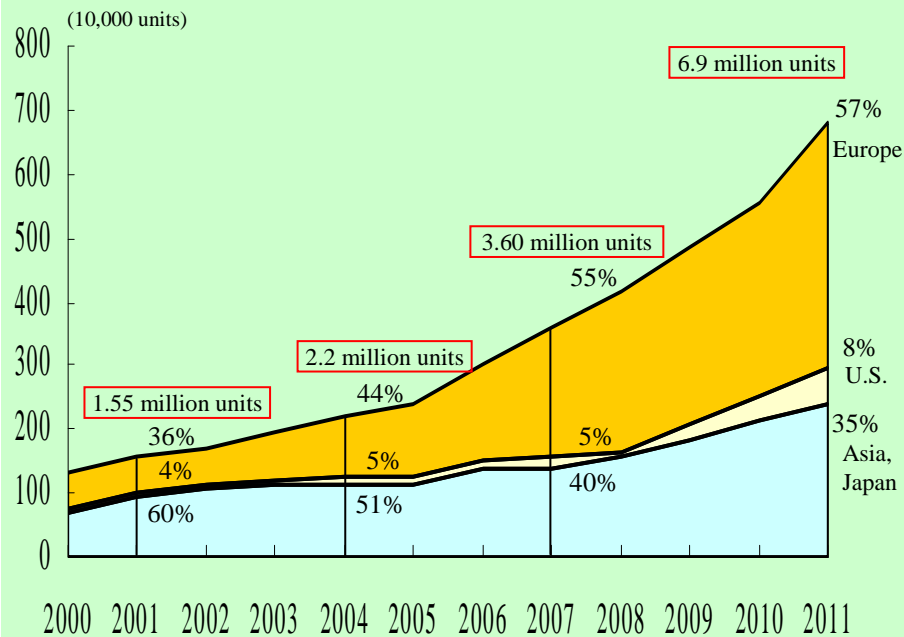
(1) Establishing a 6.9 million unit structure

- Increasing facilities at our two production bases in Sagami-hara and MEE (Netherlands) and establishing a new base in Thailand (MTA) to create a three-pronged production system

(2) Establishing a global supply chain

- Improving local procurement capabilities in order to secure supply capabilities and achieve optimum procurement

Units ordered according to region



Enhancing Product Superiority

(1) Best customer supports and most reliable products

- MD* (new design concept) technologies enable to materialize speedy development and to respond various customer requirements.
- QI-I* (innovations in product reliability) and DE-I* (digital engineering processes) activities enable to achieve world-best-in-class reliability

(2) Innovative charging systems

- Turbocharging systems for High exhaust temperature gasoline engines (better fuel economy and high response at high exhaust temp.1,050°C)
- Variable geometry systems for gasoline engines (high reliability with simple structure)
- Two-stage turbocharger systems for diesel engines (new generation technology for high output)
- 2-way variable geometry turbo (compressor and turbine) for diesel engines (torque increase 70% at low speeds by flow range enhancement)
- Electric power-assist systems (quick response by eliminating turbo-lag)



Twin integrated turbo for high exhaust temperature gasoline engines



Two-stage turbo



2-way variable geometry turbo



Electric power-assisted systems

Establishing a Global Turbocharger Business Network



MHI Equipment Europe (MEE)
Biggest market at present

“Outpost” base on the frontline in Europe, where large numbers of major customers are based

Site area: 50,000m²
Building area: 21,800m²



Mitsubishi Turbocharger Asia (MTA)

Units: 10,000 turbochargers	Cartridges	Assembled turbochargers
Production volume	250	50

Outline of MTA

Established: January 2008
 Location: Amata Nakorn Industrial Estate, Chonburi, Thailand
 Business activities: Production and sale of turbochargers and production of cartridges (production of KD parts for shipment to other supply bases)
 Site area: 147,000m²
 Building area: 60,000m²
 Direct/indirect workforce: Approx. 700 workers

Units: 10,000 turbochargers	Total worldwide production capacity by FY2011	
	Cartridges	Assembled turbochargers
Production volume	690	690

Business “Control Tower” overseeing all bases

Design center/Mother Factory
KD part supply base for all bases



MITSUBISHI HEAVY INDUSTRIES, LTD.

Units: 10,000 turbochargers	Cartridges	Assembled turbochargers
Production volume	300	140

KD part supplies



KYPC (technical partnership)



Shanghai MHI Turbocharger Co., Ltd. (SMTC), etc.

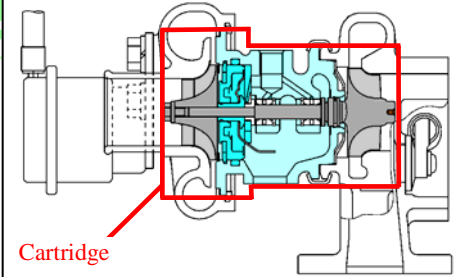
Units: 10,000 turbochargers	Cartridges	Assembled turbochargers
Production volume	40	220

Units: 10,000 turbochargers	Cartridges	Assembled turbochargers
Production volume	100	280

KD part supplies

Dual sourcing (mutually complementary relationship)

Cross-sectional diagram of a turbocharger

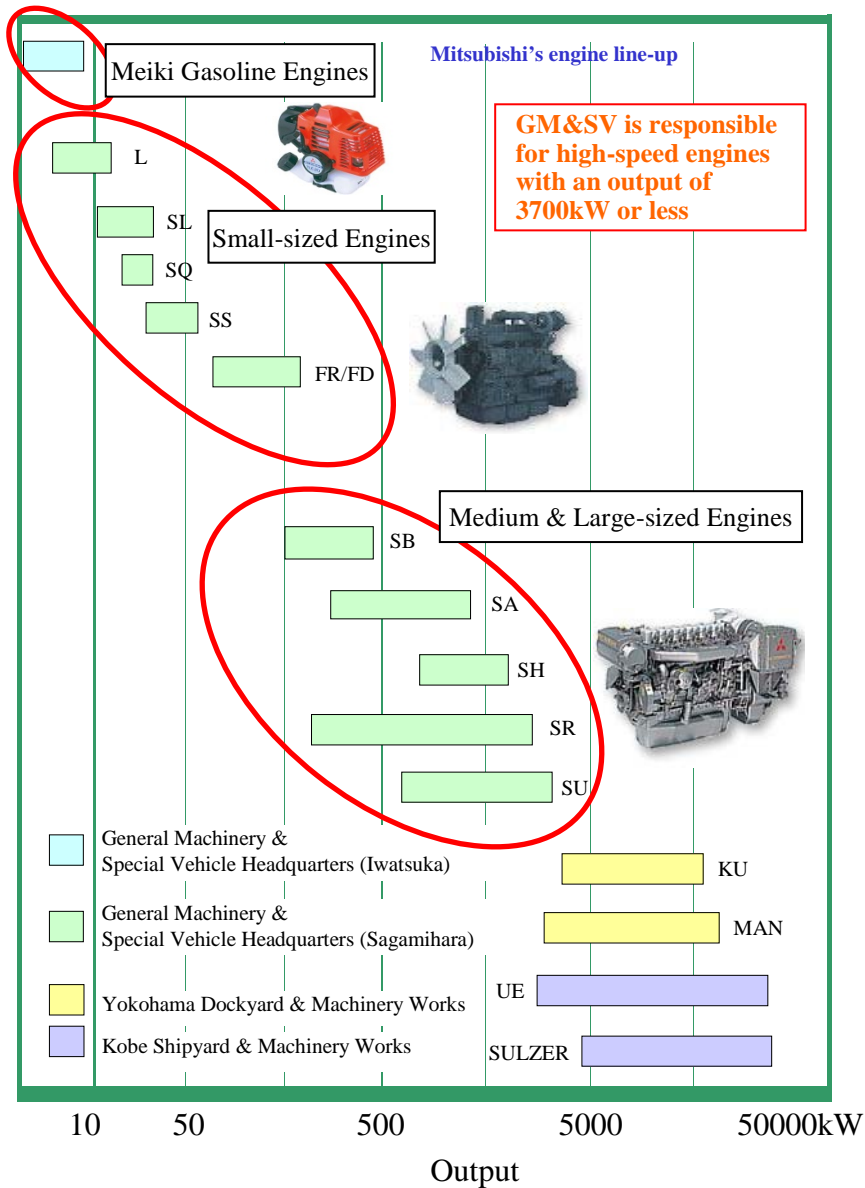


Cartridge
Core part of the turbocharger, consisting of a bearing housing and rotating parts

Market with anticipated future growth potential (Largest auto producing country in Southeast Asia)

Second KD supply base in support of Sagami-hara
Will also provide sales capabilities for Asia region

[Product strategy (2)] The Engine Business Environment

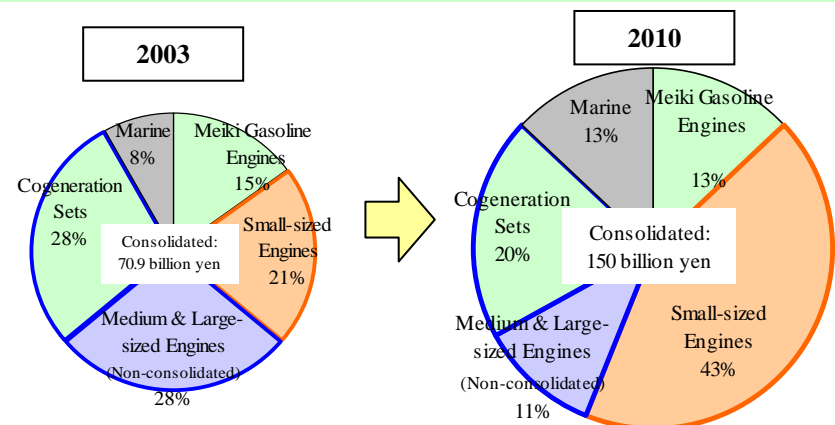


Market Environment

- Growth in demand for compact vehicular engines
 - Increase in demand for replacement engines due to tightening of emissions regulations in markets in advanced nations
 - Rapid increase in orders for existing models in emerging markets
- Growth in demand for generator sets in emerging countries struggling to cope with power supplies, in spite of soaring oil prices
- Growth in demand for marine engines due to increased marine transport the world over, including energy resource shipments within Southeast Asia and a resurgence in river-based distribution in Europe

MHI Initiatives

- Proceeding with development in line with schedules for environmental regulations in Japan, Europe and the US
- Catering to growing demand as a result of increased production capacity (including overseas bases)
- Stepping up service business, including EMS (Energy Management Services) and full maintenance contracts, and responding to an increasingly diverse range of customer needs
- Securing stable supplies of materials in line with increased production volume



Engine Business: Complying with Tighter Environmental Regulations

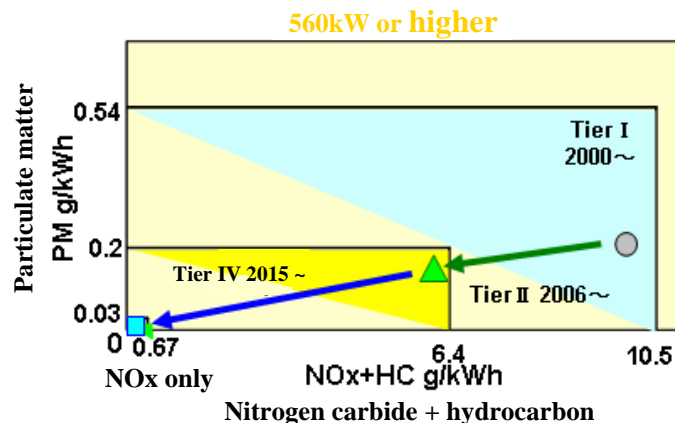
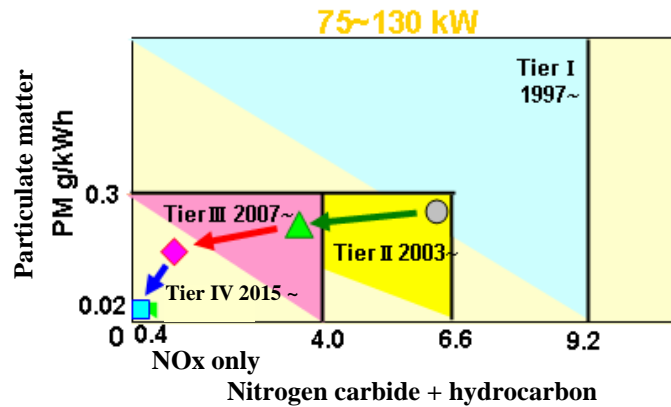
Developing engines compliant with Tier IV emissions regulations

Making the most of Mitsubishi's strengths as both an auto manufacturer and a manufacturer of key components, we are proceeding with development of both hardware and software in an effort to achieve the optimum power line.

Securing revenue sources by developing core engine technology on an in-house basis

Establishing in-house core technology in areas such as fuel injection and air systems.

Trends in emissions regulations on off-road vehicles in the US and MHI initiatives

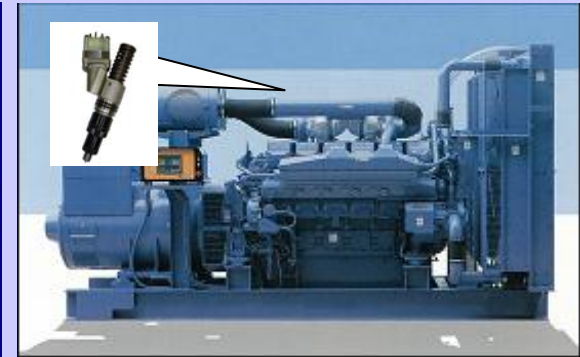


Progress with development of engines compliant with emissions regulations



Tier III compliant 100kW small-sized engines

- Fitted with common rail system
- Production commenced in March 2007



Tier II compliant 1,000kW medium and large engines

- Fitted with electronic control unit injector (in-house)
- Production commenced in July 2007

Other environmental initiatives



Highest thermal efficiency in class Clean mirror cycle gas engines

- Production scheduled to commence in October 2008



Very low noise (70dB) generator packages

Main Strategy for Compact and Meiki Gasoline Engines

Complying with tighter environmental regulations as soon as possible and expanding vehicular engine business

Expanding Business

1. Expanding sales into industrial vehicle and industrial machinery manufacturer markets in North America and Europe, spearheaded by new models compliant with emissions regulations
2. Getting MVDE (India) up and running as soon as possible in order to actively expand business into emerging markets in Asia
3. Proceeding with advance development of new models compliant with emissions regulations and increasing OEM supplies in response to supplementary demand for models from other engine manufacturers as well as industrial vehicle and industrial machinery manufacturers

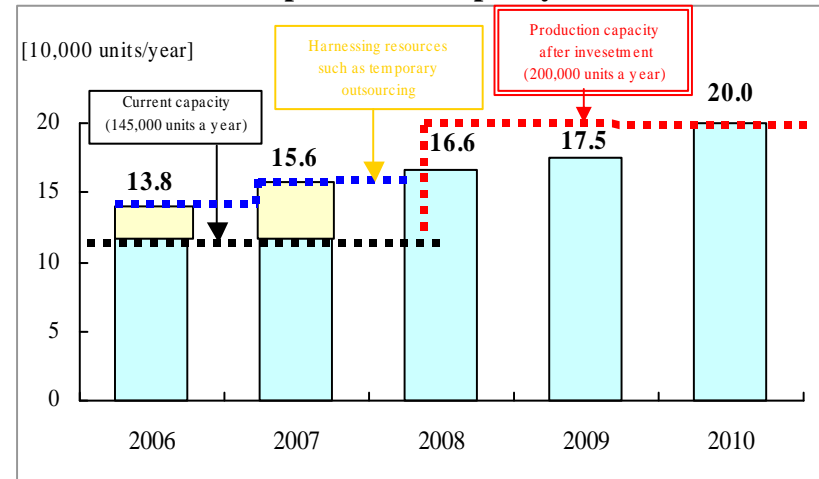
Reinforcing Service Business

1. Reinforcing regional service structure within Asia, centered around our Asia service company (MHIES-A), in order to offer customers faster service and increase revenue
2. Getting re-manufacturing operations up and running in response to a wide range of customer needs
3. Extending and improving after-sales services for major OEM customers

Increasing Production Capacity

1. Increasing production capacity at our Sagami-hara Plant in order to establish a 200,000 unit a year production structure
2. Promoting reduced man-hours and other streamlining initiatives in order to reduce production lead times (from six to four days)
3. Increasing production capacity at MVDE bases and increasing effectiveness by deploying models as soon as possible
4. Improving operational process and establishing of production control system in order to reduce losses from operation.

Compact engine sales projections and increases in production capacity

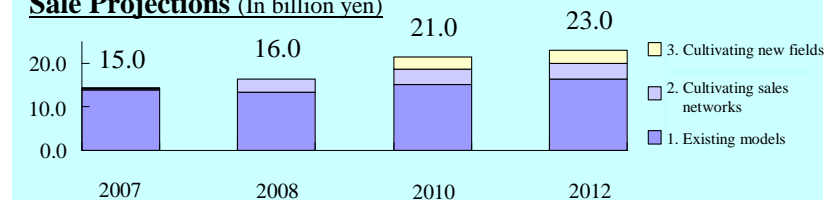


Main Strategy for Meiki Gasoline Engines

Market Development

1. Developing new customers with new emission-compliant models
2. Developing new sales network collaborating with World-Wide customers
3. Expanding into new fields with the commercial release of cogeneration systems

Sale Projections (In billion yen)



Main Strategy for Medium and Large Engines

Focusing on growing demand for marine engines and generator sets and reinforcing business profitability

Expanding Business

- Increasing sales of marine engines on the back of growing demand for shipping in line with increased worldwide distribution.
 - [Europe] Modal shift resulting in more vehicles being transported on low fuel consumption cargo ships
 - [Asia] Increased demand for coal carrier ships from countries such as China and Indonesia
 - [South America] Increase in transportation of resources and demand for container shipping due to economic growth

Arranging sales and service bases in each country in line with demand
- Increasing sales of generator sets in response to increased global power demand
 - Continuing to supply large volumes of diesel engines to generator manufacturing OEM customers in Europe and the US and establishing base load operations
 - Launching 1MW gas engines onto the market in addition to existing high-output models in response to the current construction boom in oil-producing nations in particular and increased demand for power in China

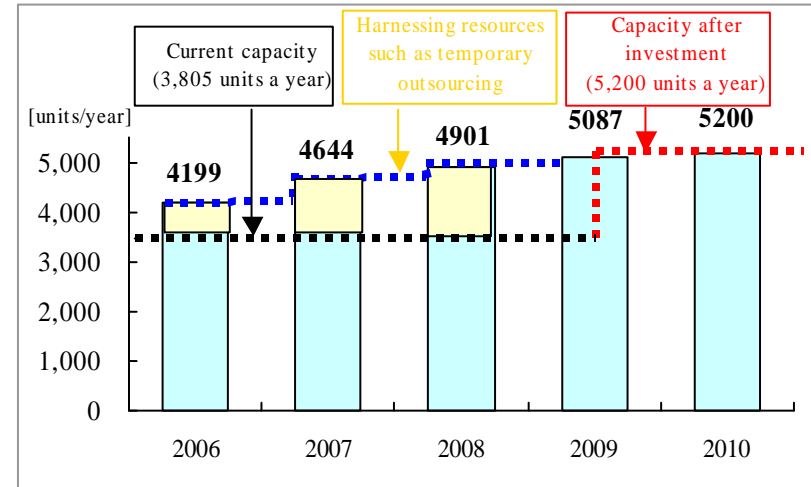
Expanding Parts and Service Business

- Establishing an Asia service company (MHIES-A) as part of a service structure designed to increase sales of service packages and spare parts
 - Broadening customer eligibility for extended warranty scheme
 - Setting up parts remanufacturing business, etc.

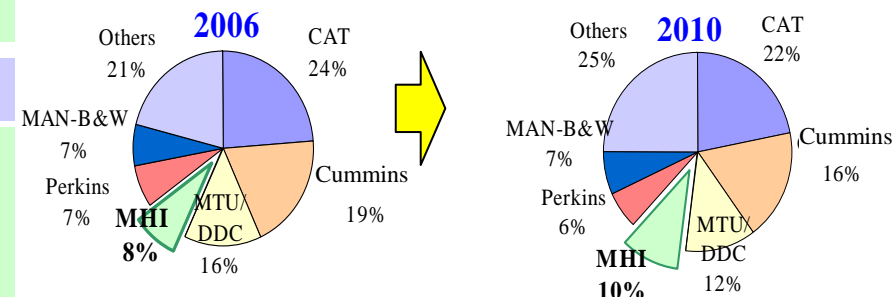
Increasing Production Capacity

- Increasing production capacity at Sagami-hara (5,200 units a year) and improving capabilities at bases in France (MEA) and Vietnam (MHIES-V) in order to establish a global production system (6,000 units a year)
- Actively promoting local procurement based around MEA and MHIES-V

Sales projections and increases in production capacity



Market share: Establishing position in market as one of the world's leading companies



Expansion into New Overseas Markets in the Engine Business

Establishment of new bases to cater to emerging markets in Asia, Central and South America and other parts of the world during FY2007 as a first step towards global business expansion into emerging markets in addition to the three core markets in Japan, Europe and the US



MHI-VST Diesel Engines (MVDE)

MVDE established as new compact engine production and sales company in India

Local production of compact engines commenced in December 2007

Established: August 2007



MHI Sul Americana Distribuidora de Motores (MSA)

Engine sales and service base newly established in Brazil
Aiming to increase sales in the rapidly growing South American market

Established: December 2007

European bases



MEE

MEA

Production and development base
MITSUBISHI
HEAVY INDUSTRIES, LTD.

North American base



MENA

Existing bases

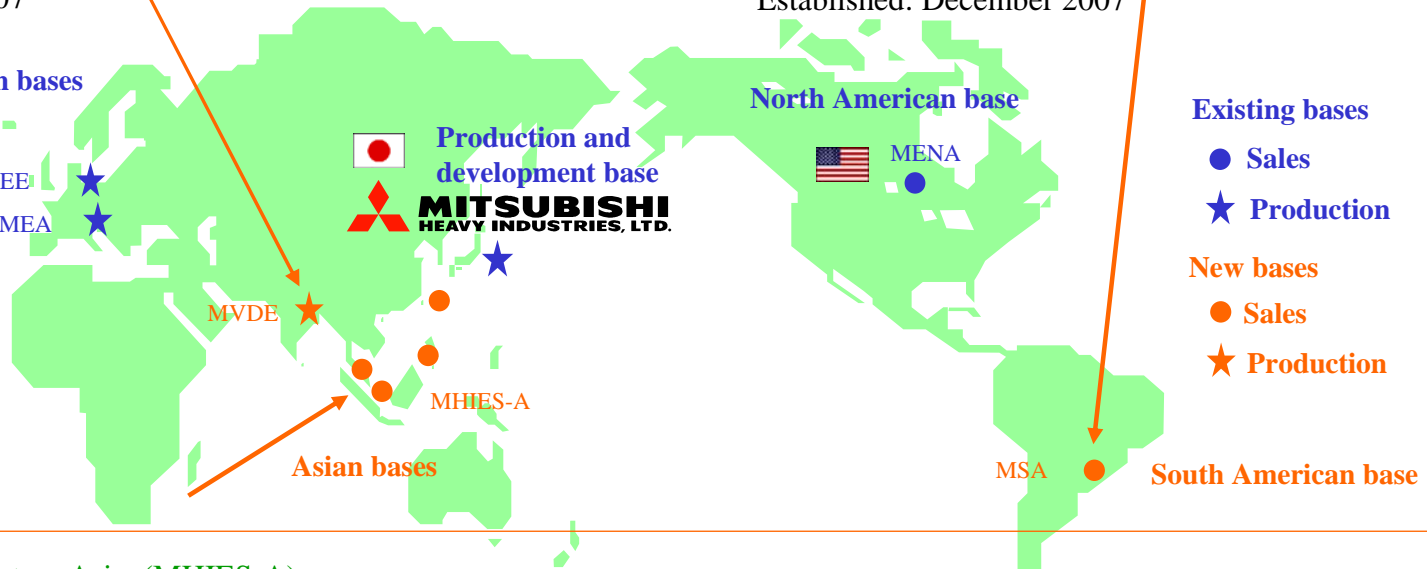
● Sales

★ Production

New bases

● Sales

★ Production



Asian bases

MSA

South American base



MHI Engine System Asia (MHIES-A)

Full launch of operations at Asian regional management company for engine business

Production commenced at MHIES-V generator set plant in Vietnam (November 2007)

Full launch of operations at other sales and service bases (MHIES-V, MHIES-L, MHIES-P, MHI Engine System)



MHIES-V (Viet Nam)



MHIES-I (Indonesia)



MHIES-P (Philippines)



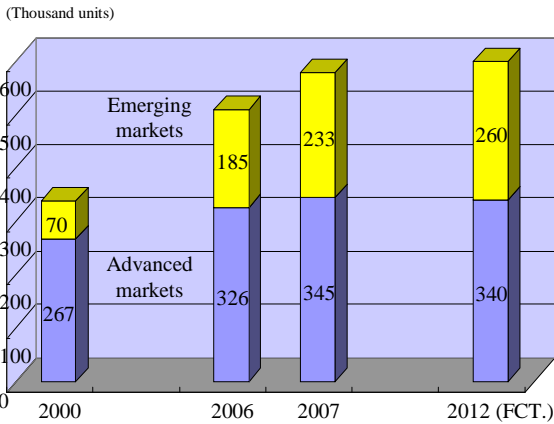
MHI Engine System (China)

[Product Strategy (3)] The Forklift Truck Business Environment

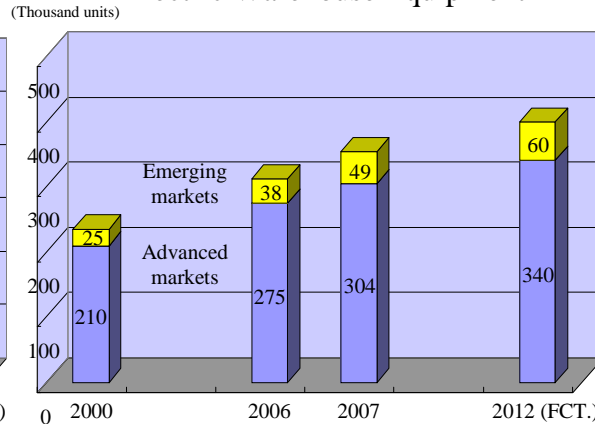
Market trends

Increase in demand for engine-powered vehicles in emerging markets and Electric Warehouse Equipment in markets in advanced nations

Counterbalance forklift market



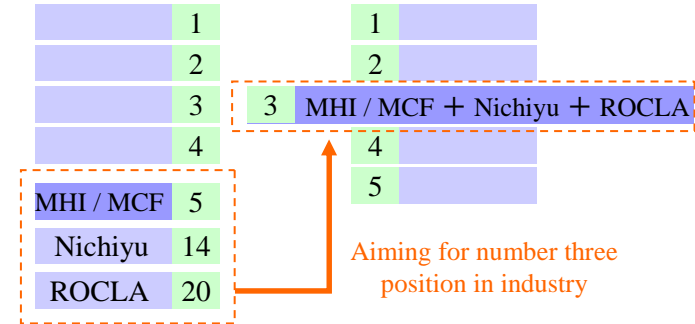
Electric Warehouse Equipment



Goals (Positioning within industry)

Aiming to secure the number three position as a group based on cooperative relationship with Nichiyu and ROCLA

Industry ranking (2007)



Market trends

MHI's policy

Emerging markets

Chinese, Russian and Central and South American markets growing in scale, particularly in terms of engine-powered vehicles

Harnessing MHI's strengths in terms of engine-powered vehicles and components to establish a production and sales structure targeted at the three core global markets

Growing demand for environmentally friendly products

Responding flexibly to an increasingly diverse range of needs, including different environmental regulations and product specifications in each market

Advanced markets

Growing demand for Electric Warehouse Equipment and diversification of needs due to shift towards small-lot distribution, particularly in markets in advanced nations

Improving range of products and establishing a sales network based on strategic partnerships with Electric Warehouse Equipment specialist Nichiyu and other partners

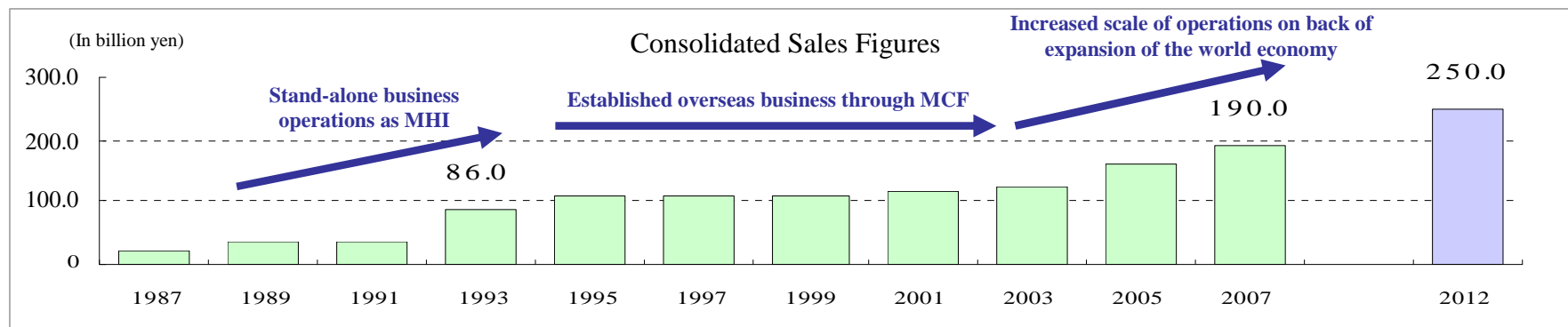
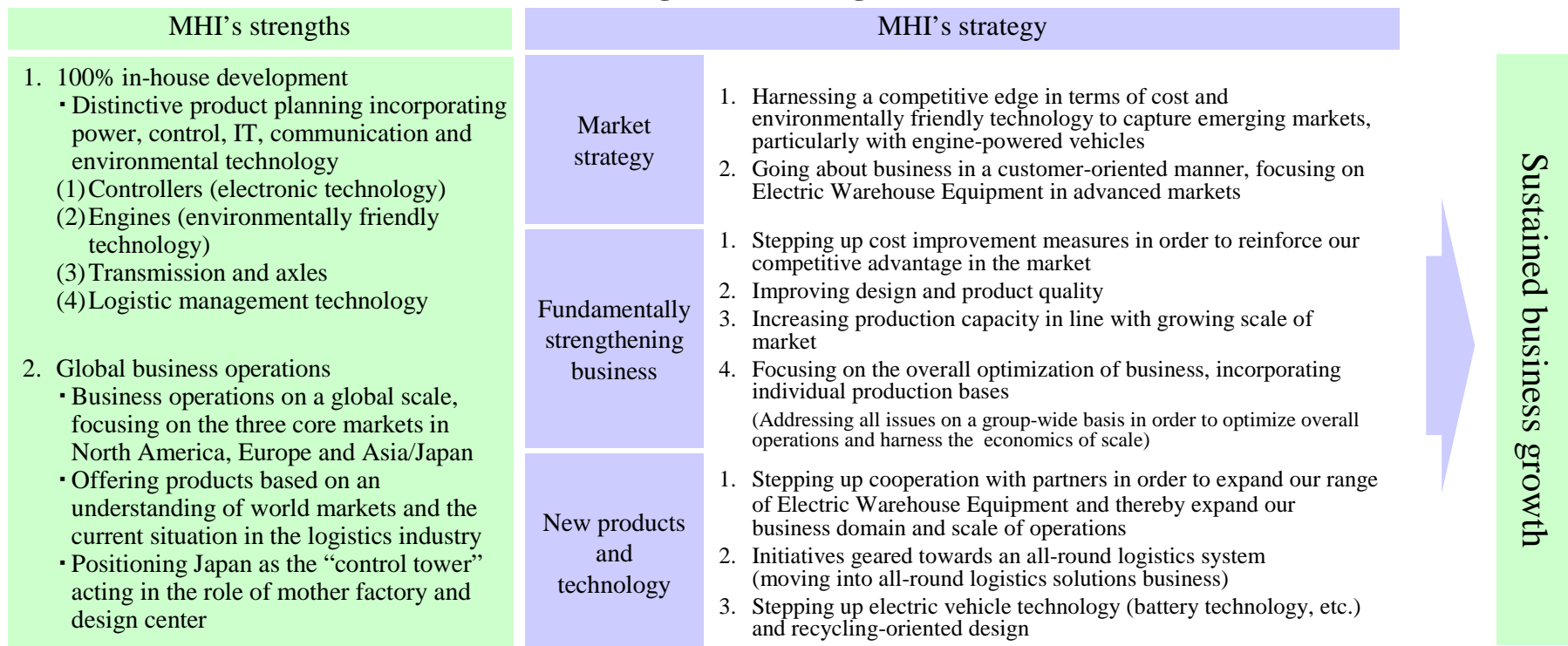
Growing demand for all-round logistics solutions

Catering to customer needs by expanding business into all-round logistics services (Battery-powered vehicles, automated warehousing, AGV)

- Expanding business domain
 - Moving into new markets
 - Expanding into environmentally friendly fields
- Stepping up cooperation with partners
 - Offering Electric Warehouse Equipment products
- Establishing a global network aimed at optimum overall operations
 - Achieving optimum production and procurement at bases located in each market and linking bases together via a powerful supply chain in order to achieve optimum overall operations

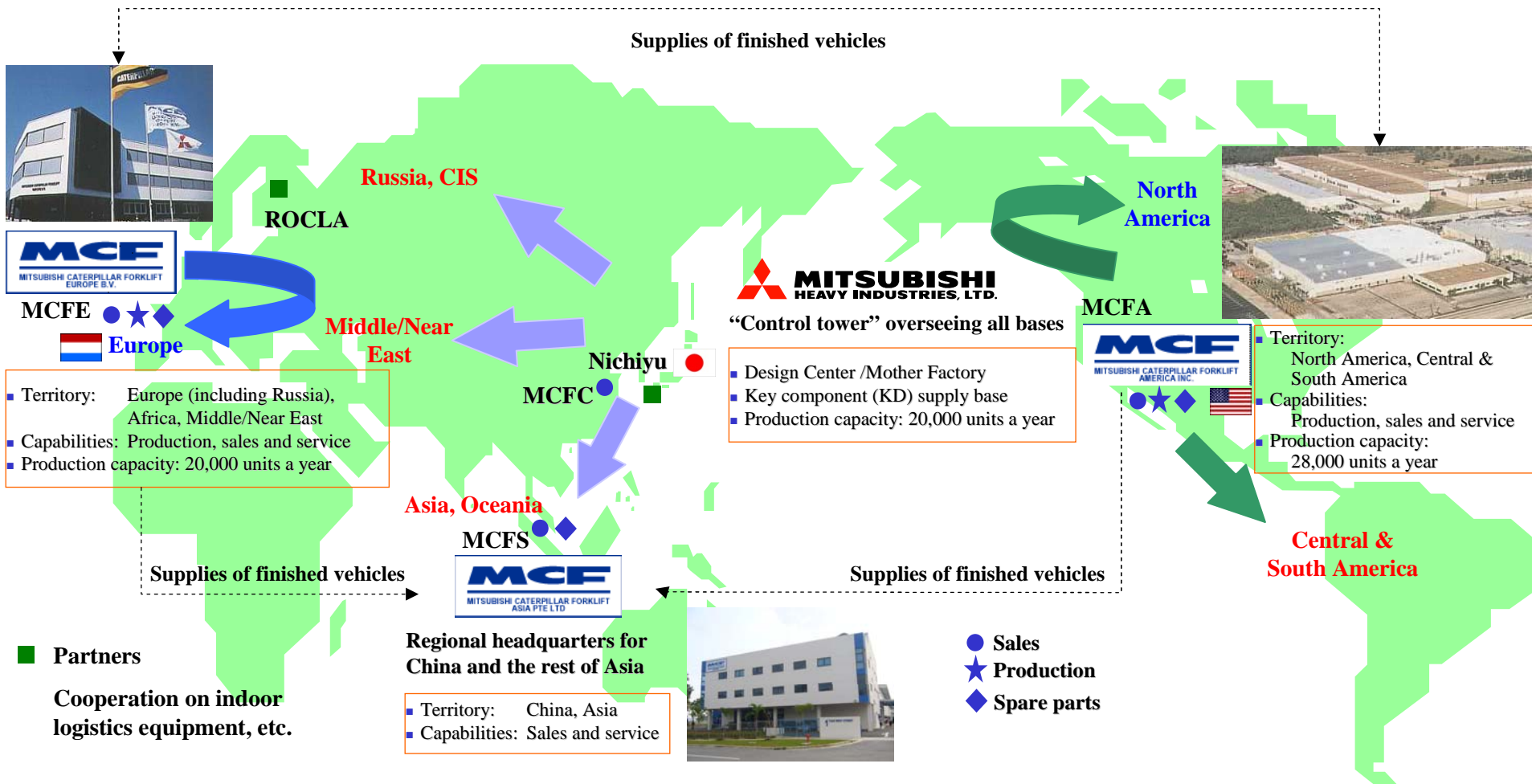
Main Forklift Truck Business Strategy

Catering to diverging needs in advanced and emerging markets and implementing initiatives aimed at sustained growth in the global market



Global Forklift Truck Business Operations

1. Establishing an optimum global production and supply system, including extending standardization of key components and parts
2. Expanding sales and service networks in emerging markets to capitalize on growing demand
3. Stepping up cooperation with strategic partners in order to strengthen and expand indoor logistics equipment operations



Forklift Truck Business Partnership Strategy

[Stepping up business ties with Nippon Yusoki (Nichiyu)]

1. Vision for partnership

A mutually complementary relationship between MHI, with its global operations (and partnerships) and expertise in engine-powered vehicles, and Nichiyu, with its powerful domestic sales capabilities specializing in Electric-powered vehicles, aimed at creating the leading manufacturer in the forklift truck industry with the support of both companies' shareholders, customers, employees and other stakeholders

2. Specific measures

- (1) Commencing sales of Nichiyu electric vehicles via MHI's brand network
- (2) Joint development of next generation electric vehicles
- (3) Strengthening sales and service network through integration of domestic sales operations
- (4) Establishing a Partnership Promotion Committee to look into other potential partnerships

3. Desired effect

- (1) Developing a full range of counterbalance vehicles and Electric Warehouse Equipment in order to cater to a diverse range of customer needs
- (2) Aiming to become the number three group in the world with Nichiyu and ROCLA



Technology and Quality Strategy

Strengthening our operating base through promoting product differentiation and supply chain improvement measures

<p>Improving product reliability</p>	<p>Establishing processes that strike a balance between development speed and quality</p> <ol style="list-style-type: none"> 1. Stepping up front-loading 2. Using 3D data to improve development processes 3. Reinforcing management at points of design change (stepping up design reviews) 4. Promoting global quality management in order to improve product quality on a consolidated basis
<p>Value chain improvement measures</p>	<p>Working on reducing lead times, cutting material costs and improving development costs</p> <ol style="list-style-type: none"> 1. Improving all operational processes from accepting orders through to development and product launch 2. Cutting costs through standardization and parts commonization 3. Using 3D data to optimize facilities and processes (Increasing efficiency of production preparations and streamlining production)
<p>Developing next generation technology and launching new products</p>	<p>Developing elemental technology and new products in order to secure a technological edge</p> <ol style="list-style-type: none"> 1. [Turbochargers] High added value VG/VFT, next generation turbocharger systems 2. [Engines] Technology compliant with emissions regulations (Tier IV), natural gas engine generator sets, multi-fuel (biofuel, etc.) compatible technology 3. [Forklift trucks] Lithium battery technology, recycling-oriented design, initiatives aimed at all-round material handling systems (automatic warehousing, all-round AGV control, etc.)