

Machinery, Equipment & Infrastructure

By pursuing achievable and immediately effective measures from the perspective of supporting the MHI Group's profitability, we will focus on creating top businesses in global niche markets.

Kazuaki Kimura

Domain CEO, Machinery, Equipment & Infrastructure

Strengths

- **Metals machinery** Market response with a full product lineup
Global presence, with operations in 24 countries
- **Turbochargers** Development of sophisticated products leveraging high-speed rotational technologies
- **Engines** Extensive lineup of products and a wide range of output
- **Forklift trucks** **Air-conditioning and refrigeration** Extensive product lineup

Opportunities

- **Compressors** Long-term expansion in the oil & gas business due to increasing global population and economic expansion in developing countries
- **Turbocharger** Expanding Chinese and North American markets
Growing trend toward the use of turbochargers on downsized engines in response to environmental and fuel performance regulations
- **Engines** Increased demand for gas engines due to spread of low-cost shale gas

Weaknesses

- Smaller share in individual fields than specialized manufacturers, and numerous small and medium-sized businesses

Threats

- Rise of manufactures in emerging countries
- Sense of uncertainty in European economies
- Economic slumps in emerging countries such as China and India
- Ongoing commoditization



Net sales

FY2014 **¥1,319.5** billion → FY2017 (target) **¥1,800.0** billion

Operating income

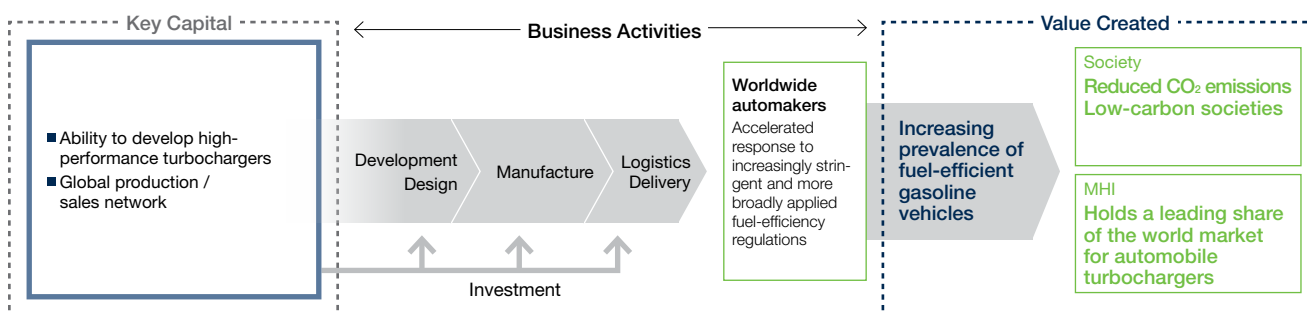
FY2014 **¥84.1** billion → FY2017 (target) **¥160.0** billion



Operating Environment

This domain is involved in a wide range of businesses handled by 15 SBUs—consolidated down from 26. The market for our turbocharger operations is forecast to expand, driven by demand for higher fuel efficiency. In the past, demand has concentrated on diesel turbochargers, but the gasoline engine turbocharger market is expected to grow at an annual rate of 10%, with particularly high growth forecast for the Chinese and North American markets. As for compressors, although falling crude oil prices are having a temporary impact, business in the oil and gas sector is forecast to grow over the medium-to-long term, and the market for compressors is slated to continue its long-term expansion. However, the scale of the market in the metals machinery business has shrunk from around ¥3.0 trillion in fiscal 2013 to approximately ¥2.4 trillion in fiscal 2014. Although this business environment appears likely to remain problematic, we anticipate a slight recovery over the long term due to the expansion of markets in India and other emerging countries.

Sample Business Model: Turbocharger



Focus Strategies of the 2015 Medium-Term Business Plan

In this domain, we will expand our scale of operations and earnings in growing business categories, accelerate the promotion of post-merger integration among established joint ventures, and restructure and integrate small and medium-scale businesses. As a result, we aim to expand orders and sales, while simultaneously transitioning to highly profitable businesses.

In one growth area, turbochargers, by fiscal 2016 we will establish a production structure capable of 10 million units per year with the aim of securing the top share of the global market for their use in passenger cars. To achieve this goal, we will expand sales in the Chinese and North American markets. At the same time, we are accelerating our development of new products, including turbochargers for trucks, strengthening our European operations as a second development center, and enhancing customer support. In the compressor business, we will forge collaborative structures with major oil and gas developers. We will also strengthen competitiveness and increase market share in the chemical plant business. In April 2015, we established a U.S. production base, which we expect to drive growth in repairs and other services and augment profitability.

With regard to accelerating the promotion of post-merger integration among established joint ventures, through synergies between our domain and Primetals Technologies, Ltd., a joint venture with Siemens AG in the metals machinery business, we expect to develop

a worldwide business network through the integration of relatively strong geographic regions. We will also optimize the operation of each of our manufacturing bases, reduce and optimize procurement and development costs, and reinforce our operations in engineering, procurement, and construction (EPC) as we work to establish our presence as a global leader. Through the integration of our forklift business with Nippon Yusoki Co., Ltd., we expect to enjoy synergistic benefits in areas such as sharing components and raising operational efficiency.

For small and medium-sized businesses that are profitable but struggling to grow, we will seek out collaboration with other companies in the same business categories and consolidate or create new business entities from these companies. We intend to revitalize businesses with lower profitability through alliances. Through these measures, we are working toward profitability across all SBUs by fiscal 2017.

Collaboration with Other Companies in the Same Business Categories

Electrostatic precipitators	Integration with Hitachi Plant Construction, Ltd., and conversion of Mitsubishi Hitachi Power Systems to Group company (October 2015)
Tunnel excavation machinery	Integration with Japan Tunnel Systems Corporation (January 2016)
Bridge construction	Transfer of shares to Miyaji Engineering Group, Inc. (April 2015)
Material handling systems	Integration with Sumitomo Heavy Industries Material Handling Systems Co., Ltd. (October 2015)
Agricultural machinery	Capital participation by Mahindra & Mahindra Ltd., of India (October 2015)

Creating Business Entities and Consolidation of Companies with Common Themes

Hydraulic machinery, particle accelerators, ITS	Restructuring/integration of small/medium-scale businesses and consolidation into Mitsubishi Heavy Industries Mechatronics Systems, Ltd. (October 2015)
Machine tools	Consolidation with sales company, creation of new business entity (October 2015)

R&D Case Study: Fuel Cell Combined Power Generation System

MHI has developed a gas engine for generator use that delivers the high levels of efficiency and power that current markets demand. Because of the tradeoff relationship between high operating pressure ratios and high turbocharging efficiencies that typically exists with turbochargers, achieving both has been problematic in the past. The newly developed engine overcomes this hurdle, achieving both through a two-stage turbocharging system that employs an intercooler. This system

can deliver high turbocharging efficiencies for both high- and low-pressure turbochargers, while enabling a high operating pressure ratio, augmenting engine output by 33% compared with other engines with the same displacement and achieving electrical efficiency of 44.7% or higher—the top level in its class. We plan to move toward market introduction after performing endurance testing to evaluate engine reliability.

■ Main Projects

Announcement	Delivery	Project
July 2015	Autumn 2015	Order received from Saudi Arabia for 80 large-scale centrifugal chillers, with combined 200,000 refrigeration tons cooling capacity
May 2015	Spring 2016	Order received from The Nishinippon Shimbun Co., Ltd., for two DIAMONDSPIRIT newspaper offset presses as part of an upgrade initiative
April 2015	Summer 2016	Order for new EAF Quantum electric arc furnace received from Acciaieria Arvedi S.p.A., of Italy
April 2015	–	Development of Dokodemo Door® platform door system accommodating railway cars with varying numbers of doors and door locations
March 2015	Early 2017	Order received from Mitsubishi Chemical Corporation for a two-phase activated sludge system incorporating advanced wastewater treatment technology, offering largest treatment capacity to date
December 2014	October 2017	Order received from Yamagata Area Environmental Office Association for construction and operation of 150 ton-per-day waste-to-energy plant
October 2014	–	Development of ABLASER laser micromachining system incorporating optical heads and other proprietary technologies
May 2014	April 2016	Order received from RockTenn Company, of the United States, for 20 corrugated box-making machines

ONE HIGHLIGHT

Establishing a U.S. Compressor Manufacturing Facility to Meet Rapid Growth in Demand

In April 2015, Mitsubishi Heavy Industries Compressor Corporation began operations in Pearland, Texas, outside of Houston, at its new U.S. compressor manufacturing and service location. Advances in shale oil and shale gas extraction technology are prompting major increases in crude oil production capacity in the United States, which in 2014 was ranked among the leading oil-producing countries for the first time in 29 years. Petroleum companies' increases in crude oil production capacity are spurring vigorous investment by petrochemical firms both within and outside the United States, and a number of mega ethylene plants capable of producing one million tons per year are being constructed. The new plant will provide comprehensive one-stop manufacturing, repair, and maintenance services for compressors and the steam turbines used to drive them. MHI is reinforcing its base of operations in the massive North American market in response to expected medium- to long-term growth in the oil and gas sector, as well as the service business.