

Intellectual Property and R&D Activities

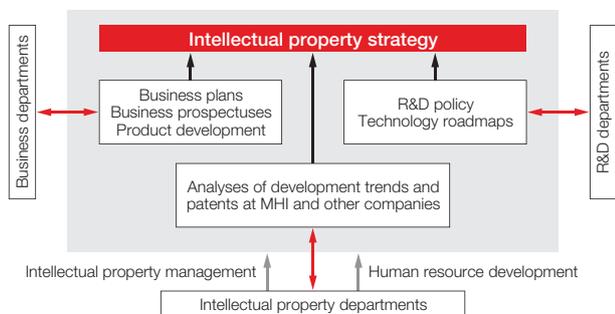
Conducting global intellectual property activities that support MHI's business strategies

An Integrated Approach Linking Businesses, R&D and Intellectual Property

Given that strengthening intellectual property strategies is one of the supportive strategies for leveraging truly comprehensive capabilities, MHI's intellectual property activities are an integral part of its business and R&D strategies.

Amid dynamic changes in the market, such as recovery from economic recession, the budding prominence of emerging markets, and reconstruction in the wake of the Great East Japan Earthquake, both the intensity of global competition and the importance of intellectual property strategies are on the rise. For MHI, bolstering intellectual property is now more important than ever. Both business and intellectual property strategies must be fully integrated to enhance competitiveness.

To this end, MHI is defining intellectual property strategies centered on the guiding policies of each business segment, with business and intellectual property departments working closely together to implement these strategies. In parallel, under the unified management of all corporate divisions across MHI, by having the intellectual property departments coordinate the intellectual property strategies of all business segments, the MHI Group can take full advantage of its comprehensive capabilities.



Intellectual Property Activity Policy

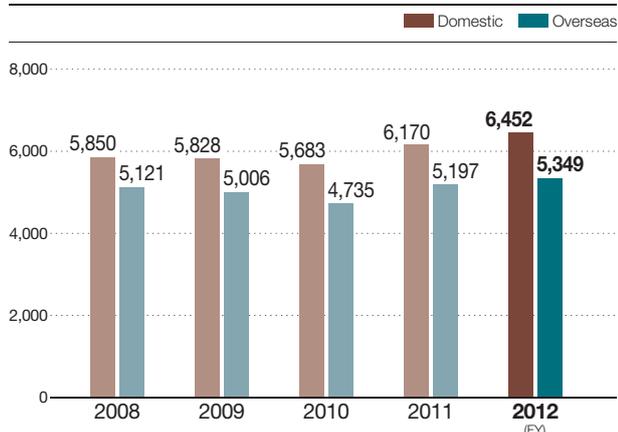
Continuing on from fiscal 2012, MHI Group's basic policy for intellectual property activities in fiscal 2013 is to pursue more global intellectual property strategies and activities and to promote intellectual property utilization.

The pursuit of more global intellectual property strategies and activities involves developing and implementing intellectual property strategies with an emphasis on the view that emerging markets will be pivotal for market expansion. MHI's development bases and other places where rights could be exercised are expected to spread out further around the world, and so intellectual property activities also need to be expanded overseas. With the number of applications being filed overseas skyrocketing, MHI is striving to redesign its business processes in order to also globalize its intellectual property business operations in a way that supports this surge.

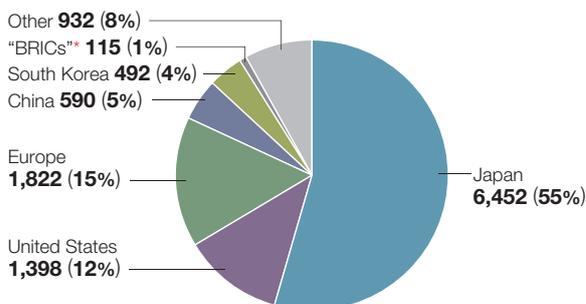
Furthermore, in a modern age where disputes over intellectual property are sometimes engineered with an objective to hinder business, in addition to a support structure for times of dispute and a buildup of intellectual property rights, MHI is reinforcing the utilization of intellectual property in line with its business strategies.

In addition to promoting an increase in the number of patent applications and the number of patents held, as a whole, the purpose of these activities is to promote favorable business, such as by adding a strategic perspective of planning the scope of rights creatively with respect to technologies needed for executing MHI's business strategies. The aim is to adopt sophisticated intellectual property measures that support business strategies, by continually refining MHI's intellectual property strategies based on business strategies centered on the business model, and by adding the perspective of protecting business to the protection of technology.

Number of Domestic and Overseas Patents



FY2012 Breakdown of Patents by Region



* "BRICs" does not include patents held in China.

Management System for the Protection of Intellectual Property

MHI's product groups each comprise multiple technologies, and cannot be covered by a single intellectual property. Consequently, there is a possibility of intellectual property disputes with other entities during the course of business in the future.

In order to reduce these risks, MHI is committed to respect intellectual property rights of others by investigating any relationships between MHI products and the intellectual property of other companies at the basic planning stage, design stage and the manufacturing stage of each product, and by promoting the sharing of information among business departments and R&D departments.

Furthermore, as MHI's ratio exported product increases, MHI is working hard to understand each country's specific system for intellectual property and to build its networks with affiliates so that swift and appropriate action can be taken even in the event of a global intellectual property dispute.

Principal R&D Activities by Business Segment

1. Shipbuilding & Ocean Development

MHI is developing energy-saving technologies and environmental impact-reducing technologies, and is engaged in R&D for cruise ships and eco-friendly vessels, including LNG carries, ferries and "pure car carriers," as well as large offshore structures and energy-efficient devices and systems that meet market needs.

Key R&D activities

- Development of large, high-performance cruise ships with

energy-saving technologies that cut fuel consumption by over 10% and technologies that reduce labor needs by over 15%

- Development of technologies to broaden the scope of application and achieve higher performance for the Mitsubishi Air Lubrication System (MALS), which cuts CO₂ emissions by reducing friction resistance between ships and seawater

2. Power Systems

MHI is developing technologies that are designed to supply energy in a stable and efficient manner, preserve the environment or improve safety, and is engaged in R&D that meets upstream to downstream market needs with respect to energy, such as utilization technologies for renewable energy sources and clean fuels, including natural gas and nuclear, as well as distributed power grid systems and high-efficiency power generation systems.

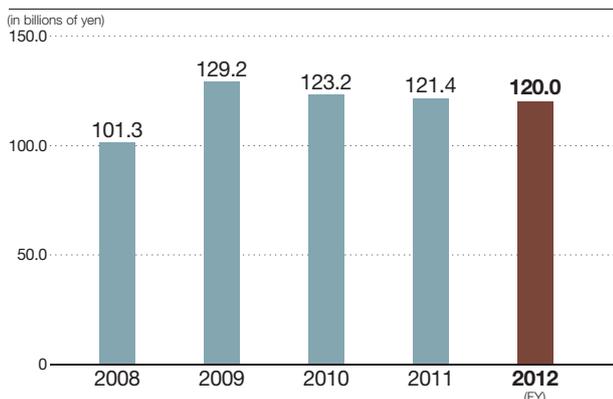
Key R&D activities

- Development of the J-Series gas turbine, a system boasting world-class output and world-leading thermal efficiency, with a turbine inlet temperature of 1,600°C, that will contribute to the realization of a low-carbon society
- Development of 7 MW offshore wind turbines equipped with one of the world's largest variable-speed, hydraulic drives

3. Machinery & Steel Infrastructure Systems

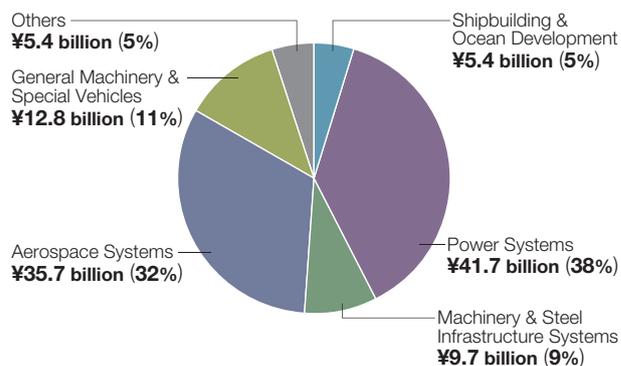
MHI is engaged in the development of environmental protection technologies, including those to mitigate global warming; transportation technologies, specifically land-based transportation and logistics; and basic facilities for the steel, chemical and other industry sectors; technologies and products for providing high-value-added products and social infrastructure, which support energy supply.

R&D Investment*



* The figures above for R&D investment include expenses related to R&D under contract.

R&D Investment by Business Segment



Note: The graph above exclude ¥8.9 billion for expenses related to reinforcing the MHI Group's common technological base.

Intellectual Property and R&D Activities

Key R&D activities

- Development of technology for capturing CO₂ from coal-fired thermal power plant boiler flue gas as a means to help prevent global warming
- Development of technologies related to smart communities, such as community-based energy management systems for electric vehicles (EV), which combine ITS, charging facilities and EVs

4. Aerospace Systems

As one of Japan's leading companies, MHI is engaged in the development of cutting-edge products, leveraging the technologies accumulated in its years of developing aircraft and aerospace equipment.

Key R&D activities

- Development of the MRJ, a state-of-the-art regional jet featuring the world's highest level of operational economy and cabin comfort
- Development of control technology and manufacturing technology that help to reduce costs and improve reliability for next-generation primary launch vehicles

5. General Machinery & Special Vehicles

MHI is engaged in R&D that addresses the polarization of markets and the diversification of demand, such as ensuring compliance with environmental regulations, increasing fuel efficiency and achieving lighter weight and a more compact form for turbochargers, engines, industrial vehicles, special vehicles and other products that contribute to social infrastructure and the fields of energy and the environment.

Key R&D activities

- Development of a high-efficiency twin scroll turbine for automo-

tive turbochargers using unsteady computational simulation, which enables both increased fuel efficiency as a consequence of engine downsizing and improved maneuverability due to higher torque

- Development of the MEGANINJA—a container-type 1,500 kW gas engine generator—to cultivate demand for distributed power generation, based on a product concept of “quick transportation, quick installation and quick generation”

6. Others

MHI is also engaged in developing technology with a focus on air-conditioning and refrigeration systems as well as machine tools. In addition to the cutting-edge technologies unique to these products, MHI also broadly applies the latest and most advanced pioneering technologies to each product.

Key R&D activities

- Development of Voxcel, an air-cooled heat pump chiller, which boasts the industry's highest coefficient of performance (COP), achieving a heating capacity up to 150% of the rated capacity even in a low outdoor temperature of -10°C, by incorporating the optimum compressor
- Development of the LH250 double column machining center, which achieves machining accuracy of $\pm 5\mu\text{m}$ (0.005mm)—the highest level in its class—and is capable of accommodating precision machining of work in excess of 2,000mm in length, by making significant improvements to the vibration absorbency of the structure and to the rigidity of the high-speed spindle, and by employing MHI's unique technology for cooling the spindle lubrication and devising a way to suppress the heat generated from the machine

TOPICS

Thomson Reuters Company Named MHI among “Top 100 Global Innovators 2012”

Mitsubishi Heavy Industries, Ltd. (MHI) has been named one of the world's 100 most innovative companies of 2012 by the American firm Thomson Reuters Company in December last year. MHI received high marks for its innovations and intellectual property activities in each of the “Top 100 Global Innovator” program's four categories: patent approval success rate, global reach of patent portfolio, patent influence in literature citations, and overall patent volume.

Thomson Reuters annually selects what it considers to be the world's most innovative companies or research institutes based on analysis of its own patent database. The 100 companies and research institutes honored are recognized as “top global innovators” for their strategic protection of intellectual property rights and their aggressive pursuit of commercialization of valuable inventions capable of having a significant impact on the global market.

This prestigious award reflects MHI's firm commitment to continuing its proactive pursuit of innovative technology developments, and to continuing its quest to actively protect and apply its innovations in the global market.

* Thomson Reuters is a New York-based global information services company. It was established in 2008 when Thomson Corporation, a Canadian information services provider, purchased Reuters Group PLC, the British communications giant. Presently Thomson Reuters has some 60,000 employees working in more than 100 countries worldwide.

