

Environmental Efforts of MHI Group



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Since its establishment, Mitsubishi Heavy Industries (MHI) Group has consistently been committed to the basic philosophy that “we deliver reliable and innovative solutions that make a lasting difference to customers and communities worldwide.” and has offered the energy/environmental conservation equipment and the products/technologies that underpin societal infrastructure. In our business activities, we have helped mitigate global-scale problems such as climate change by reducing environmental impact through our streamlined environmental management system. This report introduces our environmental efforts.

1. Introduction

In 2015, the “Paris Agreement” was adopted at the 21st Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21), which serves as a new international framework for reducing greenhouse gas emissions. This agreement requires the rise of the global average temperature to be well below 2°C from the preindustrial levels (“2°C goal”), together with the realization of greenhouse gas emissions being offset by absorption in the second half of the century. The international community has undertaken the challenges of conserving the global environment, developing a sustainable society, and realizing a decarbonized society in the second half of this century.

It has thus become socially and widely understood that the sustainable growth of society is not possible without resolving global environmental problems. Against such a backdrop, institutional investors and financial institutions are taking a growing interest in “environmental, social and governance (ESG) investment,” in which non-financial information, such as corporate environmental efforts, is also used as the basis for corporate investment decision-making.

When companies appropriately consider/handle ESG requirements and there are shareholders who include such corporate efforts in their assessment for investment, global environmental problems and social challenges can be properly addressed or improved. Even one more step forward can be made for the creation of a sustainable society. Therefore, corporate responsibility toward the environment is also of increasing importance from an investment perspective.

This report describes MHI Group’s environmental undertakings, especially focusing on its stance, its current organizational structure and activities to minimize environmental impact. Our products and technologies which help tackle global environmental problems are also introduced.

2. MHI Group’s environmental undertakings

With global-scale environmental issues being perceived as common problems worldwide, MHI Group has made its stance on environmental matters clear to the inside/outside of the company, while setting up the “Environment Committee” in 1996 to promote environmental activities with direction. At the first meeting, on the basis of MHI Group’s principles “we deliver

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reliable and innovative solutions that make a lasting difference to customers and communities worldwide,” we established the “Basic Policy on Environmental Matters” (**Figure 1**) and the “Action Guidelines” (**Figure 2**) as our principles for environmental activities (both were partly amended in 2017). These proclaim that MHI Group regards its environmental conservation initiatives as one of the most critical issues for its businesses and state its commitment to (1) improving the organizational structure for environmental management, (2) making environmental contributions through the business activities (i.e., by offering its products to the customers) and (3) devoting its efforts to minimizing environmental impact in all aspects of business activities. Being united under the Basic Policy and Guidelines, we are proceeding with these environmental undertakings. Specific activities will be described in the following sections.

Provision 1 of MHI Group’s principles reads: “We deliver reliable and innovative solutions that make a lasting difference to customers and communities worldwide.” This means that our primary purpose is to contribute to society through R&D, manufacturing and other business activities. The company shall undertake all aspects of its business activities with the understanding that it is an integral member of society and will strive to reduce its burden on the environment, contributing to the development of a sustainable society.

Figure 1 Basic policy on environmental matters

1. Prioritize environmental protection within company operations, and take steps across the entire MHI Group to protect and enhance the environment.
2. Clarify roles and responsibilities regarding environmental protection by developing an organizational structure to deal with matters related to environmental protection, and to define environment-related procedures, etc.
3. Strive continuously to improve and enhance environmental protection activities not only by fully complying with environmental laws and regulations but also, when necessary, by establishing, implementing and evaluating independent standards and setting environmental goals and targets.
4. Strive to alleviate burden on the environment in all aspects of company business activities, from product R&D and design to procurement of raw materials, manufacture, transport, usage, servicing and disposal, through pollution prevention, conservation of resources, energy saving, and waste reduction.
5. Strive to develop and market advanced and highly reliable technology and products that contribute to solving environmental and energy challenges.
6. Strive to preserve the environment in partnership with our stakeholders and gain their understanding of this policy.
7. Take steps to raise environmental awareness among all group employees through environmental education, etc., while delivering environment-related information to the public and taking part in CSR activities.

Figure 2 Action guidelines

3. Organizational structure for environmental protection

3.1 Streamlining of the organizational structure for environmental protection

In 1996, ISO 14001, the international standard on environmental management that sets out the criteria for environmental management systems in organizations such as companies, came into effect. With regard to the development of an organized structure to deal with environmental protection as stated in the “Basic Policy on Environmental Matters” and the “Action Guidelines” in response to the issuance of ISO14001, we decided to adopt the framework/system and implemented it by including it in our environmental goals. In 1997, MHI’s Yokohama Dockyard & Machinery Works became the first comprehensive heavy machinery manufacturer to be ISO 14001 certified in Japan. Since then, an increasing number of MHI business establishments have become ISO 14001 certified, and by 2013, all establishments in Japan including the head office, branch offices and research centers, have acquired certification. After the introduction of ISO 14001, each business establishment organized an environmental management system with the environment committee at the top. The Plan-Do-Check-Action cycle (PDCA) is implemented every year to promote

environmental conservation activities. With the corporate management shifting from the one-man style to group operations, MHI group companies both inside and outside Japan have been encouraged to adopt ISO 14001 as well. In this special “Environmental Initiatives” edition (MHI Technical Review Vol. 55 No. 1), the activities of Thailand’s MACO for production processes from an environmental perspective will be introduced as an example of such ISO 14001-related undertakings among group companies.

3.2 Establishment of a new organizational structure for environmental management

On October 1, 2013, MHI Group changed its business operation system from the conventional establishment-based approach in which management is conducted by product series or production site, to the domain-based approach for the attainment of more effective business management. This new approach was systematized by restructuring the old organization from the perspective of the “realization of maximum market influence” such as common characteristics in terms of customers, core technologies and business strategies. For environmental management, MHI Group also introduced a domain and corporate sector-based management system in January 2017, to effectively execute matters with the timely provision of management resources.

In this new environmental management system, new initiatives are formulated in principle at “Domain Environment Committee” meetings, etc., which are held in each of the domain and corporate sector entity, and are implemented in the respective works, plants, districts and group companies.

On the other hand, the policies and measures applicable to all group companies are discussed and formulated at meetings of the “MHI Group Environment Committee” with the Chief Technology Officer (CTO) in charge of environmental management presiding as the chairperson and other members selected from domain and corporate sector entities. The policies and measures are to be implemented through the domain and corporate sector entities, eventually covering all the companies of MHI Group. **Figure 3** shows the new MHI Group organizational structure for environmental management.

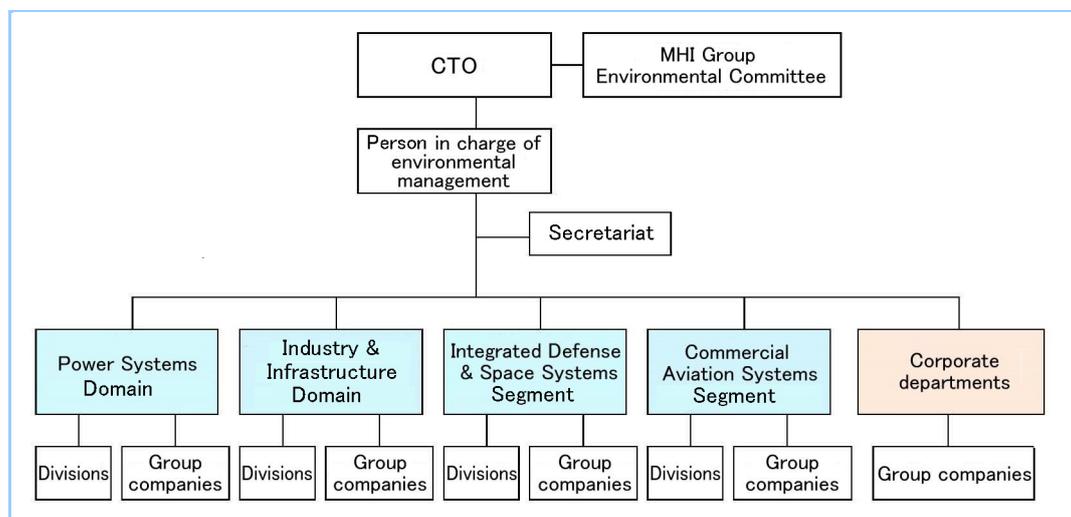


Figure 3 MHI Group organizational structure for environmental management

4. Environmental activities to minimize impact (a summary of the Third Environmental Targets)

4.1 The Third Environmental Targets

To reduce the burden on the environment in all aspects of business activities as stated in the “Basic Policy on Environmental Matters” and the “Action Guidelines,” MHI Group set the environmental targets ahead of other shipbuilding and heavy machinery companies in 2002. Since then, we have been constantly engaged in environmental activities to achieve these targets. The Third MHI Group Environmental Targets, which were implemented in 2015 as a three-year project, set out the targets in relation to the four globally-indispensable improvements: (1) reduction of greenhouse gas emissions, (2) reduction of waste generated, (3) reduction of chemicals discharged and (4) effective use of water resources. With these common targets in the group, we are

proceeding with actions both in Japan and overseas. **Table 1** details the Third MHI Group Environmental Targets, while **Figure 4** shows the time course of change in the target settings.

Although the results will be officially assessed next year, the reduction in absolute use of energy or water is steadily progressing. The individual undertakings are described in the other article of this special “environmental” edition (“Energy Conservation Promotion Efforts at MHI Works,” MHI Technical Review Vol. 55 No.1).

Table 1 The third MHI Group environmental targets

Item	Scope of target	Target (FY2015-FY2017)
Reduction in greenhouse gas emissions	Group companies in Japan	Reduce the unit energy consumption in FY 2017 by 3% compared to FY2014.*1 *1: The result will be assessed based on whether a 1% reduction was made each year
	Group companies in countries other than Japan	Reduce the unit energy consumption in FY 2017 by 3% compared to FY2014.*1 *1: The result will be assessed based on whether a 1% reduction was made each year.
CO ₂ reduction through the use of our products	Entire MHI Group	Promote the manufacture of environmentally friendly products, and report every year on the contribution to CO ₂ reductions through the use of products sold.
Reduction in landfill disposal ratio	Group companies in Japan	Ensure that the landfill disposal ratio of the entire group companies in Japan is less than 0.6% in FY2017. (However, the landfill ratio of each works, plants and districts of MHI is less than 0.5% and the other group companies in Japan as a whole is less than 2.5 %.)
Reduction in VOC emissions	Group companies in Japan	Reduce the unit atmospheric emissions of VOC (xylene, toluene and ethylbenzene) in FY2017 by 3% compared to FY 2014.*1 *1: The result will be assessed based on whether a 1% reduction was made each year.
Reduction in water usage	Group companies in Japan	Reduce the unit water consumption in FY2017 by 3% compared to FY2014.*1 (Water: industrial water, tap water, groundwater, rivers and lakes; excluding seawater) *1: The result will be assessed based on whether a 1% reduction was made each year.
	Group companies in countries other than Japan	Reduce the unit water consumption in FY2017 by 3% compared to FY2014.*1 (Water: industrial water, tap water, groundwater, rivers and lakes; excluding seawater) *1: The result will be assessed based on whether a 1% reduction was made each year.

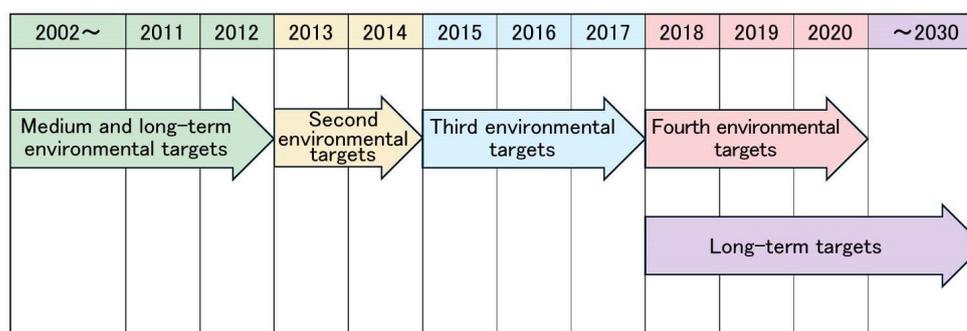


Figure 4 Timeline of MHI group environmental targets

4.2 The formulation of the Fourth Environmental Targets and Long-term Targets

Because fiscal 2017 is the final year for the Third Environmental Targets, we are setting the Fourth Environmental Targets for the next three years. Based on the “Paris Agreement” in 2015, “MHI Group Long-term Environmental Targets toward FY2030,” which coincides with the deadline of Paris Agreement, will be formulated to further contribute to curbing global warming.

5. Trend in the development of products and technologies that make an environmental contribution

With our motto “develop and market advanced and highly reliable technology and products that contribute to solving environmental and energy challenges” and “contribute to the development of a sustainable society through business activities” as stated in the “Basic Policy on Environmental Matters” and the “Action Guidelines,” we have released many products that can help conserve the environment and reduce CO₂ emissions. In particular, a considerable contribution has been made to CO₂ emissions reduction in power generation facilities through efforts such as providing power generation facilities from nuclear sources with almost no CO₂ emissions, high-efficiency gas turbine combined cycle (GTCC) facilities with an energy efficiency exceeding 60% and through the use of CO₂ recovery equipment to collect CO₂ from power plant flue gas.

For the systematic development of products contributing to environmental conservation and CO₂ reduction, the MHI Technical Standard “Basic Guideline for Environment-Friendly Product Fabrication” was established in 2005. Based on this standard, the product life-cycle environmental impact is assessed, thus making it possible to minimize the environmental burden of our products during their lifecycle.

5.1 Development of technologies that make an environmental contribution

MHI Group is taking up the development of better technologies to contribute to the mitigation of global environmental problems.

In the field of gas turbines, we aim to achieve a power generation efficiency of 65% or higher based on the results of the “development of component technologies for 1700°C class ultrahigh-temperature gas turbines” national project, which we have participated in since 2004. With this success, the current efficiency of 62% or higher in the 1600°C class high-efficiency gas turbine type J will be improved by approximately 3%. For example, by replacing a conventional 1600°C class power plant with annual CO₂ emissions of 10 million tons, the new power plant will have estimated annual CO₂ emissions of 9.54 million tons, resulting in a CO₂ reduction of 0.46 million tons per year. This reduction is equivalent to the amount of CO₂ absorbed by roughly 32.86 million cedar trees for one year.

In recent years, major countries have decided to implement stricter regulations on CO₂ emissions from vehicles engines, necessitating the development of turbochargers that can improve engine heat efficiency. In addition to various basic component technologies for better turbocharger efficiency, MHI Group has also developed electric motor-driven compressors and variable geometry (VG) turbochargers for gasoline engines in which the turbocharger’s weak point (i.e., the efficiency at low speed) can be augmented by the use of variable nozzles. Samples are currently being distributed to automobile manufacturers. The practical application of these technologies can further contribute to improving the fuel economy of gasoline engine vehicles and lowering their CO₂ emissions.

In the field of air conditioning systems, the “Kigali Amendment” to the Montreal Protocol adopted in October 2016 stipulates an obligatory phase-down of the production and consumption of HFCs, which are refrigerants with a high global warming effect. Developed countries are responsible for an 85% reduction from the baseline years (2011-2013) by 2036. As there is a possibility of tougher regulations being introduced for HFC reduction, replacement with a refrigerant with a low global warming potential (GWP) is an urgent need. Under such circumstances, MHI Group launched, as centrifugal chillers used in large-building or factory air conditioning systems, the ETI-Z series in September 2015 using the HFO-1233zd(E) refrigerant with a GWP of 1 and the GART-ZE/ZEI series in April 2017 using the HFO-1234ze(E) refrigerant with a GWP of <1. Thus, we have met the regulatory requirements ahead of our competitors and are proceeding with measures against global warming.

5.2 Products that can help mitigate global environmental problems

Our various products that can help mitigate global environmental problems are introduced in this special “Environmental Initiatives” edition (MHI Technical Review Vol. 55 No. 1).

6. Conclusion

MHI Group celebrates the 134th anniversary of its founding this year (2018) and will formulate the Fourth Environmental Targets, which will set the direction of its undertakings in the coming three years starting from FY2018 for the achievement of new goals.

In 2017, the Japanese Government Pension Investment Fund (GPIF) announced its use of ESG indicators as one of the stock selection criteria for investment in Japan. The importance of having responsibility toward ESG requirements in the corporate assessment is thus increasing in recent years.

As a responsible company in terms of ESG requirements, MHI Group will offer highly-reliable innovative solutions through its superior technologies and products, thereby helping to mitigate global-scale environmental problems and contributing to the realization of a sustainable society.