Unrivaled on the World's Seas

PROJECT MEET NEWS

Mitsubishi Marine Energy & Environment Technical Solution-System

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New MET Turbocharger Factory

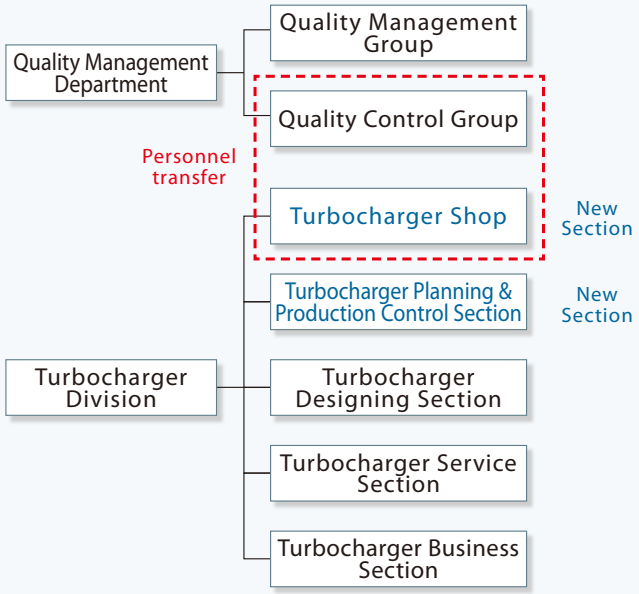
MET TURBOCHARGERS

New MET Turbocharger Factory

On January 1, 2020, MHI-MME relocated its MET Turbocharger factory in Saiwaimachi to Akunouramachi – both in Nagasaki City – as part of the move being promoted by the Mitsubishi Heavy Industries Group to consolidate its manufacturing bases.

With this, MHI-MME completed taking over MET Turbocharger production operations, including related quality control functions, from Mitsubishi Hitachi Power Systems, Ltd. (MHPS), which had carried out production on MHI-MME's behalf.

MHI-MME is now responsible for related processes, from product development to manufacture and after-sales servicing. MHI-MME will further promote integrated operations and smoother business operations, and pursue business expansion through more focused marketing and enhanced customer satisfaction.



With the relocation, all manufacturing activities at the Saiwaimachi Factory ended on December 31, 2019, closing the curtain on the factory's long history after 76 years (1943–2019).

The Saiwaimachi Factory opened in 1943 and many products of Mitsubishi Heavy Industries Group were subsequently manufactured at the factory until it became a dedicated manufacturing facility for MET Turbochargers in 2003.

- Total number of turbochargers manufactured at the Saiwaimachi Factory
  35,378 units (from 1965 to Dec. 31, 2019)

TURBOCHARGER NEW ORDER

Order Received for First MET-MBII Turbocharger Unit

MHI-MME received its first order for MET33MBII turbochargers. The first downsized MET-MBII series turbocharger, MET33MBII ,will be installed on the main engines of two new ferries to be manufactured at Naikai Zosen Corporation for Miyazaki Car Ferry.

Main engines will be the 12PC2-6B manufactured by JFE Engineering Corporation. The ferries are also scheduled to be equipped with MHI-MME fin stabilizers. Turbochargers for the first ferry are scheduled for delivery in October 2020, and for the second ferry in February 2021.

MET TOPICS

World's Largest Dual Fuel Engine Completed with MET Turbocharger

MHI-MME has been steadily delivering MET Turbochargers for the world's largest two-stroke dual-fuel X-DF engine, the 12X92DF, developed by Winterthur Gas & Diesel Ltd. (WinGD) of Switzerland and being built by CSSC-MES Diesel Co., Ltd. (CMD) of Shanghai, China. These engines will be mounted on a series of nine 23,000-TEU container vessels to be built at a shipyard under the umbrella of the Chinese State Shipbuilding Corporation (CSSC).

Many MET Turbochargers have already been mounted on WinGD's X-DF engines in the past. This major project further confirms the compatibility between MET Turbochargers and X-DF engines.

A ceremony to unveil the first unit built was held last December 2 at a CMD plant, where the engine was built.

The combination of the MET Turbocharger with the 12X92DF engine achieves uniform, lean combustion of gas-mixed air in the engine. At the same time, the turbocharger's effective utilization of exhaust gas enables both cleaner emissions and high efficiency. It makes it easy to accommodate the strict International Maritime Organization (IMO) nitrogen oxide (NOx) and sulfur oxide (SOx) emission regulations, while also reducing carbon dioxide (CO_2) emissions.

12X92DF engine

The IMO's NOx Tier III standards, which require an 80% reduction in NOx emissions as compared to NOx Tier I emission standards, have been in effect since 2016 in Emission Control Areas (ECAs). and will apply to increasingly larger marine areas going forward.

As for SOx, in addition to the ECA, where strict emissions regulations are already in place, the requirements will be intensified in all other waters from 2020, reducing the allowable sulfur content in marine fuels from the current limit of 3.5% to 0.5% or less.

The combination of MET Turbochargers with X-DF engines will realize a powerful option for meeting these stricter rules.

MET Turbocharger mounted on a 12X92DF engine

EXHIBITION

Booth Exhibited at Marintec China 2019 (Website: https://www.marintecchina.com/en-us/)

MHI-MME exhibited at Marintec China 2019, held between December 3 and 6, 2019, at the Shanghai New International Expo Centre. This was the 20th edition and the 40-year milestone of the biennial tradeshow, which is the largest international maritime exhibition in Asia.

With a presence of more than 50 years in the marine products business in China, MHI-MME long foresaw that China would become increasingly important in the marine industry and has continuously exhibited at this event from its start.

Particularly over the past 10 years, MHI-MME has been seeking an even stronger presence in China through collaboration, commencing the licensing of the production of steering gears, boilers and propellers in China.

Recently, China has often been the epicenter of information on new trends in the increasingly global marine industry. One example is the manufacture of the first unit of the world's largest low-pressure two-stroke dual-fuel engine with MHI-MME turbochargers.

MHI-MME will continue to work with licensees, while engaging in business activities to establish an even greater business presence in China.

Booth of MHI-MME

STEERING GEARS NEW TYPE

Delivery of the First SFC-105 Steering Gear Made

MHI-MME developed the SFC-105, the largest in the SFC-type steering gear lineup, delivering the first unit to Oshima Shipbuilding Co., Ltd. in May 2019.

SFC-105 steering gear

SFC steering gears are characterized by their simple, compact structure. They are currently installed on many ships. It is an enlarged version of the proven SFC-80 (torque at maximum working oil pressure: 844 kN-m), formerly the largest steering gear.

An issue during the development of SFC-105 was the occurrence of pressure surges during the switchover of the pilot operated solenoid valve. However, MHI-MME was able to reduce surge pressure by improving the pilot operated solenoid valve, achieving successful completion of the development of the SFC-105 steering gear (torque at maximum working oil pressure: 1,030 kN-m). The addition of SFC-105 to the SFC-lineup allows MHI-MME to offer steering gear that is even more optimal for ships.

MHI-MME will continue developing and offering steering gears that meet the needs of our customers.

FIN STABILIZERS NEW ORDER

Retractable Fin Stabilizer Orders Received for Helsinki Shipyard

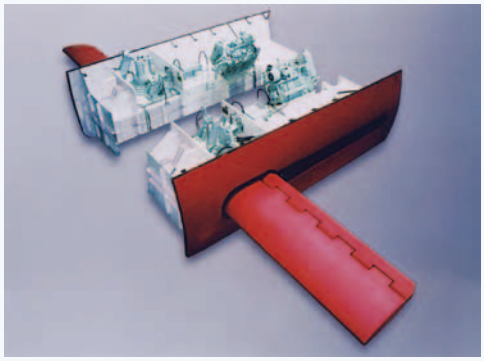
MHI-MME received orders for retractable fin stabilizers for two 157-passenger Luxury Expedition Vessels being built by Helsinki Shipyard of Finland. Both fin stabilizers are scheduled for delivery to Helsinki Shipyard by the first half of 2021.

These vessels will be used for Polar cruises from Europe to the North and South Poles, depending on the season. The fin stabilizers will reduce the roll of the vessels at sea and help provide a comfortable voyage for passengers.

This is the first fin-stabilizer order from Europe in 12 years since the 2008 order from Aker Yards. For a long time, MHI-MME was mainly focusing on projects in Japan and other Asian countries. However, production capacity was improved over the past few years, and MHI-MME worked to expand its sales channels to Europe and other regions.

With the global increase in the demand for cruise tours, there has been an increase in the building of cruise ships and ROPAX.

MHI-MME will use this order receipt as a springboard and continue to carry out proactive sales negotiations in not only Japan and Asia but also Europe for ROPAX, RO-RO and other vessels.



Retractable fin stabilizer

Nagasaki visit in February 2020

GLOBAL SULFUR CAP

Marine SOx Scrubber Approved for Regulatory Compliance

The first and second manufactured units of the DIA-SOx® R-type marine SOx scrubber (flue-gas desulfurization system), shipped by Mitsubishi Hitachi Power Systems, Ltd. (MHPS) starting in September 2019, were installed on large container ships and approved by Nippon Kaiji Kyokai (ClassNK) and Lloyd's Register after positive results in sea trials.

The scrubbers have also been approved by Singapore and Panama, where the respective ships are registered.

As such, official recognition that the DIA-SOx® R-type SOx scrubbers comply with the tighter SOx regulations – which went into effect in January 2020 outside Emission Control Areas – has been obtained.

DIA-SOx® R-type SOx scrubbers are designed for Mega container ships and were jointly developed by MHPS and Mitsubishi Shipbuilding Co., Ltd. (MSB). MHPS boasts the world's highest market share in SOx scrubbers for land-based power plants in year 2014,15,17,18 and 19 and has delivered scrubbers to customers around the world.

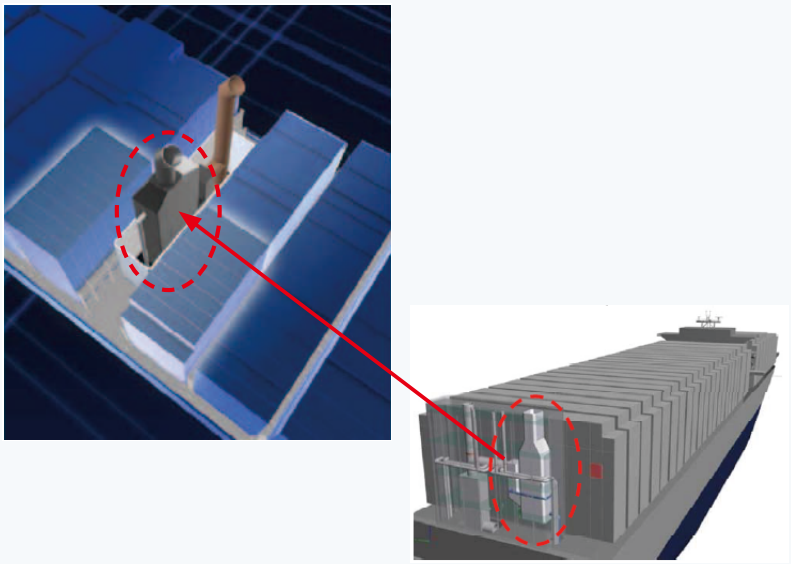
With the DIA-SOx® R-type SOx scrubber, ships can continue using existing economical fuel sources while the scrubber removes 97% or more of the sulfur in the exhaust gas, enabling compliance with the global cap on sulfur oxide emissions that has gone into effect as described above.

To process all of the exhaust gas from the main and generator engines, Mega container ships often need to install at least two scrubbers when using units manufactured by an MHI-MME competitor. However, only one DIA-SOx® R-type unit is sufficient to handle the same workload.

Installing the rectangular DIA-SOx® R-type scrubbing tower also allows the effective use of limited space and minimizes the loss of container capacity.

In addition to these first and second units, the DIA-SOx R-type scrubbers have been ordered by many ship owners and shipyards.

The Mitsubishi Heavy Industries Group will continue its efforts to contribute to the reduction of environmental impact in marine commerce.



Scrubber installation (conceptual drawing)

DIA-SOx® R-type marine SOx scrubber
(flue gas desulfurization system)

Marine Machinery Seminar holded by Mitsubishi Heavy Industries Group

With the cooperation of other companies in the Mitsubishi Heavy Industries Group, MHI-MME hosts marine machinery seminars in Athens, Greece, on a periodic basis.

The last seminar, held in July 2019, introduced environmentally friendly products, such as SOx scrubbers. In light of the tighter environmental regulations that were going to go into effect in less than six months, a presentation was also given on the outlook toward zero emissions. MHI-MME will continue to host seminars that will not only showcase our latest technologies and products but also provide details on initiatives that leverage the comprehensive capabilities of the MHI Group toward the goal of zero emissions.

Introducing Our After-Sales Services

MHI-MME provides after-sales services to meet the needs of our customers and society.

Boiler Modifications

As a solution for meeting the tightening of SOx regulations in January 2020, we performed large numbers of boiler modifications to allow the use of low-sulfur fuel oil In 2019, MHI-MME completed modification work on the main boilers of around 50 LNG-fueled ships. Because there are many different compliant fuel oils on the market, such as MGO, ULSHFO, and VLSFO, our service personnel will continue to perform modifications and adjustments according to the characteristics of the fuel, and enable stable boiler operation to be maintained.

The YK Sovereign owned by SK Shipping, which modified its main boiler

5,000-TEU container ship managed by MSC (Cyprus) on which a propeller retrofit was performed

Propeller Retrofitting

As a measure to combat increasing fuel oil costs while also helping to reduce CO_2 emissions, MHI-MME is proposing the replacement of propellers with those that are suited to slow steaming. We have an extensive track record in propeller retrofitting, which delivers proven fuel efficiency improvements.

Extending the Useful Life of Boilers and Turbines

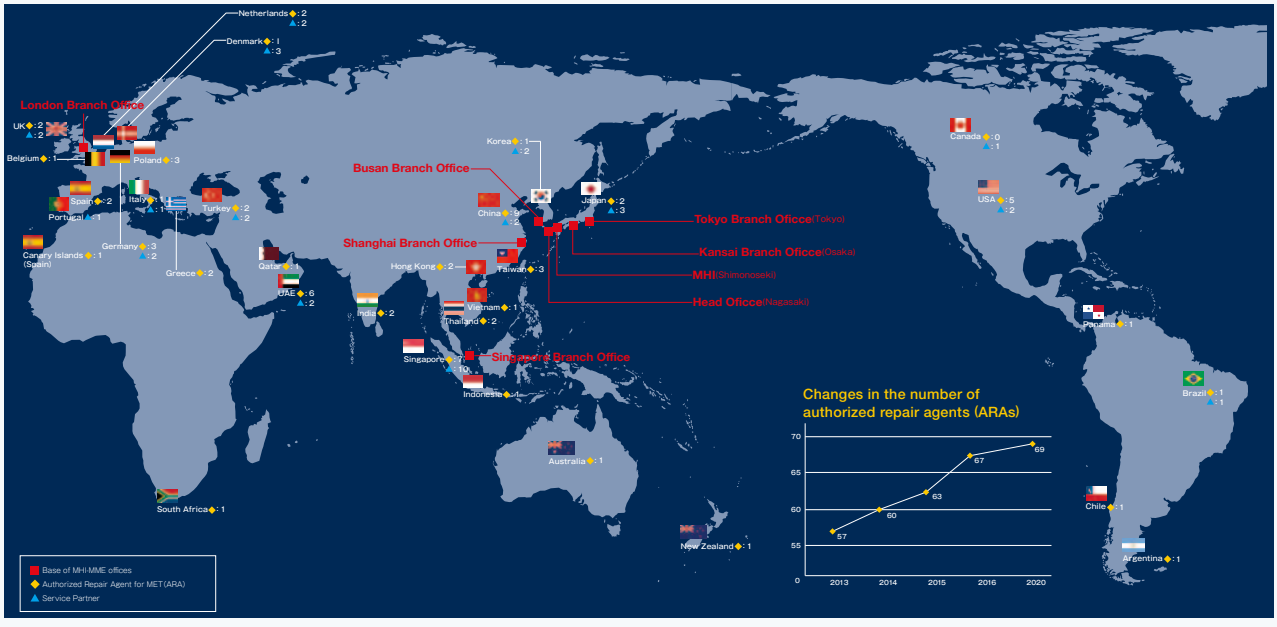
Many LNG-fueled ships driven by steam turbines are relatively older. MHI-MME performs work that can extend the useful life of the boilers and turbines installed on such ships. We propose appropriate work according to the age of the ship and the condition of its equipment, and are contributing to the greater demand for the realization of energy transport with low environmental impact.

Modification Projects for LNG-fueled ships

For projects to modify LNG-fueled FSU and FSRU, MHI-MME offers a broad range of support, such as equipment modification and supply, which includes engineering that take into account the improvement of safety and efficiency.

After-Sales Services Network (https://www.mhi-mme.com/services/index.html)

MHI-MME has in place a structure for providing swift and appropriate services around the world. We have an established global network of roughly 70 authorized repair agents for MET Turbochargers. Meanwhile, for steering gears, we have a hydraulic pump maintenance base in Singapore in addition to Japan.
Furthermore, MHI-MME has employees stationed in London, Singapore, Shanghai, and Busan to handle all of our customers' needs.
(https://www.mhi-mme.com/company/location/index.html)



STRUCTURAL REFORM

Reorganization

On January 1, 2020, MHI-MME implemented reorganization as follows.

(1) Marine Technology Integration & Steering has been established as a new office directly under the President & CEO.

(2) The Turbocharger Planning & Production Control Section and Turbocharger Shop have been added to the Turbocharger Division.

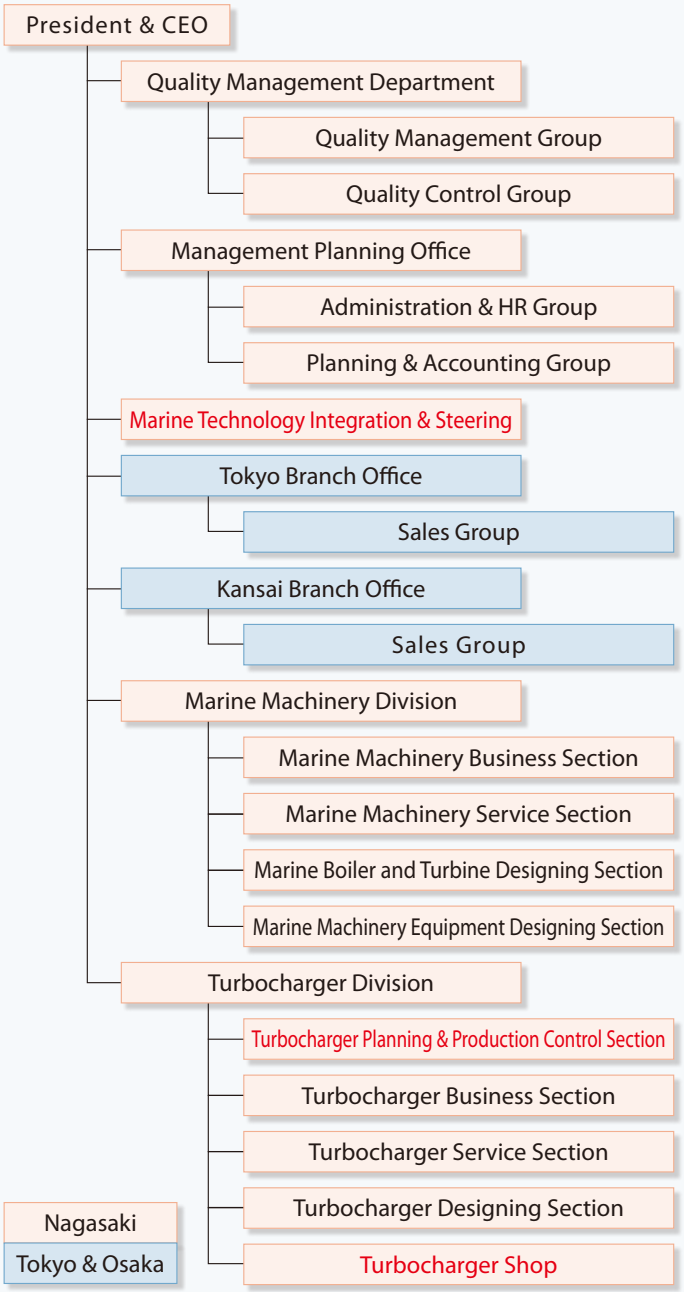
Under a two-division structure (Marine Machinery Division and Turbocharger Division), MHI-MME has been pursuing the efficiency of operations by implementing the integrated management of sales, design, and services operations at each division.

Meanwhile, we expect to see major changes to market structures due to innovations that facilitate compliance with tighter environmental regulations in the shipping, shipbuilding, and marine industries. For the sustainable growth of our business, there is a pressing need for the fundamental reform of our products, technologies, services, and business models.

In response, we have established a strategy unit that will take a long-term, macroscopic view and be responsible for the reform of product / technology development and business models.

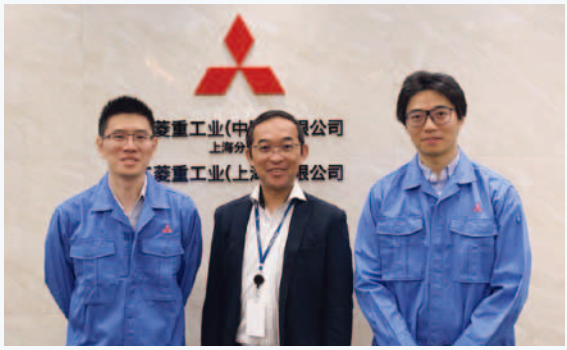
As for functions that are common to the Marine Machinery and Turbocharger divisions, intellectual property strategy, procurement control and IT/ office automation will be consolidated to strengthen centralized supervisory capabilities in terms of both technology and business.

We will aim to extend the reach of our activities as well as make further response to the needs of our customers.



SHANGHAI NEW FACE

News from MHI-MME Offices Abroad: Shanghai Branch Shigeki Wakasugi, General Manager



My name is Shigeki Wakasugi. I assumed the post of General Manager at Mitsubishi Heavy Industries, (Shanghai) Co., Ltd. in October of last year. Before coming to Shanghai, I handled marine machinery sales in Japan for many years. Shanghai is a strategically important city in China, which is a shipbuilding superpower. I intend to do everything I can to provide products and services with superior quality, technology and price to satisfy our customers in China, as I work together with everyone at this office.

Message from the President & CEO

Looking Beyond the Stricter SOx Emission Regulation Beginning in 2020

The market environment surrounding the maritime and shipbuilding industries seems to have bottomed out, but challenging conditions continue. The market remains flat, and there is no visible indication of recovery. Maritime freight movement is increasing from a macro perspective, and I believe many are hoping for a gradual shift toward recovery.

This is the year of the Tokyo Olympics and excitement is gradually building in Japan. However, the spread of the novel coronavirus (COVID-19) in China is having a profound effect on the economy. We anticipate a particularly major impact on the shipbuilding and maritime industries in which we are involved.

With the year 2020 upon us, the IMO's stricter environmental control measure – the Tier III SOx regulations – have gone into effect. There may not be any more imminent changes for the time being for NOx or SOx, but I think we will need to pay close attention to the quality stability and price movement of low-sulfur fuel.

Stricter Energy Efficiency Design Index (EEDI) regulations, which aim to reduce CO_2 emissions, greenhouse gas emission regulations, and further efforts toward zero emissions are following. Industries are scrambling in preparation for the application of countermeasure technologies, such as fuel conversion and environmental protection as well as the installation of additional machinery and equipment. Furthermore, new technologies and ideas are being proposed, and the consideration of future propulsion systems is beginning. As such, we believe that the shipping, shipbuilding, and marine machinery industries are entering an important period for making key, game-changing decisions that will decide their future.

As we enter this critical phase, we have reorganized our company by establishing Marine Technology Integration & Steering, effective January 1. We had been operating in a Marine Machinery Division and Turbocharger Division two-division structure. However, in preparation for the syncronizing of these divisions and future changes in the paradigm, we will be working to deploy more environmentally friendly technologies in the shipping and shipbuilding industries. They include the supply chain technologies, both inside and outside the Mitsubishi Heavy Industries Group, for decarbonized fuel, and toward the creation of a future low-carbon or decarbonized society. We will also work on downsizing to enable marine applications as well as simplified handling. Furthermore, we will make fundamental changes to designs, including digitalization, to streamline operations and incorporate new production methods.

Additionally, changes were implemented within the structure of the MHI Group, effective January 1, 2020. The manufacturing function for MET Turbochargers was transferred from Mitsubishi Hitachi Power Systems to MHI-MME. We will now have an integrated chain of operations for the MET Turbocharger business, from development and design to sales, quality management, manufacturing and services. Through this structural reform, we will enhance productivity and manage our business with greater flexibility so as to meet the rapidly changing needs of the market.

We will remain true to our original intent and continue to boldly take on challenges toward reform. Through the provision of high-quality products and services, we will continue to be a company that is needed and trusted by customers. We look forward to your continued support.

Mitsubishi Heavy Industries Marine Machinery & Equipment
President & CEO
Toshiaki Hori

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