

Unrivaled on the World's Seas

# PROJECT MMEET NEWS

Mitsubishi Marine Energy & Environment Technical Solution-System

16

16th Issue  
October 2019

## Compliance with the 2020 SOx Regulations

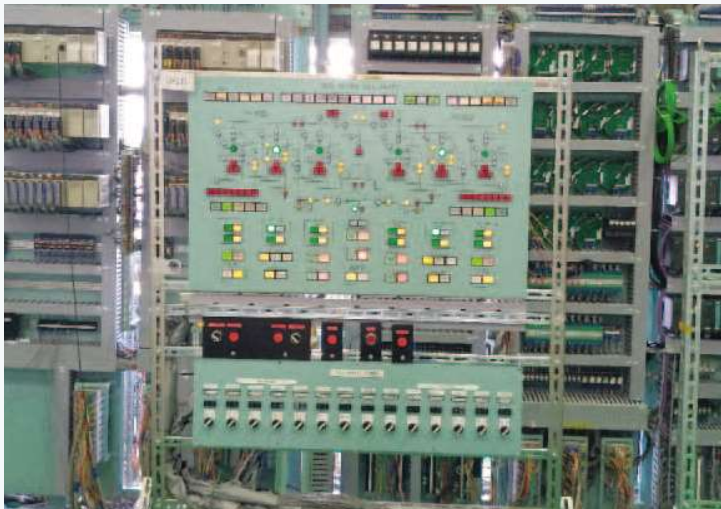
Boiler Modifications in Preparation for 2020 SOx Regulations  
Retractable Fin stabilizers Developing a New Control System

- Consecutive Regas Boiler Shipments for FSRU
- Introduction to Propeller Retrofitting
- Delivery of the First Electric Deck Crane
- Launch of monitoring through Data Logging Advance
- CIMAC Congress 2019
- Presentation at Ship Machinery and Equipment Seminar Hong Kong
- Exhibiting at Bari-Ship 2019
- MET Turbocharger Training Held for Authorized Repair Agents
- News from MHI-MME Offices Abroad: Shanghai Branch

# Proposed Boiler Modifications in Preparation for 2020 SOx Regulations

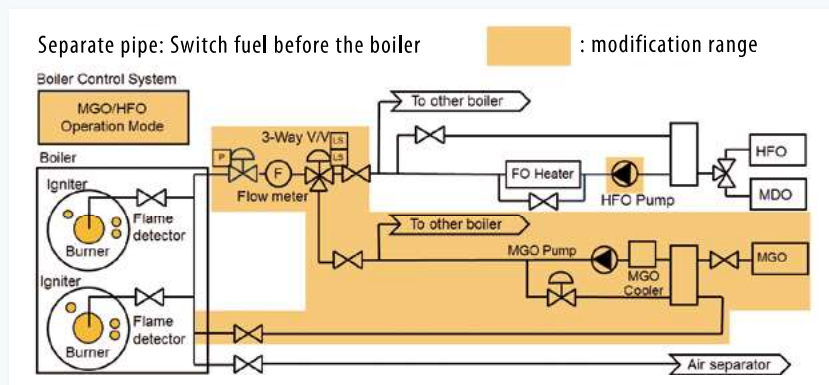
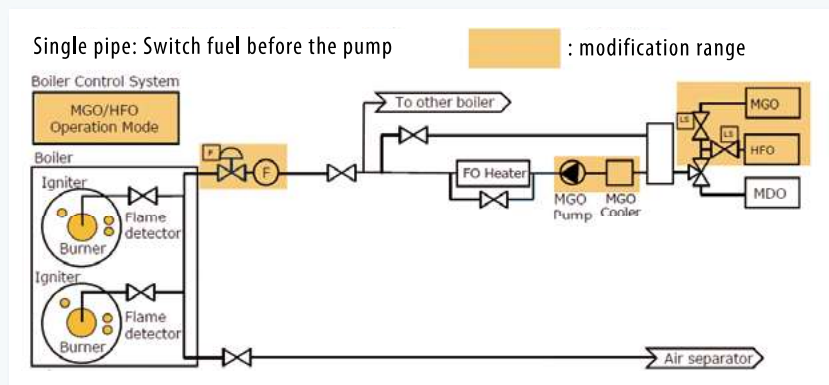
The tightened IMO regulations on SOx emissions set to go into effect in January 2020 are now nearly upon us. SOx regulations can be dealt with mainly in three ways: (1) Use low-sulphur fuel oil, (2) Install SOx scrubbers, and (3) Use LNG fuel.

For the main boilers equipped on LNG carriers, modifications to accommodate low-sulphur fuel oil are often selected, and this modification was done on the main boilers of 28 carriers in 2018 by us.



Panel replacement accompanying the use of low-Sulphur fuel oil

In 2019, MHI-MME are also working on this, for further 50 carriers set before the SOx regulations take effect. Modifications had been completed on 21 carriers as of July and MHI-MME will continue working diligently on these modifications.



## Consecutive Regas Boiler Shipments for FSRU

MHI-MME has made consecutive deliveries of regas boilers to Hudong-Zhonghua Shipbuilding, a subsidiary of CSSC in China, for floating storage and regasification unit (FSRU) will be delivered to Dynagas of Greece and to Hyundai Heavy Industries of South Korea for FSRU to Botas of Turkey.

FSRU is a floating offshore facility that stores liquefied natural gas then regasifies and delivers it through onshore pipelines. Regas boiler plays an important role by supplying the steam which is the heat source needed for regasification.

The recent delivery of regas boiler to Hudong-Zhonghua Shipbuilding was two “MAC-90BF” (evaporation amount: 90 t/h) gas/oil dual fuel MAC-type auxiliary boilers. Specifications were in line with the typical European NOx regulatory index of 200 mg/Nm<sup>3</sup> or less, which included enhanced boiler efficiency through re-use of heat from boiler exhaust gas.

Also, the regas boilers delivered to Hyundai Heavy Industries were two “MAC-50SF” (evaporation amount: 50 t/h) boilers equipped with the alternative function of a gas combustion unit (GCU) that processes evaporating gas arising from gas-free operation and boil-off gas (BOG) generated within the LNG tank.

MHI-MME maintains an extremely large share of this market, with regas boilers delivered for FSRUs built consecutively in South Korean shipyards by Norwegian ship owner Hoegh besides of the boilers mentioned above.

In addition to the high level of reliability our dual fuel boilers have achieved based on this extensive track record which is a total of at least 400 units including the main propulsion units used on LNG carriers.

MHI-MME has also received tremendous response from our customers for putting products on the market which satisfy their needs such as the aforementioned higher efficiency, compatibility with exhaust gas regulations, GCU alternative function, and more.



Regas boilers waiting to be shipped



A regas boiler being loaded onto a ship

# Introduction to Propeller Retrofitting

## - Reducing fuel consumption and greenhouse gas emissions, eliminate of engine torque rich condition-



Installing retrofit propellers

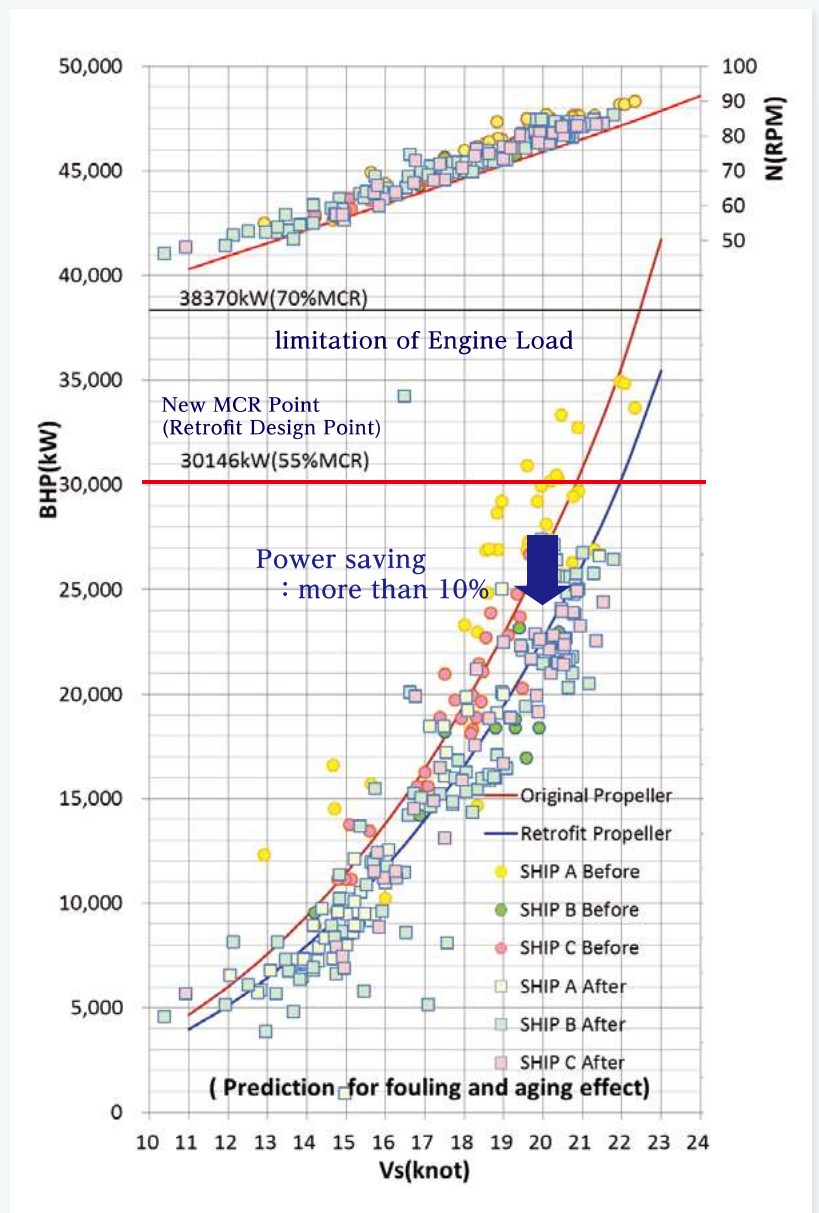
For example, MHI-MME provides many retrofit propellers to MSC Shipmanagement (Cyprus), which is actively engaged in increasing environmental measures and improving its managed fleet fuel efficiency.

Retrofitting those redesigned optimal propellers can be expected to yield fuel efficiency improvements of 5 to 10% for container vessels equipped with high-output engines in particular and also be improved by 2 to 5% for ships other than container ships, such as LNG carriers, oil tankers, product tankers and bulk carriers.

In 1904 MHI-MME became the first manufacturer in Japan to produce and sell propellers, and it has a technical background of ship design, construction, and research within the MHI Group companies.

During recent years, MHI-MME has not only designed high-efficiency propellers, but also proposed retrofit propellers for ships in service.

Since the beginning of the propeller retrofit business activities, MHI-MME has already supplied more than 60 sets of propellers for retrofit since 2013, spreading the adoption range to containerships, LNG carriers and crude oil tankers.

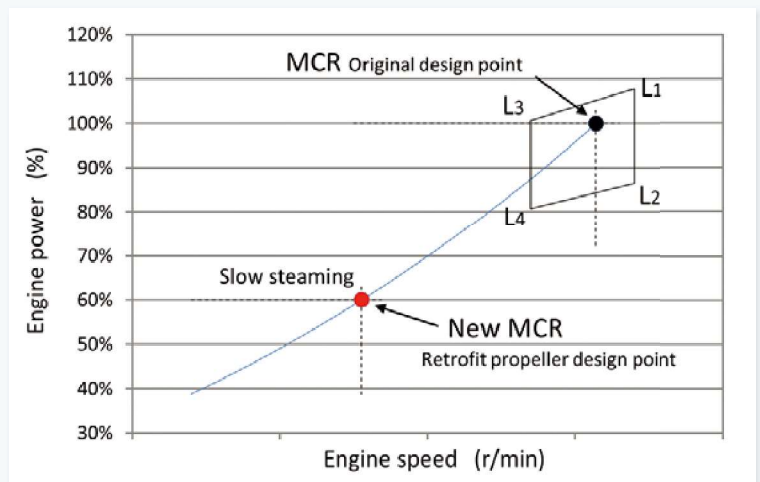


Effects of retrofit propellers on actual ships

## PROPELLER RETROFIT

The largest benefit of retrofit propellers is reduced energy consumption. For ships that reduce engine output and travel at low speeds (slow steaming) for more fuel efficiency, MHI-MME sets a new maximum for the engine usage range according to low-load operation, and re-design an optimum propeller to match that maximum load.

In addition to the above fuel efficiency improvements, MHI-MME also implements performance assessments for in-service ships, based on technical background, diagnoses the condition of the torque rich of the main engine and incorporates the countermeasures into the propeller design. This also helps to reduce maintenance costs for the main engine.



Changing the propeller design point  
Often set at maximum 60% MCR for container ships

MHI-MME also purchases the original propellers to reduce the initial investment cost of propeller retrofitting. It depends on the type and size of the ship, but we estimate investment payback period for ship owners to generally be under one year for container ships, and under two years for other types of ships. It takes around four to six days to replace the propeller, from removing the original propeller to inspecting and then installing the retrofit propeller. MHI-MME usually completes this during the period the ship is in repair yard.



Completion inspection at a Changzhou Zhonghai plant



An unloaded original propeller

Propellers are manufactured by our partner company Changzhou Zhonghai in China.

When ships are docked in shipyards in China for replacement work to be done, Changzhou Zhonghai can also purchase the original propeller. These purchases have also been made at docks in the Middle East.

Finally, fuel efficiency improvements—in other words reductions in fuel consumption—not only bring about economic benefits for ship owners, but also directly contribute to CO<sub>2</sub> and other GHG (greenhouse gas) reductions which helps reduce their environmental footprint. For these reasons, MHI-MME is proposing a propeller retrofit.

# Retractable Fin stabilizers Developing a New Control System

MHI-MME is currently developing a new control system for retractable fin stabilizers and is now working on the final testing with the aim of releasing them to the market next fiscal year.

The two main improvements over the current model are as follows.

- Better visibility and operability with an LCD touch screen as the operating panel
- Data storage function configured as an option, with the possibility of future big data utilization

One of the benefits of the new system is that the LCD touch screen will enable end users to check various data (such as time records of alarm activations) that they previously could not access, thus making it easier to investigate the cause whenever abnormalities arise.

The new control system contributes benefit not only for ship operation but also for shipbuilding.

Communication between control panels will change to digital signals which will greatly reduce the number of electric wires between control panels compared to former analog signals communication. This will reduce workloads at shipyards in cosequence where rigging work is performed.

MHI-MME will continue striving to improve customer satisfaction by understanding the needs of our customers and addressing them with our products.



The operating panel for the new control system



The operating panel for the existing control system

**MET TRAINING COURSE**

# MET Turbocharger Training Held for Authorized Repair Agents

There are 71 authorized repair agents (ARAs) for MET turbochargers in countries throughout the world, who provide timely technical services for in-service ships. To improve knowledge and workmanship while also updating ARAs on the latest information on MET turbochargers, MHI-MME gathers ARA engineers twice each year for one week session consisting of classroom study and shop training with actual machines in Nagasaki, Japan.

The sessions held in May and September this year had many engineers in attendance from over 30 companies, as MHI-MME sought to further improve their knowledge base and workmanship while facilitating mutual interaction.

MHI-MME intends to further strengthen and expand connections with ARAs while continuing to expand our global after-sales service network.



## Exhibition

# Exhibiting at Bari-Ship 2019

MHI-MME exhibited at Bari-Ship 2019, held from May 23 (Thu) to 25 (Sat) in the city of Imabari in Ehime Prefecture, Japan.

Imabari is one of the world’s largest clusters of maritime-related industries base, and the sixth exhibition event held there this year attended from a record 350 companies which is the highest event. MHI-MME is also able to greet many attendees at the booth.

Our seminar on marine energy-saving solutions on the first day of the exhibition was attended by around 80 guests from a wide range of industries including shipping, shipbuilding, and trading companies, and our new turbocharger was introduced. The seminar room was fully occupied and our presentation called attention of audience with many questions lasting even after the seminar. The third day was open to the general public, and there were many attendees with their families. MHI-MME will continue to exhibit at Bari-Ship in the future, and use the exhibition to deepen connections with customers.



The MHI-MME booth



At the seminar

## CIMAC Congress 2019

CIMAC Congress 2019 was held from June 10 through 14 in Vancouver, Canada.

CIMAC (The International Council on Combustion Engines) is a convention that gathers global internal combustion engine R&D organizations, manufacturers, and users once every three years. There were 285 papers presented overall at the congress this year, and MHI-MME presented two papers on June 12 about the latest development status of the new model MET-MBII and MET-ER turbocharger series that we are developing in-house.

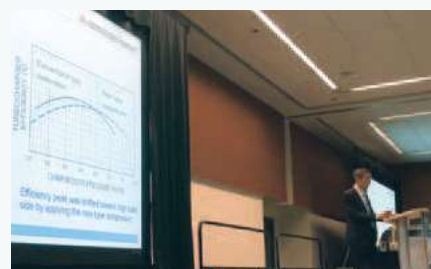
The congress this year had many presentations related to environmental action, with an increasing number of them related to needs for carbon neutral that are expected in the future.

Both of our new series of turbocharger meet the environmental needs by being compact size with high efficiency, and we engaged in lively conversations with attendees both at our presentations and at our exhibit booth.

The next CIMAC congress will be held in Pusan, South Korea in 2022. MHI-MME will be actively developing new technologies to meet market needs.



Exhibit booth



Paper presentation

## Presentation at Ship Machinery and Equipment Seminar Hong Kong

On July 9, 2019 MHI-MME attended the Ship Machinery and Equipment Seminar held by the Japan Ship Machinery and Equipment Association (JSMEA) in Hong Kong, where our new turbocharger models were introduced. With around 20 JSMEA member companies introducing their new technologies and products, and upwards of 100 attendees—mainly ship owners—in attendance, the seminar ended up being a great success. Hong Kong ship owners had great things to say about the high-quality Japanese technologies and products, which drew significant interest because of their potential for efficiency improvements that could yield environmental benefits and support expanded operations.

It was for the first time in four years that JSMEA held a seminar in Hong Kong. Participating companies then held a raffle at the reception following the seminar, and the atmosphere was lively.

MHI-MME products are widely used ships all over the world, and the ship owners, operators, and managers who use these products are spread out everywhere.

MHI-MME will continue to actively participate in seminars and exhibitions so that our information continues to reach our existing and potential users.

The new models of turbochargers will be also presented at the JSMEA ship industry seminar in Istanbul, Turkey on September 25.



At the seminar



The raffle at the reception



DECK CRANE FIRST DELIVERY

# Delivery of the First Electric Deck Crane

Mitsubishi Heavy Industries Machinery Systems, Ltd. (MHI-MS) has recently developed an electric deck crane, and the first version which was manufactured by a licensee in China (Jiangsu Masada Heavy Industries Co., Ltd.) was delivered in August 2019 to Jiangsu New Era Shipbuilding in China. This product was equipped on a 64,000dwt bulk carrier for Cypriot ship owner Lemissoler.



The specifications are net load of 36 tons, and maximum cargo radius of 30M.

One of its main features is its power supply regeneration specifications that effectively use power generated while lowering, offering a maximum of about a 40% reduction in power consumption for deck cranes.

In addition to a mechanical layout that is highly maintenance-friendly it was also made to be highly user friendly, including a touch sensor display equipped in the operator's cabin and a data logging function that makes it easy to gather crane operation data, and to learn the status of the crane whenever problems occur. MHI-MS will continue offering products and services developed from the perspective of the user.

DECK CRANE FIRST DELIVERY

# Launch of monitoring through Data Logging Advance

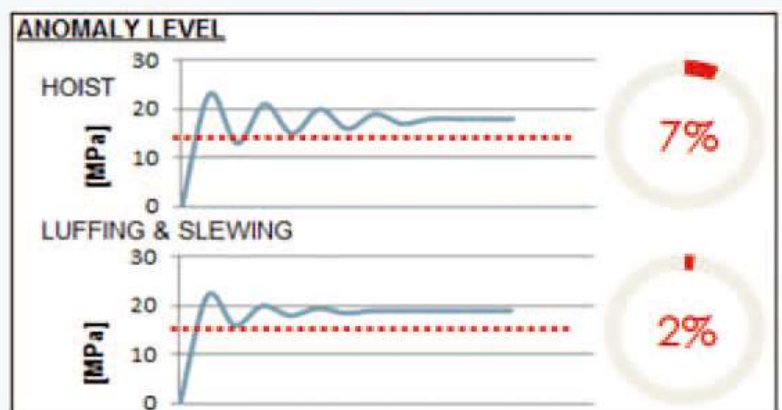
The number of ships equipped with Data Logging Advance (DLA) has now reached 25 carriers. DLA expands on the data logging function that is equipped standard on Mitsubishi electro-hydraulic deck cranes, and it is capable of monitoring hydraulic pressure waveforms and operation speed with "self-diagnostic mode," while also making it possible to record data over extended periods of time.

Equipping DLA makes it easy for crew to obtain data on hydraulic performance, allowing the causes to be discovered quickly whenever trouble arises and facilitating faster recovery. "Self-diagnostic mode" also conducts regular testing, which has made it possible to detect abnormalities such as drops in hydraulic performance at an early stage.

MHI-MS also aims to establish predictive and service lifetime diagnostic technologies which have long been a challenge, by advancing comprehensive analyses on time spent in the actions of hoisting, luffing, and slewing, operating time in both hook mode and grab mode, and data on alarm activation history and hydraulic performance.



Sequencer (controller) within the control panel



Operation data from data logging (Example) Hydraulic performance graph



## News from MHI-MME Offices Abroad General Manager Du Jianting



My name is Du Jianting from the Marine Group at Mitsubishi Heavy Industries, (Shanghai) Co., Ltd. (hereinafter “MHI Shanghai”). I am currently working hard every day with three other team members to support the sales of Mitsubishi marine products in the Chinese market.

I was appointed the head of the marine business in China in July 2016. Ever since, I have been putting my strength to use as a local resident to bridge the gaps that exist between Japan and China in terms of business practices and the way we think. At the same time, I have been focusing my efforts on further strengthening the relationships we share with Chinese ship owners, shipyards, design institutes, main engine

manufacturers, distributors and licensees that my predecessors established.

Going forward, I hope to continue working together with all parties involved to offer outstanding products, technologies and services at reasonable prices to Chinese customers in the marine business. It is my goal to grow the Mitsubishi marine business in China even further without being affected by a slowdown of manufacturing caused by international trade conflicts and protectionist policies.

On a separate note, MHI Shanghai moved to the following address at the end of February 2019.

**Address: 22th Floor, Raffles City Tower-1, 1133 Lujiazui Ring Road, Shanghai 200120, China**

**TEL: +86 21-6841-3030 (reception)**



The building where MHI Shanghai is located is a commercial complex from the first to seventh floors. Visitors can find many restaurants here that are very popular among local residents. Additionally, within the complex's premise is a building belonging to the former elite St. Mary's Hall (a Christian all-girl's school), which opened in 1881. Eileen Chang is a celebrated modern female writer from Shanghai and is one of the students who graduated from the school. This is a great destination to experience a part of Shanghai's modern history and enjoy a savory gourmet experience.

If you ever visit Shanghai, please make sure to drop by. Lastly, Mr. Wakasugi will be replacing me as the new head starting October 1 and I hope continuous your support extended to him.

Thank you.

**TOP MESSAGE**

from the President and CEO

## Preparing for 2020 and Stricter SOx Emission Regulations

The market environment surrounding the maritime and shipbuilding industries appears to have bottomed out, but challenging conditions continue as the market remains flat with no visible indication of recovery.

Furthermore, there seems to be no resolution in sight for the trade friction between China and the U.S. as the conflict escalates even further. Issues are also rising in the Strait of Hormuz, raising uncertainties for the future of crude oil price trends. Nevertheless, global maritime freight movements are growing from a macro perspective, and I believe many are expecting a gradual shift toward recovery.

Amid such circumstances, we are quickly approaching 2020, when the new SOx regulations by the International Maritime Organization (IMO) will take effect as a measure to strengthen environmental regulations. This will be followed by stricter Energy Efficiency Design Index (EEDI) regulations—which aim to reduce CO<sub>2</sub> emissions—as well as tighter GHG emission regulations and further efforts to achieve zero emission. Rapid preparations in the industries are also underway to apply countermeasure technologies, such as fuel conversion and installation of additional machinery and equipment. In addition, new technologies and ideas are being proposed and discussions have started on establishing systems that can be used to promote these measures. We believe that the maritime, shipbuilding and marine machinery industries are facing an important time for deliberations that will determine the future direction.

On a different note, as part of our movement to congregate Mitsubishi Heavy Industries plants, we will relocate the MET Turbocharger production plant from Saiwai-machi to the Akunoura-machi, both in Nagasaki city. Once constructions for the move are completed on January 1, 2020, structural changes will take place within the Mitsubishi Heavy Industries Group to shift the manufacturing functions for MET Turbochargers from Mitsubishi Hitachi Power Systems to us.

Once these changes take place, we will be in possession of an integrated chain of operations for the MET Turbocharger business, including development, design, sales, quality management, manufacturing and services. This will allow us to enhance productivity and conduct business management with greater mobility to meet the rapidly changing needs of the market environment.

We are also engaged in initiatives for the future and have begun discussing how to take all the various product and research development technologies possessed by the Mitsubishi Heavy Industries Group and adapt them to marine technology. This will aid our efforts toward fuel conversion, environmental technologies and technologies to achieve zero GHG emissions in the future.

In Japan, we have moved into a new era called “Reiwa.” MHI-MME will make a fresh start while remaining true to our origins, continuing to be a company that is needed and trusted by our customers by offering excellent products and services. We look forward to your further patronage.



President &amp; CEO

**Toshiaki Hori**

