Environmental Preservation

Efforts to Reduce the Environmental Impact of Our Products

Action Consecutive Conclusion of Neo Series Bulk Carrier

Now that CO_2 emissions volume restrictions have been placed on international marine shipping, reducing the volume of greenhouse gases (GHG) emitted by vessels has become a pressing issue. Amid such conditions, MES developed and launched the neo series of environment-friendly, fuel efficient bulk carriers. The first ship in the series, the 66,000 ton class CLIPPER EXCALIBUR (neo66BC), was completed in November 2013. Our second ship in the series, the 56,000 ton LOCH SHUNA (neo56BC), was completed in January 2014. Since then, we have continued to roll ships out of our shipyard, completing 7 neo66BC class and 9 neo56BC class carriers as of the end of March 2015. A 60,000 ton class carrier (neo60BC) is scheduled for completion in fiscal 2015.

We completed development and received orders for our latest vessel, an 182,000 ton class carrier (neo182BC), which is scheduled to be completed in 2017. We will continue taking and fulfilling orders for our neo series of vessels as we look to contribute to limiting GHG emissions in the international marine shipping industry.

neo56BC

neo66BC

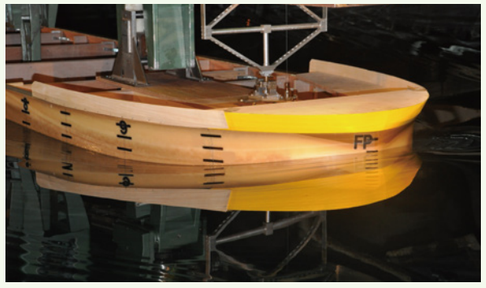
Action Very Large Crude Carriers (VLCC) Development & Design

We will use the neo series technology cultivated during our development of bulk carriers to develop and launch an environment-friendly VLCC supertanker.

While applying the elemental technology in development since 2008 to build a carrier that achieves large-volume CO_2 emission reductions, we implemented a full-scale reevaluation of the conventional VLCC vessels, including specifications, types of ships, propellers, energy-conserving equipment, and main engines. These efforts will ensure compliance with CO_2 emissions volume restrictions.

The designs we are developing will comply not only with emissions restrictions on CO_2, but also with emissions restrictions on toxic substances such as nitrogen oxide (NO_X) and sulfur oxide (SO_X). We are aiming for comprehensive improvements to our environment-friendly and fuel economy performance.

VLCC



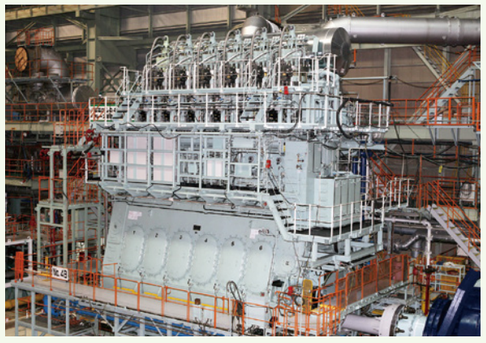
Water tank tests using a model at Akishima Laboratories (Mitsui Zosen) Inc.

Action Environment-friendly Engine System

In June 2014, we received our first order for the ME-GI, an electronically-controlled gas injection diesel engine fueled by liquefied natural gas (LNG). The ME-GI is a large-scale two-stroke, low-speed diesel engine that achieves high heat efficiency. It is also a dual-fuel engine capable of running on both LNG and heavy oil. The gas combustion systems used in small to medium-sized engines present problems such as knocking and misfiring due to output limitations and load variations during operation. For these reasons, the use of gas combustion engines in propeller-driven systems, which are used primarily in international carriers and most efficiently use engine output, has proven difficult. The ME-GI engine is the solution to this problem.

The use of LNG represents a significant reduction in SO_X and CO_2 emissions and it is expected that NO_X and particulate matter (PM) emissions will also be reduced. This makes LNG an environment-friendly fuel that also has become an economically superior option due to shale gas development. These factors have turned the world's attention to LNG as a ship fuel to replace heavy oil as the mainstay fuel in the shipping industry.

In December, we received the world's first order for an electronically-controlled gas injection diesel engine fueled using ethane (ME-GI Ethane). The ME-GI Ethane is an engine capable of running on both ethane and heavy oil. Similar to LNG, ethane is gaining much attention as an environment-friendly ship fuel.

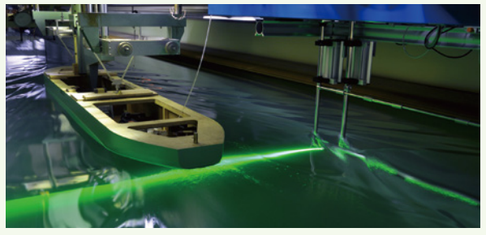

Electronically-controlled gas injection diesel engine (ME-GI)

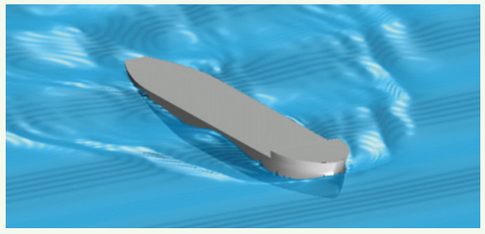
Action Applying the Latest in Performance Development Techniques

For the neo series, we combined experimental fluid dynamics (EFD) and computational fluid dynamics (CFD) to create a new performance development technique for use during design and manufacturing. Our goal was to improve not only propulsion performance and fuel economy in order to reduce CO_2 emissions and other environment impact factors, but also to achieve highly value-added product development by reducing vibration and noise.

Using a 3D particle image velocimetry (PIV) system, which represents the latest in EFD technology, we measured complex stern flow field during propeller operation and conducted comparative analyses using CFD data. This enabled our engineers to optimize shape designs for the vessel, propellers, and energy-saving components, and improve overall performance.

We also applied CFD technology toward improving performance in open water. We use performance development techniques during the engineering and design phase to improve overall environmental performance in operating conditions such as high winds and high seas.


Measurement using PIV system at Akishima Laboratories (Mitsui Zosen) Inc.

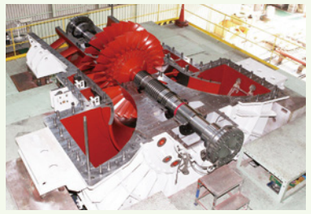

CFD analysis results for area surrounding vessel operating in 6m-high waves

Environmental Preservation

Contributing Environmental Preservation through Technology, Products and Business

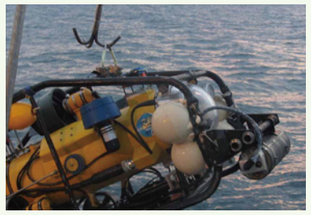
1 Blast Furnace Blower, Top Pressure Recovery Turbine

Japan's steel mills boast the lowest environmental footprints in the world. MES contributes to these achievements by providing highly efficient, highly reliable blast furnace blowers and top pressure recovery turbines (TRT). A blast furnace blower is a device that feeds large volumes of compressed air necessary for the blast furnace reaction. The TRT is an energy conservation device that uses the large volumes of gas produced as a result of the blast furnace reaction to generate electricity. Typically, a blast furnace producing three million tons/year of rough steel uses approximately 40MW of electricity (equivalent to power for 8,000 residential homes) for the blast furnace blower. A TRT can recover nearly half of that electricity, approximately 20MW. Recent efficiency improvements have led to efficiency levels near 90%, the world's highest efficiency for both blast furnace blowers and TRT. We also have participated in a project to spread TRT to India, a project sponsored by the Ministry of Economy, Trade and Industry and are proactively involved in overseas projects as we continue to contribute to reducing the environmental footprint of the world's steel mills.


Blast furnace blower

2 Development of Robot to Measure Ocean Floor Radiation

The accident at Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Plant released radioactive materials into the ocean. Identifying the distribution of those radioactive materials and their chronological movement is extremely important to prevent the spread of environmental pollution and to assist the recovery of the fishery industry.
MES contracted the research and development of a remotely operated vehicle as part of the Development of Systems and Technology for Advanced Measurement and Analysis, which is a project of Japan Science and Technology Agency (JST). This was a joint project with the National Maritime Research Institute, University of Tokyo and Kyushu Institute of Technology. The research and development activities aim to identify the distribution, deposition, and movement of radioactive materials and to clarify the mechanisms of how hot spots are created. Development is being conducted over the two and a half year period between October 2013 and March 2016. Robots will include such features as ocean-floor deposit collection capabilities, radiation measurement function using radiation detectors. We will conduct open water testing in 2015 with commercialization scheduled for 2016.


Radiation measurement system mounted on a company unit for testing

3 Tainai Wind Power Generator Construction

We delivered a 20,000 kW wind power system consisting of 10 2 MW wind power generators to Tainai, Niigata. Every aspect of this construction, from design to the transport and installation of large-scale parts for the wind power generators was approached with a focus on environment conservation. The installation location faces Sea of Japan, which is susceptible to particularly strong winds during the winter. Electricity produced by this facility is projected to be enough to power 14,000 residential homes. MES has been involved in the construction of eight wind power facilities throughout Japan. Looking ahead to increasing demand for environment-friendly renewable energy, we are expanding our involvement in wind power projects beyond land projects to include ocean-based projects as well.


Tainai wind power plant (at completion)

4 Floating Wind Power Facility Project

The 2 MW wind power facility off the coast of Fukushima completed in summer 2013 continues to operate solidly today. In December 2015, the facility recorded an operating rate above 40%, confirming the high efficiency of floating wind power facilities. Following the validation project conducted in Fukushima last fiscal year, we were selected by the New Energy and Industrial Technology Development Organization (NEDO) to participate in a new large-scale floating power facility validation project. This project is aiming to achieve a high rate of economic viability. MES is planning a validation project combining a new model light-weight floating base with a large-scale windmill.


2 MW down-wind floating ocean-based power facility – Fukushima Mirai

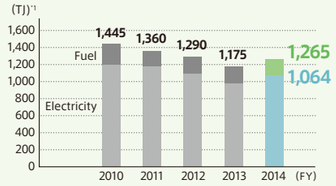
Our Approach for Promoting Environmental Preservation

As a manufacturer, MES places a particularly great importance on activities related to environmental preservation such as conserving resources and energy, reducing waste and properly managing chemical substances.

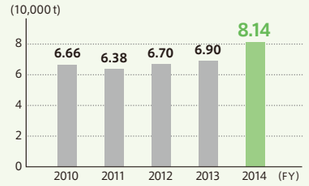
Our Efforts to Conserve Energy and Reduce CO_2 Emission

MES continues to promote a reduction in CO_2 emission through activities such as switching from heavy oil to natural gas in order to fuel of in-house power generation. The graph below shows MES total energy consumption, CO_2 emission, and purchased electricity from the past five years. Corresponding with an increase in the production of ships, which are our major products, total energy consumption for the 2014 fiscal year has increased by approximately 8% when compared to the previous year. The shutdown of nuclear power plants has caused the CO_2 emission coefficient of each power company to rise, causing CO_2 emission levels to increase by 18% since fiscal 2013.

Total Energy Consumption



CO_2 Emission *2



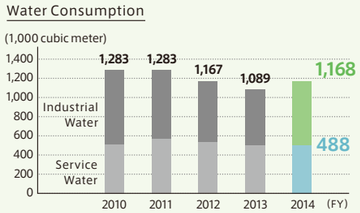
Purchased Electricity

*1 TJ: Tera Joule (=10^{12} J)
*2 CO_2 Emission calculations have been done in accordance with the Ministry of the Environment issued "Guidelines for Calculating Corporate Greenhouse Gases Emissions". Electric power CO_2 emission calculations use the adjusted CO_2 emission coefficient for designated electric enterprises published by the Ministry of the Environment.

Effective Use of Aquatic Resources

The graph on the right shows the MES five-year usage history of water. MES uses both service water (clean water) and industrial water (intermediate water). We worked to reserve water during fiscal 2014 but the amount of service and industrial water used increased by approximately 7% in comparison with the previous year.

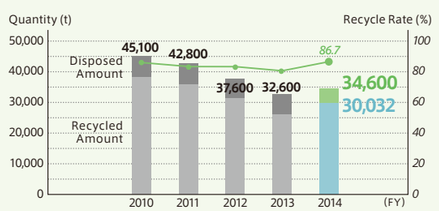
Water Consumption



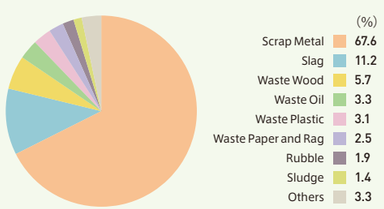
Our Approach for Reducing Waste

Unlawful dumping of industrial waste has become a major social problem. As a producer of industrial waste, MES is making every effort to fulfill our responsibilities in this area. One of these efforts involves our strict management of manifest. This is executed through periodical on-site inspections of disposal companies. Even more important is our effort to reduce the amount of waste itself. To realize this goal, MES works hard to recycle and thoroughly classify our wastes. Graphs below show the waste amount over the past five years, recycle rates and breakdown of waste amount for the 2014 fiscal year. We worked to restrain waste but fiscal 2014 saw a 6% increase of wastes in comparison with 2013. Meanwhile, the recycle rate increased by approximately 3% and became 87% because of the increased amount of metallic waste produced. We will continue our efforts to reduce waste and improve our recycle rate. In addition, we will continue to properly dispose of our waste through strict management.

Total Waste Amount and Recycle Rate



FY2014 Breakdown of Waste Amount

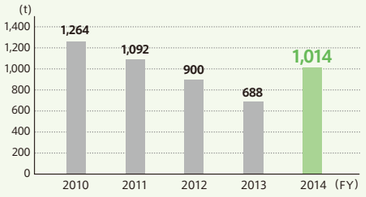


Environmental Preservation

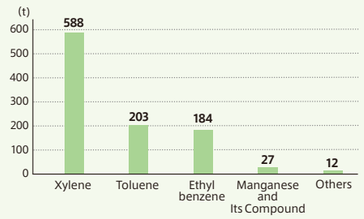
Proper Management of Specific Chemical Substances (PRTR Substances)

The majority of chemical substances used by MES are solvents and pigments used in paint. Changes in output and travel amount of specific chemical substances over the past five years are shown in the graph below. The other chart describes the breakdown of chemical substances used by MES for the 2014 fiscal year. In May of 2004, a partial revision of the Air Pollution Control Law was announced. By maintaining strict control of usage levels and by using low-emission airtight containers, MES will continue our efforts to conform to the objectives of this law.

Specified Chemical Substances
(amount of emissions + travel amount)



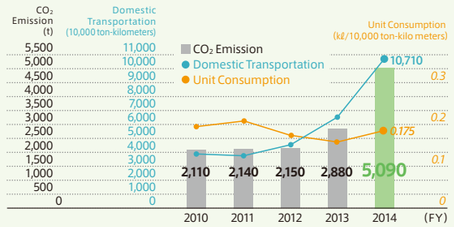
Breakdown of Specified Chemical Substances
(amount of emissions + travel amount) in FY2014



Promoting Environment-friendly Transportation

MES, as a cargo owner, is actively tackling the issue of energy conservation within the field of transportation as well. Specifically, we try to increase transportation loading rates while reducing the number of shipments by aggregating things such as shipping dates and destinations. We also are attempting to reduce the number of dedicated ships and expand the usage of consolidated shipments. All of these activities aim to reduce both CO_2 emission and energy consumption. The graph on the right shows MES CO_2 emission over the past five years as well as domestic transportation (ten thousand tons-kilo) and unit consumption (= amount of energy consumed for transportation per amount transported). When comparing 2013 and 2014 fiscal years, domestic transportation increased by approximately 60% while energy use per transportation increased by approximately 9%.

CO_2 Emission in Relation to Transportation Amount



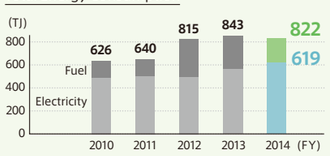
Subsidiary Environmental Management Data

The below chart shows environmental management data covering the past five years for domestic factories of MES subsidiaries within Japan.

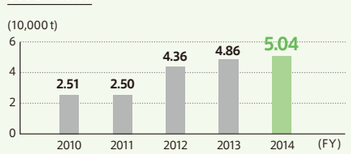
1 Conserved Energy and CO_2 Emission

The total amount of subsidiary energy consumption for the 2014 fiscal year decreased approximately 2% when compared with the 2013 fiscal year numbers. During the same timeframe, the amount of electricity purchased by subsidiaries increased approximately 4%. Energy consumption decreased but the closure of numerous nuclear power plants resulted in an increase in the emissions coefficient. As a result, the fiscal 2014 CO_2 emission increased by approximately 4% from the previous year.

Total Energy Consumption

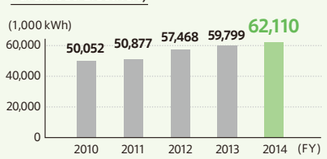


CO_2 Emission



CO_2 Emission calculations have been done in accordance with the Ministry of the Environment issued "Guidelines for Calculating Corporate Greenhouse Gases Emissions". Electric power CO_2 emission calculations use the adjusted CO_2 emission coefficient for designated Electric Enterprises published by the Ministry of the Environment.

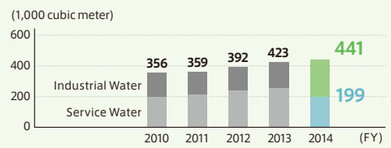
Purchased Electricity



Effective Use of Aquatic Resources

The water consumption started to increase in fiscal 2010. The water consumption went up by approximately 4% from last year.

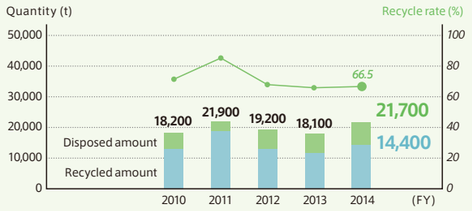
Water Consumption



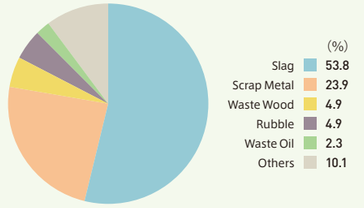
Waste-related Information

The amount of wastes for fiscal 2014 has increased by approximately 20% in comparison with fiscal 2013. Domestic subsidiaries include subsidiaries involved in iron casting, steel casting manufacturing, and ship repair operations that differ from operations conducted by MES. As such, the breakdown of waste amount by our subsidiaries also differed from MES. Approximately 54% of the waste produced by domestic subsidiaries consisted of slag (fiscal 2014). Due to the insufficient recycling of this slag, the recycle rate was 67%.

Total Waste Amount and Recycle Rate



FY2014 Breakdown of Waste Amount



Environmental Accounting

MES spent a total of 2,780 million yen on investment and cost related to environmental preservation. A detailed breakdown of these expenditures is shown below. Categories of environmental preservation costs are based on the "Environmental Conservation Cost Categories" within the "Environmental Accounting Guidelines 2005".
Among the above expenditures, a total amount of 200 million yen was spent on investment. This includes 150 million yen spent on global environmental conservation, 40 million yen spent on research and development, and 20 million yen spent on pollution prevention such as exhaust gas measures. In addition, total non-investment costs came to 2,570 million yen. This includes 2,160 million yen spent on the research and development of environment-friendly energy-saving products, 200 million yen allocated to resource circulation cost such as waste treatment, 80 million yen spent on global environmental conservation, and 70 million yen for administration cost.

Environmental Preservation Cost (= Sum of Investment and Cost : 2,777.0 million yen) (JPY million)

Categories Corresponding to Business Activities	Investment	Cost	Major Efforts and Effects
1. Business Area Cost			
(1) Pollution Prevention Cost	15.7	63.9	Exhaust gas measures, wastewater treatment, dust control and other pollution control
(2) Global Environmental Conservation Cost	145.3	81.9	Energy saving
(3) Resource Circulation Cost	—	198.4	Waste treatment
2. Upstream / Downstream Cost	—	0.4	Use of recycled paper as copy paper
3. Administration Cost	—	67.0	Environmental management system implementation, environmental reports and environmental education
4. Research & Development Cost	41.5	2,158.3	Development of various environment-friendly products
5. Social Activity Cost	—	2.4	Road cleaning, seminar sponsorship
6. Environmental Remediation Cost	—	2.2	Environmental Damage Countermeasure
Total	202.5	2,574.5	

Note: Classification of environmental preservation costs is based on the Ministry of the Environment issued "Environmental Accounting Guidelines 2005"