Environmental Preservation

Reducing annual CO_2 emissions by approx. 32,000 tons Start of operation of a mega-solar power plant on the premises of Oita Works

[Mega-solar power generation business at Oita Hiyoshibaru Mega-Solar Power Plant]

The joint project, which has been undertaken with ITOCHU Corporation and Kyudenko Corporation since 2014, has finally taken shape, with commercial operation starting in March 2016.
A large-scale solar power plant has begun to produce environmentally-friendly energy on a vast area of land on the premises of MES Oita Works.

Use of a vast area of land on the premises

Currently, fossil fuels constitute more than 80% of energy supplied in Japan, and most of these fuels are imported from other countries. The situation surrounding fossil fuels has been unstable, with the demand growing globally and the market prices becoming volatile. Fossil fuels also face environmental problems partly because they are sources of greenhouse gases. These circumstances have made it necessary to further promote the introduction of renewable energy—such as solar power, wind power, and biomass—to realize both a stable energy supply and lower the burden on the environment. To help spread the use of renewable energy, MES is taking part in an approximately 45-megawatt mega solar (large-scale solar power generation facility) project. It has also undertaken EPC (engineering, procurement, and construction) work.
This project was carried out on the site of the former Hiyoshibaru Country Club, which was located on the vast premises of Oita Works, to maximize the solar power generation capacity.

Before development

After development

Maintaining the rainwater slopes of the land

One feature of the design of the mega solar power plant is that solar panels have been set up on the existing slopes without leveling the overall site. This means that the rainwater slopes of the land remain unchanged, making it possible to use the drainage system of the golf course and limit the parts requiring drain pipe laying work to only the creeks and ponds. It also made it possible to limit land development work to partial earth cutting and filling of the greens and bunkers. As a result, the area for land development works was limited to around one-sixth of the overall site of the power plant. In addition, discussions about the maintenance operation method began in the design phase, which helped to minimize the area needed for service roads for the power plant. While mega solar power plants generally require 1.3 to 1.5 hectares of land per one megawatt, we were able to install solar panels for approximately 45 megawatts on a 46-hectare site. The overall design of the power plant was meant to reduce the environmental burden by limiting the area for land development and size of the facility.
The electric facilities installed at the plant, such as high-voltage transformers, conform to the Top Runner standards. In addition to making the plant environmentally friendly, consideration was also given to lowering the energy consumption.

Solar panels set up on the existing rainfall slopes of the land

Windbreak and protecting the wildlife

One feature of the construction work is that an effort was made to keeping as many of the trees surrounding the site as possible. The trees functioned as the windbreak for the golf course and prevented dust from being generated by the wind or other factors during the construction work. They also helped control the noise from the construction work. In addition, the trees make the power plant invisible from the outside, which is good for the landscape.
Consideration was also given to protecting living things. More than 100 living such as carp, crucian carp and tortoises lived in the five ponds of the former Hiyoshibaru Country Club. Before those ponds were filled in, the animals were carefully moved using water-filled containers so that they would not be injured. They were relocated to a pond in the garden of the guesthouse that is located on land adjacent to the solar power plant.

Former Hiyoshibaru Country Club

Carp moved out by using containers

Generating power equivalent to the annual power consumption of 9,300 homes

The expected annual electric-generating capacity of the Oita Hiyoshibaru Solar Power Plant is 52,500,110 kilowatt-hours. This is equal to the annual power consumption of approximately 9,300 ordinary homes. To lessen the environmental burden, the plant helps reduce CO_2 emissions by approximately 32,000 tons per year. We have also been proactive in pursuing other projects for generating power from renewable energy. For example, we operate a mega solar power generation facility with a capacity of approximately 22 megawatts on the same site as that of the Oita Hiyoshibaru Mega-Solar Power Plant, and one with a capacity of approximately 2 megawatts at Tamano Works. At Chiba Works, we operate one of the largest biomass power generation facilities in Japan, which has a capacity of 50 megawatts, and a wind power generation facility with a capacity of 1.5 megawatts. We continue working to contribute in various ways to improving the energy self-sufficiency rate and reducing the burden on the global environment.

High-voltage transformers that conform to the Top Runner standards

Panoramic view of the Oita Hiyoshibaru Mega-Solar Power Plant

Initiatives for promoting environmental preservation

As a manufacturer, MES places a great deal of importance on activities related to environmental preservation. These include conserving resources and energy, reducing waste, and properly managing chemical substances.

Efforts to conserve energy and reduce CO_2 emissions

MES continues to promote efforts to reduce CO_2 emissions through activities such as switching the fuel for in-house power generation from heavy oil to natural gas. The graphs on the right show our total energy consumption, CO_2 emissions, and purchased electricity over the past five years. Corresponding with an increase in the production of small engines among marine diesel engines, which are our mainstay products, total energy consumption for fiscal 2015 increased by approximately 3% year on year. On the other hand, the CO_2 emission coefficient of each power company declined, causing CO_2 emissions to fall slightly from the fiscal 2015 level.

Effective use of aquatic resources

The graph on the right shows the use of water by MES over the last five years. MES uses both service water (clean water) and industrial water (intermediate water). We strived to save water once again during fiscal 2016, and as a result of these efforts the amount of service and industrial water used fell by approximately 5% from the previous year.

Initiatives for reducing waste

The unlawful dumping of industrial waste has become a major social problem. As a producer of industrial waste, MES makes every effort to fulfill its responsibilities in this area. One of these efforts is our strict management of manifest. This is accomplished through periodic on-site inspections of disposal companies. Even more important is our effort to reduce the amount of waste itself. To achieve this objective, we work hard to recycle and thoroughly classify our waste. The graphs on the right show the waste amount and recycle rates over the past five years, and a breakdown of waste for fiscal 2016. We worked to limit waste, and as a result of our efforts fiscal 2016 saw an approximately 0.4% reduction in waste from the previous fiscal year. Meanwhile, the recycle rate increased by approximately 0.3% to 87% because of the increased amount of slag that we recycled. 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.

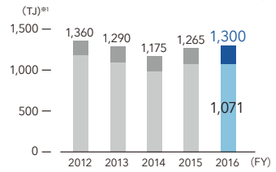
Proper management of specific chemical substances (PRTR substances)

The majority of chemical substances used by MES are the solvents and pigments contained in paint. The changes in the output and travel amount of specific chemical substances over the past five years are shown in the graph on the right. The other chart describes the breakdown of chemical substances used by MES for fiscal 2016. In May 2004, a partial revision to the Air Pollution Control Act was officially announced. By maintaining strict control of usage levels and by using low-emission airtight containers, MES continues working to conform to the objectives of this law.

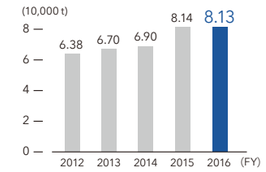
Promoting environment-friendly transportation

As a cargo owner, MES is actively tackling the issue of energy conservation in the field of transportation as well. One way in which we are doing this is by increasing the transportation loading rates while reducing the number of shipments by aggregating things such as shipping dates and destinations. We are also attempting to reduce the number of dedicated ships and expand the use of consolidated shipments. All of these activities are aimed at reducing both CO_2 emissions and energy consumption. The graph on the right shows MES's CO_2 emissions 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). Domestic transportation in fiscal 2016 increased by approximately 80% from the previous fiscal year, while energy use per transportation decreased by approximately 7% year on year.

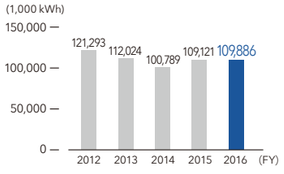
● Total energy consumption ■ Fuel ■ Electricity



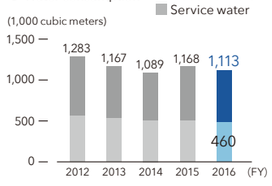
● CO_2 emissions *2



● Purchased electricity

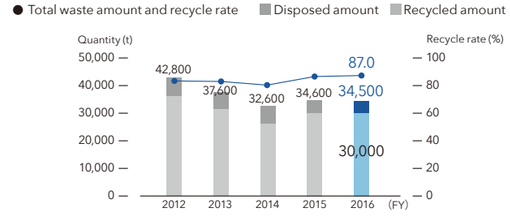


● Water consumption ■ Industrial water ■ Service water

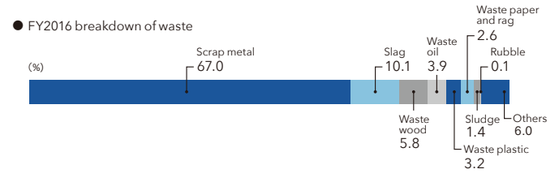


*1 TJ: Tera Joule (=10^{12}J)
*2 CO_2 emissions were calculated by following the Guidelines for Calculating Corporate Greenhouse Gases Emissions issued by the Ministry of the Environment. CO_2 emissions from electric power were calculated by using the adjusted CO_2 emission coefficient for designated electric enterprises that was also published by the Ministry of the Environment.

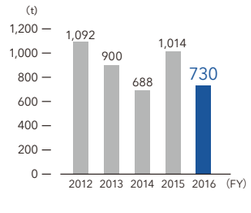
● Total waste amount and recycle rate ■ Disposed amount ■ Recycled amount



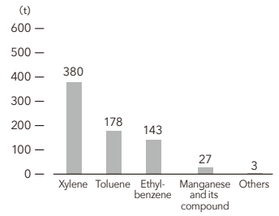
● FY2016 breakdown of waste



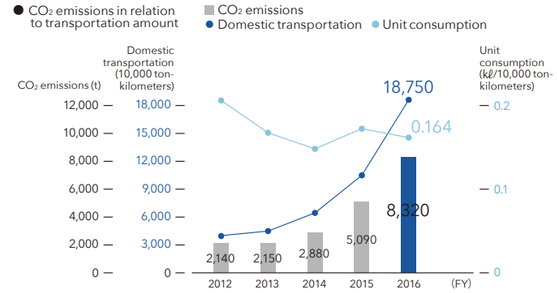
● Specified chemical substances (amount of emissions + travel amount)



● Breakdown of specified chemical substances (amount of emissions + travel amount) in FY2016



● CO_2 emissions in relation to transportation amount ■ CO_2 emissions ● Domestic transportation ● Unit consumption



Environmental management data of subsidiaries

The graphs below show environmental management data covering the past five years for the domestic factories of MES subsidiaries in Japan.

Energy conservation and CO_2 emissions

The total amount of subsidiary energy consumption for fiscal 2016 increased approximately 16% from fiscal 2015 due to the increase in the number of subject domestic subsidiaries. During that same period, the amount of electricity purchased by subsidiaries increased by no more than approximately 9%.
Despite the increase in the number of domestic subsidiaries, CO_2 emission in fiscal 2016 only increased by approximately 13% due to a decrease in the CO_2 emission coefficient.

Effective use of aquatic resources

Despite the increase in the number of subject subsidiaries, the water consumption in fiscal 2016 decreased by 0.2% from the previous fiscal year.

Data related to waste

Compared to fiscal 2015, the amount of waste for fiscal 2016 increased by approximately 4%. Domestic subsidiaries include those involved in iron casting, steel casting manufacturing, and ship repair operations that differ from operations conducted by MES. As such, the breakdown of waste from our subsidiaries also differed from MES. Approximately 50% of the waste produced by domestic subsidiaries was slag (fiscal 2015). Due to the progress in the recycling of slag, the recycle rate increased 2.5% from fiscal 2015 to approximately 70%.

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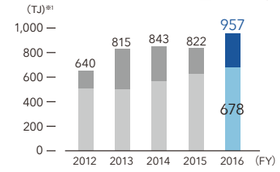
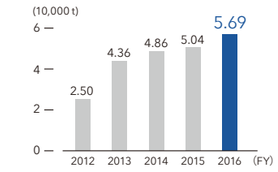
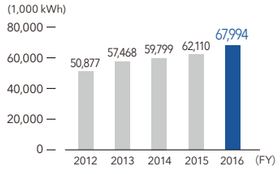


● CO_2 emissions *3



● Purchased electricity



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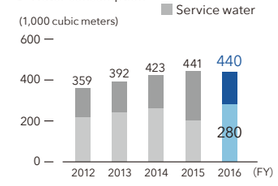

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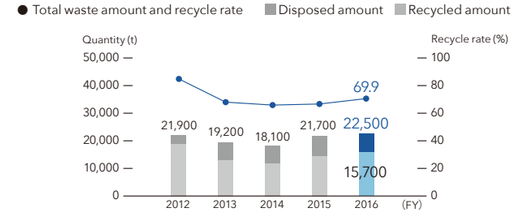
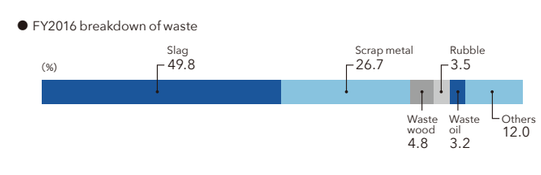


● FY2016 breakdown of waste



Environmental accounting

MES spent a total of 2,890 million yen on investments and costs related to environmental preservation efforts. A detailed breakdown of these expenditures is shown on the right. The categories for environmental preservation costs are based on the Environmental Conservation Cost Categories shown in the Environmental Accounting Guidelines 2005.
These expenditures included a total of 340 million yen spent on investment, consisting of 300 million yen spent on research and development, 20 million yen spent on pollution prevention cost such as exhaust gas measures, and 20 million yen spent on energy conservation of global environment conservation.
The total non-investment costs came to 2,550 million yen, which included 2,050 million yen spent on the research and development of environment-friendly energy-saving products, 340 million yen allocated to resource circulation cost such as waste treatment, 80 million yen spent on administration costs, and 70 million yen for pollution prevention cost.

Environmental preservation cost (= sum of investment and cost: 2,891.5 million yen) (JPY million)

Categories corresponding to business activities	Investment	Cost	Major initiatives and effects
1. Business Area Cost			
(1) Pollution prevention cost	21.8	66.7	Exhaust gas measures, wastewater treatment, dust control and other pollution control
(2) Global environmental conservation cost	16.2	1.1	Energy saving
(3) Resource circulation cost	1.6	344.9	Waste treatment
2. Upstream / downstream cost	–	0.2	Use of recycled paper as copy paper
3. Administration cost	–	82.5	Environmental management system implementation, CSR reports, and environmental education
4. Research & development cost	303.5	2,049.9	Development of various environment-friendly products
5. Social activity cost	–	0.8	Road cleaning, seminar sponsorship
6. Environmental remediation cost	–	2.4	Environmental damage countermeasure
Total	343.1	2,548.4	