Unrivaled on the World's Seas

PROJECT MEET NEWS

Mitsubishi Marine Energy & Environment Technical Solution-System

22

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Special Feature

Transition and Development in the Waste Heat Recovery Systems for Main Engines

MITSUBISHI HEAVY INDUSTRIES

Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd.

MOVE THE WORLD FORWARD MITSUBISHI HEAVY INDUSTRIES GROUP

Development of the -state-of-the-art Binary Power Generation System

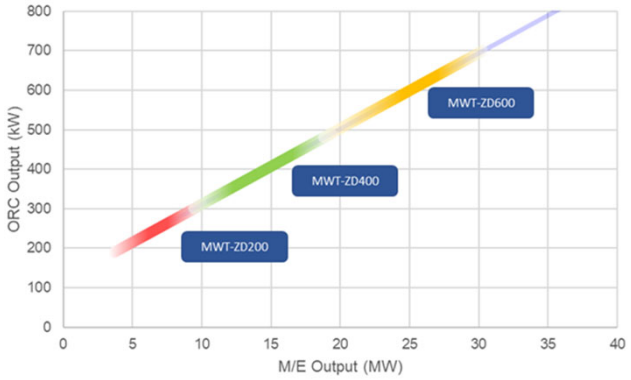
We have developed the-state-of-the-art binary power generation system based on Organic Rankine Cycle technology (WHR-ORC system)(*1) mainly for waste heat recovery from sulfur free fuel burning engines , which are becoming mainstream in the transition to a low-carbon and decarbonized society. It consists of a lineup of three models that cover rated outputs of between 200kW and 700kW and is capable of being used on a wide range of vessel types.

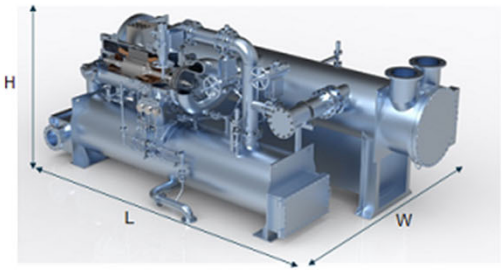
The WHR-ORC system is the most advanced waste heat recovery system with high thermal efficiency characterized by oil-free, fully sealed, and maintenance-free. It was developed by combining our marine waste heat recovery system – which includes waste gas economizer, steam turbine, and power turbine (gas turbine) that have accumulated many achievements to date – with the superior centrifugal chilling technology possessed by MHI Group company Mitsubishi Heavy Industries Thermal Systems, Ltd.. In the future, we can expect the achievement of high efficiency and energy-saving in engines powered by carbon-free fuels such as hydrogen and ammonia as well as by carbon-neutral fuels, including biomethane and bio-methanol.

Research and development for fuel conversion and the application of environmental technologies are progressing at a rapid pace in the marine vessels and maritime fields. They include R&D as measures to comply with EEDI (*2), EEXI (*3), the tightening of reduction regulations, GHG emissions regulations in various fields as well as for zero-emissions-related efforts.

To contribute to decarbonization in the maritime industry, MHI-MME is utilizing the MHI Group's wide range of technologies while accurately grasping changes in the market environment as well as the diversifying customer needs. We will continue to proactively undertake the creation of new technologies and products.

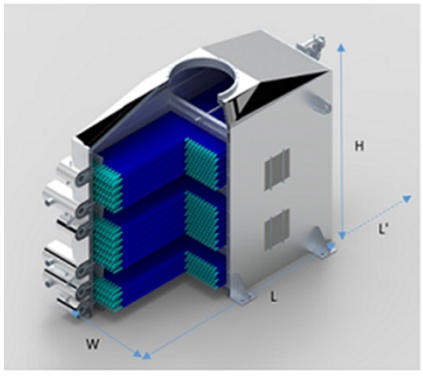
(*1) WHR-ORC : Waste Heat Recovery – Organic Rankine Cycle
(*2) EEDI: Energy Efficiency Design Index
(*3) EEXI: Energy Efficiency Existing Ship Index
(*4) WHR-HWE : Waste Heat Recovery – Hot Water Economizer





WHR-ORC system (Model : MWT-ZD600M)

ORC Frame			MWT-ZD200M	MWT-ZD400M	MWT-ZD600M
Output Range (Ref.)		kW	200 ~ 300	300 ~ 500	500 ~ 700
Dimension	L	m	4.6	4.9	5.5
	W	m	2.4	2.6	2.9
	H	m	2.3	2.5	2.8
Weight		t	15	20	26



WHR-HWE (注4)

HWE			Model 200	Model 400	Model 600
Output Range (Ref.)		kW	200 ~ 300	300 ~ 500	500 ~ 700
Dimension	L	m	4.0	5.4	6.7
	L' *	m	4.0	5.4	6.7
	W	m	1.9	1.9	3.0
	H	m	5.9	5.5	5.4
Weight	Dry	t	31.4	37.6	61.2
	Wet	t	33.3	39.9	65.5
Combination with ORC			MWT-ZD200M	MWT-ZD400M	MWT-ZD600M

* Maintenance space

STEERING GEAR LICENSE

MHI-MME Marks the 10th Anniversary of Steering Gear Licensing Agreement with Jiangsu Masada

We marked the 10th anniversary of steering gear license agreement with Jiangsu Masada Heavy Industries Co., Ltd. (Jiangsu Masada).
A commemoration event, with concerned parties from Jiangsu Masada and officials from the Nantong municipal government present on a remote basis, was held in celebration of this 10th anniversary.
Jiangsu Masada is a manufacturer of marine machinery, such as steering gears, deck cranes, and deck machineries. The company was founded in 2005 in Nantong city, Jiangsu province, China.
We concluded a license agreement for Rapson slide type steering gear in February 2012. Jiangsu Masada has an especially high sales record to state owned shipbuilders, such as the CSSC Group's Chengxi Shipyard and Huangpu Wenchong Shipbuilding, and the China COSCO Shipping Group's COSCO Shipping Heavy Industry (Yangzhou), as well as to leading private shipbuilders in Jiangsu province, including Jiangsu Hantong Ship Heavy Industry, Yangzijiang Shipbuilding, New Times Shipbuilding, and Nantong Xiangu Shipbuilding. Production of steering gear through this license agreement have exceeded a total of 460 units to date.
What is more, the annual production of steering gears under this license agreement in recent years has been around 50 units, but with the recovery in new shipbuilding market in China and Jiangsu Masada's steady receipt of orders, we expect to see more than 140 units produced in 2022. This will be a year of a big leap forward in sales.
Going forward, we will keep developing its good relationship with Jiangsu Masada, and continue to move forward while continuing to cooperate to enable the provision of even better products and services.

CONTROLLER RETROFITTING

Controller Retrofitting for Aged LNG Carrier

We have a proven track record of having retrofitted our boiler and turbine controllers on more than 110 systems for LNG carriers and recently completed its first retrofitting work which sets up individual standalone boiler control panel by separating its functionality from a distributed control system ("DCS") originally installed in the vessel.

We recommend the replacement of aging controllers for boilers and turbines installed on LNG carriers to ensure their safe, long-term operation. We began a service for systems incorporated into a DCS, which separates boiler and turbine controllers from a DCS into a standalone system without the assistance of a DCS manufacturer. After a retrofit to separate the controller, it becomes possible for us to carry out services specialized for boiler and turbine controllers, thereby enabling speedy troubleshooting.

In terms of performance, a gateway (*1) is set up on the controller of an independent system to enable data communication with the existing DCS so as to achieve operability equal to that of the controller incorporated in the DCS prior to a retrofit. What is more, the DCS parts, etc., that were used for the boiler controller can be kept as spare parts for that ship, which will help customers secure spare parts in the case that the DCS for portions other than a discontinued boiler will continue to be used.

We will continue to utilize the experience and technical capabilities accumulated up to now to provide controller modification solutions in ways that meet customer requests.

(*1) Gateway:
A device that relays communication between two devices and networks that utilize different communication methods and procedures

Before Retrofitting

After Retrofitting

MHI-MME Confirmed the Completion of Shop Trial of a Main Engine Equipped with the World's Largest Turbocharger (MET90MB)

We confirmed, in July this year, the completion of shop trial of a main engine equipped with its MET90MB Turbocharger ("MET90MB"), the world's largest turbocharger is achieving its assumed performance.

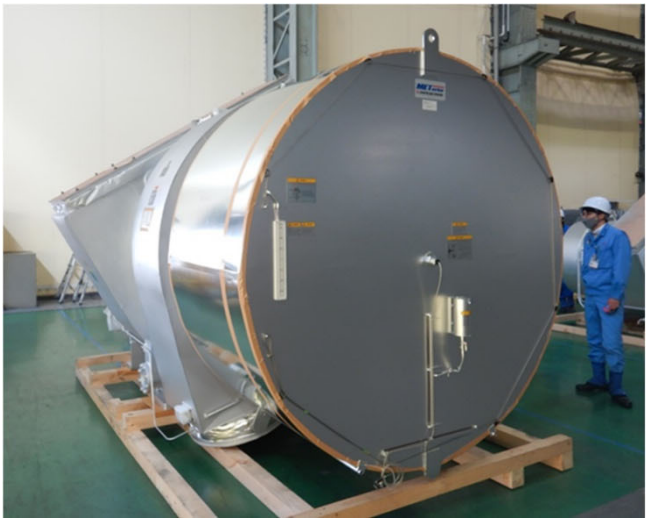
The MET90MB that underwent the shop trial was the first unit, which was delivered from our plant in January this year. Twenty-two MET90MB have been ordered for installation on the main engines of twenty-two 15,000TEU container ships, including 10 containerships of the same series. Sequential turbocharging1, which combines the use of two installed turbochargers (one MET90MB unit and one MET60MB unit in this case), was adopted for the main engine (MAN ES/8G95ME C10.5 EGRBP) used in this shop trial.

Adopting use of the MET90MB, a large turbocharger, makes it possible to reduce the number of turbochargers needed, from three units in the past to two units, enabling both a high degree of efficiency and lower maintenance costs.

MET turbochargers have already achieved the global top share in terms of the number of turbochargers installed on the main engines of mega containerships (11,000 TEU or greater). To deal with the growth in engine output resulting from the increasing size of containerships, we made the decision to include the MET90MB in its MET-MB series lineup.

As a designer and manufacturer of turbochargers, we will continue engaging in activities to enable customers to select the best option that meets their needs.

*1 Sequential turbocharging:
A set up that enables efficient turbocharging by installing more than one turbocharger on an engine and concentrating the exhaust gas to one of the turbochargers at lower engine speeds to obtain turbocharging when the amount of exhaust gas is small. When there is a large amount of exhaust gas, the gas is directed to either both turbochargers and/or to the larger turbocharger for efficient turbocharging at a broader range of engine speeds.



DECK CRANE DELIVERY

MHI-MS Delivers the First Unit of the 40-ton Slim Crane

Mitsubishi Heavy Industries Machinery Systems, Ltd. (MHI-MS) developed 40-ton Slim Crane for containerships, a new model that is even slimmer than previous models.

The memorable first unit manufactured of the new Slim Crane model was delivered this year in August for installation on 3,500TEU containership of total 10 vessels series being built at Jiangsu New Yangzi Shipbuilding Co., Ltd. (Taizhou, Jiangsu, China).
The diameter of the crane post on this new Slim Crane model is only within 3 meters, and the machine arrangement inside this new crane has been optimized to allow as many containers as possible to be loaded within a limited cargo hold.
It was manufactured by MHI-MS licensee Jiangsu Masada Heavy Industries Co., Ltd. (Nantong, Jiangsu, China)
Due to space constraints, this new model has utilized MHI-MS design expertise to enable a winch drum of single-layer winding design (against double layer winding design for conventional model),with the aim of extending the life of wire ropes.
MHI-MS is supporting distribution in the world through its wide-ranging lineup, including Slim Cranes that can be used at ports and harbors without dedicated loading and unloading facilities, such as dock cranes.

DECK MACHINERY DELIVERY

MHI-MS Delivers the First Units of Large Deck Machinery for 23,000TEU Containerships

Mitsubishi Heavy Industries Machinery Systems, Ltd. (MHI-MS) developed deck machinery (anchor windlass and mooring winch) for a 23,000+ TEU containership being built by Nantong COSCO KHI Shipping Engineering Co., Ltd. (Nantong, Jiangsu, China) for Orient Overseas Container Line Ltd. (Hong Kong).
They were manufactured by licensee Jiangsu Masada Heavy Industries Co., Ltd. (Nantong, Jiangsu, China) and delivered to the shipyard in August this year Even among containerships, which are increasing in size, a 23,000TEU+ containership is among the largest in the world.

The delivered anchor windlass has a chain diameter of 147 mm, which is the largest among products delivered by MHI-MS.
MHI-MS offers a lineup of deck machinery that meets the changes in ship needs and supports safe ship voyages.

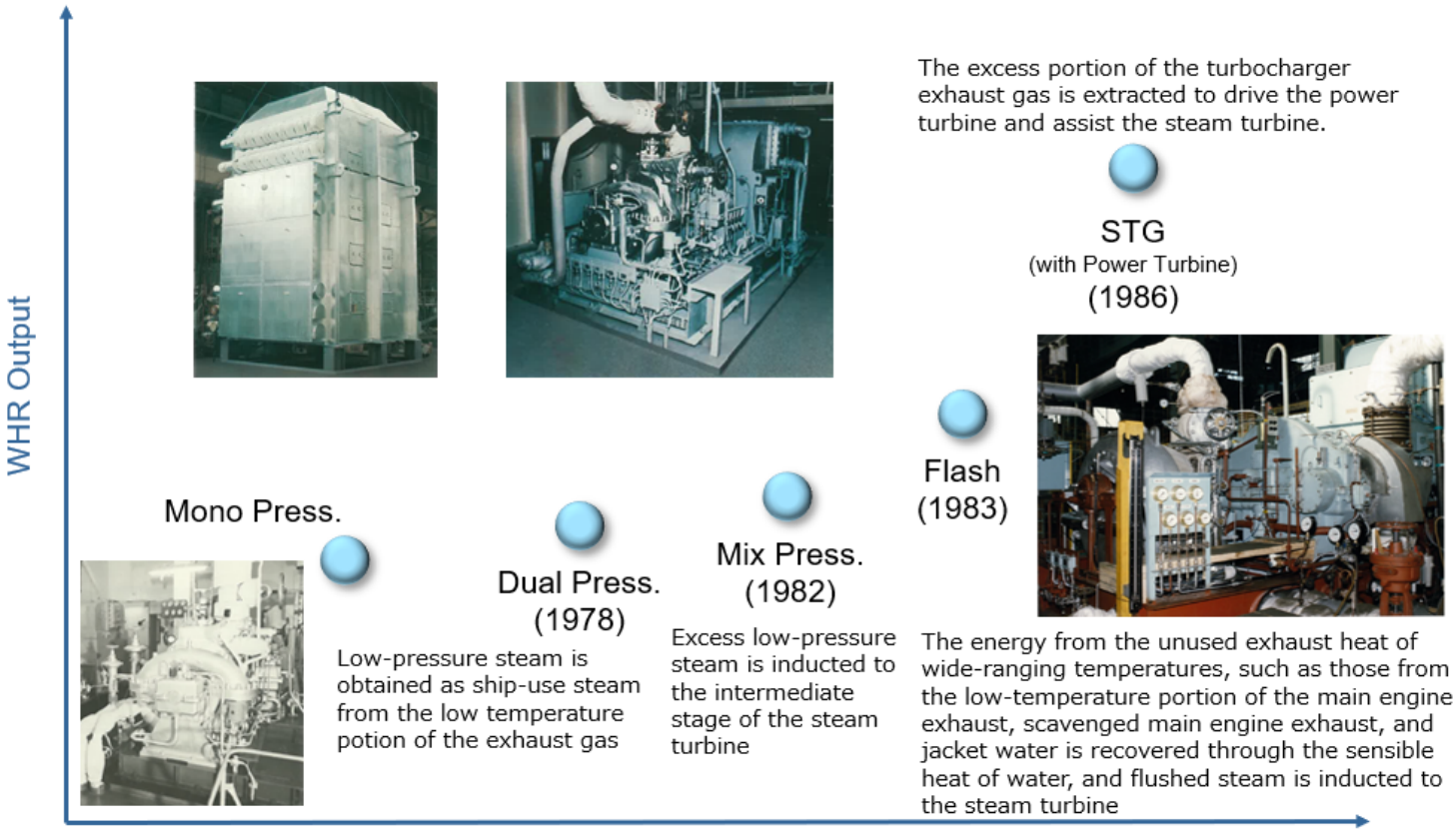
Special Feature:

Transition and Development in the Waste Heat Recovery Systems for Main Engines - and now, for the new generation WHRS

We have developed a state-of-the-art binary power generation system based on Organic Rankine Cycle technology (WHR-ORC system) (*1). It is mainly for waste heat recovery from sulfur-free fuel main engines, which are starting to become mainstream in the transition to a low-carbon and decarbonized society.
The amount of waste heat that can be recovered from main engines continues to decline due to continual improvement of the fuel efficiency and environmental performance of main engines. we have been improving and developing waste heat recovery systems in accordance with such trends, marking many achievements.
The recently developed WHR-ORC system is our cutting-edge ORC system, developed through such efforts.

First-generation systems

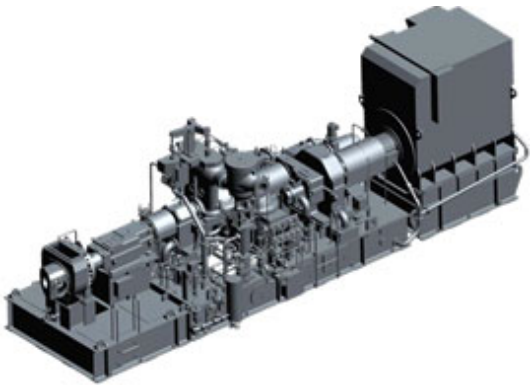
Since diesel engines first started to be used as the main engines of large vessels, economizers and other means have been utilized to recover exhaust gas energy by converting water into steam for utilization in power generation systems. The demand for energy efficiency increased after the oil crisis. Efforts made particularly in response were the improvement of main engine fuel efficiency and the upgrading of ship hull designs. With such changes, there were drastic reductions in exhaust gas temperatures and main engine required outputs. This resulted in a significant decrease of waste energy. Even under such circumstances, customers' needs to use the energy contained in main engine exhaust gas to meet the onboard electrical demands of a ship remained. Various systems were therefore improved and adopted. However, the adoption of waste heat recovery systems decreased once the rise in fuel prices settled down. Even when adopted, relatively simple waste heat recovery systems, such as dual pressure or mixed-pressure types, became predominant.



Our WHRS Track Record(First- and second-generation systems)

Second-generation systems

Beginning of 21st century, with growing environmental conscious and the rise in fuel prices, interest in Super Turbo Generating (STG) systems grew once again, mainly for large-size containerships, which have larger onboard electrical power needs. STG systems are waste heat recovery systems (WHRS) that integrate a power turbine that utilizes the excess efficiency of a turbocharger used in power generation and conventional steam turbines. This STG system utilizes both extraction gas and exhaust gas to strengthen coordination with main engines and enable optimal control, which lead to a further improvement of energy efficiency on board. To respond to onboard electrical power needs more flexibly, an energy-saving power generation package, that combined the use of an STG system and shaft generator, has been an alternative solution.

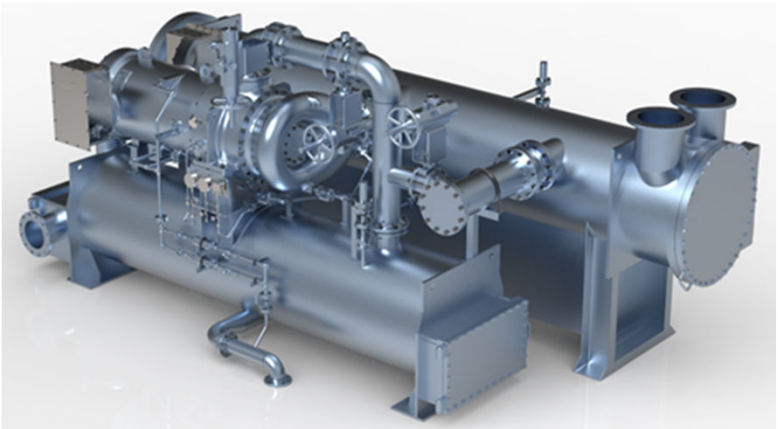


Tubine Generator

Third-generation systems

As a result of the further improvement of main engine fuel efficiency, constant slow steaming, and compliance with NOx emission regulations, the amount of main engine exhaust gas energy that can be used, decrease significantly. With this, the use of WHRS declined as they were no longer able to cover onboard power needs sufficiently and effectively. Recently, sulfur-free fuel Ships, such as LNG and methanol are increasing and its fuel price hikes also continued.
Responding to green-house gas emissions reduction became a global challenge, as well. Amid such circumstances, with the aim of making the system a main force in next-generation WHRS, we developed a WHR-ORC system that can make effective use of exhaust heat of 150 degree or lower, which was not easily extracted in the past, due to sulfur dewpoint corrosion concerns.

(*1)WHR-ORC : Waste Heat Recovery – Organic Rankine Cycle



WHR-ORC system (Model : MWT-ZD600M)

London Office

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Greeting from Atsuo Kusakabe, Head of Business Development

I am assigned to head of business development of marine machinery group which is newly established position in London office in this October.
Purpose of expansion of the office organizational structure is to contribute further to the maritime industry towards carbon neutrality and we will create proactive proposal or set up a new business scheme to cope with customer needs especially with respect to energy management.
I'm very excited about this new opportunity to get closer to the clients and the all stakeholders in the region covered by the office and will do my best to build up further good relationship.

About MHI-MME London office :

This office is established in MHI regional headquarters and opened in April 2014 to further strengthen the support framework for customers in the region. It is now located in Chiswick in West London, within a business park lush with greenery.
From April last year, the name of the company changed to Mitsubishi Heavy Industries EMEA, Ltd. As is apparent from the "EMEA" in the company name, it now handles Europe, the Middle East, and Africa.
There are many users of our products in Europe and the Middle East. We will engage in our activities with the enhancement of customer services and the provision of immediate response in mind.

Inquiry
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