

News

WÄRTSILÄ FOUND WAY TO REDUCE EXHAUST EMISSIONS

Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasizing technological innovation and total efficiency, Wärtsilä maximizes the environmental and economic performance of vessels and power plants of its customers.

In 2013, Wärtsilä's net sales totaled to EUR 4.7 billion, with approximately 18,700 employees. The company has operations in nearly 200 locations in 70 countries around the world. Wärtsilä is listed on the NASDAQ OMX Helsinki, Finland.

The existing regulations of the International Maritime Organization (IMO) on air exhaust emissions and the efforts of the European Union to harmonize with IMO MARPOL Annex VI, have tremendous impact on shipping. Legislation already has effect on fuel markets in the regulated areas, since fuel prices are expected to increase even further in 2015 when the 0.1% fuel sulfur limit enters into force. As an alternative to the use of low sulfur fuels (Diesel or Natural Gas), the Finnish company Wärtsilä, as well as others, has developed exhaust aftertreatment systems which are already in use.

By January 1, 2015 all diesel engines of all seagoing vessels in the North- and Baltic Seas, the English Channel and in a 200 nautical mile zone along the U.S. Atlantic and Pacific coastlines, must either use fuels with sulfur contents equal to or under 0.1 percentage of weight, or be equipped with an exhaust aftertreatment device ensuring a corresponding low sulfur emission. The content of sulfur in ship fuels was set at 3.5 percent and is intended to be reduced to 0.5 percent by 2020. The Norwegian cruise and transport shipping company Color Line in cooperation with Wärtsilä recently introduced its fleet retrofit program with scrubbers to reduce the sulfur emissions. As the Color Line's vessels operate solely in the Baltic Sea, they focused on three alternatives before they ordered scrubbers from Wärtsilä:

- Conversion of engines to use gas oil instead of heavy fuel, which may be the simplest but, due to significantly higher fuel price, an expensive solution.

- Conversion of engines to use natural gas instead of heavy fuel: Although this is an available technical solution and gas supply in Norway is plentiful, the conversion of engines and infrastructure onboard is very expensive.
- Continued engine operation within Wärtsilä which has a long and noted history of development of its scrubber system, working as closed loop systems with freshwater and caustic soda. In fact it was a pioneer among engine manufacturers in its ability to supply certified equipment.

In March 2014 Wärtsilä had orders for the equipment for 45 vessels, i.e. for a total of 94 exhaust gas cleaning systems for both newbuild and retrofit projects – representing more than one year of production. However, Wärtsilä's scrubbers eliminate up to 98% of SO_x from vessel emissions and reduce harmful particulate matter by up to 85%, allowing ferries to operate using conventional bunker fuel. Four separate Wärtsilä open loop scrubber systems will ensure a ship's full compliance with the International Maritime Organization's (IMO) MARPOL Annex VI regulations, and EU Directive 2005/33/EC.



Figure 1.
Color Line's vessel.

Source: <https://www.flickr.com>.

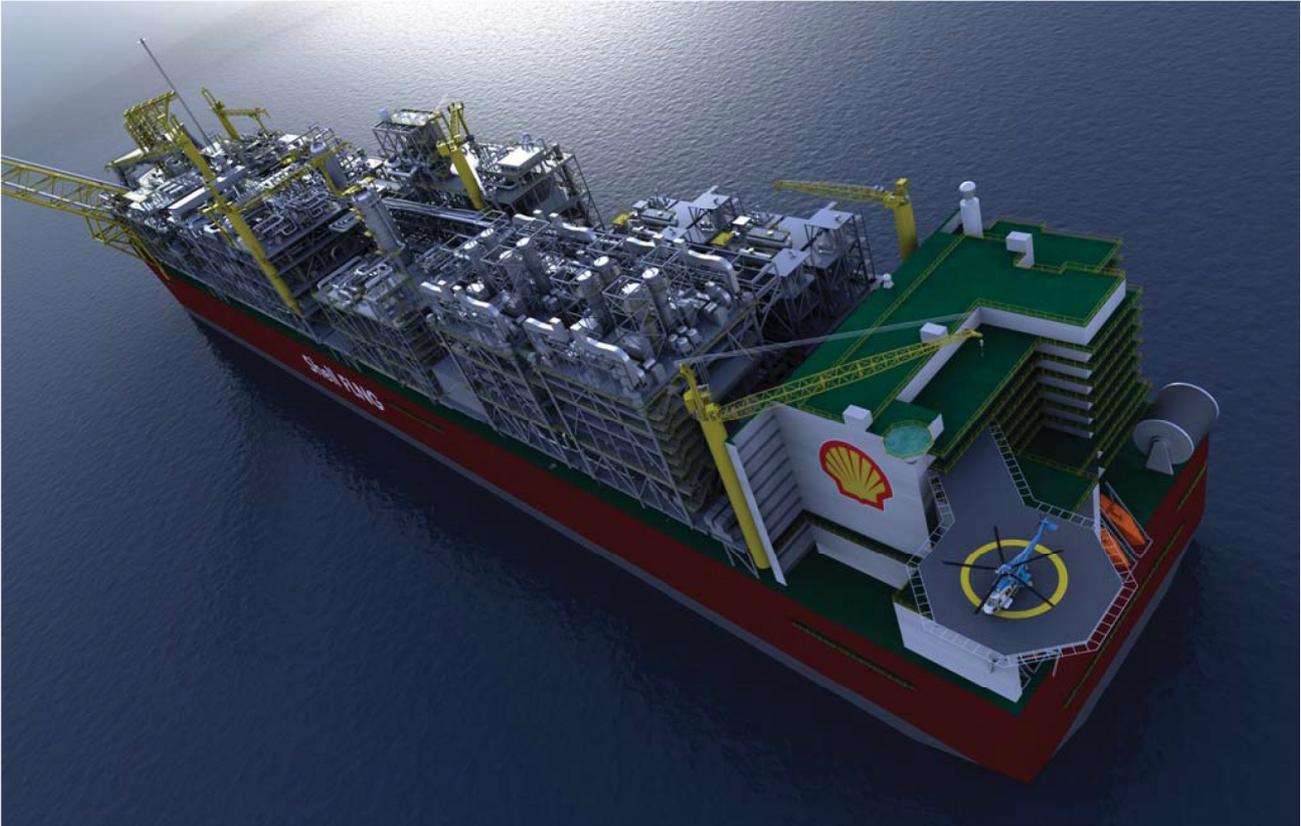


Figure 2.
Shell elude FLNG Project.
Source: <https://www.flickr.com>.

PRELUDE FLNG

Shell made its final investment decision on the Prelude FLNG Project on 20 May, 2011. It has started building a floating liquefied natural gas (FLNG) facility to produce and export LNG off the coast of Australia. Engineers worked over 1.6 million man hours during the front end engineering and design (FEED) phase of development for the Prelude FLNG Project. Shell has been pushing the Prelude FLNG project forward at a rapid pace.

It is now under construction and we are building up our organizational capacity in Australia to support the operations phase. The engineers cut the first steel for the facility's substructure in October 2012 and the major construction of the substructure and the topsides is currently well underway.

This follows from the cutting of first steel for the well heads in September 2011, the turret in May 2012 and the topsides in January 2013. Shell is preparing to drill seven Prelude development wells. This drilling program will be supported out of Broome, Western Australia.

The design and construction contract for the Prelude Darwin Supply Base has been awarded. Shell Australia is ramping up recruitment for the Prelude FLNG project. It launched the first major technical recruitment campaign in March 2013. Shell Australia is also working with universities and education providers to build expertise and capacity in Western Australia to support Prelude FLNG.

Through a multi-million dollar partnership with The University of Western Australia, Shell is funding a new chair at UWA's Energy and Minerals Institute to improve research and education in offshore engineering. The Global FLNG Training Consortium in Western Australia is a partnership between Shell, The Challenger Institute and the Curtin University. A multi-year training program under development will train FLNG technicians in Western Australia.

Prelude FLNG is the first of what we expect to be many Shell FLNG projects and builds on our existing capability and LNG leadership.

TECHNOLOGY

The floating facility will cool natural gas produced on site to $-162\text{ }^{\circ}\text{C}$ ($-260\text{ }^{\circ}\text{F}$), shrinking its volume by 600 times so it can be shipped to customers around the world. Oceangoing carriers will load LNG and other liquid byproducts (condensate and LPG) for delivery to market. The Prelude FLNG facility will be 488 m (1,600-feet) long, 74 m (240-feet) wide and will displace around 600,000 tons of water. It will be the largest floating offshore facility in the world. The Prelude FLNG facility is being constructed at Samsung Heavy Industries' Geoje Island shipyard in South Korea. The Samsung shipyard is one of the few in the world big enough for the construction of a facility of this size.

Once constructed, the facility will be towed to its location, approximately 475 kilometers (around 300 miles) north-northeast of Broome, Western Australia. The facility will be moored and hooked up to undersea infrastructure and the whole production system commissioned. The Prelude FLNG facility was designed to withstand the most powerful tropical cyclones.

It will remain permanently moored at the location for around 20-25 years before being docked for inspection and overhaul. The LNG, LPG and condensate produced will be stored in tanks in the hull of the facility. LNG and LPG carriers will moor alongside to offload the products. The Prelude FLNG Project is well placed to help meet Asia's growing natural gas demand.

The project will create around 350 direct and 650 indirect jobs. The recruitment of staff to operate the facility will ramp up during 2013 and 2014. Prelude will also generate taxes and revenue to Australia, create opportunities for local businesses and result in Shell spending billions in capital and operating

expenditure. The Prelude FLNG Project will use significantly less materials, land and seabed area than would be required for the production of the same amount of gas by a similar onshore facility.

Longer than four soccer fields and displacing six times more water than the largest aircraft carrier, the FLNG facility will be the biggest floating production facility in the world.

>600 engineers worked on the facility's design options

>200 km (125 miles) is the distance from the Prelude field to the nearest land

4 soccer fields, laid end to end, would be shorter than the facility's deck

175 Olympic-sized swimming pools could hold the same amount of liquid as the facility's storage tanks

6,700 horsepower thrusters will be used to position the facility
50 million liters of cold water will be drawn from the ocean every hour to help cool the natural gas

6 of the largest aircraft carriers would displace the same amount of water as the facility

93 meters (305 feet) is the height of the turret that runs through the facility, secured to the seabed by mooring lines

$-162\text{ }^{\circ}\text{C}$ ($-260\text{ }^{\circ}\text{F}$) is the temperature at which natural gas turns into LNG

1/600 is the factor by which a volume of natural gas shrinks when it is turned into LNG

117 % of Hong Kong's annual natural gas demand could be met by the facility's annual LNG production

20-25 years is the time the Prelude FLNG facility will stay at the location to develop gas fields

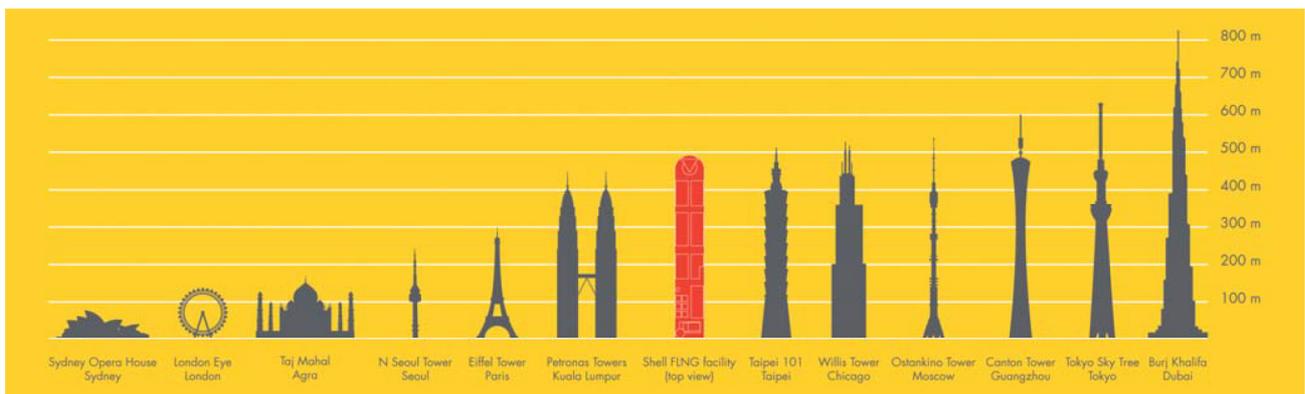


Figure 3.

From stern to bow the FLNG measures 488 m: its length is comparable to the height of iconic structures around the world.

Source: <http://www.shell.com/global/aboutshell/major-projects-2/prelude-flng/by-numbers.html>.

OLD MACHINERY IS NOT WELCOME AS OLD WHISKEY

The preliminary results of the Concentrated Inspection Campaign (CIC) on Propulsion and Auxiliary

Machinery, carried out between September 1 and November 30, 2013 in the Paris MoU region show that:

- 68 ships (41 % of all detentions) were detained for 3 months as a direct result of CIC for propulsion and auxiliary machinery deficiencies. Problem areas included main engine propulsion, engine room cleanliness and emergency source of power/emergency generator. In previous years propulsion and machinery installation deficiencies in average accounted for 7% of the total number of deficiencies within the Tokyo and Paris MoU's, ranking number six among all deficiencies in the

categories statistics. Reason enough for the Paris MoU to focus on this area during CIC.

- More than half (54%) of all CIC topic related detentions involved ships older than 20 years. This category had a CIC-topic related detention rate of 3.6 %, which compares unfavorably to the overall 1.8% CIC-topic related detention rate. The CIC questionnaire was completed during 3,879 inspections on 4,126 individual ships. A total of 1,105 CIC-related deficiencies were recorded and 68 ships (1.8 %) were detained as a direct result of the CIC. 41% of the detentions during the CIC-period were CIC-topic related.

Other statistics of note include:

- During the campaign most inspections concerned general cargo/multi-purpose ships which accounted for 1,270 (33%)



Figure 4.

Old machinery, detail from inspection.

Source: <https://www.flickr.com>.

inspections, followed by bulk carriers with 805 (21 %) inspections, containerships with 458 (12 %) inspections, chemical tankers with 343 (9 %) inspections and oil tankers with 272 (7 %) inspections.

- 34 (50 %) of the detained ships were general cargo/multipurpose ships, 9 (13 %) bulk carriers and 9 (13 %) container ships. Among the other detained ships 6 were oil tankers, 4 chemical tankers and 3 refrigerated cargo ships.
- The analysis of the recorded deficiencies shows that most deficiencies pertain to main engine propulsion (20 %), engine room cleanliness (18 %), emergency source of power/emergency generator (12 %) and emergency lighting/ batteries/switches (12 %).
- Most inspections were carried out on ships under the flags of Panama, with 495 inspections, Liberia, with 322 inspections, Malta, with 317 inspections and Antigua and Barbuda, with 246 inspections. The flags with the highest number of CIC-topic related detentions were Tuvalu with 1 CIC-topic related detention during 1 inspection, Tanzania with 6 CIC-topic related



Figure 5.
Port and view to USCG crafts.
Source: Maritime Reporter & Engineering News • MARCH 2014.

detentions during 27 inspections, Curacao with 2 CIC-topic related detentions during 16 inspections and Togo with 4 CIC-topic related detentions during 35 inspections. The CIC was a joint campaign with the Tokyo MoU.

COAST GUARD REPLACING AGING SHIPS WITH 91 NEW CUTTERS

The numerous cutters and craft of the U.S. Coast Guard — from sail training ship Eagle to large oceangoing patrol ships; from polar icebreakers to small utility boats — form a formidable fleet to meet the many challenging assignments undertaken by the service. In 2014 the Coast Guard continues its recapitalization

program with its National Security Cutter (NSC), Fast Response Cutter (FRC) and Offshore Patrol Cutter (OPC). The service plans to procure 91 cutters (8 NSCs, 25 OPCs and 58 FRCs) to replace 90 aging cutters and patrol boats. The new ships will feature more automation and therefore have smaller crews.

DOES E-LEARNING WORK?

Once a question has been carefully analyzed and a reliable answer found, it is time to use this new knowledge to help answer the next series of important questions. This is the current situation in some parts of the maritime industry surrounding the question of whether eLearning works. To illustrate, some months ago there was a familiar discussion on an online maritime group debating whether eLearning works. Arguments on both sides cited anecdotes and conjectured on topics for which we already have solid answers provided by real research. This highlights the need for the wide dissemination of existing knowledge on this issue. Therefore, this article provides some of the most compelling evidence relating to the issue of whether eLearning works in the maritime industry. This knowledge can then be used to contribute to the discussion of other pressing, yet unanswered, maritime training questions such as how to overcome cultural and language barriers in training, how to raise the standard of all maritime training without increasing costs, and how to support a culture of safety through attention to training.

“Does eLearning work”? The answer is an unequivocal “YES”. But as with any complex topic, there are many sides to that answer. So here are several quick, but very important, considerations.

Not All eLearning Experiences are Equal

Neither are all classroom experiences. There are excellent and poor examples of both online and classroom-based training. We don’t abandon the classroom just because we had a terrible instructor once. Likewise, we should not abandon eLearning just because we have encountered poor implementations (of which there are many). So when considering the question of whether eLearning works, we are comparing offerings of roughly equal quality.

The Difference Between Knowledge & Skills

Maritime industry workers require both knowledge and skills to do their jobs safely and efficiently. It is important to realize that effective training techniques for knowledge are not the same as those for skills. All skills are built on a foundation of knowledge. Therefore even if you believe you are only learning a skill, there is always a strong knowledge component to that training. So both must always be considered.

Blended is Best for Knowledge

The evidence will be presented below, but here is a quick fact. All else being equal, when comparing online learning with classroom-based learning, they come out roughly equal for teaching knowledge, with eLearning offering a slight advantage. Yes, this is surprising, but it is a fact. More importantly, if you combine online and face-to-face training (a technique called “blended learning”), you get significantly better training outcomes than by employing either online or face-to-face training alone. This is very important as it gives us an opportunity to make real training improvements that were simply not available to us 10 years ago.

No Substitute for Hands-On Training

This is one of the most common arguments I hear against online learning. Hands-on training for skills provides the context, experience, environment and tactile feedback that a simulation will approach, but never fully match. However, simulations will provide variety in, and control of, the training scenario that hands-on training can never match. Each approach offers something the other one does not. Therefore in this case we can use multiple, complementary training approaches to yield excellent results - better than either one approach is capable of producing alone.

Technology Offers Unique Benefits

In addition to improving training outcomes, adding a technology component to your training yields benefits not available otherwise. For example, eLearning systems are excellent providers of deep learning metrics and analytics. These are real-time data about how well your trainees are performing and where the gaps are. This allows you to continuously improve training at your organization and close gaps in training outcomes before they become safety or performance issues. Another example is how technology can bring training to the trainee. This has the effect of improving access to training, bringing it to those who might not otherwise have the opportunity. Technology also supports more flexible training delivery models. A very common and highly effective approach is to have trainees pre-train using eLearning, and then converge afterward at a central location for a shorter and more effective face-to-face experience. These are some of the quick facts. Let's take a look at the hard evidence now.

The Evidence

Arguably the best evidence in favor of the effectiveness of eLearning is a report published in 2010 by the U.S. Department of Education (U.S. DOE). The report is titled “Evaluation of Evidence-

Based Practices in Online Learning, A Meta-Analysis and Review of Online Learning Studies”. The strength of this report comes from the fact that it is a meta-analysis. A meta-analysis looks at a large number of independent studies and draws a conclusion based on the strength of this large collection. This is powerful because the biases or flaws of individual studies are quickly filtered out of the collective response. In the case of the U.S. DOE study, the meta-analysis looked at roughly 1,000 research studies, and then filtered them down to 45 which met rigorous design standards. From these studies the analysis came to several conclusions. Let's look at some of the most notable quotes from this study:

Online Learning Outperforms Face-to-Face Learning

U.S. DOE Quote: “Students in online conditions performed modestly better, on average, than those learning the same material through traditional face-to-face instruction. Learning outcomes for students who engaged in online learning exceeded those of students receiving face-to-face instruction.”

The difference in the effectiveness of online and face-to-face instruction is quite small, but it exists with the win going to online learning. From this we can say unequivocally that online learning most certainly does not produce inferior outcomes when compared to face-to-face instruction, as many incorrectly believe. In fairness, however, until I performed my own studies on eLearning effectiveness as a university researcher in the 1990s, I also assumed that eLearning would be inferior. I was wrong.

Blended Learning is Best:

U.S. DOE Quote: “Instruction combining online and face-to-face elements had a larger advantage relative to purely face-to-face instruction than did purely online instruction.”

The conclusion above indicates that when you use a combination of on-line and face-to-face training (referred to as “blended learning”), the learning outcomes are better than for either face-to-face or eLearning alone. This makes intuitive sense because each mode of learning has strengths the other one cannot offer. The implications are clear. If your goal is to provide the very best training possible, you should use a combined approach involving both face-to-face training and online learning.

Interaction with Peers and/or Instructors Improves Learning Outcomes:

U.S. DOE Quote: “Effect sizes [i.e. the improvement in learning outcomes] were larger for studies in which the online instruction was collaborative or instructor-directed than in those studies where online learners worked independently.”

This is a very important conclusion which cannot be stressed enough. One of the major advantages of online learning is its ability to connect people to one another, allowing them to learn from one another in a way that face-to-face training can't. While it is indeed possible and effective for trainees to learn online independently, the best outcomes are achieved when we use technology to connect people to further facilitate the learning process.

eLearning Works, Regardless of the Subject Matter:

U.S. DOE Quote: *"The effectiveness of online learning approaches appears quite broad across different content and learner types."*

eLearning has been around long enough and studied long enough for us to safely conclude that it is effective for all kinds of knowledge acquisition. There is nothing about maritime knowledge or maritime learners that makes the field immune to the benefits of eLearning. That is not to say that there are no hurdles to overcome in maritime eLearning - there are. For example, the availability of internet onboard, and the sophistication of vessel-based training both have slowed the adoption of eLearning in the industry. However, those obstacles are being (and have been) largely overcome by maritime-specific learning management systems (LMSs) and the industry is following suit by adopting eLearning methods. This study makes it clear that the benefits of eLearning are not domain-specific. eLearning works. It has strengths which create an opportunity to do better than we do now. It is not a replacement for face-to-face or hands-on training, that is the wrong discussion to be having because we already know the answer. The real discussion is about how we apply the strengths and advantages that eLearning brings to an industry that is in desperate need of better (not more) training, more uniform training, and a discussion on what we can do to achieve these.

FIRST ORDER FOR NEXT-GENERATION UEC50LSH-ECO MARINE DIESEL ENGINE DEVELOPED BY MHI-MME

- New Engine Offers Lower Fuel Consumption During Slow Steaming -

The first order for UEC50LSH-Eco low-speed marine diesel engine being developed by Mitsubishi Heavy Industries Marine Machinery & Engine Co., Ltd. (MHI-MME), a group company of Mitsubishi Heavy Industries, Ltd., was placed with Kobe Diesel Co., Ltd., a licensee of Mitsubishi UE engine technology located in Hyogo, Japan. The advanced low-fuel-consumption engine will ensure high efficiency even during slow steaming, and will be installed on a 35k chemical tanker being built by Shin Kurushima Dockyard Co., Ltd. The first UEC50LSH-Eco engine and chemical

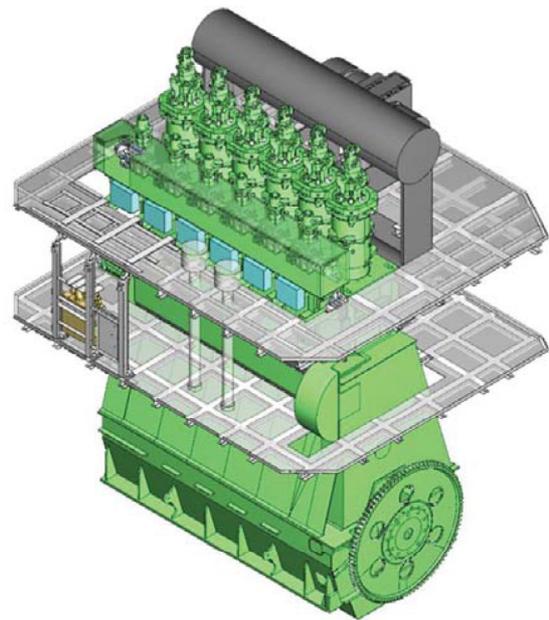


Figure 6.

UEC50LSH-Eco low-speed marine diesel.

Source: <https://www.mhi-global.com/news/story/1405271803.html>.

tanker are slated for completion in March and October of 2015, respectively.

The UEC50LSH-Eco is the first in a new series of low-speed marine diesel engines that MHI-MME is developing to follow up on its LSE series. The new series is being developed in response to market demand for engines that offer lower fuel consumption with optimized performance at lower engine speed for slow-steaming, as well as better compliance with emission standards.

Based on thorough market research, the new engines will hold significant advantages in fuel efficiency achieving power output and engine speed optimized for bulk carriers (BC) such as Handymax BC, Supramax BC and Ultramax BC vessels, as well as medium size crude oil tankers, chemical tankers, and other similar vessels. In addition, the new series will maximize fuel consumption savings by enabling vessel operators to benefit from the enhanced propulsion efficiency of long-stroke, low-speed engine operation.

Using this first order for a UEC50LSH-Eco engine as a springboard, MHI-MME and its licensees will continue to propose various innovative energy-saving and environmental solutions to enhance seagoing energy efficiency and environmental preservation efforts, and will progressively apply these technological advances to a wide range of new engine products.

FIRST ORE CARRIER EQUIPPED WITH MITSUBISHI ENERGY RECOVERY SYSTEM (MERS) GOES INTO SERVICE

- Fuel Savings of 8% Achieved in At-Sea Trial-

A Mitsubishi Energy Recovery System (MERS) supplied by Mitsubishi Heavy Industries Marine Machinery & Engine Co., Ltd. (MHI-MME), a group company of Mitsubishi Heavy Industries, Ltd., has been installed on a VLOC (Very Large Ore Carrier) for the first time. The system significantly enhances power generation efficiency by maximizing recovery and utilization of exhaust gas waste energy from marine diesel engines, and demonstrated



Figure 7.

MERS system.

Source: <https://www.mhi-global.com/news/story/1405221800.html>.

significant fuel consumption improvement compared with existing ships during at-sea trial. MERS ability to reduce fuel consumption and environmental impact has already been confirmed through installation and testing on container ships that consume large amounts of electricity, and this latest event successfully confirmed MERS' capability in other types of ships as well.

MERS is a system that optimally controls exhaust gas turbines¹ and steam turbines, enhancing fuel efficiency by recovering waste heat at a wide range of engine load. The latest MERS enables even greater waste energy recovery by incorporating shaft motors² that delivers surplus power back to the main engine. As a result, the new MERS is able to reduce fuel consumption by approximately 8%.

The number of MERS orders has progressively increased since the system's development in 2010, mainly for systems installed on refrigerated container (reefer) carriers that consume

large amounts of electricity. The latest MERS at-sea trial, however, confirms MERS' ability to efficiently recover and utilize waste energy in smaller vessels as well. Leveraging these test results, MHI-MME intends to meet fuel efficiency needs in a wider range of seagoing vessels.

Going forward, MHI-MME will continue to propose various innovative energy-saving and environmental solutions to enhance seagoing energy efficiency and environmental preservation efforts.

Notes:

1. Turbines driven by engine exhaust gas.
2. Motors to assist propeller shaft rotation.

CAMPAIGN FOR JUSTICE FOR PANAMA CANAL WORKERS

The ITF (International Transport Workers' Federation) has ramped up its campaign against the Panama Canal Authority over its ongoing failure to provide decent pay and safe working conditions for more than 9,000 affiliated maritime workers in the canal zone.

The 44-mile canal is currently undergoing a \$5.25 bn USD redevelopment, which will see the addition of two new locks and two new channels.

Today the representatives of four Panamanian unions, accompanied by ITF leadership, met with the Director-General of the International Labor Organization (ILO), Guy Ryder, at the ITF congress in Sofia, Bulgaria.

The ITF leadership, together with the Panamanian unions, submitted an application to the ILO Committee on Freedom of Association (CFA) against the Government of Panama.

They allege the violation of Conventions 87 and 98 on freedom of association and collective bargaining by the Panama Canal Authority.

The unions allege that the Panama Canal Authority failed to:

- demonstrate an appropriate level of observance of labor regulations;
- adequately observe the decisions of the National Labor Relations Board;
- provide compensatory guarantees due to the uniqueness of the Panama Canal working conditions;
- engage in good faith collective bargaining; and
- observe ILO freedom of association principles

ITF president Paddy Crumlin said the ITF would continue to promote the best interests of workers.

"Panama is now a major transport, logistical and financial hub yet despite several meetings the Panama Canal Authority refuses to budge," Mr Crumlin said.

"The ITF is very concerned about the lack of proper respect and bargaining on issues surrounding health and safety provision

on the job and workers being forced to undertake double shifts and 18-hour workdays.

"This has an unacceptable impact on safety and there are also concerns around pay, training and freedom of association.

"That's why we've taken the step to submit an application to the ILO Committee on Freedom of Association against the Government of Panama."

The ILO set up the CFA for the purpose of examining complaints about violations of freedom of association, whether or not the country concerned has ratified the relevant conventions.

Complaints may be brought against a member state by employers' and workers' organizations.

"It is important for the Panamanian workers to know that the entire ITF congress is behind them and we will fight for better rights and conditions," ITF acting general secretary Steve Cotton said.

"Freedom of association and collective bargaining are among the founding principles of the ILO and we hope our intervention leads to an improvement in working conditions for the Panama Canal workers."

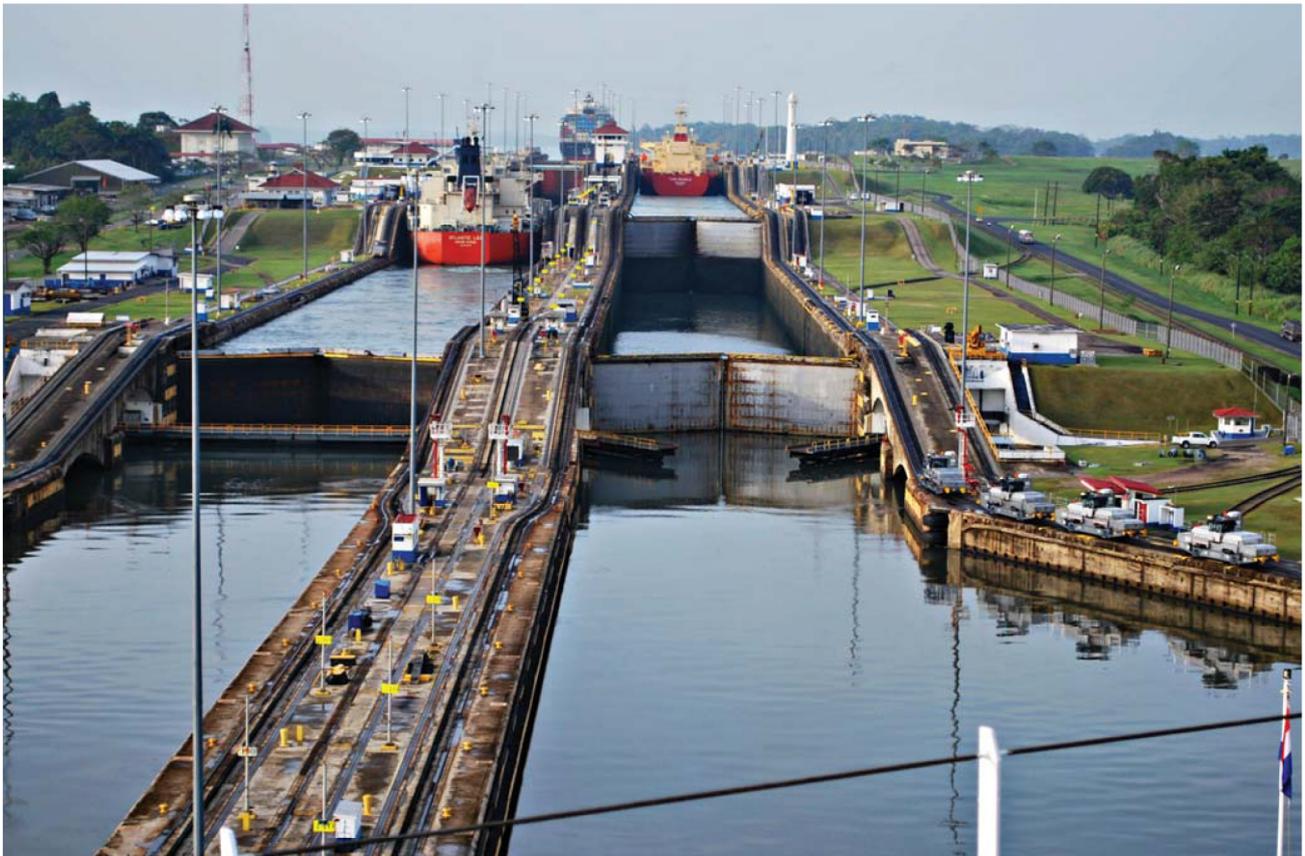


Figure 8.
View to Panama Channel.
Source: <https://www.flickr.com>.