Qatar Champions LNG as Cleaner Marine Fuel

Nakilat, Qatargas and RasGas Company Limited to convert Q-Max vessel as pilot project, making it capable of running on LNG and reducing exhaust gas and greenhouse gas emissions

Qatari shipping company Nakilat and Qatari LNG producers Qatargas and RasGas Company Limited have signed an agreement with MAN Diesel & Turbo to convert a Q-Max vessel to use LNG as an alternative to heavy fuel oil in the main engines.

The proactive initiative reinforces Qatar’s commitment toward the environment with plans to convert an existing low-speed diesel LNG carrier to use LNG as fuel thereby reducing the ship’s exhaust gas emissions.

Shipyard operator Nakilat-Kepet Offshore & Marine (N-KOM) will complete the ship’s conversion at its Erhama Bin Jabir Al Jalahma Shipyard facilities in the major Qatari Port of Ras Laffan. The modification will utilise MAN Diesel & Turbo’s ME-GI (M-type Electronically controlled – Gas Injection) systems as an innovative and flexible technology.

The Q-Max will be the world’s first low-speed marine diesel engine to be converted to use LNG as a fuel. The modification will meet current known and future stated global emissions regulations.

The control of greenhouse gas and exhaust gas emissions has a high priority in today’s shipping industry. In step with the emissions regulations, MAN Diesel & Turbo has made technical advancements to the low speed diesel engine to have the flexibility to utilise liquefied natural gas (LNG), a cleaner fuel as compared to heavy fuel oil, as an alternative fuel source employing the ME-GI concept.

Vancouver-based Waterfront Shipping has confirmed its Methanol Carrier Project for a series of 50,000-dwt methanol carriers, each powered by an MAN B&W ME-LGI main engine running on methanol.

The confirmation stems from a Letter of Intent signed by MAN Diesel & Turbo and Waterfront signed in July of this year. MAN Diesel & Turbo officially designates the ME-LGI engine as ME-B9.3-LGI. In collaboration with leading shipping lines, Waterfront reports that it is behind the 2+1 × 6G50ME-LGI engines ordered by Westfal-Larsen, the 2+1 × 7S50ME-B9.3-LGI by MOL, and the 1+1+1 × 6G50ME-LGI with Maninvest/Skagerack Invest.

Hyundai Mipo Dockyard Co., Ltd. (HMD) will build the Westfal-Larsen and Maninvest/Skagerack Invest vessels, while HH-EMD, Hyundai Heavy Industries’ engine and machinery division, will construct the engines. For the MOL contract, Minami Nippon Shipbuilding will construct the newbuildings...

Continued on page 2

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Continued on page 2
Qatar Champions LNG as Cleaner Marine Fuel

Continued from front page...

Q-Max vessels has concluded in a high confidence level with regards to safety and reliability of the propulsion system. This project is yet another milestone in Qatar’s standing as a reliable provider of clean energy to its customers in a safe and environmentally-sensitive manner and further demonstrates that proactive approach to the sustainable development of the country’s marine industry. So far, the use of LNG as a bunker fuel source in the maritime industry has been applied to conventional steam driven LNG carriers and more recently to Dual or Tri-Fuel Diesel Electric LNG ships with low-pressure, gas inject- ed, medium-speed, four-stroke diesel engines.

The use of ME-GI as an alternative will allow a cleaner fuel technol- ogy with a significant reduction in environmental emissions, cleaner burning engines with potential to increase mean time between main- tenance, provide flexibility of fuel supply to react to market changes and reduced bunkering activities which in turn will offer operations and marine risk reduction.

About Nakilat

Nakilat is a Qatari marine transport company providing the critical trans- portation link in Qatar’s LNG supply chain. Its LNG shipping fleet is the largest worldwide of other Gas(LNG) vessels. Nakilat also manages and operates four large LPG car- riers. Via two strategic joint ventures, N-KOM and NDSQ, Nakilat oper- ates the ship repair and construc- tion facilities at Erhama Bin Jaber Al Jalahma Shipyard. For more in- formation visit: www.nakilat.com.qa.

About QatarGas

Qatargas was established in 1984, and pioneered the LNG industry in Qatar. Today, Qatargas, under the guidance of His Excellency Dr. Mohammed Bin Saleh Al Sada, Minis- ter of Energy & Industry of the State of Qatar and Chairman of the Board of Directors at Qatargas, is the larg- est LNG producing company in the world, with an annual LNG produc- tion capacity of 42 million tonnes and is realizing its vision to deliver LNG to its customers around the globe, from its world-class facil- ities. Terminal Operations team oper- ates all the oil products, Tank Farms and related Marine Terminals at Ras Laffan Industrial City in Qatar. Ras Laffan is the largest LNG and oil products export terminal in the world. For more information visit: www.qatargas.com.

About RasGas

RasGas Company Limited (Ras-Gas) is a Qatari joint stock company which was established in 2001 by Qatar Petroleum and ExxonMobil RasGas Inc. RasGas acts as the operating company for and on behalf of the owners of the LNG projects RL, RL II and RLIII (Project Owners). With operations facilities based in Ras Laffan Industrial City, Qatar, Ras- Gas’ principal activities are to ex- tract, process, liquify, store and ex- port LNG and its derivatives from Qatar’s North Field. RasGas, on behalf of its owners, supplies LNG to ports to countries across Asia, Eu- rope and the Americas with a total LNG production capacity of approx- imately 37 million tonnes per annum.

For pipeline sales to the do- mestic market, RasGas also oper- ates the Al Khaled Gas Projects, AKG-1 and AKG-2 supplying ap- proximately 2.0 billion standard cu- bic feet (Bscf) per day. RasGas is currently adding production capac- ity by building the Barzan Gas Pro- ject which when fully operational in 2015, is expected to supply approx- imately 1.4 Bscf of additional sales gas to Qatar market to meet growing demand for energy at power stations and downstream industries.

RasGas currently operates the Ras Laffan Helium Plant, which was established in 2003 and came on stream in 2005. The plant extracts, purifies and liquefies helium from the North Field, the world’s largest gas field and which is located in the Persian Gulf. The second helium plant entered production in June 2013 bringing the total liquid Helium production capacity to 1.96 Bscf per year.

Contract Makes First Commercial ME-LGI Engine Reality

Continued from front page...

...while Mitsu Engineering & Ship- building (MES) will build the en- gines.

Ole Grane, Senior Vice President – Low Speed Promotion & Sales – MAN Diesel & Turbo, said: “This or- der represents a real market break- through for our Liquid Gas Injection engine and is the first such, com- mercial project that is not reliant on external funding.

Simply put, the ME-LGI engine was chosen for these carriers be- cause it is the engine best suited to the application. The LGI engine is designed to handle low-flash- point, low-sulphur fuels like LPG and methanol, etc. Consequently, its green credentials are striking with emissions of sulphur being al- most completely eliminated.”

ME-LGI development

MAN Diesel & Turbo announced the development of a new MAN B&W ME-DIAL dual fuel engine on 1 July, 2013. The engine expands the company’s dual-fuel portfolio, ena- bling the use of more sustainable fuels such as methanol, ethanol and Liquefied Petroleum Gas (LPG).

The company subsequently signed a Letter of Intent – less than two weeks later – with Vancouver- based Waterfront Shipping for the use of ME-LGI engines aboard its ships, a move that the new order now concludes. The engines will eventually run on a blend of 95% methanol and 5% diesel fuel.

Waterfront Shipping, a wholly- owned subsidiary of Metahane Cor- poration, is a global marine trans- portation company specialising in the transport of bulk-chemicals and clean petroleum products. With the growing demand for cleaner marine fuel to meet environmental regula- tions coming into effect in Northern Europe and other regions, Metha- nol is a promising alternative fuel for ships.

“Methanol is a sulphur-free fuel and provides many environmental and clean-burning benefits. In us- ing methanol-based marine fuel, we can reduce emissions and fuel costs at the same time,” stated John Hognestad, President, Wa- terfront Shipping, at the time of the signing of the Letter of Intent.

“With increasing fuel prices and upcoming shipping regulations, we identified the need to develop an engine that can enable ships to run on alternative fuels with enhanced environmental efficiencies. The ability of our ME-LGI engine to run on sul- phur-free fuels offers great poten- tial,” stated Ole Grane.

MAN developed the ME-LGI en- gine in response to interest from the shipping world in operating on alternatives to heavy fuel oil. Metha- nol and LPG carriers have already operated at sea for many years, and many more LPG tankers are currently being built as the global LPG infrastructure grows.

With a viable, convenient and economic fuel already on-board, exploiting a fraction of the cargo to power a vessel makes sense with another important factor be- ing the benefit to the environment. MAN Diesel & Turbo has previously stated that it is already working to- ward a Tier-III compatible ME-LGI version.

The G-type programme

MAN Diesel & Turbo’s G-type pro- gramme entered the market in Oc- tober 2010. The ‘G’ prefix before an engine means it has a design that follows the principles of the large-bore, Mark 9 engine series that MAN Diesel & Turbo introduced in 2006 with an ultra-long stroke that reduces engine speed, thereby paving the way for ship designs with unprecedented high-efficiency.

G-type engines’ longer stroke results in a lower rpm for the en- gine driving the propeller. This low- er optimum engine speed allows the use of a larger propeller and is, ultimately, significantly more ef- ficient in terms of engine propulsion. Together with an optimised engine design, this reduces fuel consump- tion and reduces CO2 emissions. The G-type engine is designed to be compatible with larger- diameter propellers following an ad- aptation of the aft hull design, paving the way for higher efficiencies. The ultra-long-stroke G-type engine ade- sually satisfies this trend.” Since its in- troduction, more than 350 engines have been the G-prefix.

About Waterfront Shipping

Waterfront Shipping operates the largest methanol ocean tanker fleet in the world with its fleet comprising vessels from 3,000 to 49,000 dwt. Its fleet of 18 modern, deep sea tankers delivers products to majo- r international markets in the North America, Asia, Europe and Latin America. www.wfsh-cl.com

About Westfal-Larsen

Westfal-Larsen & Co A/S is a fam- ily-owned company, founded in 1905, based in Bergen, Norway. The company is well established in the Commodity Chemical mar- kets with main focus on the trade between the Middle East and Asia. Westfal-Larsen & Co A/S currently operates a tanker fleet of two 40,000 dwt vessels built in 1995 and 1997 and eight 46,000 dwt vessels built between 2009 and 2012. Each tanker is zinc-coated and fully IMO II. In addition, the company operates two 46,000 dwt product tankers built in 2000. www.wlco.no

About Marininvest/ Skagerack Invest

Marininvest/Skagerack Invest is a private shipping and investment group, part owners and manag- ers of product and chemical tank- ers. Holdings include investments in tankers of about 80,000 dwt, chemical tankers between 20,000 to 50,000 dwt, a developing coastal shipping company and real estate. www.marininvest.se •
MAN Diesel & Turbo has recently communicated – through Circular Letter CL140942-2013/LEO – with owners and operators of a number of its MAN B&W two-stroke marine diesel engines regarding the question of cold corrosion.

This phenomenon occurs with some of the company’s newest engine types that have been designed to comply with Tier II NOx regulations and the latest Energy Efficiency Design Index (EEDI) guidelines. Some of these engines’ cylinder liners have proven to be prone to cold corrosion, caused by the liners operating at temperatures below the acid dew point.

In general, \( P_{\text{max}} \) and \( P_{\text{cr}} \) have been increased at part load in the latest engine designs, which calls for an optimisation of the cylinder-liner surface temperature. Furthermore, this development has also required rebalancing the cylinder-lube-oil’s ability to lubricate so as to neutralise the acid formation responsible for creating cold corrosion.

This article concerns the testing of, and experiencing the benefit of, high BN cylinder oils on engines with a relatively high corrosive level.

Based upon careful evaluation of these tests and service results, it was consequently decided to introduce BN100 as the new design basis for ME-C/ME-B/MC-C8.1 (and higher mark number) engine types.

Kjeld Asbo, Director of Customer Support and based at MAN Diesel & Turbo in Copenhagen, said: “An excess of cold corrosion is damaging to cylinder liners and demands prompt attention from engine operators. Through MAN Diesel & Turbo’s cooperation with lubricating-oil manufacturers – and after extensive on-board testing – we recommend increasing the oil BN to 100 to neutralise any condensating acid on the liner otherwise causing cold corrosion, while maintaining the same cylinder-lube-oil feed rate or incurring just a moderate increase.

For engine designs prior to mark 8.1, the risk of cold corrosion is, in general, limited as these engines’ layout, load variations and part-load operation do not lend themselves to fostering the same level of acid conditions. However, based on a number of applications we have investigated, we have also observed the cold corrosion of some pre-8.1 engines. Therefore, despite the fact that many pre-mark 8.1 engine designs operate successfully using mid-BN-range lube oils (50-BN-60) commonly available on the market, we recommend paying close attention to any engine wear by using MAN Diesel & Turbo-recommended drain-oil analyses and by making regular cylinder inspections. Accordingly, mid-range oils should only be used when there is positive wear-data directly backing this course of action up.

Asbo concluded: “Essentially, any presence of cold corrosion should prompt an increase in the affected engine’s lube-oil feed rate or BN level.”

Cylinder-lube oil

To achieve the optimum cylinder-lube oil dosage, the optimum BN level and cylinder-lube oil are employed. To this end, Fe (iron) and BN levels in the drain oil should be regularly measured.

As standard, MAN Diesel & Turbo recommends initially observing actual lubricating demand when circumstances change, such as when operating a new engine, changing cylinder-oil type, etc. The company recommends starting with a high feed-rate factor – an ACC factor of 0.40 g/kWh × S% – and, through this, obtaining knowledge of the actual wear rate. If the wear is confirmed as low, then the cylinder-oil dosage can be reduced by lowering the ACC factor in incremental steps of 0.05 g/kWh × S%.

Piston-ring wear can be measured directly at scavange-port inspections, either by measuring the remaining depth of the CL grooves or, on large-bore engines with cermet-coated top piston rings, by measuring the coating thickness with a coating-thickness gauge. As earlier stated, a quicker response may be obtained by on-board-measuring of the iron content and the remaining BN in the drain oil from each cylinder.

In the event that cylinder oils lower than BN100 are used for the mark 8.1 engines and newer, an increased lubrication level must be taken into account. As an example to illustrate this, if a BN85 cylinder oil is used, the oil dosage (the ACC factor) must be suitably increased with the relationship BN100/BN85. Here, as an example, the starting ACC factor should accordingly be: 0.40 × 100/85 = 0.47 g/kWh × S%.

Availability of BN100 cylinder oils

The major oil companies have been working on bringing BN100 cylinder oils into the market in recent months. Several BN100 cylinder oils have already obtained MAN Diesel & Turbo’s interim or full NOL (No Objection Letter), allowing these oils to be used in its engines. BN100 cylinder oils are already available in many ports from some suppliers and are expected to be available from all major oil companies during 2014.

Lubricating when operating with fuels with low sulphur content

As usual, MAN Diesel & Turbo recommends that vessels operating in and out of SOx-ECAs areas to additionally carry low-BN cylinder oil and to simultaneously switch from the BN100 oil to the low-BN oil when switching from high- to low-sulphur fuel. The BN100 cylinder oil can be used continuously for fuels with a sulphur content greater than 1.5%, and occasionally for shorter periods (one to two weeks) when operating on fuels with less than 1.5% sulphur. When running on fuels with a sulphur content less than 0.1%, the cylinder oil must be a BN40 or lower.

MAN Diesel & Turbo has previously released another Circular Letter (CL118681-2013/LEO) addressing this same subject, entitled ‘Increase of Cylinder Oil Dosage on Engine to Reduce Corrosive Cylinder Wear’. Both letters are freely available from the company upon request. Furthermore, a new service letter – SL2014-587 – was released to operators during March 2014 and contains all official guidelines for the lubrication of MAN B&W-type engines.

General guidelines

Different engine types and different engine operation conditions may require different cylinder lubrication needs.

No Objection Letters assume that the recommendations in MAN Diesel & Turbo’s latest issued engine type specific guidelines are followed and come with three conditions, such that the feed rate is compensated in relation to MAN Diesel & Turbo’s basic design recommendation; that BN and total iron (Fe) values in the drain are carefully monitored and the values measured are in accordance with the latest issued engine-type specific guidelines; and that the marketing material associated with the lube oil complies with the latest issued engine-design specific guidelines.

Summary

Through a number of different initiatives, including increasing the cylinder-liner surface temperature and adopting higher-BN cylinder-lube oil, MAN Diesel & Turbo has successfully reduced cold corrosion to the level that liners and piston rings are designed for. Based on individual applications, a further increase in BN level has shown that a reduced cylinder-lube-oil feed rate is possible in certain cases.
MAN Diesel & Turbo is introducing the MAN EcoCam as a retrofit solution for the low-load optimisation of its low-speed, mechanical engines with single turbochargers. The EcoCam offers significant fuel savings of 2-5 g/kW – with short payback times – and delivers an increased $P_{\max}$ cylinder pressure through the adjustable exhaust-valve timing.

Christian Ludwig – Head of Retrofit & Upgrade – MAN Diesel & Turbo, said: “Slow-steaming is now an established industry standard across all segments, including the tanker and bulker markets, and MAN Diesel & Turbo continuously seeks to further refine its technology and improve efficiency. The MAN EcoCam adjusts the exhaust-valve timing between 10 and 60% load, giving a 2-5 g/kW fuel saving with minimal to no interruption to a vessel’s schedule during installation.”

He concluded: “The MAN EcoCam has been thoroughly tested and we are happy that we are now able to provide our customers with a low-load tuning method for mechanically controlled engines with a single turbocharger.”

MAN Diesel & Turbo is initially rolling out the MAN EcoCam to a specific section of its low-speed portfolio, that is, a number of its MAN B&W S50MC-C two-stroke engines, and will eventually introduce it in graduated steps to its mid-bore and large-bore engine programme.

In addition to this, the company states that the EcoCam installation is a straightforward process that just involves the fitting of new, exhaust-valve actuators and a control system. This can be carried out unit by unit when the vessel is in port.

### Functionality

The MAN EcoCam introduces a flexible cam profile, which the company calls a virtual cam. The profile is controlled hydraulically by adjusting the amount of actuator oil in the hydraulic pushrod.

Low-load tuning has an impact on torsional vibration and NOX. Whenever a low-load tuning method is installed on an engine, the impact of both the torsional vibration and the NOX level have to be taken into account to ensure that the impact of the vibrations is not harming the engine and that the NOX level is still in compliance with IMO regulations.

The new torsional vibration calculation and NOX amendment are included when buying the MAN EcoCam.

### Fuel savings and payback

The EcoCam’s effect on fuel reduction has been verified by two independent testbed installations as well as on board a test vessel in service.

The earlier closing of the exhaust valve provides a higher compression pressure, thereby delivering a higher combustion pressure and a lower fuel-oil consumption. Flexible exhaust-valve timing has traditionally only been available to electronically controlled engines.

Depending on an engine’s load profile, the MAN EcoCam typically generates savings in the range of 2-5 g/kWh. For smaller engines, this can result in a payback period of as little as 1½ years as is the case, for example, with a 6S50MC-C engine with 6,000 annual running hours.
Kappel Propeller Retrofit Set to Revitalise Oil Tanker

Indian crude-oil carrier to benefit from innovative, fuel-saving screw

MAN Diesel & Turbo’s PrimeServ retrofit team recently signed an agreement with Great Eastern Shipping Company (GESCO) of Mumbai, India regarding a propeller retrofit upgrade for their M/T ‘Jag Lavanya’ – a Samsung-built 105,000-dwt crude oil carrier from 2004.

Kappel fixed-pitch propellers
MAN Diesel & Turbo recently announced a strategic focus that added the Kappel design to its fixed-pitch propeller portfolio, both for newbuildings and as a retrofit solution to vessels already in service. After a decade’s cooperation with inventor J.J. Kappel, MAN Diesel & Turbo took over the Kappel design business in 2012 and has since developed it further in terms of fixed-pitch propellers. The fuel savings and performance characteristics for controllable-pitch propellers, featuring the unique Kappel blade design, have been well documented over the last five years.

Increased efficiency
Retrofit calculations on different fixed-pitch propellers evaluated for the M/T Jag Lavanya show the superiority of the Kappel design. Christian Wollerup Sørensen, Sales Manager, MAN Diesel & Turbo said: "With this vessel’s speed and operating profile, the new Kappel propeller will deliver a fuel saving of 4% together with a reduced level of pressure impulses to hull – and without adding any other, efficiency-improving devices."

Short delivery time
The four-bladed, 6.9 metre Kappel propeller for the Jag Lavanya was scheduled for delivery from China in early 2014. "As a result of the excellent and efficient cooperation between the Mumbai shipowners and MAN Diesel & Turbo’s India and Frederikshavn locations – and last, but not least, our Dalian Marine Propeller (DMPC) production partner in China – we agreed upon an extraordinarily short delivery time to match a planned docking by the vessel," said Christian Wollerup Sørensen.

Propeller production in China
MAN Diesel & Turbo’s prolific partnership with Dalian Marine Propeller was recently confirmed with another order – a production agreement for a series of 7.2-metre Kappel propellers for the world’s largest car carriers to be built by Xiamen Shipbuilding Industry, China.

M/T Jag Lavanya – main data

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About GESCO
The Great Eastern Shipping Company Limited is India’s largest private-sector shipping company. The company has two main business areas: shipping and offshore. The shipping business is involved in the transportation of crude oil, petroleum products, gas and dry bulk commodities, while the offshore business services the oil companies in its offshore exploration and production activities through its wholly-owned subsidiary Greatship (India) Limited.
The Flexible Dual-Fuel Solution

Unveiled at a major event at MAN Diesel & Turbo’s Copenhagen Diesel Research Centre in May 2011, the ME-GI engine allows the use of either oil or gas fuel while working in the highly efficient Diesel cycle. With an order book that continues to be filled up, on this page, René Sejer Laursen, from MAN Diesel & Turbo in Copenhagen, answers questions on the culmination of many years’ work. On the right, we hear from Teekay, the customer.

Now that there are orders for vessels with the ME-GI engine, what makes you so confident that you have the experience for such a gas-injected model?
The ME-GI is a diesel engine, and we have been designing diesel engines for more than 100 years. The ME-GI’s electronic hardware and most of the software is based on our ME-type electronics that have been in successful service for over a decade. We first installed a 40 MW stationary 12K90MC-GI in Japan in 1994. This, along with extensive testing on our in-house research engine, as well as demonstrations in front of customers at our licensees in Japan and Korea, has provided convincing evidence that we have perfected the gas components and supporting systems.

What is pilot oil and what is it needed for?
The pilot oil starts the combustion process, as the ignition of the ME-GI is a diesel engine, and we have been designing diesel engines for more than 100 years. The ME-GI’s electronic hardware and most of the software is based on our ME-type electronics that have been in successful service for over a decade. We first installed a 40 MW stationary 12K90MC-GI in Japan in 1994. This, along with extensive testing on our in-house research engine, as well as demonstrations in front of customers at our licensees in Japan and Korea, has provided convincing evidence that we have perfected the gas components and supporting systems.

What is the amount of the pilot oil?
We guarantee a maximum pilot fuel of 3%.

Otto-cycle engines require high quality gas – What about the ME-GI?
If we look at the quality of natural gas worldwide, less than half has a methane number higher than 80. In an Otto-cycle, low-pressure engine, power will be reduced quickly with a lower methane number. By working in the Diesel cycle, where knocking is not an issue, high gas quality is not required.

How much methane slip will there be on an ME-GI engine, and what’s the effect?
The methane slip on the ME-GI is virtually undetectable due to its operation in the Diesel cycle. When measurable, it is some 0.2 g gas per kWh. The methane slip from an Otto-cycle engine during routine operation can be up to 5% of the gas and, during manoeuvring, can be 10%. This represents a direct efficiency loss since methane is, in fact, the fuel and this is an unburned or wasted portion that needs to be added to the gas consumption number. Note that methane is over 36 times worse than CO₂, as a greenhouse gas. Additionally, since it reflects unburned gas that performed no useful purpose in the engine, it is an important factor in the specific gas consumption.

Is the high-pressure system safe? What safety systems are on the engine that will detect gas leakage?
The system is extremely safe, and has multiple interlocks to ensure safe operation. The gas is in the inner pipe of the double-walled piping, and the external pipe is ventilated a minimum of 30 times per hour. The inner pipe is tested to 1.5 times the operation pressure of 300 bar, and the thickness of the outer pipe is sized to take 1.5 times max. rupture pressure coming from the inner pipe. In the event of leakage, hydrocarbon detectors will change the engine over to fuel operation while purging the system of gas. Such a change-over will take place without the engine stopping and is hardly noticeable. In a high-pressure system there is no need for explosion devices on the engine or bursting discs in the exhaust stack as would be required in a low-pressure system.

At what loads is the ME-GI capable of operating on gas?
At 10% load, the engine will switch from gas burning to purely fuel oil operation. It will then switch back to gas operation automatically when the load goes above 10%. The process is completely transparent and the operator does not have to do anything, as it is all controlled by the ME-GI control system.

Can the ME-GI burn ONLY fuel or gas, or...?
The ME-GI can burn whatever portion of gas or fuel desired, subject to the 10% low-load switchover to gas.

Regarding emissions, it has been indicated that the MAN B&W two stroke ME-GI engine will require an EGR or SCR when Tier III emissions rules come into effect in 2016. Is that the case?
When Tier III comes into effect, the ME-GI will utilise either EGR or SCR to achieve the appropriate NOₓ levels. This is a consequence of the high efficiency of the Diesel cycle because NOₓ is formed when burning gas at high temperatures. With a lower combustion temperature, less NOₓ is formed. However, that also means a much lower efficiency. Otto-cycle engines that run only on gas will not require EGR or SCR due to the lower temperature/efficiency but, if they are to run on fuel oil, will require SCR. In effect, they would not be dual-fuel engines, they would be gas engines as they cannot burn fuel without after-treatment. Note that there is no need for scrubbers with an ME-GI system.

What power ratings are the ME-GI engines available in?
The entire MAN B&W product line of two-stroke engines from the 5-cylinder S30 at 3,200 kW, to the 14-cylinder K98E at 87,220 kW are available as ME-GI. In addition, all stroke lengths (L, S and G) are available as ME-GI. Because the necessary hardware changes from ME to ME-GI are not major, it is not a significant issue to make as a gas-injected engine. Lead time is essentially the same as for a standard ME engine, which can vary from yard to yard and depends on the current order backlog.

René Sejer Laursen, MAN Diesel & Turbo in Copenhagen
Teekay Gives its OK to ME-GI

Tony Bingham, Director of Business Development and Technology at TeeKay Shipping discusses the reasons his company chose MAN Diesel & Turbo's dual-fuel, two-stroke ME-GI engine and their expectations for the future.

What was the background behind Teekay choosing the ME-GI engine?
At Teekay we believe that it is advancements in technology that will drive change in the shipping industry faster in the next ten years than it has over the last 20. Teekay has been watching the development of the ME-GI engine for several years and has been involved in the qualification process with other ship owners and charterers.

Teekay went through a lengthy process of investigating the possibility of re-engining some LNG steam ships and it was during this project that the ME-GI solution showed itself to be a logical choice for the future. The fuel savings it provided together with the extra gas that could be delivered to the customer by removing the steam plant resulted in an extremely attractive payback period. The steam plant replacement project was the stimulus for us to investigate the use of ME-GI in a newbuild project.

We worked very closely with DSME over a two year period on the newbuild project and after confirming the design, economics and the readiness of the charterers to accept the new engine arrangement, we placed the order in December 2012 confident that these vessels would be the next generation of LNG ships. In summary, when we set out on this project we wanted to:
- Reduce Drive Train Complexity
- Reduce Fuel Consumption
- Lower Opex Costs
- Deliver Customer Value

What specific considerations did you take into account in making your choice of engine?
In selecting the ME-GI we recognised a number of key factors:
- The engine is based on proven technology in that the base engine is used in the majority of ships world-wide and Teekay had 96 of these engines in its own fleet at the time of ordering.
- The base engine has proven itself to be very reliable and is well known to our seagoing engineers, who are very positive about the selection and look forward to the new vessels arriving into the Teekay fleet.
- Conceived methane slip and the growing debate around the subject and found the engine to give the lowest slip of all the propulsion plants.
- We also looked at the through life operational costs and established the engine to be the most economic of all the solutions available.

What benefits do you expect to gain from using the ME-GI?
- A well-known engine and our engineers have been very positive about the selection and look forward to the new vessels arriving into the Teekay fleet.
- There will be a reduction in high voltage components in the engine room so we see a reduction in the safety risks associated with high voltage.
- We will have vessels which meet and exceed the EEDI requirements making them the most energy efficient LNG ships available.

How positively do you expect the ME-GI to impact on your fuel budget?
The fuel savings will be seen by the customer, however it is not just the fuel savings. The design we have developed with together with DSME will result in the customer being able to deliver more cargo on an annual basis, thus improving their economics further.

Is it a challenge being an early adopter of this technology?
We have worked hard to promote the ME-GI technology through presentations to potential customers and as a result we have laid our design out for all to see. The disadvantage of our openness has been that the competitive advantage has been short-lived with a steady increase in the adoption of the technology being realised.

We have found that charterers are very interested and committed to what we have done and our work has been validated by our own internal teams. The industry will see variations on the theme as we move forward but we believe our solution is still the optimum arrangement ordered to date. Over the last 12 months we have seen a shift in tenders being issued, with ME-GI technology now being specified as the sole propulsion solution for a charter or an option for serious consideration.

Generally speaking, how do you see the market developing in the future in terms of fuels and engine technology?
The future is going to be increasingly focused on efficiency and the environment, therefore engines that can operate on fuels which are less onerous on the environment are going to be key. This may not be engines that just burn methane but will include other gas based fuels such as methanol, DME and LPG. We are already looking for the next solution, the next step change in technology. We cannot see it yet but as we said above technology is moving fast and we will be ready for it.

In light of this, how important will the ME-GI engine’s flexibility be?
The ME-GI has met and exceeded our requirements, it is technology that is proven, reliable and available today. It is the most efficient solution available at the moment and the whole vessel design exceeds the Energy Efficiency Design Index specified for ships to be built in 2025. We have a vessel that is going lead the next generation of LNG ship design and be competitive for many years to come.
PrimeServ New York Speaks the Language of Business

Recently appointed as Regional General Manager at PrimeServ New York, DieselFacts paid a visit to Ruben Caparros’ latest port of call to hear his plans for the local after-sales hub.

The roots to Caparros’ journey from his home in Spain to New York lie partly in a huge PrimeServ Valencia job in November 2012 that took 30 days with 20 people working day and night.

Caparros says: “It was a really challenging job, probably the most stressful one I ever had, but ultimately we completed the job successfully. However, afterwards, I swore that never, ever again would I have the problem of feeling at a disadvantage because my English wasn’t at the same level as the native-English-speaking customers.” DieselFacts hastens to add that Caparros’ command of English is already excellent and suspects he is a perfectionist in this regard.

This question of language dovetailed with him feeling that he was ready for a new challenge after five successful years in Valencia. He eventually asked Wayne Jones – Head of the PrimeServ Diesel Business Unit – for a placement in an English-speaking country, either starting a new PrimeServ or growing an existing one. Subsequently, Jones nominated him for the vacant New York position.

Leaving colleagues, family and friends was tough, but Caparros moved to the States in the summer of 2013 with his wife and daughter, which made the move easier. They live in Bridgewater, out in the New Jersey countryside, about half an hour west of work in Woodbridge, also in the Garden State, but just a half-hour or so from Manhattan.

Ironically, Caparros is not the only Spanish-speaking immigrant in the US and he complains: “We go to the park with my 3-year-old daughter and want to talk to the parents in English, but most of them speak Spanish!”

Changing times

PrimeServ New York is in a state of flux and Caparros has had several issues to take care of since his arrival. With PrimeServ North America moving headquarters from Woodbridge to Houston, Caparros inherited a large facility of 3,900 square metres. He immediately set about consolidating space by moving everything into one main building since – by applying lean and SS techniques – a simpler and more logical layout is more effective.

Caparros also states that one of his main tasks for the following year, together with the HSEQ department, will be to set up the workshop with the MAN standard, implementing ISO, OHSAS (Occupational Health and Safety Advisory Services) and 6S, a modification of the Japanese SS workplace organisation methodology that includes “Safety” as the 6th S.

He has also, since his arrival, done a full analysis of the Woodbridge operation and drafted an investment plan that runs to the end of 2014. Caparros says: “The shop has to become a sales channel so we can confidently invite customers and sales people to drop by, knowing they will get a good impression of our operation. Ultimately, when growth returns, a decent shop will help close sales.”

Core business

From a workshop point of view, PrimeServ New York offers a broad range of services. Caparros says: “We have a very big machining capacity in this shop – lathe machines, milling machines, boring machines, as well as turbocharger and injection equipment. We can do a lot of welding and hot jobs too. Top cylinder covers, two-stroke spindles and seats are a specialty of ours where we cut them down, weld them up, machine them to the correct dimensions, wash them, and then oven bake them to check for and relieve thermal stress.”

Training

Another vital objective for Caparros is to prepare the local team and the shop, including developing a personalised training program for diesel technicians. Caparros also states that one of his main tasks for the following year, together with the HSEQ department, will be to set up the workshop with the MAN standard,

The service centre’s location was chosen because it’s close to New York City and the Port of New York and New Jersey, a major venue source of revenue for the service hub. There are four container terminals in the port whose combined volume makes it the largest on the East Coast, 3rd busiest in the United States and 20th worldwide. Port facilities in the Big Apple itself are reserved almost exclusively for the significant cruise liner business.

PrimeServ New York takes care of the American East Coast – excluding Florida, which is under PrimeServ Fort Lauderdale’s remit – and mainly works in New York and New Jersey Port, Baltimore, Norfolk, Savannah, and even land-locked Philadelphia, which is on a fork of the Delaware river and navigable up to the city.

Caparros adds: “We also support Florida by sending many engineers for turbocharger or genset jobs to the Caribbean to Bermuda and Puerto Rico, among other places. Also, when Fort Lauderdale requires our help, we assist with 23/30 tug overhauls and 28/32s as well, both in Woodbridge and in Florida. The four-stroke department also has service contracts with Norwegian Cruise Lines and does 48/60 engine overhauls for cruise ships based in NY and Boston.”

PrimeServ New York is also one of nine PitStop – MAN PrimeServ’s spare-parts program – centres worldwide, which is another big revenue stream locally.

Premium customer base

Cruise ships are a big part of the business. Caparros says: “We have a very big cruise liner business. There are four container terminals in the port whose combined volume makes it the largest on the East Coast, 3rd busiest in the United States and 20th worldwide. Port facilities in the Big Apple itself are reserved almost exclusively for the significant cruise liner business.”

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And there’s much more to come.

Safety as the 6th S

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Norwegian Player to Power LNGCs with ME-GI Units

Continued adoption of dual-fuel, low-speed engine type by market augurs well for future

Knutsen OAS Shipping, the Norwegian shipping company, has placed an order for 2 x 2 767/ME-GI engines in connection with the building of two 176,300 m³ capacity LNG carriers.

The specified engines are also based on MAN Diesel & Turbo’s new, ultra-long-stroke, G-type concept to deliver an even higher, overall propulsion plant efficiency. MAN Diesel & Turbo has verified that, even when compared to the best, modern DFDE propulsion solution, an ME-GI engine delivers fuel savings of more than 30 tonnes of gas per day when operating at a normal ship speed of 15-17 knots. To date, MAN Diesel & Turbo has clinched orders for 42 dual-fuel units, representing a power output of 780 MW.

The ME-GI engine

The ME-GI engine represents the culmination of many years’ work. Depending on relative price and availability, as well as environmental considerations, the ME-GI engine gives shipowners and operators the option of using either HFO or gas – predominantly natural gas. An ME-GI counterpart that uses LPG and methanol is also being developed. Hyundai became the first MAN Diesel & Turbo two-stroke licensee to demonstrate the ME-GI concept in Korea in late-2012, with Mitsui following in April 2013. At the time, MAN Diesel & Turbo predicted a broad, potential market for its ME-GI engine. Subsequently, the company reported much interest in the engine and has since confirmed several orders from significant market players. MAN Diesel & Turbo sees significant opportunities arising for gas-fuelled tonnage as fuel prices rise and modern exhaust-emission limits tighten. Indeed, research indicates that the ME-GI engine delivers significant reductions in CO₂, NOₓ, and SOₓ emissions. Furthermore, the ME-GI engine has no methane slip and is therefore the most environmentally friendly technology available. As such, the ME-GI engine represents a highly efficient, flexible, propulsion plant solution.

About Knutsen

Knutsen OAS Shipping AS is a fully integrated shipping company with headquarters in Haugesund, Norway. Knutsen covers shipping operations, newbuilding supervision, chartering and project development in-house. The company has a strong focus on technology development that includes its own concepts for Floating Production Storage and Offloading (FPSO) vessels and Liquid Natural Gas (LNG) vessels, as well as arctic LNG carriers. Knutsen is also a world-leading technology developer within systems to reduce emissions of Volatile Organic Compounds (VOC), systems for ballast-water treatment and the marine transport of compressed natural gas. The latter technology is especially interesting for handling offshore loading and the transport of natural gas and gas volumes from well testing.

Future challenges

Another broad trend that Caparros is conscious of is MAN’s leading of the technological charge from diesel to gas engines. He says: “We understand that now is the right time for change, mainly because of emissions and also because natural gas is cheaper than heavy fuel. MAN Diesel & Turbo’s challenge so is to develop safe, reliable products in terms of cost reduction, efficiency, the environment and safety that will fulfill customer needs in the future.” Similarly, he states that the main challenge for PrimeServ New York is to steadily improve its service and to continue growing its global network so it can move closer to the customer and understand local needs better. He finishes the view by stating: “We never know what is coming next, but the most important thing is to have the right people in place with the right skills and the right products so we can face any challenge that arrives with confidence.”

Caparros turns up. He says: “What they do is, they make contact with the customer, approach them, and understand their needs. And then, if there is something concrete with potential for a long-term relationship, it’s given to me so I can approach the customer and begin more detailed discussions.”

He also wants to utilise his large machining capability and apply it to any other relevant jobs, such as at power plants, cleaning up intercoolers, heat exchangers, welding, re-machining – basically applications that PrimeServ traditionally hadn’t had much dealings with before.

In this context, he adds that the paper industry is another segment of interest as it has many scrubbers on their own bat and also based on leads
Norwegian Cruise Line Places Trust in MAN Prime Movers

MAN Diesel & Turbo has won the order from Meyer Werft for new cruise vessels for Norwegian Cruise Line to supply its V48/60CR engines with diesel-electric propulsion systems.

The ships will be built at Meyer Werft in Papenburg, northern Germany. Norwegian is a longstanding customer of MAN Diesel & Turbo with almost its entire fleet powered by the 48/60 and 58/64 engine types.

The new ships — accorded the project name ‘Breakaway Plus’ — will be the largest in Norwegian’s fleet. At 163,000 gross tons and approximately 4,200 passenger berths, the vessels will be larger than the previous 146,000 gross ton Breakaway-class ships ordered at Meyer Werft in 2010, but will incorporate many of those vessels’ unique design elements and innovations.

The Breakaway Plus vessels will each be powered by five engines — 2 × 14V + 3 × 12V48/60CR Tier II types — capable of delivering 76,800 kW, compared to the four driving the Breakaway-class ‘Norwegian Breakaway’ and ‘Norwegian Getaway’ vessels. The five engines will operate with MAN Diesel & Turbo’s well-proven, state-of-the-art, common-rail injection system that is suitable for both heavy fuel oil and distillate fuels. This technology, developed in-house by MAN Diesel & Turbo and fully optimised for its engines, provides superior performance in terms of fuel consumption and smoke emissions, especially at part load.

Norwegian’s new and innovative Breakaway class vessels will sail first to Bermuda for the summer and the Bahamas and Caribbean in the winter. Construction of Norwegian Breakaway’s sister ship — ‘Norwegian Getaway’ — is well underway with delivery scheduled for January.

Sokrates Tolgos, Head of Sales & Turbo, said: “With this new order, we are extremely pleased to continue our long-standing relationship with Norwegian and Meyer Werft, both of whom have always been innovative with high demands for quality standards and professionalism from their suppliers.

Norwegian pioneered the concept of Freestyle Cruising offering guests the freedom and flexibility to enjoy their cruise vacation on their own terms. Furthermore, it was the first company to introduce MAN 48/60 common-rail technology into its operating fleet six years ago. Ever since, all its MAN powered new-builds have been ordered with the fuel saving electronic CR injection system.”

Tolgos concluded by saying: “Our company’s firm approach of risk-controlled introduction of new technologies into the market is bearing fruit. This is fully in line with the very high safety, reliability and environmental standards we encounter in the cruise business, where the parties involved strive not only to meet but even to exceed the level required by regulation wherever possible.”

Graphical rendering of the Breakaway Plus vessel (courtesy Meyer Werft)

MAN Diesel & Turbo Builds Power Plant in Saudi Arabia

MAN Diesel & Turbo has received an order from the United Cement Industrial Company to build a power plant in Saudi Arabia.

Five MAN 20V32/44CR engines will provide electricity for a new cement works 160 kilometers to the south of Jeddah, near the Red Sea. With a total output from the plant of 54.5 MW, the works will be able to produce around 5,000 tons of cement a day. MAN Diesel & Turbo is building the power plant under an EPC agreement (Engineering – Procurement – Construction) and will therefore take care not only of delivering the engines themselves, but also of the erection of all essential ancillary equipment – from the machine control room and the cooling system to the processing and disposal system.

A consortium partner is responsible for local deliveries and services. The order is worth tens of millions of euros to MAN. “Saudi Arabia is a key market for our power plants division, and one in which we have decades of experience,” says Dr. René Umlauf, CEO of MAN Diesel & Turbo. “We believe there is tremendous potential in the domain of local power plant solutions for independent energy generation in particular, for example for cement or steel works. The United Cement Industrial Company is a new client for us and one we have convinced with our technical concept.” Saudi Arabia’s demand for cement is set to rise in the medium term, since the country’s development plans envisage a variety of construction and infrastructure projects. The new cement works operated by the United Cement Industrial Company is being built in a very hot, sandy region in which temperatures can reach up to 50 degrees Celsius in the summer. The reliability of MAN engines during operation in such extreme conditions was one of the key criteria behind the purchase. The power plant’s system design has also been optimised to accommodate the climatic conditions.

The engines feature MAN Diesel & Turbo’s proven modern common-rail technology. This electronically controlled injection system yields excellent results in terms of fuel consumption and emissions. Construction of the plant began in the autumn of 2013, with delivery of the engines scheduled to take place in mid-2014.”
Major Conference Marks Final Phase of Helios Project

EU-funded initiative on gas-fuelled, two-stroke ship engines draws to a close in Copenhagen

A major international conference on November 27th last in Copenhagen marked the final phase of the EU-funded Helios project.

Helios is a cooperation research project within the EU’s 7th Framework Programme for Research and Technological Development/Transportation with MAN Diesel & Turbo acting as coordinating partner. The general objective of the project is to develop a research platform for an electronically controlled, two-stroke, low-speed, marine diesel engine that operates on the principle of the direct injection of HP Compressed Natural Gas (CNG) to meet the needs of the emerging LNG market. A large audience of 150 experts from around the world attended the conference to hear presentations on the gas-engine technologies garnered from Helios as well as on other factors influencing the development of gas-fuelled ship engines.

Activities and results

A broad range of activities were initiated over the past three years under the Helios framework. A concrete result was the development of the new, gas-fuelled ME-GI engine, a dual-fuel unit that MAN Diesel & Turbo has since released to the market with success. Generally speaking, Helios has generated many positive results and increased the knowledge base in several technical fields, including the development of:

- gas-engine components
- a new gas injection valve and other main components
- a gas-control block
- a new gas-composition sensor and a new handheld calibration device
- a dedicated control and safety system
- laser-optical, temperature-measurement technology
- new high-temperature materials
- the analysis of potential tribology and corrosion problems.

First orders of gas-fuelled ship engines

As previously mentioned, Helios’ most significant result is the development of the ME-GI engine, utilising the direct-injection principle, a concept the market has embraced and which several shipowners have already placed orders for. Recently, Matson (USA) ordered two giant ME-GI gas engines – the largest dual-fuel engines ever ordered in terms of power output – for two new container vessels, while American TOET and Canadian Teekay also signed ME-GI orders at the very end of 2012 and will become owners of the most environmentally friendly, two-stroke, low-speed vessels in the world with the first scheduled to be complete in 2014.

MAN Diesel & Turbo assesses the potential for more orders in this new, emerging market segment as great.

Cooperation

The Helios results were gathered through an innovative collaboration with an array of different universities and companies. Stemming from this, a research platform was constructed at MAN Diesel & Turbo in Copenhagen, where various ideas were tested and components subsequently developed.

Environmental benefits

The ME-GI engine complies with the IMO’s Tier II requirements and, in combination with EGR (Exhaust GasRecirculation), its emissions are below Tier III limits. A particularly significant, environmental benefit is the ME-GI’s very low methane slip. The major benefits stemming from the Helios project are summed up in the following table:

<table>
<thead>
<tr>
<th>Environmental benefits</th>
<th>Name</th>
<th>Type</th>
<th>Country</th>
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</thead>
<tbody>
<tr>
<td>NOx</td>
<td>MAN Diesel &amp; Turbo (Coordinator)</td>
<td>Large company</td>
<td>Germany</td>
</tr>
<tr>
<td>CO</td>
<td>University of Erlangen</td>
<td>University</td>
<td>Germany</td>
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<tr>
<td>CO2</td>
<td>Germanischer Lloyd</td>
<td>Large company</td>
<td>Germany</td>
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<td>Jönköping University</td>
<td>University</td>
<td>Sweden</td>
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<td>PM</td>
<td>Kistler Instruments Wintherthur AG</td>
<td>Large company</td>
<td>Switzerland</td>
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<td>Air pollution</td>
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<td>University</td>
<td>Sweden</td>
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<tr>
<td>Emission</td>
<td>TGE Marine Gas Engineering</td>
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<tr>
<td>Thermal efficiency</td>
<td>Uppsala University</td>
<td>University</td>
<td>Sweden</td>
</tr>
</tbody>
</table>

More information on the Helios project is available at www.helios-fp7.eu or contact MAN Diesel & Turbo directly: Senior Manager Lars Juliusen, Coordinator (Tel.: +45 33 85 13 97) or Programme Coordinator Nils Freese (Tel.: +45 33 85 13 68)

Carnival Cruise Lines Selects MAN Engines

World’s largest cruise operator chooses common-rail, four-stroke engines to power its new generation of cruise liner

MAN Diesel & Turbo has won the order from Miami-based Carnival Cruise Lines to supply five 48/60CR engines for its next generation of cruise liner.

The newbuilding will feature a diesel-electric propulsion system. The vessel will be built in Italy at Fincantieri S.p.A., one of the world’s leading cruise shipbuilders.

With a gross tonnage of about 133,500 tons and a passenger capacity of about 5,000, the ship will be the largest vessel in the Carnival Cruise Lines’ fleet. Its construction represents the introduction of a brand new class of ship that will be powered by five MAN Tier-II-type engines – 2 × 14V48/60CR + 3 × 8L48/60CR types – capable of delivering 62,400 kW. The vessel is scheduled for delivery in spring of 2016.

Dr. Stephan Timmermann, of MAN Diesel & Turbo’s Executive Board, said: “This new order is yet another historical milestone for the company in what is a technologically but also commercially demanding market. Gaining the confidence of Carnival Cruise Lines, the world’s largest cruise operator, fills us with pride but we are also aware of the high level of expectation that working with a major, new customer brings.”

Timmermann concluded: “This new cruise order for Carnival Cruise Lines is our second at Fincantieri within a rather short period of time. It clearly signals the deepening of our nascent collaboration with one of the world’s dominant cruise shipbuilders, something we view as very encouraging.” During the evaluation period to select the most suitable engine configuration, Carnival Cruise Lines and Fincantieri paid special attention to the highest possible degree of redundancy, safety, power flexibility and reliability. The five 48/60CR engines will operate with MAN Diesel & Turbo’s well-proven, state-of-the-art, common-rail injection system that accommodates running on both heavy fuel oil and distillate fuels. This technology, developed in-house by MAN Diesel & Turbo and fully optimised for its engines, provides superior performance in terms of fuel consumption and smoke emissions, especially at part load compared to its MO Tier II engine version with conventional injection system. Sokrates Tolgos, Head of Cruise & Ferry Sales, MAN Diesel & Turbo, said: “We are extremely pleased with what is a very positive development for us in the cruise segment. Our company’s firm approach of risk-controlled introduction of new technologies into the market over many years is bearing fruit and fully in line with the very high safety, reliability and environmental standards demanded by the cruise business. The recently increased number of new cruise customers opting for MAN engines encourages us to maintain our focus on continuous innovation without compromise on quality and reliability. We feel honored to welcome Carnival Cruise Lines as our new customer. This is an excitingly positive milestone for our future growth in this market, which has always been a frontrunner for environment, emission reduction, and state-of-the-art technology.”
New Gas Turbine Generation Delivers Extremely Low NOₓ

Oberhausen easily meets legal NOₓ requirements through the innovative use of combustion chambers with premix technology

Not only highly efficient, but also particularly low in emissions, MAN Diesel & Turbo has managed to reduce the nitrogen oxide emissions of its new MGT gas turbine generation to an extremely low level in test-stand runs.

“In addition to the particularly high efficiency, one of our primary development aims was that the new gas turbine family had to be equally economic and environmentally-friendly all the way down the line,” said Dr. Sven-Hendrik Wiens, Vice President Gas Turbines. “The single digit NOₓ values now realised in the load range between 50 and 100% with the MGT 6100, the single-shaft version of the new MGT gas turbine family, prove that we have achieved this aim comfortably.”

Less than 10 ppm nitrogen oxide were detected in the exhaust gas on the test stand in Oberhausen during all operating conditions between half and full performance of the gas turbine. In comparison, The German Federal Emission Control Act currently specifies a limit value of 36.5 ppm (equivalent to 75 mg/ Nm³) in its “Technical Instructions on Air Quality Control (TA Luft”).

“We are convinced that we can repeat this excellent result in further versions of the same type. In a further step, we are planning on guaranteeing our customers very low nitrogen oxide values based on the test results, thereby increasing the competitiveness of the gas turbine,” said Frank Reiss, Head of Combustion Technology. The development department in Oberhausen achieved these extremely low emission values with an ACC combustion chamber modified and further developed for the new gas turbine generation.

MAN Diesel & Turbo has already developed and successfully implemented an “Advanced Can Combustor” (ACC) for their time-proven THM gas-turbine family. These can-type combustion chambers work on the principle of premix technology where the fuel is already premixed homogeneously with the combustion air before entering the combustion chamber. The result is that fuel-rich hot strands are avoided, meaning that significantly less nitrogen oxides, which are harmful to both living beings and plants at higher concentrations, are formed in the exhaust gas.

The new gas turbine generation, with its six to eight megawatts output, has great potential to drive the energy revolution forwards. The turbines can be started up comparatively quickly in under ten minutes and can ideally supplement strongly fluctuating, renewable energy sources such as wind or solar power as generator drives. Funding was received for the development of the new gas turbine under the North Rhine-Westphalia Objective 2 Programme 2007-2013 “Regional Competitiveness and Employment (ERDF).”

“With regard to this aspect, it is particularly important that we have achieved low nitrogen oxide emissions in a wide load range because it is exactly this flexibility that will be in demand in the future, especially for decentralised power generation,” explained Dr. Wiens. SolVin was the first customer to put into operation a two-shaft MGT 6200 at their Rheinberg site at the end of June 2013. As a cogeneration or Combined Heat and Power (CHP) system, it produces power and process heat for the manufacturer of basic chemicals, with a total efficiency of over 80%.

For further information
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See DieselFacts online with video clips: www.mandieselturbo.com/dieselfacts or download the app to your iPad or Android tablet.

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MAN Diesel & Turbo

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