BY IAN CAMERON

The service crew from Pon Power A/S, Caterpillar's MaK dealer for Scandinavia, completed the conversion to low emission engine (LEE) standard on the *Fure West* in just four days.

IMO II in Focus

Retrofitting Caterpillar's MaK LEE standard is quick and easy

Following the successful commercial debut of the MaK M 43 C LEE in late 2007, low emission engine (LEE) technology is now also available for the MaK M 32 C series, which is widely used in general cargo and offshore support vessels like AHTS, PSV and ERV. Based on one of the most reliable medium-speed marine engines so far developed, the new M 32 C LEE already meets IMO II emission regulations, which do not become effective until 2011.

Caterpillar has made sustainable development a challenging target of its "Vision 2020" strategy. Having monitored both the development of emission regulations and customer expectations, the company believes that electronically controlled engines will gradually become the norm. And, with its proprietary simulation and analysis tools for engine combustion, its expertise in fuel system manufacturing and its internal electronic control designs, Caterpillar is well prepared to set the standard for environmentally friendly diesel engines. Strong evidence for this is provided by Caterpillar's ACERT Technology, the product of a US$500 million investment structured on the broadest possible product, application and manufacturing base in the industry.

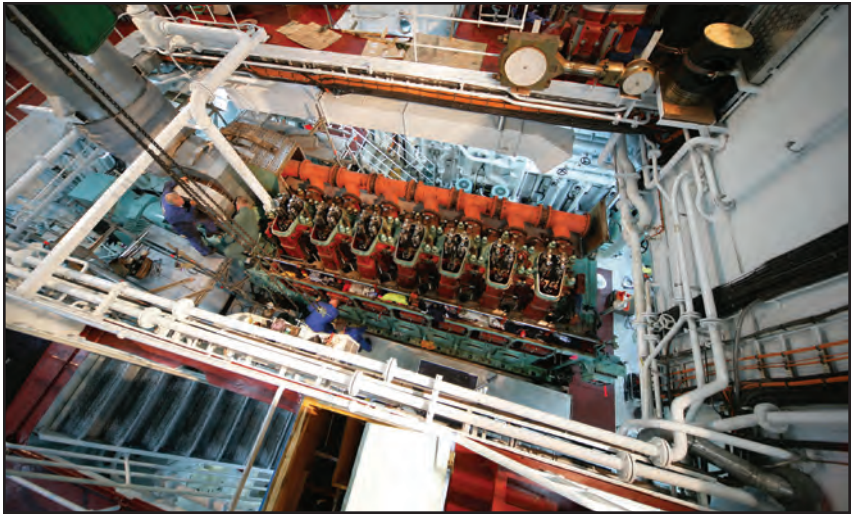
The goal for MaK medium-speed marine engines has been clearly defined, said Dr. Udo Schlemmer-Kelling, manager – Research at Caterpillar Motoren in Kiel, Germany. "Exceed customer expectations by minimizing emissions while at the same time maximizing product value. Consequently, our strategy has had to comply with the MaK brand reputation: superior reliability in heavy fuel operation, best-in-class fuel efficiency and outstanding durability."

Back in 2000, Caterpillar Motoren identified three emission levels for the MaK marine product in order to meet short- to midterm emission regulations. These were a base line IMO engine, which fulfills MARPOL 73/78, Annex VI requirements, an IMO-compliant engine with invisible smoke emissions and a LEE, which meets the expected NOx emission range of IMO II and is also smoke-invisible. In addition, this strategy favors proven technology inside the existing engine, which has clear advantages in terms of cost, complexity and maintenance.

After comprehensive simulation and prototyping of MaK LEE technology in 2001-2003 and after some final adjustments and improvements, Caterpillar Motoren, together with Caterpillar Marine Power Systems, was ready to put its unique technology to the test. During a scheduled vessel stopover in Rostock, Germany, in October 2007, the retrofitting of the chemical tanker, *Fure West* was completed in just four days. This also included Marine Classification Society approval. This was accomplished in cooperation with Furetank Rederi AB Sweden and a service crew from Pon Power A/S, Caterpillar's MaK dealer for Scandinavia, supported by engineers from Caterpillar Motoren in Kiel and Rostock.

Furetank Rederi AB of Donsö, Sweden, runs five product and chemical tankers on European shipping routes. *Fure West* and its sister ship *Fure Nord* were delivered by Edward Shipbuilding Co. Ltd. of Shanghai, China, in 2006 and 2004 respectively. With a length of 144 m, a 21 m beam and 9 m draught, the 16 000 DWT tankers reach a top speed of 15.4 knots. Both vessels have, to date, relied on IMO-compliant MaK 7 M 43 C main engines rated 6180 kW at 500 r/min. The MaK 7 M 43 C LEE has been operating aboard *Fure West* since October 2007 and has exceeded both the expectations of its owner Furetank and Caterpillar. The company claimed further that this makes it not only the first known vessel afloat with an IMO II-compliant engine running on heavy fuel oil (HFO), but also a landmark for future vessels.

"With NO_x emissions down to 8.3 g/kWh, or 36% below current IMO regulations, and soot emissions reduced to less than 0.5 filter smoke number [FSN] over the whole load range, our MaK LEE technology clearly deserves the name low-emission engine," said Schlemmer-Kelling, highlighting the results of final sea trials with *Fure West*.



A MaK 7 M 43 C marine engine is shown here during its retrofit to the LEE standard. All existing MaK M 20 C, M 25 C, M 32 C and M 43 C series marine engines can be converted to MaK LEE standard — at about only 15 to 25% of the cost of a new IMO II-compliant engine.

All existing MaK M 20 C, M 25 C, M 32 C and M 43 C series marine engines can be converted to MaK LEE standard — at about only 15 to 25% of the cost of a new IMO II-compliant engine. Built upon proven technology within the existing engine, MaK LEE offers many advantages for vessel owners and operators. MaK LEE already provides a power plant that complies with upcoming IMO II emission regulations. This allows shipping companies to increase their reputation for environmentally friendly marine business operations.

In addition, the emission levels achieved with MaK LEE enable shipping companies to obtain special environmental certification with the Marine Classification Societies, such as DNV Clean Design, GL Green Passport, LR Character N or the German Government's Blauer Engel. These environmental classes not only add to the vessel owner's image but also reduce harbor fees in some parts of the world.

By 2010, a major part of all MaK M 20 C, M 25 C, M 32 C and M 43 C marine engines built will be of LEE design. Eventually, and once IMO II emission regulations take effect, every medium-speed marine engine produced at Caterpillar Motoren facilities in Kiel and Rostock or Guangdong, China, will be a state-of-the-art MaK LEE.

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