

For worldwide release: September 23, 2008

Release Number: M12PR08

Expert on board – Revised MaK DICARE system serves all engine monitoring and maintenance needs

Hamburg, Germany – A chief working 24/7, who knows the engine inside out and can predict any problem – wouldn't that be great? With MaK DICARE, you can have such an expert aboard at all times, ready to serve your needs. Introduced as early as 1987 and since sold more than 500 times, DICARE probably is the best-tested marine engine monitoring system available. About 700 MaK engines world-wide, on vessels and in power stations ashore, are currently supervised with DICARE. The latest, completely revised version, being presented at SMM 2008, combines well-established features with faster signal processing and improved usability, based on common industry standards.

A comprehensive solution

MaK DICARE is an expert system enabling real-time diagnosis and condition-based maintenance of any MaK four-stroke medium-speed diesel engine – creating the prerequisite for years of trouble-free engine operation. DICARE is designed as an online monitoring system, however, data logging followed by offline evaluation on demand is also possible. As well as using the system solely on board, fleet managers or technical supervisors ashore can also access real-time data via the Internet or satellite. By tracking both current engine status and long-term trends, DICARE enables optimum utilisation of scheduled maintenance, service personnel and spare parts, cutting operating costs and extending service life.

In principle, DICARE detects engine operation deviations from a set of nominal values. These values are for a perfectly running engine and derived from data recorded during individual customer acceptance runs on the factory's test bed. They take into consideration changes in engine operating points and ambient conditions in complex thermodynamic formulas.

Features granting maximum reliability

DICARE indicates malfunctions immediately and at a glance, taking into account empirical data, plausibility considerations and built-in expertise from decades of MaK diesel engine design. For ease of use, the initial report is subdivided into the diagnostic sectors exhaust gas, turbo charger, fuel oil, lube oil and cooling water, using a simple colour-coding of regular versus irregular values. In a second step, the complete set of measured values as well as detailed troubleshooting instructions can be displayed, also with recommended actions priority-coded.

Special attention is placed on monitoring the following criteria:

- Overall temperature levels to identify thermal overload at an early stage.
- Intake air pressure and temperature to identify performance drops due to fouling or wear.
- Charge air pressure, temperature and dew point to identify fouling or misadjustment.
- Fuel temperature and viscosity to identify any malfunction of the viscosity control unit.
- Fuel rack position and power output to identify injection pump wear.
- Lube oil consumption to identify any possible wear.
- Cooling water pressure and temperature for optimum operation.
- Exhaust gas temperatures to identify deviations in the fuel or air system at an early stage.

Easy to operate, easy to integrate

DICARE was introduced on MS DOS platform in 1987, followed by a 16-bit MS Windows version in 1997, which eventually led to today's state-of-the-art 32-bit version. Data was initially received from the alarm system, but now the engine's existing control bus system is leveraged. Measured values are displayed on self-explanatory engine diagrams and gauges. Automatic data recording enables black box functions. Trends can be seen on charts ranging from 5 minutes to 12 months and which specifically identify long-term changes in engine condition as a result of wear or deposits. Standard system interface enables quick data exchange with related applications like maintenance or spare parts management. DICARE is also available for Cat[®] brand marine engines.

The first commercial DICARE offline version was installed in March 1987 on the ro-pax ferry “Langeland II”, its successor “Langeland III” received the first DICARE online version in April 1989. Many ships around the globe have since then been fitted or will soon be fitted with either DICARE version, including recent projects:

- Norwegian Cruise Line “F3” series (Cruise Ships, USA)
- AIDA Cruises “Sphinx” series (Cruise Ships, Germany)
- BC Ferries “Super C-Class” series (Ro-Pax Ferries, Canada)
- Tallink “Star” (Ro-Pax Ferry, Estonia)
- Brittany Ferries “Pont-Aven” (Ro-Pax Ferry, France)
- U.N Ro-Ro “FSG Ro-Ro” series (Ro-Ro Ferries, Turkey)
- Various owners “Sietas Type 168/168a/168b” (Container Feeders, Germany)
- Briese Schifffahrt “BBC Europe” series (Multipurpose Cargo Vessels, Germany)
- Arklow Shipping “Arklow Faith” series (Mini Bulkers, Ireland)
- Furetank Rederi “Fure West” series (Chemical Tankers, Sweden)
- Fisher Tankships “Solent Fisher” (Chemical Tanker, UK)
- Lauritzen Fleet Management “Tessa Kosan“ (LNG Tanker, Denmark)
- Upper Lakes Towing “Joseph H. Thomson” (Articulated Tug Barge, USA)
- Edison Chouest Offshore “Vice Adm. K. R. Wheeler” (Offshore Vessel, USA)
- Seaguard Offshore “Caledonian Vision” series (Offshore Vessels, UK)
- China Oilfield Services “Hai Yang Shi You 111” (Offshore Vessel, P.R. China)

In addition, several shipping companies have ordered DICARE offline for fleet management and engine supervision from land. Likewise, Caterpillar® dealers are using the same approach to offer vessel owners and operators a package comprising DICARE data interpretation and, based on the results, tailor-made MaK engine service, maintenance and overhaul.

A wealth of experience

“Having MaK DICARE on board gives us peace of mind!”, that’s how Jens Kohlmann, Principal Technical Manager Newbuildings, AIDA Cruises, Rostock, Germany, sees the major benefit of the system in cruise operations. “We have ordered DICARE for all six ‘Sphinx’ generation

vessels. It enables the crew aboard to carry out comfortable monitoring of each the 4x MaK M 43 C marine engines as well as detailed real-time engine diagnosis from ashore if any unexpected incidents should occur. However, we are more than happy to say that so far there has been no need to utilise remote access since all the engines on ‘AIDAdiva’ and ‘AIDAbella’ have performed very well”.

Jens Schubert, Fleet Manager with Oldenburg-Portugiesische Dampfschiffs-Rhederei (OPDR), Hamburg, Germany, has chosen a different approach for his container feeders. “We are using DICARE only at the company headquarters. The chiefs aboard read off all the engine data manually and send it to me. I type it into the system and do all the remaining analysis. For other vessels, our service partner Zeppelin Power Systems is in charge of DICARE data input and evaluation. I am convinced that this offline approach, which combines human expertise and smart software, is the best possible way. We have relied on MaK DICARE for about 10 years and the system has clearly proven its worth and allowed me to do my job more efficiently”.

Characters: 7,023

Pictures available on request:

- 1.) MaK DICARE Screenshot – Initial Report for multiple Engines**
- 2.) MaK DICARE Screenshot – Engine Details for single Engine**
- 3.) MaK DICARE Screenshot – Trend Analysis for single Engine**
- 4.) DICARE aboard – AIDAdiva with 4x MaK 9 M 43 C**
- 5.) DICARE aboard – OPDR Tanger & FOCS Tenerife with MaK 7 M 43 C**

About Caterpillar Marine Power Systems

Caterpillar Marine Power Systems, with headquarters in Hamburg, Germany, brings together all the sales and service activities for Cat and MaK branded marine products within Caterpillar Inc. This organization provides premier marine power solutions (high and medium speed with outputs from 11 kW to 16,000 kW) and customer service from a single source for the global ocean-going, commercial and pleasure craft markets. The Caterpillar Marine Power Systems sales and service network includes more than 2,100 dealer locations world-wide and is well positioned to support customers wherever they are.

More information is available at www.cat-marine.com or www.mak-global.com.

About Caterpillar

For more than 80 years, Caterpillar Inc. has been making progress possible and driving positive and sustainable change on every continent. With 2007 sales and revenues of \$44.958 billion, Caterpillar is a technology leader and the world's leading manufacturer of construction and mining equipment, clean diesel and natural gas engines and industrial gas turbines.

More information is available at www.cat.com.

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