

Advanced sensors enable preventative maintenance

The use of precision sensors within condition monitoring systems has demonstrated that machinery health data can be collected and utilised without the need for increased crew training and can prevent unplanned downtime

German condition monitoring specialists Prüftechnik believes that an effective condition-based maintenance (CBM) programme can be implemented on board ships without extra skills being acquired by the crew. The two types of condition monitoring currently available to shipowners are collecting data on portable instruments or installing an online condition monitoring system.

“The choice of system depends on the type of machine, the regulations and the user requirements,” said Simon Lebherz, areas sales manager, Prüftechnik.

“Although critical machinery on board can benefit from continuous online monitoring, for machines such as motors, pumps and fans, the use of portable data collectors and the appropriate software will usually suffice. However, it is necessary to run an accurate CBM programme and understand which measurement locations and what kind of measurement tasks are needed to collect meaningful machinery health data. An automated measurement location recognition system with customised measurement tasks is crucial.”

One solution is provided by the Vibcode sensor system which automatically identifies the coded measurement location and records data from the fixed measurement studs designed to ensure a reliable vibration signal transmission. A typical workflow is then compiled by specialists and the user that defines a list of machines to be monitored and the information required. Details such as, but not limited to, the type of bearing, operating speed, power and foundation type will be included in the workflow. Once the required number and location of measurements has been established for all the machines the CBM database is set up by a specialist. Grouped into measurement routes, the data can then be downloaded onto



Routine monitoring of equipment can reveal important machinery health data

the portable instruments.

The operator of the instrument connects the Vibcode automatic measurement location recognition transducer to the coded studs that have been previously mounted on the defined measurement points on the various machines. The transducer reads the coded location and understands which measurement tasks need to be taken at each coded point. Once the measurement routes have been finished they are uploaded and stored by the Omnitrend software.

Generally, measurements are taken every four to six weeks and the ability of the system to automatically recognise the correct measurement location reduces the risk of error to an extent that unskilled labour can operate it. Characteristic overall values, known as ‘level 1 monitoring, such as machine vibration and roller bearing condition data are recorded on graphs and trended by time.

Alarm limits can be set to alert the user quickly to any deterioration of machinery health. To identify the cause of a problem detected, in-depth analysis can be performed using further signal measurements such as

spectra, envelope spectra and time waveforms. The signal analysis, known as ‘level 2 monitoring’, identifies problems such as unbalance and misalignment. Analysing the collected data requires a skilled vibration analyst, which cannot usually be found within the vessel’s crew.

To facilitate the export of data to a skilled analyst Prüftechnik has developed an ‘intelligent data replication process (IDRP) functionality that is integrated in the Omnitrend software platform. For analysis purposes, a small data export file can be sent to a service provider by email. The shore-based service provider or specialist automatically collects the files via the ‘email centre’ software that stores the data files from the vessel in the corresponding database. Therefore, due to the IDRP functionality no further offline synchronisation procedures are required.

One company to benefit from reports prepared by the ISO certified vibration specialists at Prüftechnik is Qatar Shipping Company (QSC). Based in Doha, QSC uses the reports containing diagnostic information and recommendations

to assist the crew in performing repair work to prevent unplanned shut downs and to increase machinery availability.

"The remote analysis service increases the benefit of our CBM programme," said Rahul Bhargava, technical manager at QSC. "So far we have prevented some unplanned shutdowns by using the diagnostic reports generated by the vibration experts at Prüftechnik. We have discovered a number of bearing defects since we started the programme one and a half years ago. This has massively helped us to prevent serious damage to the motors as well as extending the overhaul intervals and saving us a lot of money."

Designed for installation near the lubrication system of a machine, the Kittiwake online sensor suite reports metallic ferrous wear debris, the condition of the oil, including contamination and the moisture content.

"Bearing failures are known as a common root cause of thrusters and gearbox failures and around 80 per cent of those are the result of incorrect, unsuitable or contaminated lubricant," said Michael Dines, fuel and oil testing manager, Kittiwake Developments. "We expect lubricants to reduce frictional resistance, reduce wear, protect against corrosion, assist with sealing, contribute to cooling, remove contaminants and debris and provide a cushion on start up. Any other component of the equipment that was so relied upon would be periodically, if not continuously, monitored for condition."

According to Kittiwake, ensuring lubricant condition monitoring, controlling contamination and detection of wear debris using a single sensor is impossible, at least for the foreseeable future. Designed to offer real-time condition monitoring of critical plant the Kittiwake sensor suite uses its own piston pump to make frequent inspections of oil and machinery health. This reduces the risk of sampling error, and data from the sensors can be streamed via a network system, allowing remote condition monitoring and more effective maintenance planning.

"Far too often the health of the lubricant is overlooked entirely or only monitored occasionally by oil analysis services," continued Mr Dines. "Onboard test kits and wear debris monitors can provide accurate information in minutes, but the real value comes from continuous monitoring of these critical systems. Online sensors for monitoring the health of equipment, such as vibration sensors, have been in use for many years and are well trusted. However, only in the past few years have lubricant condition sensors become widely accepted. Now, the condition of the lubricant, the presence of contaminants and even the amount of wear debris and the wear mechanism occurring can be monitored online. Sensors and modern interface methods provide simple to understand results through a multitude

of communication channels and are undoubtedly the future of lubricant condition monitoring."

The AVL engine performance and optimisation system (EPOS) is a monitoring and analysis system that delivers information about engine condition and potential faults in systems such as fuel injection, combustion process, liner/piston wear, valves and turbochargers based on knowledge implemented in the software.

The system, recently launched for marine applications with HFO engines, delivers a recommendation for optimised engine performance while providing information to the fleet management and central support teams.

EPOS is an open diagnosis platform for the

monitoring and automatic diagnosis of large-bore combustion engines and their auxiliaries. Working with Kongsberg Maritime has provided the expertise to apply the system to marine applications and has enabled AVL to bring this technology into the maritime sector.

The standard online installation is a permanent cylinder pressure monitoring system. Measurements and automatic diagnosis can be triggered manually or via a scheduled task and auxiliary engines can be included into the monitoring by using a separate mobile cylinder pressure sensor.

The data acquisition for this system is based on a new monitoring sensor for

Condition Monitoring the Intelligent Way



Photo courtesy of Subsea 7



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cylinder pressure. This sensor is developed for permanent use with HFO and other fuels, and has been successfully tested in the field in various applications. The sensor uses proven piezo-technology and a hermetically integrated amplifier makes the sensor suitable for the marine environment. Smart indicating units provide the data from cylinder pressure sensors, fuel pressure sensors and other signals from the automation system.

Additional data from other external measurement systems and diagnoses are exchanged via a data interface. This unique system develops its full capability in combination with a modern Kongsberg automation system.

In some cases, the latest EPOS can be installed on existing Kongsberg equipment without the need for a separate screen.

Using a sophisticated software package for post-processing of data, the system allows modern data presentation and handling at three different user levels. The diagnosis module estimates the probability of possible engine faults and is based on general physical dependencies so the basic set up can be achieved more easily.

Data from acceptance tests and sea trials can be used as references, and additional use of AVL simulation tools for compensation of measurement errors and verification of engine behavior is also possible.

Intertek expands OCM programme

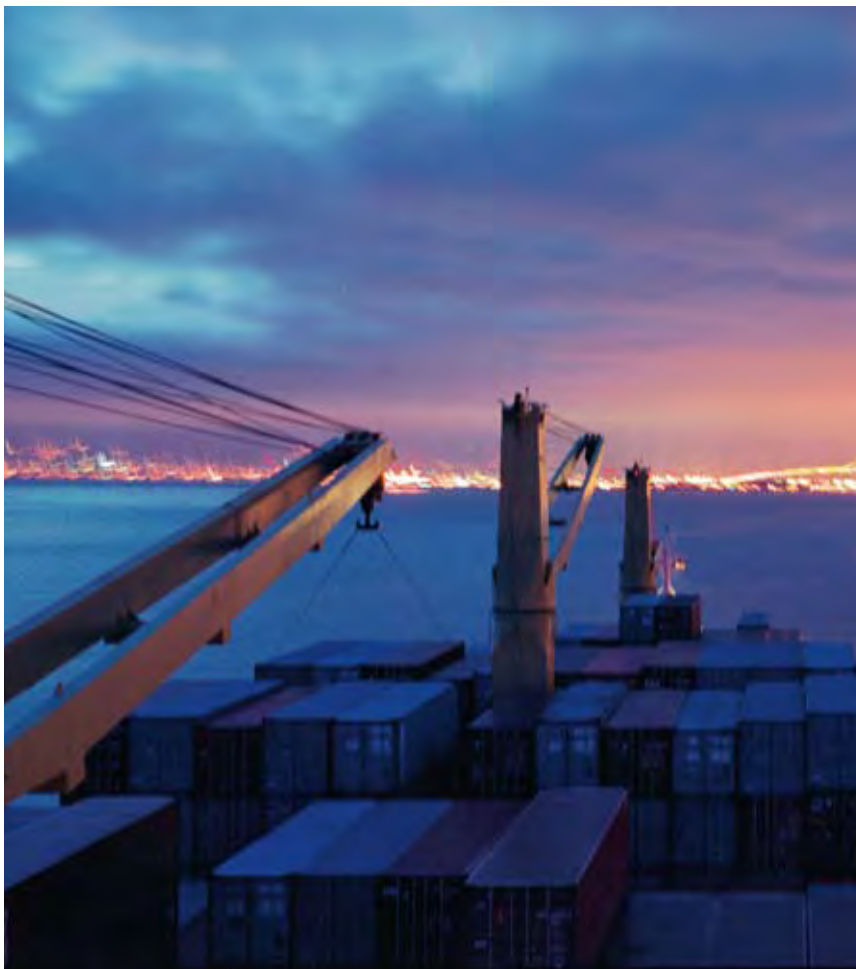
Intertek is expanding its Lubricant Quality Scan (LQS) oil condition monitoring programme (OCM) to a further nine regional laboratories. LQS is an established testing procedure providing a comprehensive, independent lubricant machinery monitoring service. Originally a Lloyd's Register (LR) business, LQS was acquired by the Intertek group in 2006.

Over the past two decades it has provided a service specifically designed to assess the quality of marine lubricating oil. This service identifies problems and compiles expert reports giving advisory action where appropriate. What differentiates LQS from other OCM services is its full engineering interpretation of the data utilising the original LR methodology and expertise.

To meet with customer demand, Intertek has identified nine key global locations strategically placed to serve its marine clients. The service adds benefit to these existing Intertek facilities that already conduct bunker analysis and cargo inspection, by offering clients a consultative approach to their scheduled OCM programme. The new locations are:

- Columbus, Ohio
- San Antonio, Texas
- Sharjah, UAE
- Mumbai, India
- Shanghai, China
- Singapore
- Rotterdam, Netherlands
- Sines, Portugal
- Macaé, Brazil.

Intertek's programme is specifically designed to assess the quality of lubricating oil to identify problems and compile expert reports from interpretation of the data. By conducting regular scheduled lubricant analysis, Intertek can assist in reducing downtime due to machinery failures caused by wear on critical components. The programme has designed specific test suites for engine, hydraulic, grease and sterntube systems applying manufacturer and regulative guidelines. Designed to aid the lubricants role in preventing potential problems including; fuel dilution, wear, loss of viscosity as well as monitor oxidation. Each test includes a report with service recommendations based on the data from the analysis. In addition, historical data is accumulated to help identify and track any trends in wear, based on the composition and amounts of contaminants. Intertek's OCM programme has a team of tribologist's on hand to offer guidance, explain test results, discuss maintenance history, or suggest corrective action. *MP*



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