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CASE STUDY

MANAGING CHANGE —

Wallem and AO Schiffahrt uses FluidScan® for Shipboard Condition Monitoring

With depressed freight rates and overcapacity of shipping on lucrative trade routes, most shipping companies across the world are now practicing "slow steaming" operations. Operating the main "two-stroke" engines at 40-60% of their nominal output results in dramatically lower fuel costs but at high risk of cylinder cold corrosion if lubrication is not carefully managed. Adding to the complexity is the recent expansion of low sulfur emission control areas (SECA) on the most profitable trade routes, requiring ship operators to switch over to low sulfur fuels in these zones. These business and operational variations are driving ship owners and operators to look for technologies that can keep pace with change and provide more insight to the engine lubrication conditions.

Wärtsilä and other engine manufacturers stress the need for more regular piston underside inspections and the need to measure the residual BN frequently to optimize cylinder feed rates and avoid cold corrosion. The Wärtsilä Two-stroke Services Team (Winterthur, Switzerland) recently released a new technical bulletin, RT-161 with updated requirements concerning cylinder lubrication management and new guidelines on shipboard condition monitoring in the current operating climate.

Ship operators such as Wallem Ship Management (Hamburg, Germany) deal with this challenging business and its environment and are employing new tools to monitor the changing lubrication conditions on board. The goal is simple — find ways to maintain and improve ship reliability while keeping costs under control.

"Implementation of ultra-low sulfur fuels changed most engine manufacturers' recommendations concerning engine performance parameters as well as cylinder lubrication and corrosion control techniques," says Tomasz Placzek, Technical Superintendent for Wallem. "Today operators are more focused on daily monitoring of drained oil piston undersides and from stuffing boxes. Measuring base number together with other parameters helps to define cylinder lubrication actual feed rate and inlet base number of the lubricant in use."



The M/V Belo Horizonte, owned by AO Schiffahrt, uses the FluidScan to optimize the cost of cylinder lubrication and control premature wear.



Operators drawing daily cylinder lube oil samples from piston underside drain.

Cylinder oil remains expensive and applying the right amount at the right time is the ship's goal. In today's market, prices of new cylinder oil can range from $1300 to $2500 per tonne. A ship powered with a 12 cylinder engine may easily consume 300 tonnes of cylinder lube oil per annum. Over lubrication (a conservative approach to prevent cylinder corrosion and scuffing) can cost ship managers and owners over US $100,000 per year, per ship in lubricant costs – a number that can be trimmed with closer BN monitoring to calibrated feed rates.

Current Challenges

Most ship operators rely on lube supplier onshore laboratories for their oil analysis needs. The results are naturally time delayed, so it is difficult to change cylinder lubrication feed rates based on a data point taken ten or more days in the past. Some ship owners and operators looking for an onboard result have invested in a manual chemical "shaker kit" method. These systems are time consuming and involve a number of hazardous chemicals, leading ship operators to use them sparingly which defeats the advantage of frequent onboard BN measurement. Due to an average testing time between three and ten minutes, varying accuracy, and chemical handling, ship operators have sought a better alternative. What's more, the consumable costs add up over time.



Typical hazardous materials supplies for shaker kits. They require safety training and proper storage.

A New Approach

The FluidScan infrared analyzer is a handheld spectrometer designed to measure lubricant condition and water contamination accurately and consistently without the need for solvents or hazardous materials. It measures the oil absorbance spectrum in the mid-IR range. Instead of using FTIR technology, which is more widely used in oil analysis laboratories, a diffraction grating-based optic with detector array is used for better portability and durability. An innovative application-specific chemometric calibration is applied on the raw IR spectrum to obtain oil condition information such as oxidation, nitration, sulfation, anti-wear additive, Total Acid Number (TAN), Base Number (BN), water, glycol contamination and soot. A patented flip top cell uses one drop of oil, takes less than one minute and does not require any chemicals or solvents to clean. The analyzer also has an onboard database with asset information and preset alarm limits utilizing a traffic light system so maintenance personnel can make immediate decisions right after the measurement. An early marine fleet operator of the device was the US Navy marine logisitics arm – the Military Sealift Command TAK-E (roll on roll off) class of supply ships, and the time savings and improved results led them to acquire the system across the fleet.

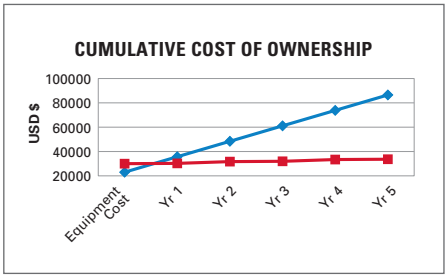


The FluidScan Q1200 IR analyzer provides a quick, accurate measurement for lubricant condition without the need for solvents or hazardous materials.

Practical Experience

The Wallem Group is one of the world's largest and most experienced providers of maritime solutions. Managing over 400 vessels, Wallem Ship Management seeks out opportunities to trim costs on behalf of its clients and this led the Hamburg Office Fleet Manager to investigate the FluidScan technology. Wallem proposed the use of the FluidScan on the 229 m (751 ft) M/V Belo Horizonte (IMO 9605645) a bulk carrier owned by Verwaltungsgesellschaft Alexander Oetker Schifffahrt, Hamburg.

The M/V Belo Horizonte was working the Brazil Shanghai trade route in 2014. "Use of Spectro FluidScan has already proven that daily monitoring of drained cylinder oil condition is the only remedy to optimize the cost of cylinder lubrication without risk of premature wear of cylinder liners and piston rings" says Mr. Placzek. "We collect samples from each cylinder on a daily basis for analysis on board. The amount of samples that must be tested on board adds up quickly, considering most bulk carriers have five or six cylinder engines. In general, with approximately 200 days at sea annually, the bulk carrier is taking 1000 to 1200 analyses of lubricant samples."



Avoiding the need for solvents and frequent shore side calibration saves considerable money over traditional shaker kits over a multiyear period. The FluidScan Q1200 Series (red) costs are over 50% lower than shaker chemicals after two years.

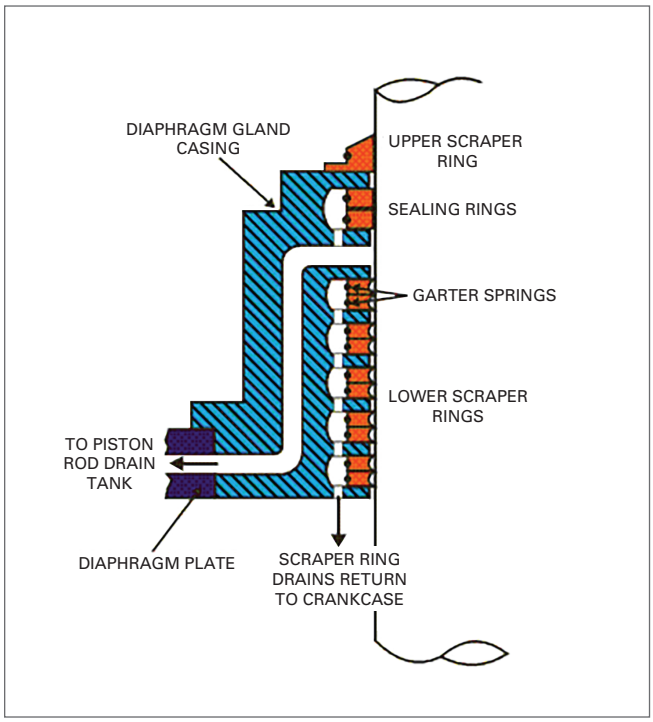
The Base Number of drain oil from each engine cylinder is reported daily to the ship's technical personnel for feed rate optimization procedures. Maintenance staff keep records on board of other parameters besides the BN; the data logging feature on Fluidscan makes this easy to achieve. Total Acid Number and water content of oil from stern tube and system oil are measured and tracked. Samples collected from storage tanks containing fresh lubricants are tested, as are analyzed samples of circulation oil used for mixing with additives. All this testing is possible because of the versatility of the tool and the built-in oil application libraries.

The Wallem team liked the speed of the system along with the repeatability.

"Though the time consumed for daily analyses is an attractive benefit of using



Operator testing for BN in the ship office. Results are quick and easy.



If rings are damaged or worn, more cylinder oil enters the system oil through the stuffing box. In the case described above, the cylinder oil polluted the system oil, and it was detected by the crew using Fluidscan.

the device, accuracy of measurement is most important. Based on our observations, Base Number measurements with commonly used shaker methods provide higher results of 3-5 BN numbers that are not sufficient for corrosion control and premature wear of engine components," noted Mr. Plazcek. The FluidScan produces results that are comparable with oil analysis results received from shore-based, professional laboratories.

Onboard Monitoring Catches a Problem

The benefit of immediate results can really influence how the crew manages potential lubrication-related problems that lead to disruption of normal operations. A recent example occured on the Belo Horizonte. Frequent analysis of the main engine crankcase oil collected for adjusting the Blending-on-Board system indicated higher water content as well as unexpected Base Number results on the system oil. A quick onboard inspection revealed the problem in a cylinder stuffing box area and was immediately addressed.

Ease of Use and Maintenance

The device is equipped with intuitive, clear operation procedures that operators on board the vessel implemented correctly without the need for training to conduct the oil analyses.

Mr. Placzek was particularly pleased that the unit can be fixed remotely as much as possible. A problem requiring a software upgrade was rectified by technical personnel available on board the vessel; landing ashore for repair was not required.

Summary

Reduction of maintenance costs are one of the main factors for ship owners and ship operators. The shipping market is slowly recovering from the global recession, however lowering maintenance costs will remain a top priority to secure actual long-term profits for ship owners. Reduction of cylinder lubrication cost with increased overhaul intervals, together with the extension of service life of engine components, are key targets in every budget calculation and maintenance plan. The FluidScan Q1200, tested on board a Wallem-managed bulk carrier, proved to be a reliable and accurate tool for oil analysis, safe for the crew's daily use and available 24/7 without the past delivery problems nor the reagents/solvents used for traditional measurements/analyses on board the vessel.

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