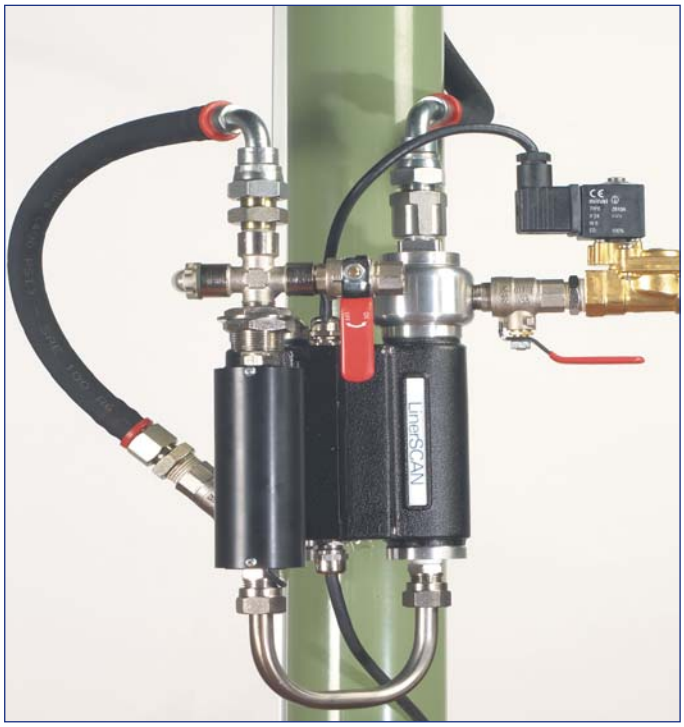
a new era in asset protection

LinerSCAN



The worlds first real-time liner alarm
Early warning system for main engine damage

Kittiwake
Measuring, Monitoring & Managing

Introducing LinerSCAN from Kittiwake. The world's first real-time alarm system for engine liner wear. LinerSCAN marks a new era in asset protection, providing early warning against critical engine damage whilst providing the information needed to save on lube oil costs.

Why LinerSCAN?

In an era of high oil prices and environmental anxiety, ship owners are facing untold pressures – from spiraling costs to increasing maritime rules and regulations. Maximising vessel performance has become an even higher priority under such circumstances, where reliability and durability can result potentially in savings worth thousands – or even millions of dollars.

Marine technology specialist Kittiwake has for years provided the industry with innovative ship-based solutions to help onboard engineers monitor and test fuel, lubricant and water conditions to achieve better operational performance.

These critical fluid test kits, developed using patented Kittiwake technology, have pioneered machinery condition monitoring at sea, enabling engineers to check fuel and lubricant condition and take remedial action where necessary at short notice.

In the past, this kind of precision analysis was confined to shore-based laboratories. Detailed testing of liquids on any vessel required samples to be packaged and then sent away with results returned typically after a period of weeks or perhaps months.

Today, you cannot afford the luxury of time. The sooner the results are in your hands the sooner you can take decisive action. By the time lab results come back it may be too late.

Benefits

Monitoring engine liner wear is critical to the health and performance of any modern vessel operating in the current environment. Slow steaming, drives to cut fuel consumption, decreases in sulphur levels and cylinder oil formulation changes will continue to force shipping into unknown territory.

LinerSCAN acts as an early warning system, alerting ships engineering personnel to potential main engine damage or failure. This allows preventative maintenance during the ships passage to the next port, or even a route change. Be ready for the future by installing LinerSCAN and;

- Dramatically reduce engine damage by spotting the first signs of wear
- Reduce cylinder oil feed rate to the optimal value.
- Spot signs of scuffing prior other systems
- Employ proactive maintenance programs
- Spot the early damage caused by the ingress of CAT fines
- Accurately control replacement liner bedding-in
- Increase engine reliability
- Optimize maintenance & overhaul schedules

- Identify unusual wear from abnormal conditions
- Lower environmental impact

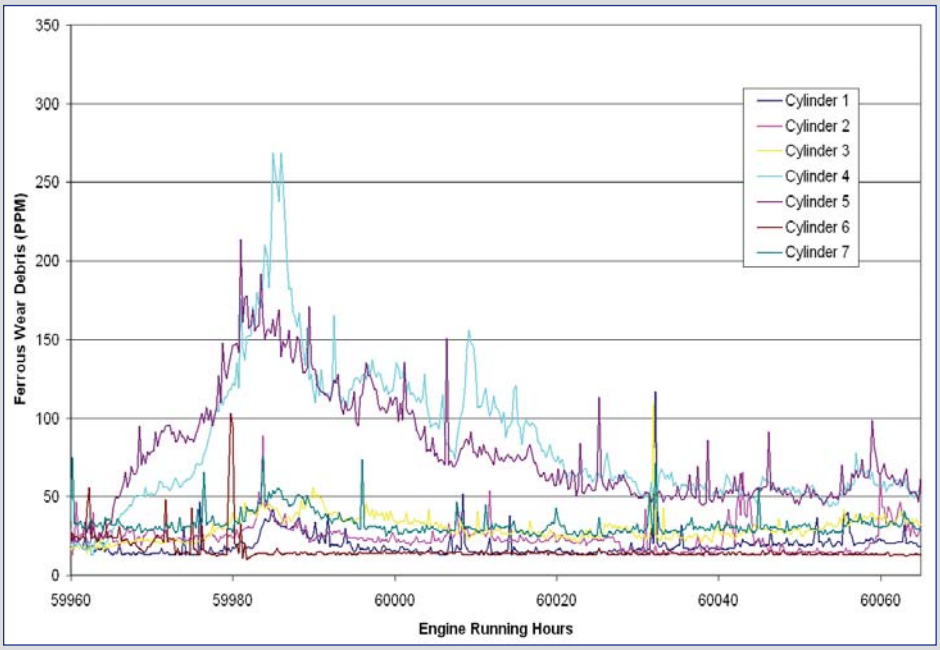
Measurement and Performance

LinerSCAN measures the amount of iron in cylinder lubricant by a method known as magnetometry, where a sample is tested in a magnetic field. Utilising a novel shielding method the system exploits a fundamental physical effect; namely the change of inductance due to the presence of a magnetic material.

LinerSCAN has been installed on vessels since 2004. Various engine types and sizes from 6 to 10 cylinders were used for testing and are now in commercial use.

Analysing the scavenging air space drain oil from each cylinder for iron (Fe) has been proven to give the operators an indication of relative changes of cylinder liner wear. On many occasions and at very early stages, the sensors reported the onset of severe wear and other engine problems such as cat fines in the fuel.

The system noted changes in iron levels caused by imbedding processes, increases in wear caused by routine inspection and was also able to highlight periods where the engine was subjected to higher stress levels.



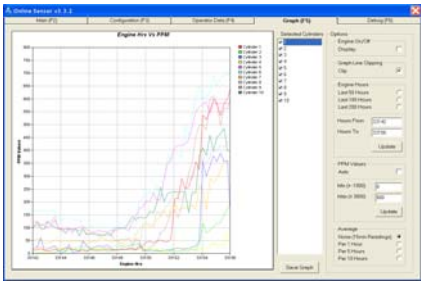
This chart shows the ability of LinerSCAN to detect and trend the amount of iron particles in the cylinder oil in real time.

Feed rate was reduced by 10% on cylinders 4 and 5 at 59961 engine hours. Wear levels increased for a short time and were monitored before returning to normal levels.

This process was then repeated across the other 5 cylinders providing an overall 10% decrease in cylinder oil usage.

Software

LinerSCAN software enables you to continually monitor critical cylinder information on screen using a bespoke graphical user interface.



Features include the ability to view Real time Sensor data with respect to Engine hours with a graphing and trend tool. Talk back functionality enables you to remotely change sensor settings such as the measurement interval. The software allows input for major maintenance to avoid false alarms from bedding in processes and to log parameters such as; fuel Sulphur level & scavenge space pressure.

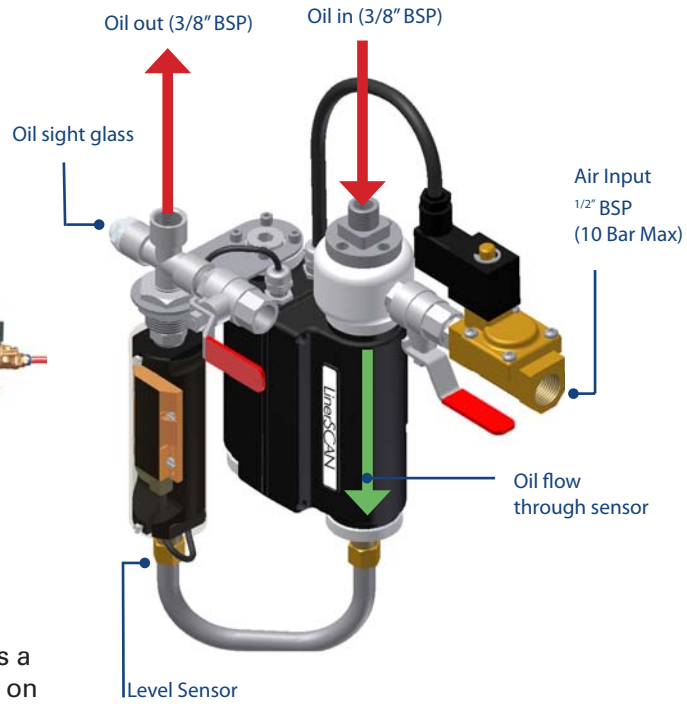
Features

- LinerSCAN utilises patented ANALEX technology from Kittiwake.
- Highly capable communications enable the system to link with ship management systems via CAN, RS232 and 4-20mA.
- LinerSCAN takes the usage of oil analysis data a stage further than is possible with laboratory or test kit results.
- Complete with a bespoke user-friendly software interface.
- LinerSCAN is a compact unit, once installed, the workings of it can be ignored.
- Virtually no training required for its use, it is quickly installed, and begins to provide savings immediately.

Installation

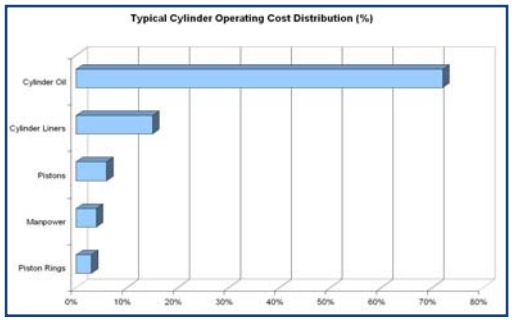
The LinerSCAN system can be installed by our team of expert engineers. Sensors will be installed to allow sampling on the first horizontal piece of pipe. See the installation image and drawings (right).

Photograph shows a typical installation on scrapedown pipe



Rapid Return on Investment

The use of LinerSCAN is not solely limited to the prevention of engine damage. Constant real-time monitoring of liner wear gives engineers a vital tool in maintaining and optimising cylinder oil feed rates and helps reduce many other associated costs.



Ref: Developments in Cylinder Liner Lubrication, L Eriksen, May 2003 - K90MC Engines

Prevent Damage

These photographs are examples of actual wear caused to an engine liner and cylinder by fuel that contained high levels of catalyst fines.

The LinerSCAN monitoring system helps prevent wear by alerting you to potential problems BEFORE any major damage is caused.

MAN B&W Diesel Supported

MAN / B&W Diesel: *"...Analysing the scavenging air space drain for iron (Fe) has been proved to give an indication of cylinder liner wear. ... Drain analysis can be used as an early indication for discovering suddenly increased wear situations. ... Kittiwake has developed equipment ... for monitoring of cylinder condition through scavenge drain analysis. Based on successful test results, MAN B&W has no objections that the ANALEXrs Total Ferrous Sensor is used on two-stroke engines. This equipment may be used to monitor the effect of cylinder oil feed rate changes. ... It can also give an early warning if unusual high wear is occurring because of fuel problems such as catalyst fines, or other reasons and can possibly avoid engine damage..."*

About Kittiwake

Since 1993 Kittiwake has provided the industry with innovative ship-based solutions to help onboard engineers monitor and test fuel, lubricant and water conditions to achieve better operational performance.

Operating from 6 international offices and through a network of agents and distributors our innovative approach to solving real life problems has made us a favoured supplier to many large organisations worldwide including international navies, oil majors, offshore platform operators and thousands of other industrial users.

The Kittiwake critical fluid test kits, developed using patented technology, have pioneered machinery condition monitoring at sea, enabling engineers to check fuel and lubricant condition and take remedial action where neccessary at short notice.

In the past, this kind of precision analysis was confined to shore-based laboratories. Detailed testing of fluids on any vessel required samples to be packaged and then sent away with results returned typically after a period of days, weeks or even months. Kittiwake solutions for sampling and analysis provide instant results when your ship needs them the most.

Visit www.kittiwake.com and www.linerscan.com for more information about Kittiwake and the LinerSCAN system.

Ordering Information

Product Code	Description
FG-K17400-KW	LinerSCAN Sensor complete (one per cylinder)
FG-K17401-KW	LinerSCAN Software & Network (one per engine)

LinerSCAN installation will be carried out by our skilled engineers. Price and a detailed quote are available on request. Contact Kittiwake for more information about your specific engine type and application.

LinerSCAN Sensor Features

Robust cast iron enclosure providing strength and magnetic shielding

3/8" BSP connections for quick and easy installation

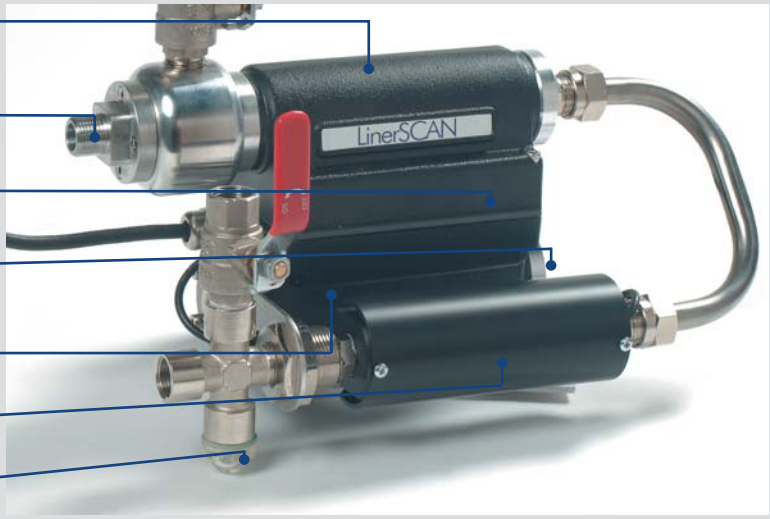
Sealed to IP65, suitable for industrial use

LED indicator providing a visual indication of sensor status

Reference coil for controlled temperature stability

Level Sensor increasing frequency and speed of readings

Oil sight for manual fill level checks



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