IS CONTAMINATED OIL DAMAGING YOUR CRITICAL ASSETS?

ifm

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Introduction

In today's times, preventing unnecessary downtime is of utmost importance in increasing overall equipment efficiency and profit margins. There are a number of reasons that contribute to unscheduled downtime, one of them being the failure of critical assets.

Examples of critical assets are: a large gearbox in a SAG Mill; a gearbox in a ship or tug; a large excavator or drag line hydraulic power pack. These assets can cost hundreds of thousands of dollars to purchase and mechanical wear is their biggest enemy. High oil quality is mandatory for these systems as it prevents excessive mechanical wear.

Testing methods

Under normal conditions oil samples are taken after an elapsed period of time and sent away for testing using Blot Paper and Microscopic Assay testing. While this is a perfectly acceptable method of testing, it is a time consuming process. From the time a sample is sent to a laboratory for testing, and then returned with the results can take up to two weeks or even longer in some cases depending on how busy the laboratory is. Then of course, the responsible person has to take even more time interpreting the results and acting on the findings.

The result of this long process is that more wear and damage will occur during this time if the oil is substandard.

In addition, every oil sample test has an associated cost factor. This cost will compound over time resulting in a substantial outlay of money to support oil testing methods. The costs include: labour costs to obtain the samples; costs to send the samples to and from the laboratory; laboratory testing costs and other labour costs to analyse the results.

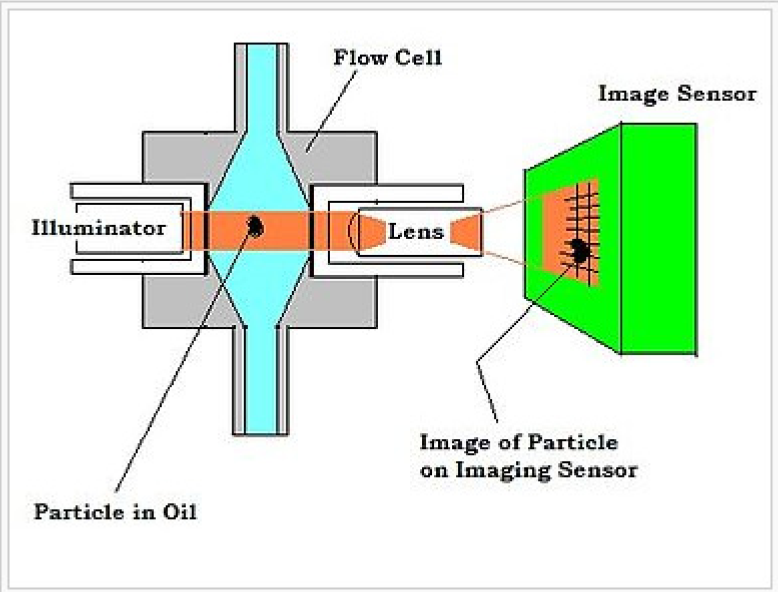
An effective method of overcoming the lengthy process and keeping costs to an absolute minimum is by implementing continuous online monitoring. It is a once-off cost that will provide a solution for many years. The advantage of continuous online monitoring is that an indication is received when the oil becomes contaminated. This eliminates the risk of oil becoming contaminated between scheduled oil sample testing periods as well as incurring unnecessary testing costs when the oil is not contaminated. Additionally, online monitoring will detect oil that is contaminated by a faulty component such as a damaged or ill-fitted filter which could allow oil to re-enter the system or unwanted water or air bubbles in the system.

Principles used to count particles

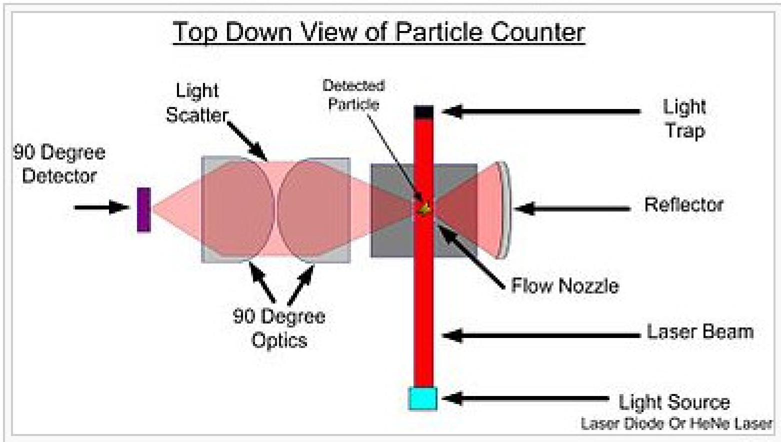
A method used to determine if oil is contaminated, is by counting the particles in the oil and detecting the size of the particles. A device used to detect and count particles in liquids is called a particle counter. By its description a particle counter is a single particle counter that detects and counts particles one at a time. The process of particle counting is based upon light scattering, light obscuration, or direct imaging. A high energy light source is used to illuminate the particle as it passes through the detection chamber. The particle passes through the light source (typically a laser or halogen light) and if light scattering is used, then the redirected light is detected by a photo detector. If light blocking (obscuration) is used the loss of light is detected. The amplitude of the light scattered or light blocked is measured and the particle is counted and tabulated into standardized counting bins. The image below shows a light scattering particle counter diagram.

There are several methods used for detecting and measuring particle size or size distribution (though many exist); Light Blocking (obscuration), Light Scattering, coulter principle and direct imaging.

The Light Blocking optical particle counter method is typical useful for detecting and sizing particles greater than 1 micrometre in size and is based upon the amount of light a particle blocks when passing through the detection area of the particle counter. This type of technique allows high resolution and reliable measurement.



The Light Scattering Method is capable of detecting smaller sizing particles. This technique is based upon the amount of light that is redirected by a particle passing through the detection area of the particle counter. This redirection is referred to as light scattering. Typical detection sensitivity of the Light Scattering method is 0.05 micrometre or larger. However, employment of the condensation nuclei counter (CNC) technique would allow higher detection sensitivity in particle sizes down to nanometer range.



Direct imaging is a technique that uses the light emitted by a laser as a source to illuminate a cell where particles are passing through. The technique does not measure the light blocked by the particles but rather measures the area of the particles functioning like an automated microscope. A pulsed laser diode freezes the particle motion. The light transmitted through the fluid is imaged onto an electronic camera with macro focusing optics. The particles in the sample will block the light and the resulting silhouettes will be imaged onto the digital camera chip.

Conclusion

The light blocking method is specified for particle counters that are used for counting in hydraulic and lubricating fluids. Particle counters are used here to measure contamination of hydraulic oil, and therefore allow the user to maintain their hydraulic system, reduce breakdowns, schedule maintenance during no or slow work periods and monitor filter performance etc. Particle counters used for this purpose typically use ISO Standard 4406:1999 as their reporting standard, and ISO 11171 as their calibration standard. Others also in use are NAS 1638 and its successor SAE AS4059D.

ifm efector has delivered yet another innovation – a particle counter called the LDP100. The LDP100 uses a high intensity laser and an extremely high resolution photo detector which utilises the light blocking principle to detect the oil entrained particles. The LDP 100 not only ensures that the oil is free of particulate contaminants but also warns of impending damage through the particle count. When a high particle count is found there is a root cause for it and this must be addressed before major wear and damage occurs.

Continuous online monitoring solutions are not new to the market but many have proven to be unreliable or not work in the fashion that is expected.

The superior design of the LDP100 changes all that. One of the main reasons for its success is that it: can be placed in the high pressure side of hydraulic units up to 420bar; can handle viscosity levels between 0cst and 480cst; and requires only 50ml/min to 400ml/min to operate satisfactorily. It has a scratch resistant high pressure sapphire glass lens to cope with the rigours of entrained particle abrasion.

The LDP100 is versatile and can be used as a continuous online monitoring system or it can be used together with ifm efector's display as a portable monitor.

ifm efector has been producing high quality innovative sensors since 1969 and the LDP100 is no exception. It is easy to use, exceptionally well built and strong to handle the rigours of hostile environments found in mobile, mining and marine industry.

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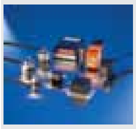
ifm electronic – close to you!

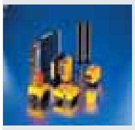
Overview
ifm product range

Position sensors



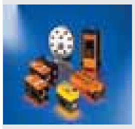
Sensors for motion control

Industrial imaging

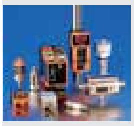


Safety technology

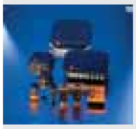
Process sensors



Industrial communication



Identification systems



Condition monitoring systems

Systems for mobile machines

Connection technology

Accessories