Keeping your Lubrication Program in the Crosshairs

LUNETA

An in-depth look at Luneta's Condition Monitoring Pod® (CMP®) and how it can improve your lubrication program.

Lubricant related failures are the root cause of most machine failures. Examples of lubricant related failures include contamination, oil starvation, or chemical incompatibilities. A good lube program proactively targets and eliminates these root causes with simple solutions like training, daily inspections, filtration, and application of predictive maintenance tools. One such tool is Luneta's Condition Monitoring Pod or CMP. The CMP is a 5-in-1 inspection tool designed specifically for maintenance professionals to detect lube related failures more easily.

A machine's lubricant is a repository of information about what's going on inside your machine. Failures happen over time, and they leave clues along the way, most of which are visible to the naked eye. The CMP can expose these clues and bring them to the attention of a maintenance technician during routine inspections.

The CMP is the Swiss Army Knife of sight glasses.

The CMP accomplishes this with an assortment of simple tools all conveniently packed into a single device. Some of these tools include a rotatable 3D sight glass, a flat front face with crosshairs, a visible magnetic plug, two types of corrosion indicators, an oil sampling valve, and a pilot tube for live-zone sampling. The CMP is the Swiss Army Knife of sight glasses - and just like any Swiss Army Knife, the CMP is useful and powerful.

The CMP's multiple inspection tools, ease of use, and convenience make it possible to detect lubricant related failures more reliably during daily inspections. Some of the more common fault conditions the CMP can detect are low oil levels, oil degradation, water contamination, entrained air, foam, wear debris, and other none-lubricant related failures. These fault conditions include both root causes (water contamination, for instance) and active failures exhibited by abnormal levels of wear debris.

Low Oil Level

Machine failure due to inadequate lubrication is very common. Oil supply is necessary to keep moving parts cool and to prevent surfaces from deteriorating from corrosion, abrasion, scuffing, and pitting. Machines are often starved of oil due to neglect or because the oil level indicator was challenging to use. Sight glasses are difficult to use if they are no longer transparent due to staining (fouling), or if they are of the flat-window variety with limited viewing angles. Flat-window sight glasses are a poor choice because machines are typically installed in such a way that line of sight into the sight glass is very restricted, if not impossible. To make matters worse, flat-window sight glasses cast a shadow over the oil, hindering visibility, especially in low light situations.

The CMP features a 3D sight glass that captures light, illuminating the oil, and making oil level observations easy from any angle and in any condition. The CMP's sight glass also features a flat front face with embedded crosshairs for

accurate oil level readings and optimized wall thicknesses to eliminate distortions. The sight glass is also molded entirely from the advanced Tritan™ polymer, which is highly stain resistant, crystal clear, and stronger than bulletproof glass. The CMP makes oil level observations so easy and reliable that, when coupled with daily inspections, your machines will never go thirsty again.

Water Contamination

Water is one of the most destructive forms of oil contamination. Water can enter a machine from poorly stored new oil, condensation, or failed seals. Water accelerates the natural oxidation process of the base oil, changes the oil's physical properties (e.g., viscosity), reduces lubricity, and even decreases the effectiveness of most additives that suppress corrosion and sediment. Water is one of the most destructive forms of oil contamination because it not only degrades the oil but also attacks and deforms surfaces inside the machine through corrosion.

A rusted steel indicator is an alarm that water is present and that the risk of corrosion inside your machine is very high.

This CMP at a food processing plant is indicating water contamination. Notice the rust on the steel corrosion indicator at the top of the sight glass. Fluctuations in oil level have caused some of the rust to break off and be captured by the magnet below.

Water is challenging to see inside most sight glasses unless there is a large amount of free water, or the water is fully emulsified, causing the oil to appear milky and opaque.

The CMP can expose the presence of even small amounts of water, both visually and through its corrosive properties using a steel corrosion indicator. The CMP's indicator is suspended and visible inside the sight glass. This indicator is primed for corrosion and will generally rust before exposed surfaces inside the machine. When water is present, the indicator corrodes and changes in color from shiny metallic to black or orange. This change is visible through the sight glass and can be easily observed during daily inspections. Rotating the sight glass also lifts the indicator out of the oil for cleaning and closer inspection without the risk of losing oil.

A rusted steel indicator is an alarm that water is present and that the risk of corrosion inside your machine is very high.

Oil Degradation

When a lubricant breaks down, so does its performance, and eventually, so does the machine. Oil degradation is the result of oxidation, heat, age, additive depletion, and contamination. One of the main side effects of oil degradation is that the lubricant changes color and becomes more acidic. When this happens, cupric components inside the machine, like bronze bushings or worm gears, become vulnerable to corrosion.

The CMP can detect this change with an optional copper corrosion indicator. Similar to the steel indicator, the copper indicator changes color in the presence of a degrading oil. Copper indicators typically turn from a copper color to a black, blue, or green when exposed to acidic conditions. A corroded copper indicator is a sign that the machine's oil chemistry has changed, and there is a higher potential for machine failure.

Sampling

A corroded indicator or a change in oil color doesn't always identify the root cause or severity of what is going on inside the machine – only that conditions have changed. When this happens, pulling an oil sample and sending it to a lab for analysis is recommended.

The CMP makes oil sampling easy with a built-in sampling valve and pilot tube. Bending the pilot tube to an optimal position for live-zone

sampling is recommended. Live-zone sampling means capturing a sample of active, moving oil that best represents conditions during and after lubrication of frictional surfaces. Anywhere other than the live-zone means pulling a sample from the bottom or corners of a machine sump, where gravity would have settled water, sludge, and sediment. Oil samples from such stagnant locations do not accurately portray the active fluid being used to transfer energy and wear. As such, the lab results would not be as helpful in diagnosing potential machine failures.

Wear Debris

Wear particles signify that surfaces within a machine have begun to break down. Small amounts of wear debris are common in many machine oils; however, when a lubricant begins to fail, the rate of wear debris generation typically increases, and machine failure becomes more likely. The sooner a change in wear debris production is detected, the more likely machine failure can be prevented.

The CMP in this photo is on an ocean dredging vessel and is displaying a collection of wear debris on its magnetic plug.

Wear debris can be composed of various metals, but the most common is ferrous based (iron and steel). As such, most wear debris can be attracted and collected on a magnet. Magnetic drain plugs are commonly used to collect wear debris; however, they do not help provide real-time information because they are not seen until they are removed at the time of an oil change.

The CMP features a magnet suspended inside the sight glass for real-time observation of wear debris collection. The magnet should be observed daily for any changes. It's typical for small amounts of debris to collect over time – the magnet is helping to remove iron and steel particles from the oil. However, when there is a sudden increase in the amount of collected ferrous metal, abnormal wear is occurring, and machine failure is impending.

The CMP features a magnet suspended inside the sight glass for real-time observation of wear debris collection.

When the magnet becomes full, rotating the sight glass lifts the magnet out of the oil for further analysis and cleaning. Wear debris analysis helps determine where and how the ferrous particles were generated. Most oil testing labs are equipped with instruments and software for analyzing wear debris.

Air Contamination

Air can change the properties of a lubricant and is a common major or contributing cause of machine failure. Air can contaminate a lubricant many ways, such as through the suction side of a pump or a leaking seal. And, like water, air takes many forms: dissolved, entrained, free, or as foam on the surface. Air accelerates the rate of oil degradation, changes the oil's ability to transfer heat, contributes to pump cavitation, and can cause erratic operation of hydraulic systems. Foam on the surface of the oil can also alter oil levels and make level observations through a sight glass difficult.

This CMP Sight Glass on a gearbox at a mine is indicating air contamination by foam on the surface of the oil.

The CMP's 3D sight glass is beneficial in identifying air contamination. Entrained air will cloud the oil inside the sight glass, and foam will rise to the surface, if not fill the entire sight glass. Both of these conditions are easily observable during daily inspections.

Other Forms of Failure

A machine's lubricant is a fantastic source of information about what's going on inside your machine. The CMP harnesses this power by offering the lubricant technician a variety of simple inspection tools, most of which only require the naked eye. These tools make it possible for failures to be detected before they become catastrophic. Sometimes these failures are not lubricant related (misalignment, for instance) but evidence that failure is occurring and can be readily observed through inspection of the CMP.

A mysterious white substance is being indicated by the Condition Monitoring Pod at a water reclamation facility in Arizona.

One such example involved a pump at a water reclamation facility in Arizona that utilizes over forty CMP's. During a routine inspection, a technician noticed an opaque white substance in the sight glass. The technician rotated the sight glass to agitate the substance and concluded it was gelatinous in nature and suspended within the oil. A sample was taken using the convenient sampling valve and the lateral ports on the sight glass; however, lab analysis was inconclusive. Further investigation revealed that a PTFE oil slinger had been improperly installed and was wearing severely. The wear debris from this slinger was what had produced the white gelatinous substance captured and displayed by the CMP. Had it not been for the CMP the oil slinger would have ultimately failed, leading to a more catastrophic and more costly failure of the pump.

Conclusion

A good lubrication program is about being proactive, predictive, and simple - Luneta's Condition Monitoring Pod is a winning combination of all three. The CMP utilizes the power of daily inspections and the human eye to make detecting potential failures easy and reliable. With a host of predictive maintenance tools, the CMP can detect all sorts of lube related failures, from water contamination and damaged internal surfaces, to oil degradation and even worn-out oil slingers. Luneta's CMP can help you keep your lubrication program in the crosshairs so that you never miss a thing.

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For more information about Luneta's Condition Monitoring Pod

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