

LUBE

TECHNI-GRAM



FROM:

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August 2001

Silicon...it's bad news for oils!

Periodically, I have users of SWEPCO's Laboratory Oil Analysis Program (LOA) ask the question...“what are the possible sources of silicon in oil?”

Naturally, the silicon that is measured by oil analysis labs is to determine dust or dirt ingress. Since silica and silicates make up a large portion of the earth's crust, they are present at high concentrations in natural soils and dust. It is for this reason that silicon is used as the main indicator of dust or dirt entry into a component.

Before the use of oil analysis, a dust entry problem would go undetected until a routine tear down or failure occurred. Even then, often the wear would be attributed to lubricant breakdown or normal wear and tear. With the use of oil analysis, equipment owners can get a much clearer picture of whether they have a dust or dirt entry problem based on the tracking and increase in the silicon level of the oil and an acceleration of the wear pattern.

Since the largest percentage of SWEPCO's LOA samples are from engines, the following examples are drawn from engine applications. Generally, when an internal combustion engine has a dust/dirt entry problem, tracking the type of wear that takes place can help determine the manner in which the dust/dirt enters:

Normal Wear - normal wear patterns (lack of exceptionally high metal wears) combined with high silicon readings can indicate 1) a silicone sealant, grease or additive has been used and come in contact with the oil (a silicone based defoamant additive can be a prime suspect in many lubricants), and 2) accidental contamination of the oil sample may have occurred.

Increased Top-End Wear - increased levels of iron, chromium, and aluminum can be caused by airborne dust/dirt that has been drawn into the combustion chamber being forced down between the ring, piston, and cylinder. This is caused by a defective air cleaner or a damaged induction system. A check of the air filter, induction hoses, gaskets, and the inlet manifold for cracks can help eliminate this contamination.



... to keep it running

Increased Bottom-End Wear - increased wear levels of iron, lead, tin, copper, and aluminum can indicate that dust/dirt is getting into the lube oil directly and not past the pistons and rings. The likely sources are: 1) leaking seals, 2) defective breather, 3) damaged seal on oil filler cap or dipstick, or 4) dirty storage containers and/or top-off containers.

This type of dust/dirt contamination goes directly into the oil and will be pumped through the oil filter before entering the bearings. Therefore, the first step is to examine the oil filter for: 1) dust/dirt contamination and 2) bearing wear material. If excessive dust/dirt is found, thoroughly check all seals and breathers, etc. Check the oil storage containers and top-off containers for the source of contamination. If excessive dust/dirt is not found in the filter, check the way the oil analysis sample was taken to determine if any outside dust/dirt accidentally dropped into the sample container. Be sure to check the oil filter at the next service.

Yet another source of silicon can be in the form of casting sand. Some components are made by casting in sand (silicon oxide). Although new components are generally cleaned thoroughly prior to installation, it is not uncommon to see 50-100 ppm of silicon from new equipment. This level should drop as the component breaks-in and regular oil changes take place. And, of course, when any repair work is done to an engine or other component, it is possible that the increased wear rates discussed above are due to a “rebedding in” process and silicon comes from contamination while the component was opened for repairs.

* **Special Tip** - For equipment working in dusty environments, one of the main sources of dirt and contaminant ingress is through inadequate or faulty air breathers. In this case, consider using an upturned high-efficiency oil filter as an air filter. Oil filters are typically more effective at removing particles from the air than they are from removing them from oil.

For systems that do not need to breathe excessively (splash lubricated gearboxes), the use of an expansion chamber breather, which effectively seals the gearbox from the outside, is the best option.