

LUBE

TECHNI-GRAM



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CAN YOU FILTER OUT OXIDATION?

I came across this question while scanning one of many industry publications I receive. The author of the article gave the following informative and succinct response:

“Figuratively oxidation can be filtered, that is, it can be slowed or reduced through proactive maintenance practices (cleaner, dryer, cooler, etc.).

In reality, oxidation cannot be filtered because oxidation is a chemical aging process driven by catalyst such as high temperature, water, air, metals (in the form of wear debris and contamination) and other contaminants such as fuels and process chemicals. Hence minimizing the ingress of these will reduce or significantly slow the oxidation rate of the oil resulting in longer lubricant life.

However, by-products of oxidation such as acids and fine polar insolubles can be removed by the use of advanced separation technologies such as electrostatic separators, ion-exchange resins, and activated alumina. Additionally, dense absorbent depth-media (compressed cellulose, etc.) such as commonly used on by-pass and off-line filters, can be effective at removing sludge and oxide insolubles. Because oxidation is auto-catalytic, the removal of oxides can help slow further oxidation.”

One of the most frequently asked questions I receive is “what is oxidation?” This is a very complex question, and while numerous pages could be written on the subject, I will briefly summarize what oxidation is, as well as the detrimental conditions it can bring about when allowed to go unchecked.

From a quality standpoint, one of the most important properties of an oil is its chemical or oxidation stability. Oxidation is the form of deterioration to which all oils in service are exposed. Oxidation of lubricating oil is the result of oxygen chemically combining with oil molecules. The oxidation of lubricating oil is accelerated by high temperatures, catalysts (such as copper), and the presence of water, acids, or solid contaminants. The rate of oxidation increases with time. Oil additives are also subjected to oxidation and their performance features can be changed as a result.



... to keep it running

The compounds formed in the early stages of an oil's oxidation are not in themselves harmful. However, further oxidation converts these initial oxidation products into acids which attach and corrode metals. The metal salts formed as a result of this action, and the products of oil oxidation themselves, are catalysts that speed up further oil oxidation. Uncontrolled, this can have a snowballing effect and can create a chain reaction.

Oxidation tends to raise the viscosity of an oil. Continued oxidation then yields products that are less and less oil like and which eventually become insoluble in the oil. One type of oil oxidation forms resins which are soluble in the oil. This formation causes a darkening in color and an increase in viscosity in the oil. Resins and other oxidation products begin to form immediately after the oil is put in use. The rate of formation can be extremely low or exceedingly high, depending on the oil and operating conditions. When these products come into contact with very hot surfaces, there is a tendency for some types to be changed into insoluble compounds that may either bake out on the hot surface or circulate as solids suspended in the oil. In the form of hard dark coatings, such products are called varnishes or lacquers; other forms, which often settle out in some low point in the systems are called sludges. Frequently, these sludges together with coarse sand, small bits of metal, and other types of dirt, form even more objectionable mixtures that might be called "super sludges."

Obviously, a high rate of oxidation cannot be tolerated in many systems because the products of oxidation can clog small orifices, jam tightly fitted parts, reduce bearing clearances, plug lines, and ultimately increase operating temperature, thereby further accelerating lubricant deterioration. Moreover, since products of oxidation are acidic, they are likely to attack metal parts and thus destroy precisely machined surfaces.

Much has been done to improve oxidation resistance by the use of selected base stocks, special refining methods, and oxidation inhibitors. SWEPCO's entire line of quality lubricants, which are manufactured from solvent refined, high viscosity index, paraffinic base stocks, start out with a higher thermal stability than conventional oils. We then use a highly active oxidation inhibitor, the performance of which is further enhanced by SWEPCO's exclusive proprietary additives, Lubium and Dimonyl, to provide superior resistance to oxidation and to de-activate the catalytic effect of some metals. This properly balanced formulation assures long, effective lubricant life in a multitude of applications ranging from normal to severe operations.