# How to Check and Reduce Acid Levels in Compressor Lubricant

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When it comes to lubricating rotary-screw air compressors, a unique set of circumstances can make the process difficult. This is because in most lubricant applications, oxygen, heat and moisture are not continually combined. Two of these three factors are often combined, but not all three.

In a rotary screw air compressor, the lubricant is constantly injected into the compressor air end along with the intake air, and both are moved through the compressor chamber. As the air is compressed in the chamber, heat is generated. It's this combination, along with the moisture present in the atmosphere, that makes the application difficult.

Today's synthetic compressor lubricants represent some of the highest lubrication technology anywhere. The older lubricants used have a very complex set of additives designed to stave off the effects of the harsh conditions of a rotary-screw compressor. As the lubricant is used, the additive packages will begin to deplete and acids will begin to form. The acids are derivatives of sulfuric acid, which attacks and destroys the metal components inside a compressor unit.

When a new synthetic lubricant is installed, the total acid number (TAN) will be 0.0 and the barium level will be 350 to 400 PPM. Barium is an additive that retards the formation of acid. As the additive package begins to break down, the barium will deplete and the TAN will begin to rise. When it hits 2, it's time to change your lubricant.

Over the years, we've often seen TANs of 13 to 20 and higher. Customers often wonder how the TAN can be so high when they change the lubricant every year. Here's how that happens:

First, when oil in a compressor is drained normally, about 10% of the lubricant remains in the lines, in the cooler, or in the bottom of the sump. If someone changes the oil and the TAN is 2.0, and if took 12 months for it to reach that mark, then the oil that has remained will contaminate the new oil. The TAN this time will reach 2.0 in 10 months and it may hit 4.0 by the time the annual oil change takes place.

The 10% is left behind again and the TAN will reach 2.0 in eight months. By the time this annual change takes place, the TAN could easily be 15. And the next year the TAN could hit 30 or even 40. When the TAN reaches those high levels, big trouble starts. Usually there is serious corrosion of the compressor leading to air end failure.

In the case of polyglycol-based lubricants, such as Sullair 32, the polyglycol has a

unique characteristic which causes the lubricant to begin smelling extremely foul. It can be so bad, it will force people out of the plant. This odor is simply a byproduct of the sulfuric acids reacting with the polyglycol-base stock of the lubricant.

By the time this foul smell begins to manifest itself, the TAN is very high. In order to prevent a compressor failure, the lubricant needs to be drained. Special effort needs to be made to drain as much as possible. The cooler needs to be drained from all lines and the bottom of the sump needs to be cleaned.

When this happens, a heat-activated cleaner should be used in the compressor, allowing it to circulate as the compressor comes to its operating temperature. The cleaner will actually dissolve the sludge and varnish deposits created by the high acid lubricant. Once the unit has operated for 30-40 hours at operating temperature, the entire load of lubricant needs to be drained and discarded. The compressor should then be refilled with normal lubricant.

In order to prevent high acid levels from recurring, compressor operators should obtain a sample of the lubricant at least every 4,000 hours. Firms like Air Engineering and others will perform free laboratory analysis. This will indicate the TAN as well as 27 other compounds in the lubricant. Metal wear will show as will moisture content. This is the single best thing a compressor operator can do to prevent unexpected compressor failures.

There's one other thing to keep in mind about compressor lubricant. While today's synthetic compressor lubricant is truly remarkable it's designed to last 8,000 hours for every 10 degrees above 180 degrees F that a compressor operates, oil life is cut in half. As the oil life is depleted, the additive packages are also depleted and the ability to stave off acid formation is decreased. Even if a unit operates on a very hot day or two and the discharge temperature reaches 200 degrees (which happens often) that batch of oil is probably only good for 2,000 hours. If it's allowed to operate for 6,000 more hours, chances are good that the acid level will get very high and then contribute to the spiraling-up effect described earlier. The best way to monitor this is through oil analysis.