Application Engineering Note: scrolls & “green slime”

White Mineral Oil and Low-side Leaks – (green slime formation)
High temperature generated during a low-side loss of charge, together with water and air pulled into the system, degrades the white mineral oil by oxidation and hydrolysis. The resultant degradation products attack copper components. The green oil is formed from the dissolved ionic copper compounds that are soluble in the oil. The green slime is due to the water hydrolyzing copper compounds forming copper hydroxide that forms a “grease like” material with the oil. Green oil/slime usually forms as a result of a low-side loss of charge.

Green Slime Appearance
Green slime is more prevalent in systems using a compressor that has a bronze, or other largely copper containing bearing. Other metals such as aluminum and iron would react similarly but their ionic compounds are white or light red/yellow and thus do not contribute to the green color observed. The green slime is noticed mostly with scroll compressors, however the same phenomena occurs with piston compressors and white oil. Usually the piston type compressors fail before the system is contaminated with green slime.

Yellow Mineral Oil and Low-side Leaks
Yellow mineral oil degrades more rapidly in systems with a low-side loss of charge, and becomes black and gummy. It apparently can’t get around the system as easily as the more stable white mineral oil. Although many, if not all, of the same processes take place, the yellow oil’s lower chemical stability causes it to mostly gum-up in the compressor where it is formed, while the white oil’s “green slime” often appears down stream from the compressor.

Why Does Copeland Use White Mineral Oil?
- Improved Temperature Stability
- Better Lubrication Of Thrust Bearings
- Less Susceptible To Oil Pump Out
- Lower Miscibility

How To Prevent Green Slime?
Install a low pressure control or prevent low side system leaks and other situations leading to the introduction of air and water into the system.

How To Remove Green Slime?
Follow the guidelines in the Application Engineering Bulletin AE24-1105-R4 “Principles of Cleaning Refrigeration Systems”. Often with a bad-case of contamination it is more economical to replace the entire system.

Copeland guidelines are not meant to replace the system expertise available from system manufacturers.

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