A look at long drain in anti-wear hydraulic oils

The world of hydraulics has been getting increasingly complex in the last few decades. To cater to larger load requirements for both mobile and stationary pump applications, fluid pressures have increased multiple times, with consequential increase in operating temperatures and duty cycles. Pumps are also becoming increasingly sophisticated, with simple vane pumps and high-pressure piston pumps evolving to complex hybrid designs.

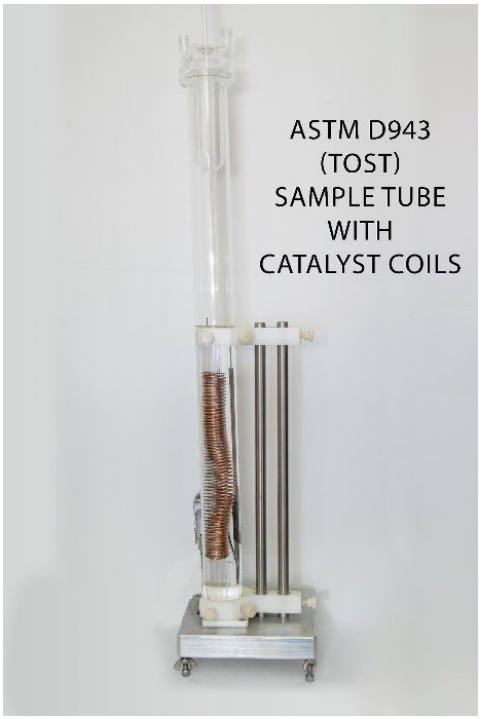
Amidst these changes, the requirement for long drain in anti-wear hydraulic oils is a continual topic in the industry. Maintaining as long a time period as possible between oil changes reduces the down time of working equipment, enhances its overall efficiency and further reduces oil consumption. The end result is an overall reduction in the total cost of ownership of the equipment. Hence end users, Original Equipment Manufacturers (OEMs) and lubricating oil marketers are constantly striving to get more out of the lubricant, targeting higher intervals between drains and a longer service life.

Well formulated hydraulic oils play a key role in the reliability and performance of modern hydraulic equipment, whether they are in used in industrial applications or in construction equipment. The key performance requirements that needs to be considered are: Thermal conductivity, Pressure and Power Transmission, Oxidation Resistance, Wear Protection, Corrosion Protection and Seal Compatibility, which are summarized in the Performance Requirements diagram above.

In Chevron Oronite, we undertake a rigorous process in the development of new hydraulic oil additives in order to meet the demanding requirements of both OEMs and end consumers. During the process, a combination of bench tests in the laboratory and tests involving actual equipment are used. Some prominent examples of these tests are:

Bench Tests

- Turbine Oxidation Stability Test or “TOST” (ASTM D943). During the development of a new hydraulic oil, the TOST is a helpful test that helps to evaluate the oxidation performance of the candidate oil over an extended period of time. It involves subjecting the candidate oil to a state of oxidation by maintaining the oil at a high temperature of 95°C and bubbling air through it. The oxidation state is further accelerated by adding a copper and steel coil catalyst to the oil. The lubricant condition, which is determined by its Total Acid Number (TAN), is then measured periodically over a maximum period of 10,000 hours. A good hydraulic oil, blended with a Group II base oil, will maintain a TAN of less than 2.0 mgKOH/ gm for at least 5,000 hours.



- Thermal Stability Test (ASTM D2070). Is a common bench test that measures the ability of a hydraulic oil to prevent oxidation and sludge. In this test a lubricant is heated to a 135 °C and the temperature maintained for 168 hours while two metal rods, one of copper and another of steel, are fully immersed. At the end of the test, the TAN, viscosity increase in the lubricant is measured, while the discoloration of

copper and steel rods are rated according to the standardized color chart. The fluid is considered to have met the requirements of the test if the TAN, viscosity increase, sludge, copper removed, and ratings on the appearance of the steel and copper rods are within the pre-defined limits.

OEM-specific tests

In addition to bench tests, candidate hydraulic oils will also need to go through OEM-specific tests using the manufacturers' designated test methodology in order to be qualified by the OEM for use. Oronite has installed several OEM-approved test stands, one of which is the Denison pump test that qualifies the oil to Denison's HF-0 and other specifications. Using the Denison hybrid pump (Model T6H20C) which houses both a vane and piston pump, the test objective is to determine the ability of the lubricant to protect the parts in the pump and maintain critical functions like filtration. This rigorous test runs for over 600 hours and involves a "dry phase" where the unadulterated candidate lubricant is tested for 300 hours and a "wet phase", where 1% of water is added to the lubricant and tested for a further 300 hours. At the end of the test, the pump is disassembled, and pump parts are measured for weight loss and wear.

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