

As engine oil manufacturers continue to develop new products designed to be stronger and last longer, some are also recommending drain intervals. Original equipment manufacturers also specify drain intervals and qualify oils for use in the equipment they sell. However, in both instances, it is important to recognize that these recommendations may not be all inclusive of every operating condition or every application in which the oil might be used. An OEM's recommendations are often tied to warranty requirements and if not followed, can affect claims related to extended drain intervals.

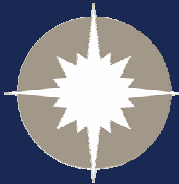
So how do you know if recommended intervals provide adequate protection? Will the oil last as long as they say it will in your everyday environment and under the conditions in which you operate? Could it last longer? Only by testing it will you know for certain. Considering the manufacturer's specifications along with oil analysis results and laboratory recommendations is the best way to **safely** optimize drain intervals, minimize wear and preserve equipment health.

All new oils will have a starting Total Base Number (TBN). TBN is determined by the oil's additive concentrations and represents a measurement of the lubricant's ability to neutralize acid. Comparing the used oil's TBN to its starting TBN when new, will determine how much longer the oil can be used without causing any damage to the engine. When TBN has dropped to 35% of the starting TBN, the oil should be changed. **NOTE:** In order to compare apples to apples and to set accurate condemning levels, ASTM D4739 should be used to determine the TBN of both new and used oils.

Perform the following tests to determine a used oil's suitability for continued use:

- Elemental Analysis (24 Metals by ICP – ASTM D5185)
- Fuel Dilution % (by Gas Chromatography)
- Soot % (by FTIR – Infrared Analysis ASTM E2412)
- Water by Crackle
- Viscosity @ 100° C (ASTM D445)
- TBN (ASTM D4739)
- Oxidation/Nitration (by FTIR – Infrared Analysis ASTM E2412)

However, relationships between TBN results and other test results should also be evident. For example, oxidation occurs during the natural breakdown of a lubricant as it ages or degrades under certain conditions. Degradation acids eventually form. Nitration is indicative of combustion by-products (blow-by) which



eventually produce nitric acid. Acids adversely affect TBN as they reduce the oil's alkaline reserve therefore, as TBN decreases, oxidation/nitration will increase.

If the oil is not changed, viscosity will also increase as well exposing the engine to lubrication starvation, increased wear and even failure. Provided that all other tests performed do not show elevated levels of wear and/or contamination, coinciding trends in TBN, viscosity and oxidation/nitration are sufficient to determine whether or not the oil should be changed.

It is also important to note that accurate and complete lubricant and equipment information is crucial when submitting samples to determine optimum drain intervals. Knowing the engine manufacturer and model as well as the manufacturer, type and grade of oil can significantly affect both the analyst's interpretation of the test results and the severity level assigned to the report.

Time on both the lube and the unit is also key to receiving the most accurate drain interval recommendation. Unit time is the number of hours or miles/kilometers to date on the engine. Lube time starts at zero after an oil change and is an accumulation of hours or miles/kilometers until the oil is changed again. The ability to compare these amounts of time with the test results allows the analyst to accurately and safely pinpoint an optimum drain interval.

Also remember that no two situations are alike. The same oil can be used in identical applications but under completely different operating conditions – the recommended drain interval may work for one but another may be able to exceed it considerably. Test results and maintenance recommendations are dependent upon knowledge of the operating environment, duty cycles, load and horsepower.

Monitoring TBN in conjunction with trends in both oxidation/nitration and viscosity and keeping an eye on contamination and wear is the best way to safely optimize drain intervals. Never drastically extend or skip sampling intervals when testing to extend drains as upward trends in wear and contamination can be missed and your ability to predict and prevent failures significantly reduced. Always consult with your lubricant supplier, engine manufacturer and laboratory analyst before exceeding an OEM's suggested drain interval or beginning any extended drain testing program.