SOS SERVICES – FLUID ANALYSIS

TOTAL ACID (TAN) AND BASE NUMBER (TBN)

William Adams SOS Laboratory offers an advanced oil analysis that includes TAN and TBN analysis which assists in monitoring deterioration of used oil.
These tests are available through SOS Kit part Number SOS3TANBN at a cost of $42.00 + GST. These kits are identified by the red lid on both the sample bottle and the mailing canister. It includes the complete standard oil analysis with the addition of the TAN and TBN test. These tests are complicated and take longer to process, so expect a 3 day turn around time. We highly recommend that a sample of new unused oil is also provided as a reference.

These additional tests are specifically recommended for:
- Spark ignited gas engines
- Monitoring and measurement of oil degradation
- Close management of oil change intervals
- Specific OEM requirements

TAN

TAN measures the acid build up in oil during use and is only required for certain applications. TAN typically increases with either oxidative degradation of the oil or accumulation of contaminants from the environment. This accumulated acid reflects the depletion of the corrosion inhibition package in the oil. Any significant change in TAN should be investigated as the acids in the oil can cause corrosion.
ASTM D4378 method is used where the oil is titrated with a base material (KOH) to determine the amount of base required to neutralise the acids in the oil. The results are reported in mg KOH/g.

TBN

TBN is a measure of the oil's alkaline reserve. Engine oil contains additives with alkaline compounds formulated to neutralise the corrosive acidic by-products of the combustion process. This allows the oil to help prevent corrosive damage in the engine. TBN measurement is a critical requirement of a Gas Engine's Fluid Analysis Program, however it also has benefits for Diesel Engines. IP 400 method is used and reports results in mg KOH/g.

Gas Engines	Diesel Engines
Many gaseous fuels contain sulphur compounds which can form highly corrosive acids in the oil and places gas engines at a higher risk of corrosive wear. TBN will measure how much reserve additives the oil has left to neutralise the acids.	For Diesel engines, TBN can measure how much active additive is left in a sample of oil. This can be useful for situations where there is a need to find the optimal oil change interval.

METHODS

TAN and TBN test methods are all based on the same fundamental approach where a "standard" acid or base is added to the used lubricant slowly until a pre-defined end-point is reached. Each method in itself is subject to variability in addition to variability between methods and laboratories. When monitoring TAN and TBN is critical to establish a baseline using a specific method and laboratory and then continuing to use that method and laboratory. The test parameters, solutions, operators and maintenance of the titration equipment all play a significant role in the repeatability and ability to trend and compare results.

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Comparing Results

There are several methods by which to determine TAN and TBN. Each of these tests serve a specific purpose and results between these methods cannot be compared. ASTM methods are time consuming and typically use hazardous materials, therefore many modified versions of these ASTM methods are being used. This is acceptable as long as the results are repeatable and reproducible.

Comparing results can be misleading and confusing if not controlled. With the variability within methods, between methods and then also laboratories and instrumentation it is highly recommended to establish a consistent program.

Do's In Comparing	Don'ts in Comparing
Compare results to historical results through trending	Switch back and forth between methods
Consistently use the same lab and test method for a specific lubricant	Don't switch back and forth between labs
Ensure that representative (new oil) sample is provided to establish the baseline	Don't compare results between different methods or labs

Standardized Methods for testing TAN

ASTM D664 and D974 are the most common, with ASTM D1534 and D3339 being used for special cases.

D664	**Potentiometric – potentiometer detects the acidic constituents and converts it to an electronic read out. Method used by William Adams Lab.**
D974	Colorimetric – sample changes colour once acidic constituents have been neutralised
D1534	Similar to D974 by using a colour change. Method is designed for electric insulating oils (transformer oils).
D3339	Similar to D974 but for small oil samples of 2g

Standardized Methods for testing TBN

The most common referenced are ASTM D2896 and D4739. IP400 is a relatively new method and many long established laboratories may not have changed from the established ASTM methods they use. This may require large investment in changing instrumentations and solutions.

IP400	**Suitable for both new and used oils. Relatively new method. Uses less hazardous materials to conduct testing. Values are typically lower than ASTM D2896 and D4739. Method used by William Adams Lab.**
ASTM D2896	Common for new unused oils and typically used by lubricant manufacturers for comparison of new oils. Values are typically greater than D4739 and IP400. Not to be used as baseline for trending.
ASTM D4739	Common method for used oils and trending over time. Should be used as baseline for trending. Two values are reported (Buffer and Inflection), but labs do not typically indicate which one they report on.