

Why acids measurements are so important for mineral oils, biodiesel and lubricants



Acid in engine oil is a major driver of corrosion, oxidation, nitration and increased viscosity, all of which are downsides that affect performance. Ultimately, it's a root cause of equipment harm.

For years, Total Base Number (TBN) and Total Acid Number (TAN) methods have been known in the field to determine remaining oil life, they indicate the amount of performance-related additive left in engine oil. These analyses are useful to know as they indicate when it is time to change engine oil.

Of course, these two measurements are important, and give clear view of the quality of the oil, but sometimes, it's not enough. In addition, a more detailed mix of indicators can be made to provide a full picture of oil health and performance, including:

- Wear metals
- Oxidation
- Viscosity

Another more recent method is the acid or neutralisation number, which is a measure of the amount of free acids (as fatty acids) in a substance (as an oil or resin), usually expressed as the number of milligrams of potassium hydroxide required to neutralise 1 gram of substance. The acid number for an oil sample is indicative of the age of the oil, and can be used to determine when oil needs to be changed.

DEFINITIONS & METHOD DESCRIPTIONS

Total Acid Number (TAN) is a measure of acid concentration present in a lubricant. The presence of acidic contamination, additive package and oxidation by-products govern the acid concentration of a lubricant.

ASTM D664 is the commonly accepted test method for TAN. In this technique, the sample is dissolved in isopropanol and toluene with a small amount of water, and the solution titrated with alcoholic potassium hydroxide.

A reference and glass electrode are then placed in the solution and connected to a potentiometer/volt meter. The titration endpoint is reached when the meter reading in millivolts corresponds to a buffer solution, or a well-defined inflection point is found.

Total Base Number (TBN) is a measure of alkaline concentration present in a lubricant. Alkaline additives are used to formulate engine oils to prevent the build-up of acids in a lubricant as it breaks down.

ASTM D2896 is the accepted method for TBN in used and new oils. This involves dissolving the sample in glacial acetic acid and chlorobenzene, and titrating with perchloric acid in glacial acetic acid. Potentiometric titration is used to determine the endpoint with a glass electrode within the solution, and a reference electrode connected to the sample solution through a salt bridge.

Acid or neutralisation number is the measure of the amount of KOH required to neutralise the acid contained in a lubricant. Acids formed as oils oxidise with age and service.

As oil-fats rancidify, triglycerides are converted into fatty acids and glycerol, causing an increase in acid number.

For all these methods, we have some ready to use solutions, see the table below.

Description	Pk	Cat. No.
Chlorobenzene/acetic acid - ASTM D2896, TBN solvent	2,5 l	5154.2500
	2,5 l	5138.2500
	5 l	5138.5000
Toluene/2-Propanol/water titration solvent - ASTM D664, TAN solvent	25 l	5138.9025
Alkali blue indicator solution - DIN 51558, ASTM D974-64	2,5 l	86131.320
Phenolphthalein GPR RECTAPUR®	250 g	26237.231
Phenolphthalein 1% in 2 Propanol Technical	1 l	8626.1000

Other ASTM solvents are available, just go to vwr.com



<p>AUSTRIA VWR International GmbH t +43 1 97 002 0 info.at@vwr.com</p> <p>BELGIUM VWR International bvba t +32 (0) 16 385 011 vwr.be@vwr.com</p> <p>CZECH REPUBLIC VWR International s. r. o. t +420 321 570 321 info.cz@vwr.com</p> <p>DENMARK VWR International A/S t +45 43 86 87 88 info.dk@vwr.com</p> <p>FINLAND VWR International Oy t +358 (0) 9 80 45 51 info.fi@vwr.com</p>	<p>FRANCE VWR International S.A.S. t 0 825 02 30 30* (national) +33 (0) 1 45 14 85 00 (international) info.fr@vwr.com * 0,18 € TTC/min</p> <p>GERMANY VWR International GmbH t 0800 702 00 07* (national) +49 (0) 6151 3972 0 (international) info.de@vwr.com *Freecall</p> <p>HUNGARY VWR International Kft. t +36 52 521130 info.hu@vwr.com</p> <p>IRELAND / NORTHERN IRELAND VWR International Ltd / VWR International (Northern Ireland) Ltd t +353 (0) 1 88 22 222 sales.ie@vwr.com</p>	<p>ITALY VWR International S.r.l. t +39 02 3320311 info.it@vwr.com</p> <p>THE NETHERLANDS VWR International B.V. t +31 (0) 20 4808 400 info.nl@vwr.com</p> <p>NORWAY VWR International t +47 22 90 00 00 info.no@vwr.com</p> <p>POLAND VWR International Sp. z o.o. t +48 58 32 38 200 info.pl@vwr.com</p> <p>PORTUGAL VWR International - Material de Laboratório, Lda t +351 21 3600 770 info.pt@vwr.com</p>	<p>SPAIN VWR International Eurolab S.L. t +34 902 222 897 info.es@vwr.com</p> <p>SWEDEN VWR International AB t +46 (0) 8 621 34 00 kundservice.se@vwr.com</p> <p>SWITZERLAND VWR International GmbH t +41 (0) 44 745 13 13 info.ch@vwr.com</p> <p>UK VWR International Ltd t +44 (0) 800 22 33 44 uksales@vwr.com</p>
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