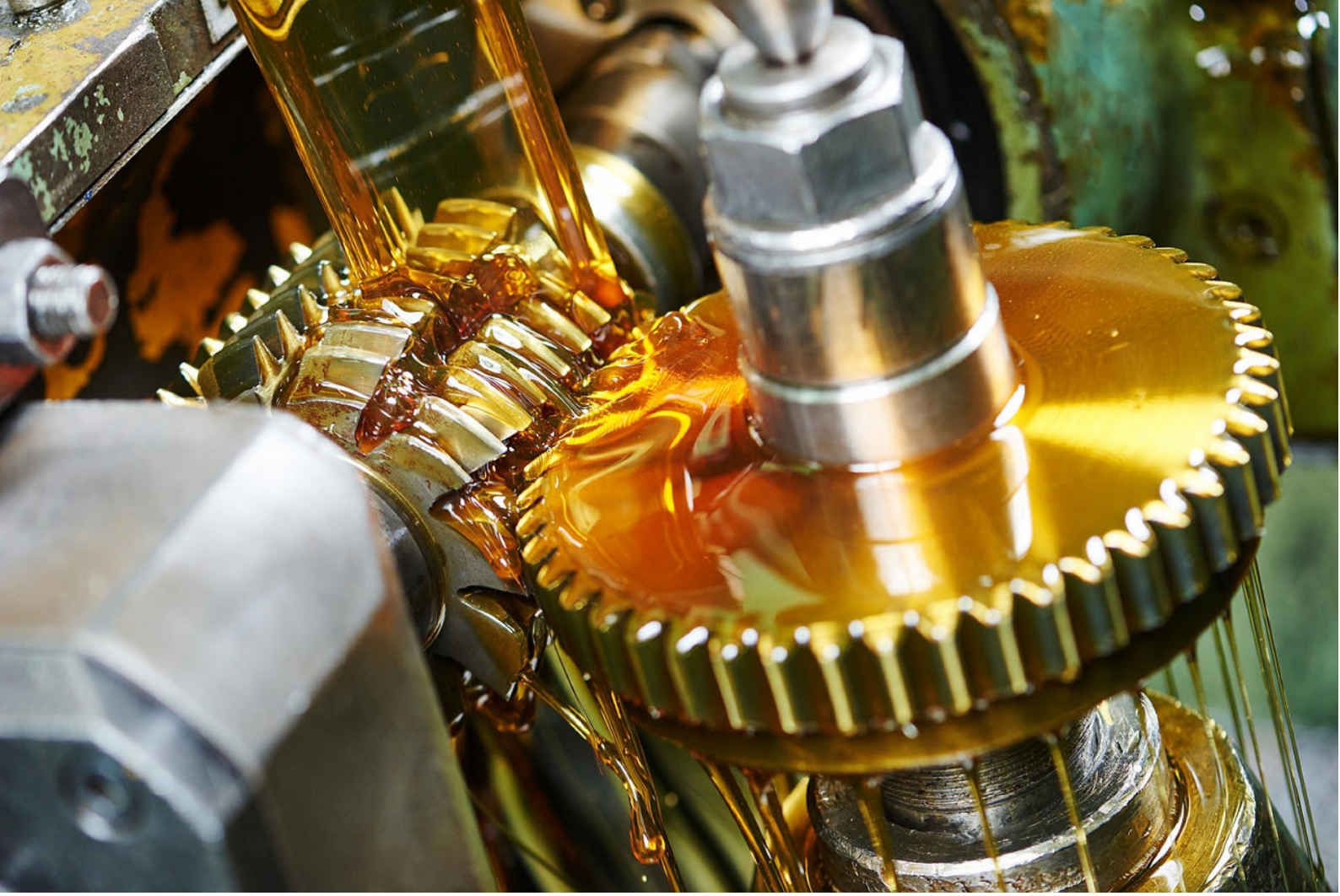

TITRATION APPLICATION NOTE H-141

Acid number in crude oil and gas oil according to ASTM D8045

Fast and reliable analysis of various oil products used in the petrochemical industry by thermometric titration

Accurate knowledge of the total acid number in crude oil is important for the determination of its price. Additionally, by monitoring the acidity of crude oil and the associated process oils, unexpected shutdowns can be prevented, and thus costly treatment chemicals preserved.

Thermometric titration is a reliable method for the analysis of the total acid number (TAN) in assorted petroleum products. During thermometric titration (TET), the enthalpy change of the reaction is monitored rather than the potential. The titration endpoint is revealed by an inflection in the temperature curve.

In this Application Note, the acid number of multiple oil products is determined with titration as per ASTM D8045 by using catalytic thermometric titration. Compared to potentiometric titration, TET is faster and more convenient.

Metrohm

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on miscellaneous crude oil products.

Usually, sample preparation is not required. However, some samples may require slight warming or dissolution in xylene prior to titration. It is possible to titrate warm samples (<60 °C) without a loss of resolution or precision.

EXPERIMENTAL

The determinations are carried out on an OMNIS Professional Titrator equipped with a dThermoprobe (Figure 1). To avoid manually handling chemicals, all solutions can be automatically added using an OMNIS Dosing Module.

Figure 1. OMNIS Titrator Professional equipped with a dThermoprobe and a rod stirrer.

An appropriate amount of sample is weighed into the titration vessel, and solvent as well as paraformaldehyde are added. Afterwards, the solution is titrated until after the first exothermic endpoint with standardized potassium hydroxide (Figure 2).

RESULTS

This method offers very accurate results for TAN as displayed in Table 1.

Table 1. Results for the total acid number determination according to ASTM D8045 on an OMNIS system equipped for the thermometric titration.

TAN (n = 6)	Mean in mg KOH/g sample	SD(rel) in %
Cutting oil	0.96	0.2
Desalted Crude	0.76	2.1
Raw Crude	0.73	1.1
Vac. Light Gas	1.23	0.0
Vac. Heavy Gas	1.25	0.8
Atm. Heavy Gas	1.15	1.2
650 Endpoint Gas	0.73	1.1

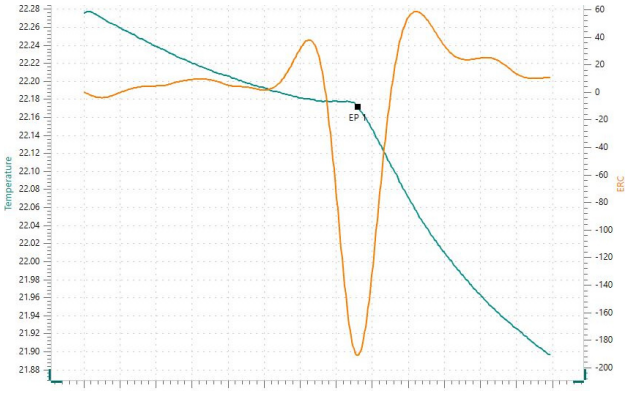

Figure 2. Titration curve of the thermometric determination of a raw crude oil sample.

CONCLUSION

Thermometric titration is a very fast and accurate method that can determine the TAN of various crude oil products in one easy titration. No sensor maintenance is required, making TET a robust alternative to other color indicator titration test methods.

Analytes:	**Acid number, TAN**
Matrix:	**Mineral oils; Lubricants, coolants, cutting fluids**
Method:	**Titration**
Industry:	**Chemical; Petrochemicals & biofuels**
Standards:	**ASTM D8045**

Titration Application Note H-141, Version 2 – 2024-03
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