



Application Note AN-T-098

Total base number according to IP test method 400

Base number of petroleum products determined following IP 400

Acids are formed in engines during the combustion process through oxidation of hydrocarbons and sulfur compounds. These acids can attack the engine surfaces, causing corrosion. The alkaline reserve of engine oil serves to neutralize these acids and thus protect the engine from damage. The alkaline reserve is the amount of alkaline additives in the oil that serve to neutralize harmful acids. The total base number (TBN) value determines the alkaline reserve of oil.

The TBN value is expressed in milligrams of potassium hydroxide (mg KOH) per gram of oil. A high TBN value means that the oil has a high alkaline reserve and therefore offers good protection against acids. It is recommended to have TBN values of at least 8 mg KOH/g for modern engines.

Some benefits of using conductometric titration for this analysis according to IP test method 400 include accuracy, speed, simplicity, sensitivity, and flexibility.

SAMPLE

A new commercially available motor oil was

used for the analysis.

EXPERIMENTAL

Hydrochloric acid in a 2-propanol solution was used to titrate the sample up to the first equivalence point. The conductivity was measured after each titrant addition.

A 5-ring conductivity cell was used as the measuring cell. **Figure 1** shows the system that could be used for this analysis.

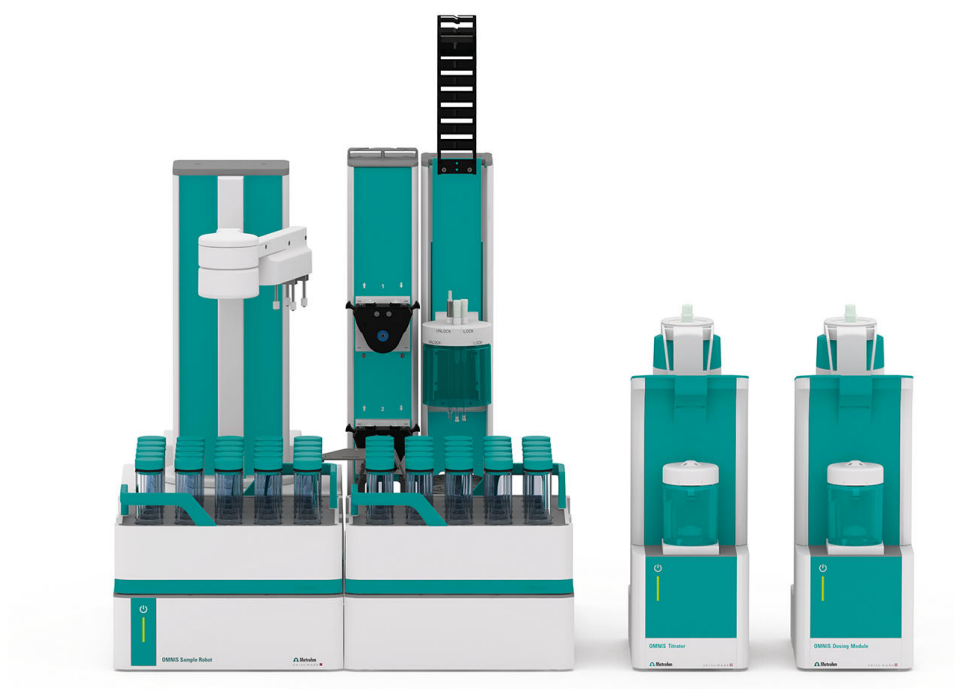


Figure 1. OMNIS Titrator with an OMNIS Dosing Module and OMNIS Sample Robot.

RESULTS

The determination of the TBN value in motor oil gave accurate results (**Table 1**). An example

determination is shown in **Figure 2**.

Table 1. Results of the motor oil determination by conductometric titration according to IP 400.

Sample	Result TBN	RSD in %
Motor oil (n=6)	7.85 mg KOH/g	0.4

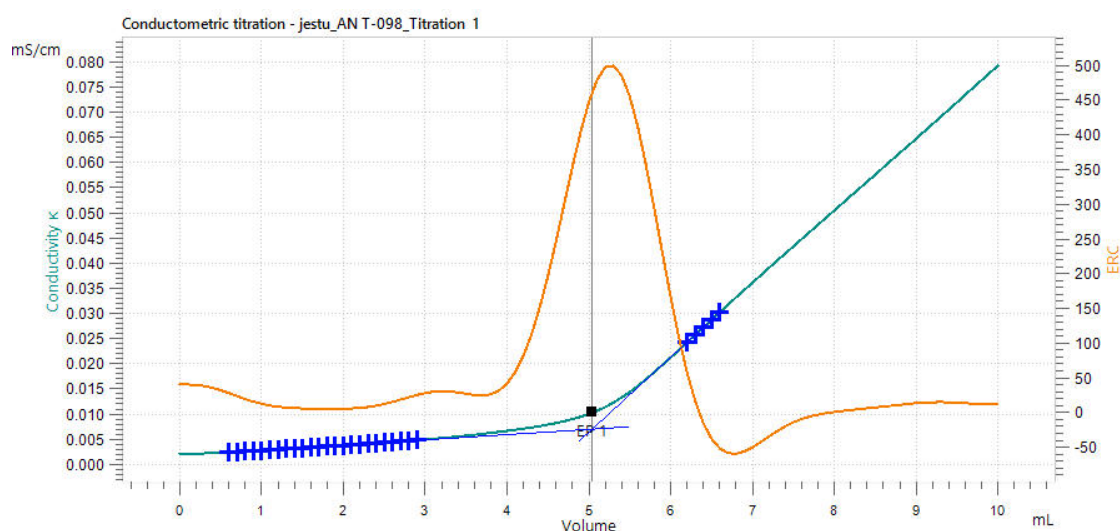


Figure 2. Example titration curve to determine the total base number in motor oil according to IP test method 400.

CONCLUSION

This analysis method does not require indicators or complicated instruments. Compared to other titration methods, it is highly sensitive, giving users precise results.

The measurement is easy to perform and is applicable to a variety of sample types. Measuring suspensions, slurries, and cloudy or colored solutions (e.g., diesel fuels or oil samples) is straightforward.

The robust design of the conductivity measuring

cell makes it easy to clean. Unlike a potentiometric sensor, the cell does not require any rehydration time between measurements. It is possible to use conductivity titration to titrate highly diluted solutions, nonaqueous solutions, strong acids, and weak acids or bases. The endpoint of this titration method is sharp and precise compared to other titration methods.

CONTACT

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CONFIGURATION



OMNIS

スタンドアローン稼働またはOMNIS滴定システム
のメインパートとしての、革新的なモジュール式
のOMNIS電位差滴定装置です。3Sリキッドアダプタ
テクノロジーにより、化学物質の取り扱いに
関してはこれまでにないほどの安全性を誇ります。
滴定装置は測定モジュールおよびシリンダー
ユニットによって自由にコンフィグレーション
することができ、必要に応じてスターラで
拡張することも可能です。様々なソフトウェア
機能ライセンスにより、様々な測定モード
および機能の使用が可能です。

- パソコンまたはローカルネットワークを介した制御
- 他のアプリケーションまたは補助溶液のための他の滴定モジュールもしくはドージングモジュールが4つまで接続可
- プロペラスターラの接続可
- 様々なシリンダーサイズに対応: 5、10、20、50 mL
- 3Sテクノロジーによるリキッドアダプター: 化学物質の安全な取り扱い、メーカーのオリジナル試薬データの自動伝送

測定モードおよびソフトウェアオプション:

- 終点滴定: 機能ライセンス「Basic (ベーシック)」
- 終点滴定および当量点滴定 (等量/変動): 機能ライセンス「Advanced (アドバンスド)」
- 並行滴定を伴う終点滴定および当量点滴定 (等量/変動): 機能ライセンス「Professional (プロフェッショナル)」

OMNIS

A WHOLE NEW LEVEL OF PERFORMANCE

Function license "Conductometric titrator" for the OMNIS Titrator Contains the function modes MET COND; MEAS U/T/pH/COND; Liquid Handling; Titration only with internal buret of an OMNIS Titrator;



Measurement channel for one OMNIS Titrator or Titration Module for the connection of conductivity measuring cells.



5 c = 0.7cm-1Pt1000 (0.65 m)

セル定数 $c = 0.7 \text{ cm}^{-1}$ (指針値) の5リング電気伝導度測定セル、内蔵型Pt1000温度センサーおよび OMNIS Measuring Module Conductivityとの接続のための固定式ケーブル (0.65 m) 付き。

このセンサーは、以下の液体などにおける中程度の電気伝導度 ($5 \mu\text{S}/\text{cm}$ から $20 \text{ mS}/\text{cm}$) の測定に適しています:

- 飲料水
- 表流水
- 廃水