



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

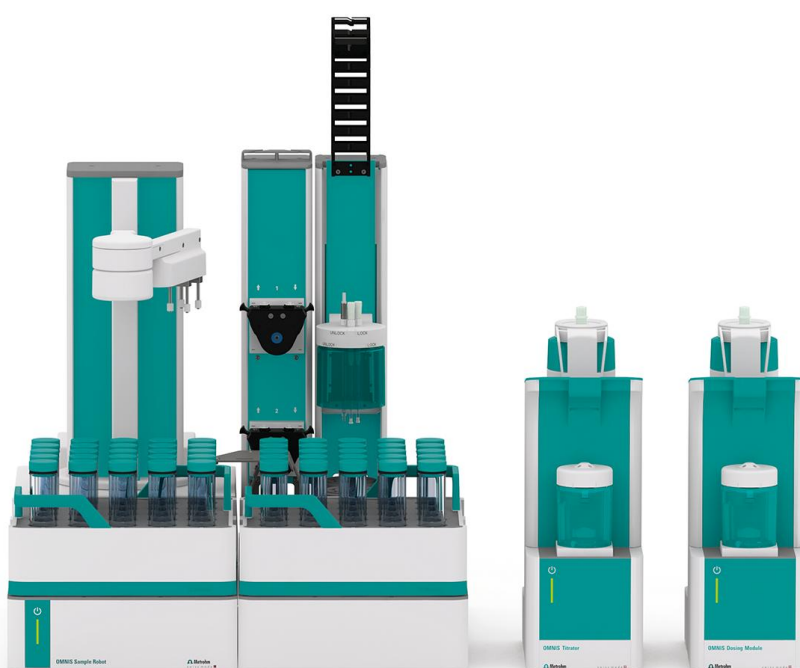
A new commercially available motor oil was

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.

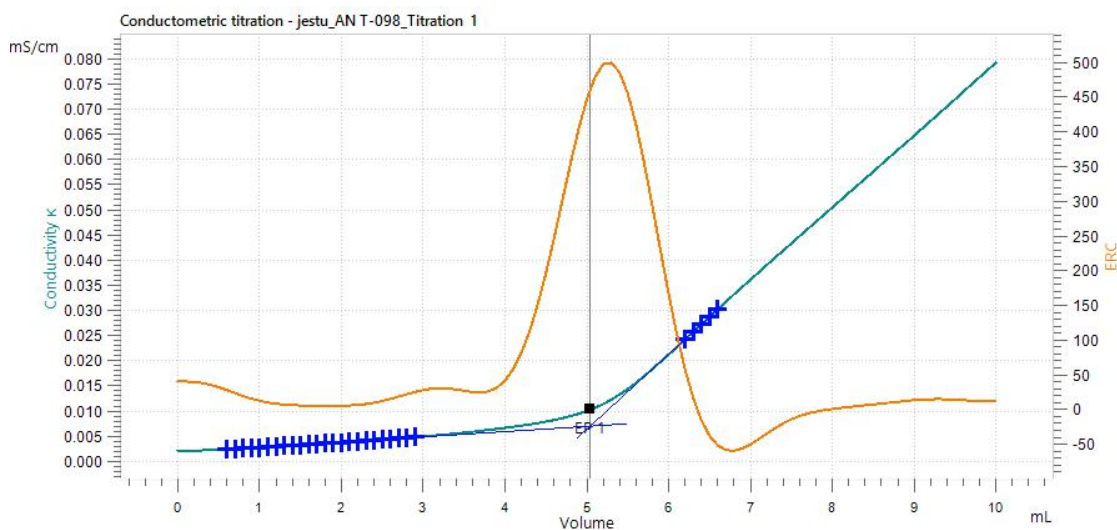
## RESULTS

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 Titrator

新型、模式位分析 OMNIS Titrator 滴定,于独立行或作 OMNIS 滴定系的核心元件行。由于采用 3S 瓶配器技,理化学品从未像在一安全。可以使用量模和量管元自由配置滴定,并在需要展一台拌器。由于采用不同的件功能可,因此可以有不同量模式和功能。

- 通算机或本地网控制
- 可以其他用或助溶液外接最多四个滴定模或加液模
- 螺旋拌器的接方式
- 可提供不同大小的量管:5、10、20 或 50 mL
- 采用 3S 技的瓶配器:安全理化学品,自生商的原  
始数据

### 量模式和件:

- 点定滴定:“Basic” 功能可
- 点和等当点滴定(一/):“Advanced” 功能可
- 点和等当点滴定(一/),包括平行滴定  
:“Professional” 功能可

# OMNIS

A WHOLE NEW LEVEL OF PERFORMANCE

功能可“率滴定”,用于 OMNIS Titrator  
包含功能模式

- MET COND
- MEAS U / T / pH / COND
- 快量化液体理
- 使用一个 OMNIS Tritator 的内部滴定管行滴定



OMNIS Titrator 或滴定模的量通道,用于接。



5  $c = 0.7 \text{ cm}^{-1}$  Pt10000.65 m

池常数的 5  $c = 0.7 \text{ cm}^{-1}$  (指数),集成有温度探  
Pt1000 和固定 (0.65 m),用于接到 OMNIS 率量模上

。

感器用于量中等的率(5  $\mu\text{S}/\text{cm}$  至 20  $\text{mS}/\text{cm}$ ),例如:

- 用水
- 地表水
- 水