



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.

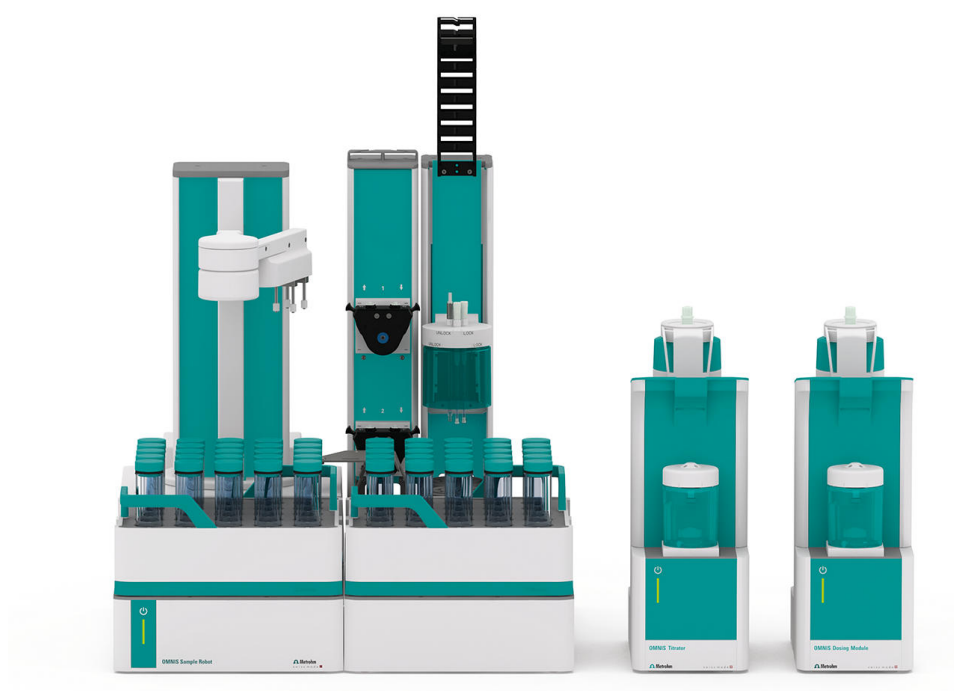


Figure 1. OMNIS Titrator with an OMNIS Dosing Module and OMNIS Sample Robot.

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

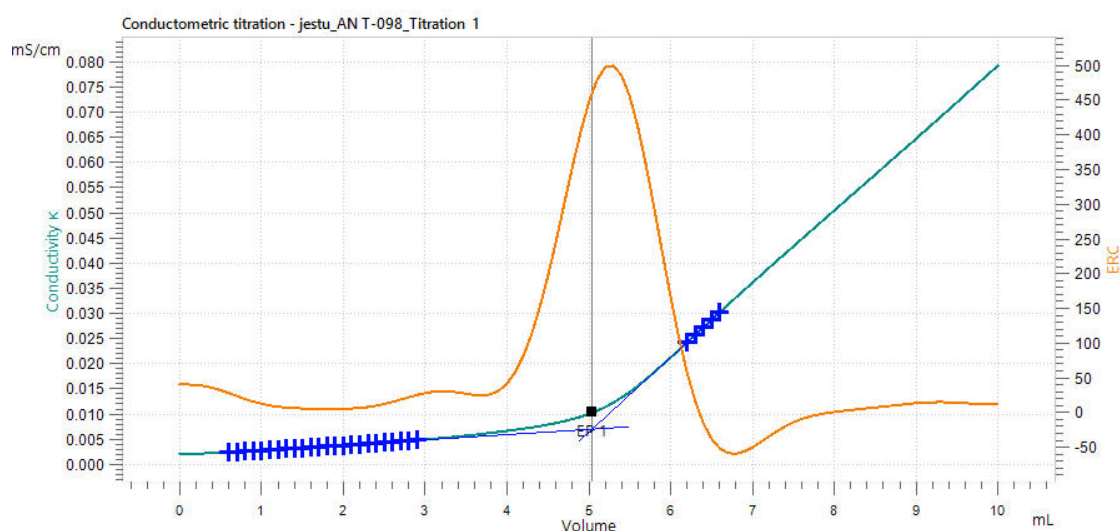


Figure 2. Example titration curve to determine the total base number in motor oil according to IP test method 400.

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

创新型、模块式电位分析 OMNIS Titrator 滴定仪,适于独立运行或作为 OMNIS 滴定系统的核心元件运行。由于采用 3S 试剂瓶适配器技术,处理化学品很安全。可以使用测量模块和计量管单元自由配置滴定仪,并在需要时扩展一台搅拌器。由于采用不同的软件功能许可证,因此可以有不同的测量模式和功能。

- 通过计算机或本地网络控制
- 可以为其他应用或辅助溶液另外连接四个滴定模块或加液模块
- 螺旋搅拌器的连接方式
- 可提供不同大小的计量管:5、10、20 或 50 mL
- 采用 3S 技术的试剂瓶适配器:安全处理化学品,自动传输生产商的原始试剂数据

测量模式和软件选项:

- 终点设定滴定:“Basic” 功能许可证
- 终点和等当点滴定(单一/动态):“Advanced” 功能许可证
- 终点和等当点滴定(单一/动态),包括平行滴定:“Professional” 功能许可证

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

功能许可证“电导率滴定仪”,用于 OMNIS Titrator 包含功能模式

- MET COND
- MEAS U / T / pH / COND
- 灵快量化液体处理
- 仅使用一个 OMNIS Titrator 的内部滴定管进行滴定



OMNIS Titrator 或滴定模块的测量通道,用于连接电导电极。



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

带池常数的 5 环电导电极 $c = 0.7 \text{ cm}^{-1}$ (指导数值),集成有温度探针 Pt1000 和固定电缆 (0.65 m),用于连接到 OMNIS 电导率测量模块上。

该传感器适用于测量中等的电导率($5 \mu\text{S}/\text{cm}$ 至 $20 \text{ mS}/\text{cm}$),例如:

- 饮用水
- 地表水
- 废水