Fully automated determination of TAN/TBN according to ASTM D664 and ASTM D2896

Fast and reliable analysis of non- and fully synthetic motor oil used in the automotive industry by potentiometric titration

Knowing the exact acid number and base number of an engine oil is important to determine its quality. Monitoring the total acid number (TAN) and total base number (TBN) of engine oils can also prevent damage to engine components. Both TAN and TBN can be accurately determined in fully synthetic and conventional engine oils used in the auto

industry.

This Application Note presents the determination of TAN (ASTM D664) as well as TBN (ASTM D2896) in motor oil samples using potentiometric titration methods. Automated parallel titration is performed using the OMNIS Sample Robot S and the OMNIS Titrator equipped with dSolvotrodes.

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SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on fully synthetic motor oil SAE 5W/40 as well as non-synthetic (conventional) motor oil SAE 30, labelled as mineral oil.

No sample preparation is required.

EXPERIMENTAL

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

An appropriate amount of sample is weighed into the titration vessel and solvent is added. Afterwards, the solution is titrated until after the first endpoint with standardized potassium hydroxide for the total acid number, or with standardized perchloric acid in acetic acid for the total base number.

One exemplary titration curve of TBN with $HClO_4$ is shown in Figure 2.

Figure 1. OMNIS Sample Robot S equipped with an OMNIS Titrator, OMNIS Dosing Module, and dSolvotrode for the automated determination of TAN and TBN in motor oil samples.

RESULTS

This method offers very accurate results for TAN and TBN oil analysis as displayed in Tables 1 and 2.

**Table 1.** Results for the TAN oil analysis according to ASTM D664.

Motor oil (n = 6)	Mean in mg KOH/g sample	SD(rel) in %
SAE 5W/40	3.80	1.6
SAE 30	1.16	1.2

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Table 1. Results for the TAN oil analysis according to ASTM D664.

Motor oil (n = 6)	Mean in mg KOH/g sample	SD(rel) in %
SAE 5W/40	3.80	1.6
SAE 30	1.16	1.2

Table 2. Results for the TBN determination according to ASTM D2896.

Motor oil (n = 6)	Mean in mg KOH/g sample	SD(rel) in %
SAE 5W/40	9.05	0.4
SAE 30	1.01	1.6
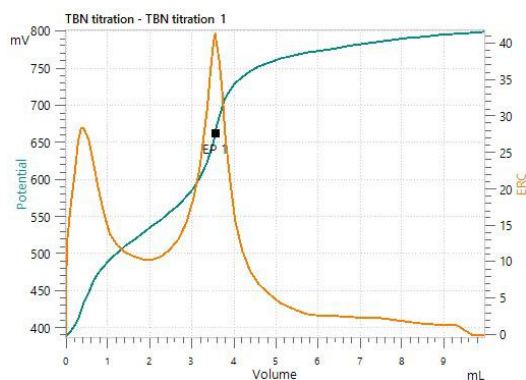
Figure 2. Titration curve of the TBN determination of SAE 5W/40.

CONCLUSION

Titration is a very fast and accurate method that can determine the total acid number and total base number of engine oil (both synthetic and conventional). The OMNIS Titrator equipped with a dSolvotrode delivers reliable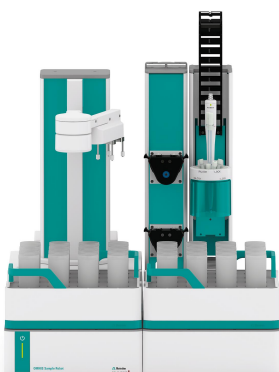 determinations. This automated system offers flexible analyses combined with high-end software. Aside from improving the precision and speed of the determinations, OMNIS provides results that are on par with or better than other established titration systems.

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CONTACT

CONFIGURATION

OMNIS Sample Robot S Pick and Place

OMNIS Sample Robot S 具有一个"蠕"模(2 通道)和一个 Pick&Place 模以及大量附件,可直接入全自滴定。此系具有个品位置,可用于 32 个 120 mL 的品。此模化系供已完全安装完,因此可在短内投入行。

系也可根据需要展配外台蠕以及多加一个 Pick&Place 模,由此使通量翻倍。如果需要更多工作台,可将此 Sample Robot 展 L 格款型的 OMNIS Sample Robot,由此可使七个品的品在多四个 Pick&Place 模上并行理,将品通量大四倍。

OMNIS Professional Titrator

新型、模式位分析 OMNIS Titrator 滴定,用于行点和等当点滴定(一/)。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。包括用于使用其他滴定或加液模平行滴定的"Professional"功能可。

- 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
- 可以展磁力拌器和/或螺旋拌器
- 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 Dosing Module

用于与 OMNIS Titrator 滴定相的加液模,以展外用于滴定/加液的滴定管。可以展磁力拌器和/或螺旋拌器,以作独的滴定台使用。可自由 5、10、20 或 50 mL 量管元。

dSolvotrode

用于所有非水性酸/滴定的 OMNIS 数字合式 pH 。玻璃膜性差的溶液行了化,并且由于活的磨口隔膜,也用于非常的品。

此可与非水参比解(化或四乙基化)一起使用。

存在相的参比解中。

dTrodes 可在 OMNIS Titratoren 上使用。

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