



Application Note AN-K-070

L'eau dans les produits pétroliers

Fully automated determination according to ASTM D6304

Moisture in petroleum products causes several issues: corrosion and wear in pipelines and storage tanks, an increase in debris load resulting in diminished lubrication, blocked filters, or even harmful bacterial growth. As a result, increased water content can lead to infrastructure damage, higher maintenance costs, or even unwanted downtimes. Due to these costly factors, water content is a critical factor regulated in many trade specifications, and also defines the price of these products. An accurate and reliable determination is therefore necessary, since even small deviations can have a large impact on the selling

price.

As petroleum products contain low moisture content, coulometric Karl Fischer titration is the method of choice. Using a Karl Fischer oven to vaporize the water present in the sample prior to titration not only greatly reduces matrix interferences, it can also be fully automated. This allows a reliable and cost efficient analysis of the water content according to **ASTM D6304** (Procedure B) in products such as diesel, hydraulic oil, lubricant, additive, turbine oil, and base oil.

Find more information in the video:

SAMPLE AND SAMPLE PREPARATION

To demonstrate the versatile use of the moisture determination in petroleum products with the Karl Fischer oven, the results from various samples such as diesel, hydraulic oil, lubricant, additive, turbine oil, and base oil are shown in this application note.

All samples are completely homogenized before

sampling. After homogenization, the sample is weighed directly into the sample vial. Sample size is dependent on the expected amount of water. The sample vials are sealed airtight and placed on the sample rack.

EXPERIMENTAL

Prior to starting the sample determinations, the titration cell is conditioned and the oven is heated to the desired temperature. The ideal oven temperature releases all water quickly but does not lead to sample decomposition, which would falsify the result.

Once the system is prepared and stable, the sample is placed in the oven. A carrier gas passes through the sample, transferring the vaporized water into the titration cell where the water content is determined.

The titration and the gas extraction of the sample is stopped as soon as the defined endpoint is reached and the drift (amount of water per time period) falls below a predefined value.

RESULTS

For all samples, acceptable standard deviations are achieved using the oven accessory, regardless of whether the sample had a low or high water content

or contains interfering additives. The results for the various samples are given in **Table 1**.



Figure 1. Fully automated system consisting of an 874 Oven Sample Processor with 851 Titrandu for the coulometric Karl Fischer after vaporization of any moisture present in the sample.

Table 1. Results of the water determination in various petroleum products after vaporization of the moisture within the sample according to ASTM D6304.

Sample (n = 4)	Mean / (mg/L)	SD(abs) / (mg/L)	SD(rel) / (%)
Diesel	27.8	1.7	6.08
Hydraulic oil	44.6	0.7	1.57
Lubricant	22.9	1.1	4.63
Additive	2830.7	6.2	0.22
Turbine oil	18.9	2.5	13.39
Base oil	17.0	0.6	3.41

CONCLUSION

With the 874 Oven Sample Processor and 851 Titrand, a fully automated determination of water in petroleum products is possible according to **ASTM D6304** Procedure B. Furthermore, to prevent inaccurate results caused by sample decomposition at higher temperatures, it is possible to determine the

optimal oven temperature for each sample with the 874 Oven Sample Processor. Thus, using the water evaporation technique the moisture content can be determined reliably without matrix interferences at the optimal temperature.

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CONFIGURATION



851 Titrando avec électrode génératrice à diaphragme

Coulomètre avec électrode génératrice à diaphragme et 801 Stirrer.

La coulométrie est la méthode idéale pour déterminer les traces d'eau (10 µg à 10 mg d'eau absolue) dans les liquides, les matières solides et gazeuses. Comme la coulométrie est une méthode absolue, la détermination du titre n'est pas nécessaire.

Le **851 Titrando** rend les titrages coulométriques simples et rapides.

Gamme de mesure recommandée : 10 µg à 200 mg d'eau absolue

Utilisation avec le logiciel OMNIS, tiamo ou le Touch Control. Satisfait aux exigences des BPF/BPL et de la FDA, telles que celles de la réglementation 21 CFR Part 11, le cas échéant



874 Oven Sample Processor

Le 874 Oven Sample Processor sert pour la préparation thermique automatisée des échantillons pour le titrage Karl Fischer. La méthode d'extraction avec four est surtout adaptée aux échantillons qui libèrent leur eau seulement à des températures très élevées, des échantillons difficilement solubles ou qui réagissent avec le réactif KF.

Licence OMNIS autonome avec 2 licences appareil

Elle permet l'utilisation du mode autonome du logiciel OMNIS sur un ordinateur Windows™.

Caractéristiques :

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- Elle doit être activée via le portail d'octroi de licences Metrohm.
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