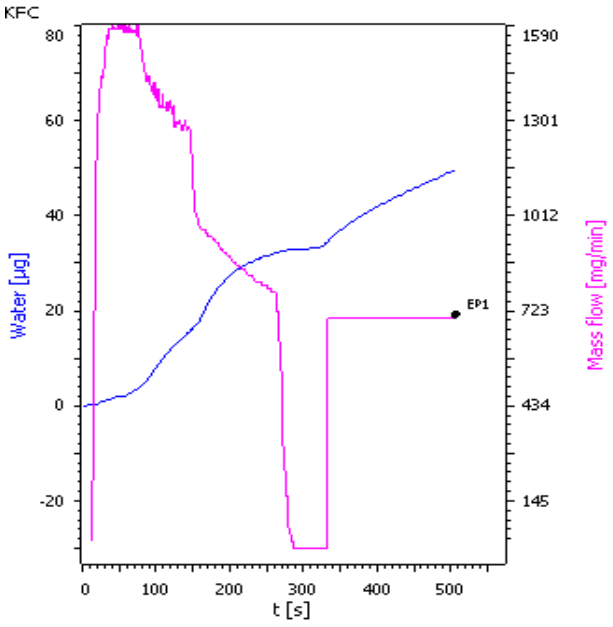
Titration Application Note K-058

Water in liquid butane

Determination according to ASTM D7995



Excessive amounts of moisture in liquefied petroleum gas (LPG) such as butane can seriously damage petrochemical infrastructure. Pipelines can corrode, valves freeze solid, and the calorific value of the product is much lower.

While other techniques such as the valve freezing method provide an estimate of the dryness of a gas, these techniques are unable to determine the exact amount of water present in the sample matrix. Using the 875 KF Gas Analyzer, the water content can be determined quantitatively and fully automatically. A sample of liquid butane is drawn from the gas cylinder and heated to bring it into the gaseous state. The gas volume is determined with a mass flow meter and then introduced into a coulometric Karl Fischer (KF) titration cell for water determination. By using the established coulometric KF titration method, the water can also be quantified reliably and fully automatically for water contents in the low ppm range.

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Method description

Sample

Liquid propane/butane mixture

Instrument

Fig. 1: The 875 KF Gas Analyzer, which was used for the determination

Sample preparation

The sample cylinder is connected to the 875 KF gas analyzer with the appropriate connections. It is installed upside down to detect the liquid phase of the sample cylinder.

Analysis

The liquid butane is sampled and heated to vaporize it. The gas volume is determined and then introduced into a coulometric KF titration cell. There the water content is determined by coulometric Karl Fischer titration.

First, a calibration factor for the mass flow meter is determined. This calibration factor converts the gas volume into mass of gas.

To prepare the system, it is first flushed with sample. The system is then dried with nitrogen. As the water content of the sample might be very low, it is important to have a low start drift, which is achieved by drying the system with nitrogen.

When the system is dry and the coulometric KF cell is conditioned a minimum sample amount of 1 g is added for the determination and then titrated.

Results

Sample (n = 3)	Mean / ppm	RSD / %
Butane	5.8	9.5

Summary

With the 875 KF Gas Analyzer, a fully automatic determination of water in liquid butane is possible. All steps such as, sampling, evaporation, and KF titration are carried out by the system. The system thus is able to determine the water content reliably even in the very low ppm range.

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