Water content measurement in marine engine oils

Summary Information

- Correlates well with ASTM D6304 and D3401
- Detection range: 250 ppm to 5000 ppm
- Portable and battery operated
- Mid-Infrared Spectroscopy

Product Description

The IR Sphinx spectrometer measure the mid-infrared spectrum of a sample and extract relevant parameters. The spectrometers do not contain any moving parts but use a solid state dispersion element in combination with black body infrared emitters to measure the infrared spectrum of a sample. This results in a unique product which is robust, battery operated and weighs less than 0.5 kg. The spectrometer can be configured to measure from 2.5 µm-5.0 µm or from 5.5 µm–11.0 µm. The IR Sphinx spectrometer come with a sophisticated but user friendly software called Sphinx Suite. The software is modular and the user can choose from a number of different software modules. The software is compatible with many common operating systems.

Application

The combustion process in engines produces acidic by-products which are absorbed by the engine oils. The Total Acid Number (TAN) is a measure of the acidity of the oil. The acidity or the TAN of the oil has to be controlled as acidic components corrode the metallic parts of the engine. In modern engine oils the acidic components are neutralised by alkaline components which are described by the Total Base Number (TBN). By monitoring the TAN of the oil important information about the quality and performance of the oil can be extracted.

The ASTM standard to determine the Total Acid Number is described in ASTM D664 and it is based on a titration method. However the Total Acid Number can also be accurately measured using mid-infrared spectroscopy and the results correlates well with the relevant ASTM standard.

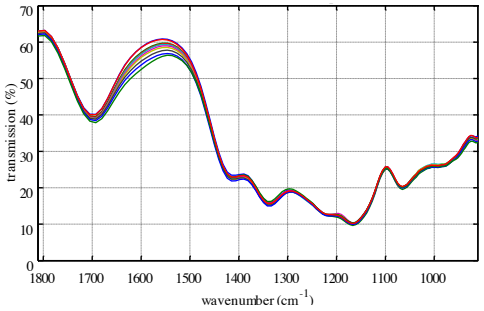
How to use

The IR Sphinx spectrometer enable the user to quickly measure the water contamination level of an oil sample. Depending on the product range the measurement is carried out in a slightly different way. For the IR Sphinx ATR products the oil sample placed on top of the ATR crystal making sure that the entire crystal is covered by the oil.

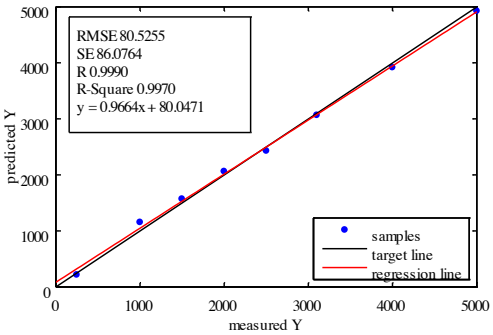
For the IR Sphinx transmission products the oil sample has to be present in the sample chamber. The transmission systems are best suited for inline measurement where the oil sample is delivered to the sample holder via a pumping system. Alternatively a syringe can be used to deliver the sample to the sample holder.

Once the sample is in place the measurement is started from the software. After about 30s the analysis of the sample is available.

Results & Performance



Infrared absorption spectra of a commonly used marine engine oil. The visible changes in the mid-infrared absorption spectra are directly related to the water absorption of the oil. A chemometric analysis of the spectra can be carried out using the Sphinx Suite software.



The results above are the results of a PLS1 analysis of the measured absorption spectra of the marine engine oils. The results are compared to the results of a reference analysis from a certified oil laboratory. The correlation between laboratory results and measured results are excellent.

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