

# Total Base Number of marine engine oils

## Summary Information

- Correlates well with ASTM D2896
- Detection range: 0.5–99 mg KOH/g
- 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  $\mu\text{m}$ -5.0  $\mu\text{m}$  or from 5.5  $\mu\text{m}$ -11.0  $\mu\text{m}$ . 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 need to be neutralised by the engine oils. If that fails these acidic by-products will attack the engine and potentially result in catastrophic failure. To compensate the acids the engine oil has a limited reservoir of alkaline components which are described by the Total Base Number or TBN. Monitoring the TBN in engine oil is therefore most critical as it can prevent damage to the actual engine.

The TBN decreases over the lifetime of the oil and once it decreases below 60% of the fresh oil the neutralisation potential of the oil diminishes and the oil should be replaced.

The ASTM standard to determine the TBN is described in ASTM D2896 and it is based on a titration method. However as alkaline components of the oil can also be detected very accurately using mid-infrared spectroscopy and the results between the ASTM standard and infrared spectroscopy correlate extremely well.

## How to use

The IR Sphinx spectrometer enable the user to quickly measure the Total Base Number 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.

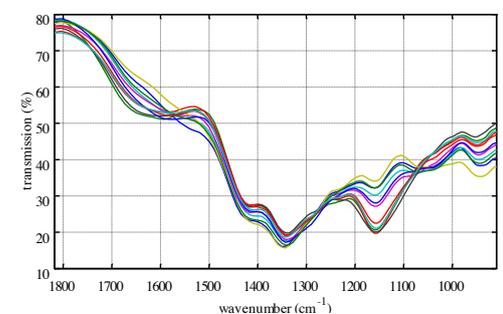
For the IR Sphinx transmission products the oil sample has to be present in the sample chamber. The transmission systems are best suited for inline measurement where the oil sample is delivered to the sample holder via a pumping system. Alternatively a syringe can be used to deliver the sample to the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

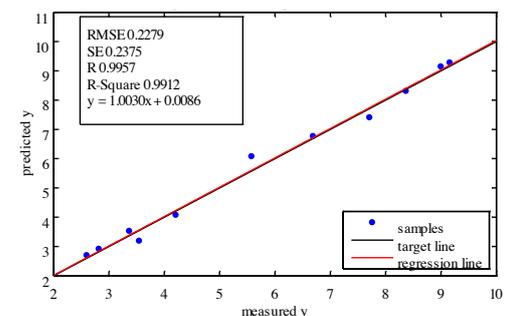
Comline Elektronik Elektrotechnik GmbH  
Karl-Rapp-Straße 1 • 92442 Wackersdorf • Germany  
Fon +49 94 31 / 75 65-0 • Fax 75 65-25  
comline@comline-elektronik.de • www.comline-elektronik.de



## Results & Performance



Mid-infrared absorption spectra of a typical marine engine oil at different points during the lifetime of the oil. Note the visible changes in the spectra which are related to specific oil degradation effects.



The Total Base Number (TBN) has been calculated from the measured absorption spectra using the SphinxSuite software module. The plot compares the TBN obtained from analysing the mid-infrared absorption spectra to the TBN obtained from the same oil sample in an accredited oil analysis laboratory. The correlation between the results is exceptional.

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