TOTAL IRON CHECK

Digital Test for Chemical Determination of Total Iron Content (Patent Number: 2982974)

Cylinder Drain Oil (CDO) analysis also called **Scrape Down Analysis (SDA)** with on-board testing equipment is an important method to closely monitor the wear of engine cylinder components (pistons, piston rings and cylinder liners) of two-stroke marine diesel engines. Along with routine engine inspections, on-board measurement of iron particles in cylinder drain oil (CDO) at regular intervals is crucial to directly and accurately assess the condition of cylinder lubrication.

Different wear types of engine cylinders can lead to increased iron content in CDO:

1. **abrasive iron wear** caused by mechanical friction between piston ring package and cylinder liner → ferromagnetic iron particles;
2. **corrosive iron wear** or so-called **"cold corrosion"** (acid corrosion due to chemical reaction from combustion residues and sulphur present in the fuel oil) → non-magnetic iron salts.

The surfaces of cylinder components can be subjected to different wear mechanisms simultaneously. Therefore, it is important to regularly test cylinder drain oil samples (CDO) for the **combination of corrosive and abrasive wear**, i.e., to measure the **total iron** content beside the remaining base number (BN). This is also required in various service letters from leading engine manufacturers.

Martechnic® offers a digital test device **TOTAL IRON CHECK** for easy on-board CDO analysis to monitor the degree of **total iron concentration**.

The enhanced, redesigned version of the test device includes several updated features:

1. Upgraded navigation menu with the possibility to create individual named data slots for up to 20 different cylinders units.
2. Large memory capacity: storage of 400 measured values with date and time stamps.
3. USB to serial connection for quick transfer of test results into a terminal program and further into Excel or similar software.

The principal aim of on-board testing **with TOTAL IRON CHECK** is preventive monitoring, i.e., early detection of any abnormal wear processes before serious engine wear occurs. Thereby, early identification of unusual measurement values (e.g., gradual, but constant increase of total iron concentration as well as high

amounts detected) can help to inform the engine operator about impeding damages in the engine to take a closer look at the problem and to be able to initiate appropriate countermeasures promptly.
The measurement of **total iron content** in cylinder drain oil (CDO) is based on the chemical reaction of iron present in cylinder lubricant in corroded or abrasive state and special reaction liquid. Irrespective of iron nature (corrosive and/ or abrasive) and size, all iron particles will be identified, measured and displayed by the **TOTAL IRON CHECK**. A two-chamber measuring system of the test device enables testing of two CDO samples simultaneously and helps to save time when assessing multiple samples of different cylinder units.

Test Kit "TOTAL IRON CHECK" incl. Reagents and Accessories

Features:

- Measuring range: 15/20-1100 mg/kg (ppm)
- Measuring temperature: 70 ˚C
- Measuring time: about 20 min. for two cylinder drain oil (CDO) samples
- Measurement method: illuminance meter with LED source
- Accuracy: +/- 20 mg/kg (ppm) (confirmed repeatability of test results)

Benefits:

- Precise semi-automatic measurement of total iron content
- Processing of two samples simultaneously (effective time-saving technique)
- Easy-to-read, digital display of test results
- Storage of the measured iron values per cylinder with date and time stamps
- Early warning of abnormal wear processes in case of regular application
- Efficient adjustment of lubrication of crosshead engines

The degree of total iron concentration that can be measured with the **TOTAL IRON CHECK** can be ranging up to 1100 mg/kg (ppm). The measured values will be automatically saved on the internal memory chip.
The presence of iron in a CDO sample can also be visually observed after the automatic measurement is completed. If the sample contains any iron, the color of the liquid in the glass vial changes to blue. The intensity of the blue color is related to the amount of iron present. The darker the hue of the fluid, the higher level of iron concentration the cylinder lubricant contains.
Additional measurement of corroded iron in a similar manner as total iron and then calculation of abrasive iron value is possible in order to find the root cause.
Through a combination of total iron test and BN measurements with Martechnic®'s **TWIN CHECK 4.0** test kit, proper lubrication of cylinder components and therefore optimal engine performance can be reached.