

CMT Case Story 05 / 2026

Improved Onboard Cylinder Condition Monitoring

The Challenge

Germany's USC Barnkrug, the ship services division of Elbdeich Reederei, manages and crews a fleet of about 32 small to medium feeders in the 300 to 750TEU segment, along with a series of larger 1400TEU containership powered by two-stroke diesel engines running low-sulphur fuel.

As the newbuild containerships move the company away from its four-stroke engine comfort zone, USC Barnkrug looked for a partner to provide insight and analysis of the two-stroke engines' scrape down oil to support a cost-effective cylinder oil lubrication and engine maintenance strategy.

Cylinder lubrication requires careful control. Operators must ensure that feed rates are sufficient to protect engine components, while avoiding excessive oil consumption. To this end, USC Barnkrug evaluated total iron (Fe) measurement solutions from a range of suppliers but identified several limitations during onboard use.

Results discrepancy

A key issue was a discrepancy between onboard test results and subsequent laboratory analysis.

According to the operator, these differences meant that onboard results could not be used with confidence when assessing whether feed rates could be adjusted.

In addition, repeatability was limited. Testing the same sample multiple times did not produce consistent results.

The process itself also imposed a significant operational burden. Total iron measurement required:

- The use of chemicals and supporting equipment
- A time-intensive procedure, with testing across a seven-cylinder engine taking approximately five to six hours

As a result, the method did not provide the level of practical support required for onboard decision-making.

Having had experience with its cloud-based PREMETS engine analysis platform, USC Barnkrug approached CM Technologies (CMT) for a better solution for optimising the cylinder oil feed rate, where it provides a direct indication of liner and ring wear.

This enables operators to monitor wear trends and assess lubrication performance based on actual mechanical condition rather than indirect indicators.



Ferrous Wear Debris Meter

The Approach

CMT's Ferrous Wear Debris Meter (FWD) was suggested.

This easy-to-use tool measures ferromagnetic wear particles in cylinder drain oil not only to detect any impending damage but to gain invaluable insight into the wear life cycle of the tested equipment.

Compatible with a range of applications – two-stroke diesel engines, gearboxes and other machinery that requires oil lubrication – the meter provides repeatable and accurate measurements of ferromagnetic material concentration down to single ppm levels. Particle dielectrics, additives, and water content size do not affect the measurements/readings.

It was agreed that USC Barnkrug would trial the test kit on a newly delivered 1400TEU vessel, with testing carried out over a two-month period, during which time onboard engineers carried out repeated measurements to evaluate performance.



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Individual samples were tested multiple times. In some cases there were up to six tests per sample to assess repeatability. The onboard results were then compared with laboratory analysis.

Trial findings

The trial identified several differences between FWDM and the total iron measurement methods used previously. These included:

1. Repeatability

FWDM measurements were consistent when the same sample was tested multiple times. While some variation was observed, this was within an acceptable tolerance range. This contrasted with previous methods, where repeated testing did not consistently produce the same result.

2. Alignment with Laboratory Results

Measurements obtained using FWDM were reported to be closer to laboratory results than those obtained using total iron measurement. This improved alignment increased confidence in onboard data.

3. Testing Processes

The FWDM method simplified the testing process.

- No chemicals were required
- Consumables were limited to simple components such as plastic tubes
- Testing time was reduced compared to total iron measurement

Where total iron testing for a seven-cylinder engine required approximately five to six hours, the FWDM method reduced the time required for analysis, lowering the workload for onboard engineers.

Outcome

Based on the results of the trial, USC Barnkrug decided to discontinue the use of total iron measurement methods and is now rolling the FWDM method across two-stroked engine vessels in the fleet.

The decision was based on three factors observed during the trial:

- Consistent and repeatable measurements
- Closer alignment with laboratory analysis
- Reduced complexity and testing time

The FWDM method provided data that could be used more effectively by onboard engineers when assessing cylinder condition and lubrication performance.

Conclusion

The collaboration with USC Barnkrug demonstrates the importance of measurement reliability and practicality in onboard engine monitoring.

The trial showed that FWDM-based analysis provided repeatable results, closer alignment with laboratory data, and a simplified testing process compared to previously used methods.

These characteristics enabled USC Barnkrug to adopt a measurement approach better suited to its operational requirements, supporting onboard assessment of cylinder condition and lubrication performance.

Unlike spectrometric laboratory methods, which may only detect smaller particles, FWDM measures all ferromagnetic material present in the sample, including larger wear debris to provide a direct indication of liner and ring wear. This enables operators to monitor wear trends and assess lubrication performance based on actual mechanical condition rather than indirect indicators.



FWDM with case

