WHY EEXI AND CII NEEDS HIGH QUALITY DATA

From a vessel optimization enthusiasts perspective

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THE BLIND SPOT

Last years experience while validating operational vessel data

57%

implausibilities detected >1 month after appearance

38%

of issues would lead to a worse CII than it actually is. *

Due to the upcoming regulations in the area of the Energy Efficiency Existing Ship Index (EEXI) with the subsequent annual reporting of the Carbon Intensity Index (CII), ship operators are requested to reduce emissions which correlate with fuel consumption. In addition to emission limits, which must be respected by January 1st, 2023, these thresholds will be lowered annually and must be achieved and reported via the CII. Required preparation efforts vary greatly amongst operators. Many shipping companies currently work with manual noon reports, other vessels already have copious quantities of data. As a result, the following impression emerges: there is a blind spot with regards to continuously monitoring the essential influences and parameters in order to react on short notice. Using validated operational data is a precondition for making the right decisions in terms of efficiency measures, or to optimize maintenance and spare parts planning.

HQD needs HFD

Optimization models experience

HIGH QUALITY DATA NEEDS HIGH FREQUENT DATA

To improve vessel performance, enable sensor self-validation and fault detection or condition-based maintenance, we need both validated and reliable measurement devices and analytical models fed with operational values. For both of these requirements, high-frequency data are required. For the measurement of primary parameters such as power, fuel consumption or vessel speed, one-minute intervals with 1000+ data points a day are recommended. For secondary systems, approximately 100 data points a day would be sufficient for reliable health monitoring.

*Result of initial primary data validations of historic data sets

DATA COLLECTION IS ONLY THE HALF BATTLE

In the area of reporting for accounting purposes, and in order to fulfill reporting obligations in the area of EU-MRV etc., the classic Noon reporting may be a good alternative. However, operating a vessel requires more than that. In essence, everything comes down to safety, compliance, planning and optimization. Particularly in the areas of safety (unplanned breakdowns or shutdowns), planning (downtimes) and optimization, there are avoidable operational conditions that are expensive and sometimes dangerous. Noon reports provide mean values or counter readings over 24 hour time periods, which do not provide any information about operational behaviour: while we can assume that a ship has been operating constantly, we cannot know for sure. We have no opportunities to detect or validate sensory anomalies, and with about 200 days per year at sea we certainly cannot create any reliable operational profiles for different trim positions, drafts, environmental conditions such as winds and currents as well as different speeds. If you cluster the operational states according to these selected dimensions, only a few dozen data records per year remain.

In essence, it's all about compliance, safety, planning and optimization.

In addition to model calculations, these data sets define the basis for (in MEPC-76 terms) technical and operational measures, which are intended to help optimize the CII below the required threshold values. Larger structural retrofits such as ESD (Energy Saving Devices) run the risk of referring to irrelevant databases or to calculations that do not guarantee that they will deliver the desired improvements in real operation.

Conversely, experience has shown that simply collecting data does not provide any added value if there is no strategy to exploit that data after its acquisition. The opposite is the case - too much data from unprocessed signals can lead to excessive demands and frustration, as expectations of an operational competitive advantage are not met. Many operators may own a real treasure store of data because they have implemented high-frequency data logging for several years, but the real challenge is to extract information from that data. One example of such information is whether that data is reliable and usable, because only then would deriving knowledge from the information be possible.

We need to focus on the relevant primary data - but on short notice.

Investigations of around 200 ships with high frequent data logging in the area of performance monitoring have shown that undetected errors of speed log (static offset and dynamic error), shaft power and consumption measurement (mostly zero point drift or offsets) do not allow meaningful benchmarking. This makes the determination of speed consumption curves just as impossible as by unvalidated noon reports. And one more thing: the calculation of the speed loss, which is described by ISO19030 as the KPI for a docking or hull polishing forecast, is also not meaningful for the ships examined. In 38% of the analyzed data sets, input values that would be used for the upcoming CII calculation have been found to be implausible and would have led to a disadvantageously high value.

What to do with these information?

A WAY TO SOLVE THIS ISSUE

There are many ways to determine optimal operational profiles and to benchmark performance across an entire fleet using gray and black-box models and algorithms, but first we need to do our homework: the data validation.
The most important thing is the detection of implausibilities on short notice. In recent years, the observation of retrospective analyses of historical data has shown that almost 60% of the implausible measured values that have already been used for reporting and fleet management were only discovered a month or more later. In many cases, small offsets, which are difficult to determine by a crew using snapshots, remain completely undetected. An overall correlation of a vessel's operational behavior offers a conclusive approach to initially validate the time series data. Simulating small errors in primary parameters, such as a 1 kn incorrect determination of the speed log at
15 kn speed, results in a relative shaft power determination error of 10%. This was observed on a 300m container ship. Fortunately, with a ship-to-shore connection, such problems can be identified quickly on shore and remote measures can be initiated. Of course, validated data also helps with planned maintenance and spare parts planning. Additionally, information about the last calibration and health status is required regardless by the technical measures such as ShaPoLi (ShaftPowerLimitation). This brings us right back to where we started...

The costs for satellite communication, continuous data maintenance and a cyber-secure ship-to-shore transmission are no longer obstacles.

Your homework? Deciding what will be your next step to be able to place your trust in high quality data as reliable source.

ABOUT THE AUTHOR

After training as a ship mechanic, the marine double patent for navigational officers and marine engineer was acquired in Flensburg followed by a time of seagoing as a marine engineer on cruise vessels. For about 9 years Klas Reimer has been working in the product development at Hoppe Marine GmbH - since 2015 in a leading position with focus on new applications and data analysis. Since 2018, he is responsible for the research and development department activities in Hamburg.

The Master's degree with focus on Change Management has been acquired besides work, in order to be able to meet the future challenges of increasingly volatile conditions, agile development methodologies and cultural changes in a professional manner. The MBA related study helps to focus on product and services development which meets customer needs.