

ISO 19030 – Motivation, Scope and Development

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Abstract

This paper describes the history of ISO 19030 for hull and propeller performance assessment for ships in service. It outlines initial motivation, purpose and implementation of the standard. The standard is intended to serve the wider community as well as support shipping operators and suppliers in better business practice.

1. Why ISO 19030 is needed?

Today hull and propeller performance is a ship efficiency killer. According to the Clean Shipping Coalition in MEPC 63-4-8, poor hull and propeller performance accounts for around 1/10 of world fleet energy cost and GHG emissions. This points to a considerable improvement potential; 1/10 of world fleet energy costs and GHG emissions translates into billions of dollars in extra cost per year and around a 0.3% increase in man-made GHG emissions. The culprits are a combination of biofouling and mechanical damages. Most vessels leave the new build yard or subsequent dry-docking with their hull and propeller in a fairly good condition. Then on account of a combination of biofouling and mechanical damage, hull and propeller performance begins to deteriorate.

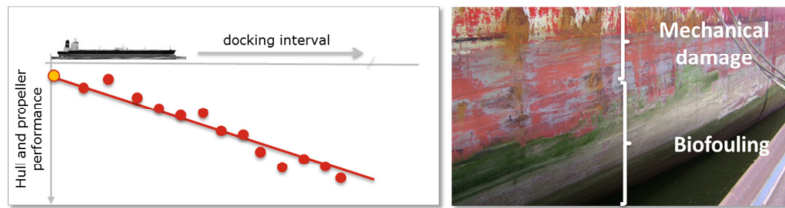


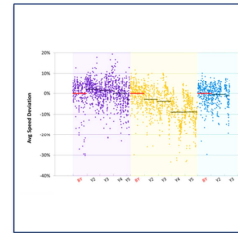
Fig. 1: Hull and propeller performance

There are technologies and solutions on the market that can protect the hull and maintain good performance over the full duration of the docking interval - why then is hull and propeller performance still so poor?

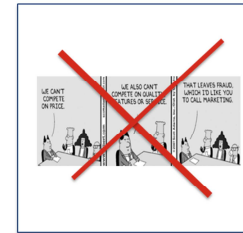
In the past the problem has been a lack of measurability. If one cannot measure it, one cannot manage it. Now a multitude of measurement methods are being introduced in the market; some quite good, some really bad, most of them proprietary (black box) and many using their own yardsticks. It is becoming challenging, however, even for the most resourceful to determine which of these methods can be relied upon and which cannot. Moreover, the measurement methods have different and incompatible yard sticks resulting in the measurement output serving to confuse rather than inform.

This standard is intended for all stakeholders that are striving to apply a rigorous, yet practical way of measuring the changes in hull and propeller performance. It could be ship-owners and operators, companies offering performance monitoring, shipbuilders and companies offering hull and propeller maintenance and coatings. ISO 19030 will make it easier for decision makers to learn from the past and thereby make better informed decisions for tomorrow. It will also provide much needed transparency for buyers and sellers of technologies and services intended to improve hull and propeller performance. Finally, it will make it easier for the same buyers and sellers to enter into performance based-contracts and thereby better align incentives.

Allow learning from the past to make better decisions for tomorrow



Provide needed transparency for buyers and sellers of fuel saving tech.



Enable performance based contracting and better alignment of incentives

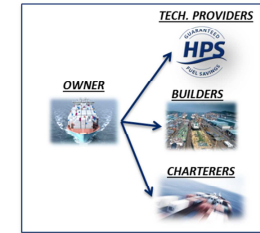


Fig. 2: Why ISO 19030 is needed

2. What ISO 19030 cover

ISO 19030 outlines general principles of, and defines both a default as well as alternative methods for, measurement of changes in hull and propeller performance. The standard defines sensor requirements, measurement procedures, including various filters and corrections, as well as how to calculate a set of four performance indicators for hull and propeller related maintenance, repair and retrofit activities.

One of the performance indicators is “In-service performance”. In-service performance refers to the average change in hull and propeller performance over the dry-docking interval. Performance over the first year following the docking is compared with performance over whatever remains of the docking interval – typically two to four years. This performance indicator is useful for determining the effectiveness of the underwater hull and propeller solution – for example the hull coating system used.

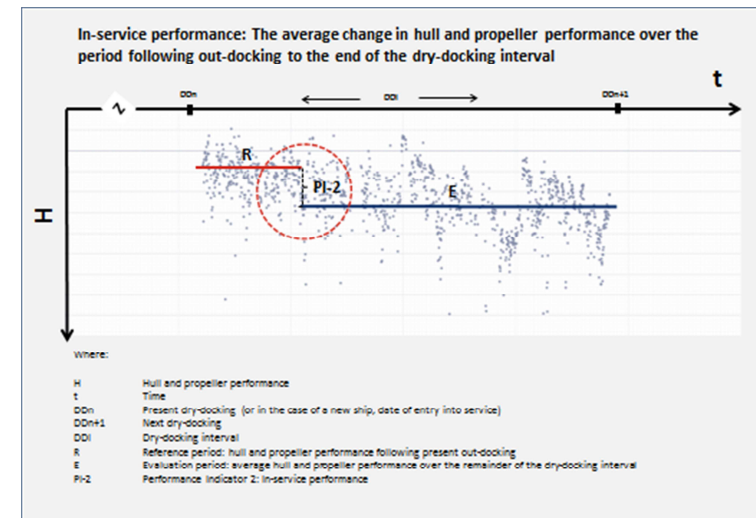


Fig. 3: Performance indicators in ISO 19030 – In-service performance

The three additional performance indicators are “Dry docking performance”, “Maintenance trigger” and “Maintenance effect”:

- Dry docking performance: Hull and propeller following the present out-docking is compared with the average performance from previous out dockings. This provides useful information on the effectiveness of the docking.
- Maintenance trigger: Hull and propeller performance at the start of the dry-docking interval is compared with a moving average at a point in time. Useful for determining when hull and propeller maintenance is needed – including propeller polishing or hull cleanings.
- Maintenance effect: Hull and propeller performance in the period preceding the maintenance event is compared with performance after. This provides useful information for determining the effectiveness of the event.

ISO 19030 is fairly all-encompassing. It covers what sensors are required, how these are to be maintained, step-by-step procedures for filtering and correcting the data, and finally how the individual performance calculators are to be calculated.

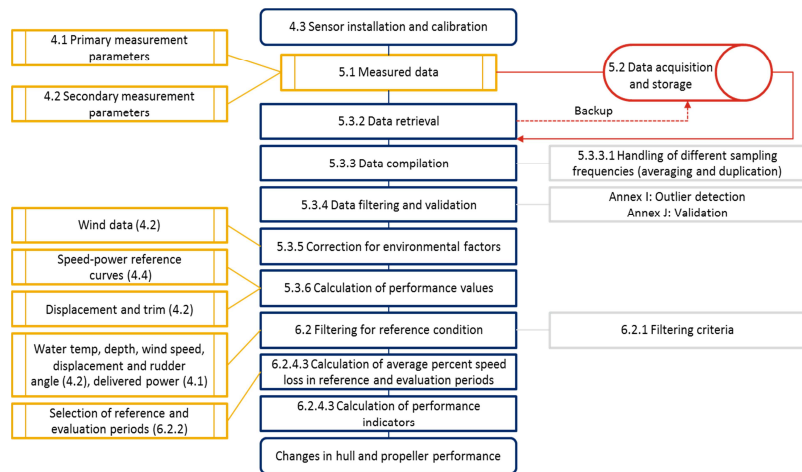


Fig. 4: ISO 19030 scope

The standard is organized into three parts:

- ISO 19030-1 outlines general principles for how to measure changes in hull and propeller performance and defines the 4 performance indicators for hull and propeller maintenance, repair and retrofit activities.
- ISO 19030-2 defines the default method for measuring changes in hull and propeller performance. It also provides guidance on the expected accuracy of each performance indicator.
- ISO 19030-3 outlines alternatives to the default method. Some will result in lower overall accuracy but increase applicability of the standard. Others may result in same or higher overall accuracy but include elements which are not fully validated in commercial shipping.

Descriptions and explanations are outlined in ISO 19030-1. Methodological alternatives that are state-of-the-art and mature are addressed in ISO 19030-2. Alternatives that are state of the art but not fully

mature have either been included in ISO 19030-3 or will be addressed in future revisions of the standard. Alternatives that give the same overall accuracy are included as options in ISO 19030-2. Finally, alternatives that yield lower overall accuracy but increase applicability of the standard are covered in ISO 19030-3.

3. How ISO 19030 has been developed

The process towards developing the ISO19030 started when the Environmental NGO Bellona Foundation and Jotun A/S had informal discussions on how to improve energy efficiency within the maritime sector. Bellona Foundation looked for a robust and verifiable way to reduce CO₂ emissions, whereas Jotun A/S saw the need for a more transparent approach to verify a myriad of performance claims on hull and propeller maintenance.

A series of workshops held in accordance with Chatham House Rules involved a steadily increasing number of stakeholders and paved the way for a common understanding among performance monitoring companies, measurement manufacturers, ship maintenance system providers, classification societies, shipbuilders and ship-owners and their associations. Bellona Foundation and Jotun subsequently held a side-event at IMO-MEPC meetings and presented the embryo for a reliable and transparent hull and performance standard at several maritime conferences.

Work on the ISO-Standard was initiated in June 2013 when Working Group 7 under SC2 TC8 was formed. Svend Søyland from Nordic Energy Research serves as the Convener of the working group and Geir Axel Ofstedahl from Jotun has the role as Project Manager. A series of Working Group meetings were held; Oslo (June 2013), Tokyo (November 2013), Hamburg (July 2014), Pusan (November 2014), San Ramon (February 2015) and Copenhagen (September 2015). More than 50 experts and observers, representing ship owners, shipping associations, new build yards, coatings manufacturers, performance monitoring companies, academic institutions, class societies and NGOs participated in the ISO working group that reached consensus on ISO 19030 standard. Additional industry stakeholders have been consulted and involved as a part of this extensive process. World-class experts shared their deep expertise in a truly collaborative effort and put aside their professional ties. A determination to find workable compromises was the hallmark of the drafting process. Representatives that in other contexts would be fierce competitors share expertise, policies and performance data etc. This was a larger than usual Working Group under the ISO-system and the by far largest with the Ship Technology section. The drafting process uncovered a need to address both the most rigorous methods available and the most commonly used approaches used. This led to the division into three parts.

A Committee Draft of part 1 and 2 (CD) was submitted in March 2015. A Ballot among P-members was concluded in May 2015 with sound support. The target date for submitting a Draft International Standard (DIS) of all three parts was December 2015. An ISO-Ballot was concluded in March 2016 and it is expected the Standard will achieve final approval and official publication by June 2016. The Working Group (WG7) will remain operational in order to prepare future revisions and refining the standard.

The preparation for the Standard was followed with great interest for both trade journals and all relevant stakeholders. Many stakeholders are in the process of incorporating the standard in their daily operations and prepare contracts that use the ISO-standards as a point of departure. Ship owner associations are drafting guiding documents and ISO 19030 may also become the bedrock for a carbon offset/crediting scheme incentivising greenhouse gas emission reductions.

4. Frequently asked questions related to ISO 19030

This standard aims at comparing the change of hull and propeller performance of one ship over time compared only to its own performance. Sister ships are regarded to have inherently different performance profiles based on trade and areas of operation. The standard is not developed as a tool to rank

ships or classes of ships. The standard measures relative and not absolute performance. The Working Group acknowledged that “speciality” ships such as offshore service vessels, towing ships, barges etc. and ships with irregular trading patterns are less likely to yield benefits of ISO 19030.

The focus of this standard is limited to hull and propeller performance and do not cover the overall performance of the ship. Covering overall ship performance would be a more challenging task as it includes engine train performance, quality of fuel, wind resistance as well as other drivers of energy efficiency used on board a ship. This first iteration of the hull and propeller performance standard covers fixed single or twin pitch propellers.

In order to include e.g. variable pitch propeller(s) the methodology would have to be developed further. Variable pitch propeller(s) introduce added complications that the first version of this standard was unable to accommodate. Support for variable pitch propellers will - if justified - be included in later revisions of the standard.

The default method (part II) lays out how ship owners and operators can achieve the most accurate measurement of changes in hull and propeller performance. The default method is based on the application of measurement equipment, information, procedures and methodologies that are generally available and internationally recognized. This will evolve over time and revisions of the standard will accommodate improved approaches.

A number of ships will not be equipped with the measurement equipment, information, procedures and methodologies which is required to meet the default method. Part 3 outlines alternatives to the default method for measuring changes in hull and propeller performance and defines the effects these alternatives will have on overall accuracy. Part 3 introduce proxies or alternative measurements and outlines how they will affect the overall accuracy. The more alternatives introduced combined with changes in data collection frequency and evaluation periods will subsequently decrease the accuracy. For some applications a lower accuracy may still be acceptable to the user of the standard. The selection of acceptable measurement criteria will depend on the specifics of the vessel, operations, and anticipated use of the performance indicators.

Continuous monitoring provides more data points to allow greater accuracy during shorter evaluation periods and reduce human error and filter out various conditions (for instance transient conditions and bad weather). Continuous monitoring is a requirement of the default method. Noon reporting is still a common practice on many vessels. Noon reporting is therefore an option in part 3.

Part 2 have minimum requirements outlining instrument specification, maintenance and calibration procedures. The alternative method in Part 3 offers several proxy options with alternative measurements. The accuracy of a measurement is determined by both its’ trueness and precision (ISO 5725). Trueness refers to the closeness of the mean of the measurement results to the actual (true) value and precision refers to the closeness of agreement within individual results. Precision is a function of both repeatability and reproducibility, where reproducibility refers to the variation arising using the same measurement process among different instruments and operators, and over longer time periods. Measurement procedures have a considerable impact on the reproducibility of, and therefore on the accuracy of, the performance indicators.

The ISO standard filters and corrects for wind based on on-board wind measurements. Annex C in Part 1 explains how calculations of true wind speed and direction. Salinity is rarely measured on-board vessels. Seawater temperature is used to filter out icy water conditions since the ISO standard cannot take into account the ice conditions directly (less than 2 degrees Celsius). For the time being, waves are not measured and not filtered out directly. However, wind generated waves will indirectly be filtered out by filtering for wind. Further revisions of the standard may take into account waves directly, but at the time of this version of the standard, accuracy of wave measurements are not considered adequate.

The basis for accuracy in this ISO standard is Consistent with ISO 5725-1 Accuracy (trueness and precision) of measurement methods and results. Three important sources of uncertainty influencing the accuracy of the performance indicators are:

1. measurement uncertainty (e.g. related to a sensor’s accuracy - both uncertainty that might be observed in a laboratory test in ideal conditions, and any additional uncertainty that might be related to a sensor’s installation, maintenance and operation by an operator);
2. uncertainty introduced through the use of a sample, an average or aggregate values of a parameter when that parameter is variable with time (e.g. using an average of the wind speed over a period of time);
3. uncertainty introduced through the use of equations that necessarily simplify relationships in order to manage the complexity, or because of imperfect information (e.g. use of sea trial data for draught corrections, or the approximation in the Admiralty formula if used to normalize data measured at a specific draught to a reference draught).

Bearing in mind that this standard is measuring relative changes in performance, differing response from speed measured by speed logs and GPS readings it is not a concern as long as it is constant. Sensor drift will on the other hand need to be monitored and trigger calibration. The standard assumes that instruments are calibrated according to manufacturers’ specifications. Users of this standard may use fixed speed rather than power as a constant. Power increase will be computed from speed loss using the speed reference curves.

References

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