Chapter 3
Technical Fuel Conservation:
Hull and Propeller Performance

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ABSTRACT

Hull and propeller performance monitoring is receiving more attention now than at any time in tanker industry history. The advent of new hull coating systems in connection with bunker prices and emission reduction initiatives has led to new scientifically sound metrics for evaluating the efficiency of drydock treatment, comparing hull coating systems on similar tanker types and determining economically optimal intervals for in-water husbandry. This chapter describes how technical fuel conservation policy, including a hull and propeller performance monitoring system, leads to enhanced vessel efficiency. Success of such a policy requires a tanker organization to employ a strong integration of efficiency metrics with daily operational policy and procedures. An example of such a policy: "It is the tanker company policy that the fuel consumption and the corresponding emissions shall be reduced as much as possible, however, still allowing that the profit of running the ships shall be optimized." The main elements of this policy are outlined herein.

BACKGROUND ON SHIP PERFORMANCE

For most ships delivered from a shipyard there is a diagram showing the relation between speed and required power for one or more loading conditions, as shown in Figure 1. This diagram has been prepared based on theoretical calculations, and in most cases has also been confirmed by model tests and by a speedy trial immediately before delivery.

This speed trial is a complicated and time-consuming procedure. The ship must be loaded correctly, the weather needs to be reasonably good, and the trial has to take place in a test area with deep water at a time when there is no other immediate traffic. Time must be given to accelerate the ship up to a constant speed and, as a sea current may be present, each speed run has to be made twice in opposite directions in order to

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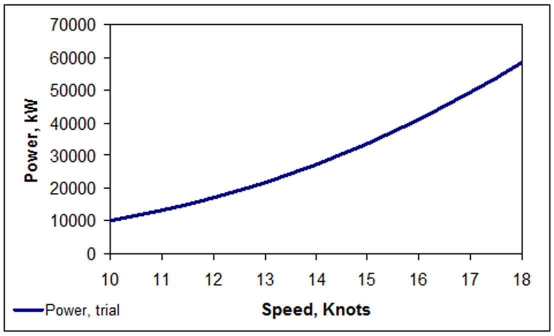
Figure 1. Ship performance, power vs. speed



compensate for this. Consequently, only a limited number of draft/speed combinations are tested, so the achieved speed/power results, properly adjusted for temperature, salinity, weather, and draft differences, are merely used to confirm or adjust the already existing diagram. If the engine's Maximum Continuous Rating (MCR) is plotted in this diagram, the maximum speed for the ship may be found as illustrated in Figure 2.

Ship owners know that this is not the speed they can expect in daily operation, and so for commercial considerations they define a so-called "service speed." This service speed is traditionally found by adding 15% to the power curve and subtracting 15% from the engine power line as shown in Figure 3. The 15% added power is expected to consist of 5% for weather losses plus 10% for losses due to hull and propeller surface roughness caused by marine growth and corrosion.

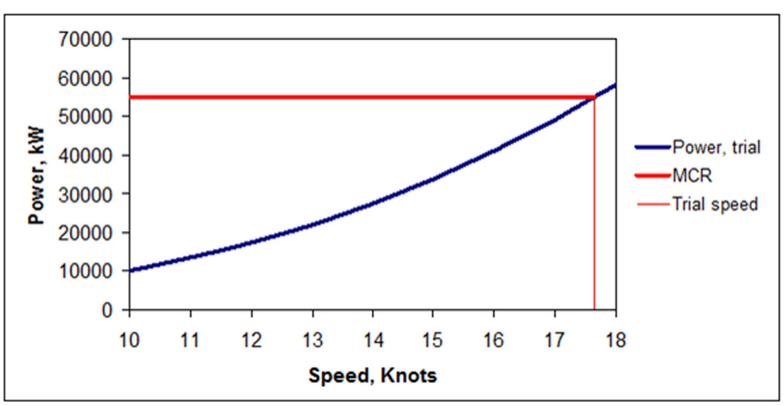
The actual situation with respect to marine fouling for any particular ship may be worse. This will only be discovered if the fouling is significant because it is very difficult in practice to get a reliable and reasonably accurate picture of the speed/power performance of a ship in service.

Degradation of the Performance

The main reason for performance degradation is marine growth on the ship's hull. This subject is treated thoroughly in the technical literature, for instance in an excellent way by the International Association of Tanker Owners (2009). Here it shall only be mentioned that ship owners are allocating a lot of time and money to prevent or mitigate the degradation. The main remedies are various types of coatings applied to the underwater part of the hull at regular intervals, and in some cases, in-water brushing of the hull and polishing of the propeller.

Altogether, the total costs of all ship owners' anti-fouling precautions are on the order of 1.5 billion USD per year or approximately 5% of the total marine fuel oil costs. Unfortunately, it is difficult to determine if this money is invested in the optimum way. There are many different types

Figure 2. Ship performance, power vs. speed, trials



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