

Workshop – Application of the Konect Design Method for designing an interface for vessel performance monitoring

In this workshop the Konect design method should be applied to derive an interface for vessel performance monitoring.

The use case is situated in the maritime domain and aims at reducing fuel consumption for ships during voyage. For this several aspects of the ship have to be minded:

- Speed Optimization
- Maneuvering Optimization
- Trim and Draft Optimization

Each aspect and the information elements to be considered are described in the following text:

- **Speed Optimization:** To save fuel during voyage the speed and acceleration and braking should be minded. For this one has to know that each ship has an **optimal speed** at which the fuel consumption is minimal. To estimate if the ship is driving at optimal speed the **actual speed** has to be known and has to be compared to the optimal speed. Furthermore the ship has to reach the harbor in the right time for unloading cargo to avoid waiting times or problems with the place to berth. To reach this, the ship has to drive at so-called “**just in time speed**”. This speed needs also be compared to the actual speed. As a last point the acceleration is important for saving fuel. A more smooth/constant speed increase or decrease reduces fuel consumption. This can be seen with the **acceleration** and **shaft rpm acceleration** – an indicator for the rotation speed of the propeller. To save fuel and having a smooth speed increase or decrease the acceleration has to be low.
- **Maneuvering optimization:** Aspects influencing the maneuvering can also lead to higher fuel consumption e.g. headwind or high waves can lead to a higher resistance and thus to higher fuel consumption. Thus the **relative wind direction and speed** as well as **relative wave direction and speed** is relevant. Furthermore, the maneuvering should be quite smooth to avoid high fuel consumption (similar to acceleration trend). Thus the **rudder angle trend** is important and the **autopilot state** (as the autopilot can ensure smooth adaption of the ships heading according to a set course).
- **Trim and Draft Optimization:** As a last point the ships position in the water is relevant for the fuel consumption. This includes **trim** (e.g. see Figure 1), **draft** (the part of the ship below water), and the **depth under keel** (distance of the ship to the ground). For this one has to know that there exists an **optimal trim** and an **optimal draft** for each ship (this differs from ship to ship) for having a minimal possible fuel consumption. The depth under keel becomes important at a certain (e.g. X meters) at which the low depth can increase fuel consumption. Thus besides the actual depth under keel also its **relevance** is important.

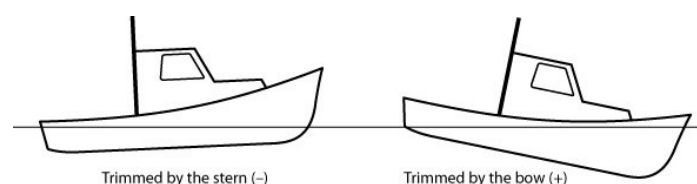


Figure 1: Trim (source: <http://www.otenmaritime.com>).