

A floating cooling lab



Large amounts of electric energy are consumed when cooling water is pumped to cool components in the engine room. A.P. Moller - Maersk targets the potential savings with a project set to scope out best practices for retrofit and building of new ships. Therefore, a 3 year industrial Ph.D. at Aalborg University will turn Gudrun Maersk into a floating cooling lab in pursuit of the perfect cooling solution for the 21st century.

The cooling system is a key component in the ship's safety, and the main challenge is to keep the low temperature cooling system stable. Today, a cooling system is driven by a constant speed pump which ensures a stable temperature when used together with mixing circuits and fixed flow restrictions. Unfortunately, by using a constant speed pump, the cooling system is running at an overall higher capacity than needed. By changing from constant speed pumps to variable speed pumps, the energy consumption will be reduced, and at the same time the need for mixing circuits will be removed. Furthermore, the use of valves on subsystems will replace the need for fixed flow restrictions.

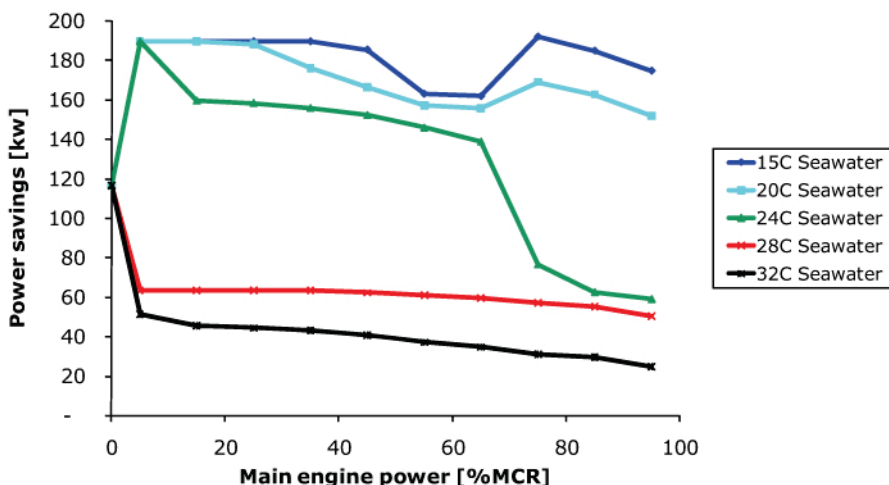
On the 7,000 TEU container ship Gudrun Maersk, this should generate 980,000 kwh/year energy savings which equal 235 tons fuel oil and 731 tons CO₂ a year. The energy savings are estimated in a master's thesis from Aalborg University, which has been confirmed by cooling system simulations based on data collected by the A.P. Moller - Maersk Ship Performance System, MSPS. In addition to the environmental benefits, the payback time for the shipowner will be less than 2 years.

Keeping cool and stable

In order to obtain these savings, variable frequency drives (VFD), valves and smart control algorithms need to be implemented. VFD's and valves are already off-the-shelf items but safe and energy-optimal control algorithms for ships have not been developed yet. The cooling system is a key component in the ship's safety, and the main challenge is to keep the low temperature cooling system stable. Therefore, an industrial Ph.D. at Aalborg University will focus on combining fault tolerance and robust control with self optimization.

Long-term gains

The long-term goal of the project is to provide a decision package that scopes out different possible improvements and their impact on ship economy as well as the environment. The calculated savings are based on the simple constant pressure system which will be used in the beginning as it is a safe and predictable option. The project partners expect to increase savings with more advanced and self-tuning control algorithms. The fleet roll-out decision package is expected to evolve over time as more knowledge and experience is gathered.



Project facts

Category: **Machinery**

Emission reductions:

CO₂

NO_x

SO_x

Partners:

A.P. Moller-Maersk

Odense Steel Shipyard