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Marine Keel Cooler Optimization Tool

Sponsored by Frank Ruggiero Cummins INC. ***Faculty Advisor: Steven W. Van Sciver, Ph.D.***

Abstract

Cummins Marine is in need of an updated tool which would provide the Marine Application Engineers accurate feedback when validating the cooling capacity of a keel cooler.

The team is tasked to make a new tool which will enable the user to validate a wider variety of manufactured keel coolers, as well as providing a keel cooler design suggestion to satisfy cooling requirements.

Project Statement

"The current Cummins Keel Cooler Tool provides no feedback on a particular design and is limited in its capability."

Goal Statement

"Design a more versatile design tool which generates feedback and provides a more user friendly interface."

Software Design

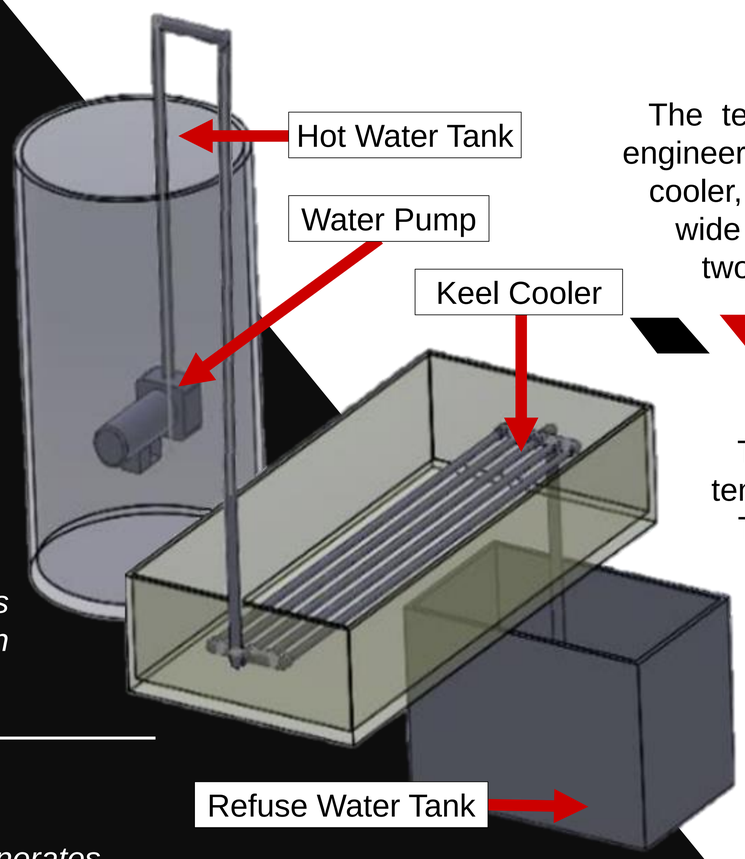
The software enables Marine Application Engineers and boat builders two modes, keel cooler design and/or validation.

Design:

User is asked to enter information about the vessel installation. The program will then output a keel cooler design complete with accurate sizing per material selection.

Validation:

User is asked to input information of a current installation to validate the cooling capacity of the current keel cooler in different operating conditions. If current design fails, user will be taken to the 'Design' mode.



Design plan for the keel cooler testing apparatus

Hardware Design

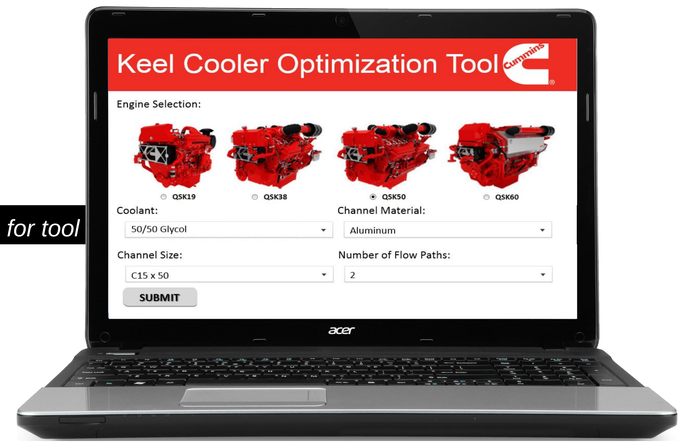
The testing apparatus provided the team a means to validate the predictive engineering in the software. It consists of a heated water reservoir, water pump, keel cooler, and water bath. It simulated the worst case operating scenario for a vessel, wide open throttle for a vessel which is stationary. This test was conducted under two different keel cooler configurations: single flow path and multiple flow path.

Conclusion

The software developed by the team accurately predicted the expected temperature difference and overall heat transfer of the keel cooler apparatus. The software was then validated with an actual installed system where results came back within a 5% error margin. The team has succeeded in improving the current software to meet the needs of Cummins.

Acknowledgments

The team would like to acknowledge our advisor, Dr. Van Sciver for his insight and direction. We would also like to acknowledge Frank Ruggiero for the sponsorship of this project.



Newly designed HTML/CSS Interface for tool