Simulation, experimentation, and collaborative analysis of adjacent heat exchange modules in a vehicular cooling system

车用冷却系统中相邻热交换器模块的仿真、实验与匹配分析

Citation: Yu-qi Huang, 2013. Simulation, experimentation, and collaborative analysis of adjacent heat exchange modules in a vehicular cooling system . *Journal of Zhejiang University-SCIENCE A (Appl Phys & Eng)*, 14(6):417-426. [doi:10.1631/jzus.A1300038]

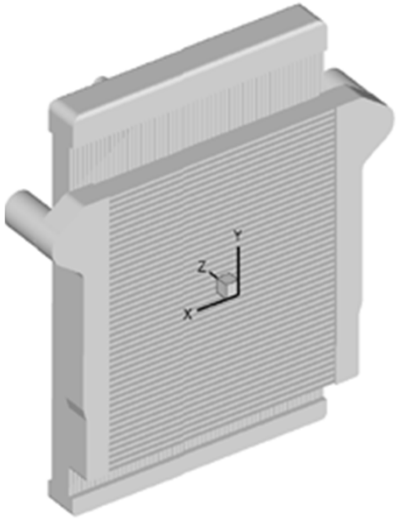
Main goal of this paper

- A vehicular cooling system consisting of several heat exchange modules which could be arranged in various orders, and each combination may produce different effects because of interactions among the heat exchange modules. In this study, we aimed to explore the principles governing interactions among adjacent heat exchangers in a cooling system.

Main approach adopted

- Typical approaches of this study are ***three-dimensional simulations*** and ***wind tunnel tests***.
- Three modules with different combinations were simulated, compared, and examined using a collaborative analysis, and the results were validated with experimental data based on wind tunnel tests.

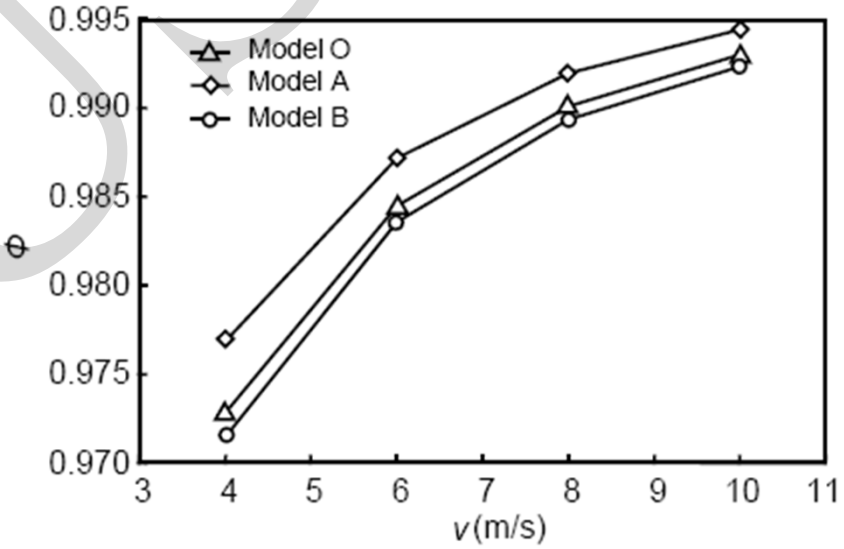
Computational model and results



Three different adjustments were compared in this study:

1. Changing the relative positions;
2. Changing the spacing; and,
3. Changing the flow pattern of the hot medium in the CAC

It was found that the heat dissipation of the modules is affected by their relative position, and the rules comply with the field synergy principle: the more uniform the temperature difference (between cold and hot mediums) distribution, the better is the heat transfer performance.



Uniformity factor of the TDF in the radiator