Thermal Cycle CFD Simulation of a Charge Air Cooler

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Charged Air Cooler (CAC) used in heavy machinery and equipment is exposed to alternating heating and cooling even when the vehicle is not operational and at varying engine speeds which causes considerable thermal stress and fatigue. Hence, failure rate of CAC product is considerably high and the need to analyze the product computationally is of paramount importance.

Current effort is to develop a simulation methodology to obtain temperature distribution of the Charged Air Cooler, which can then successfully mapped onto a structural model for a structural and fatigue analysis. Emphasis is given to the complexity of the geometry, size of the mesh, need for high performance computing in order to analyze a model with a mesh size of about 80 million elements. Geometry was cleaned up and volume meshed in STAR-CCM+.

Impact of simulation driven product development strategy will also be discussed as CAC CFD simulation can reduce the physical testing from months to days.

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