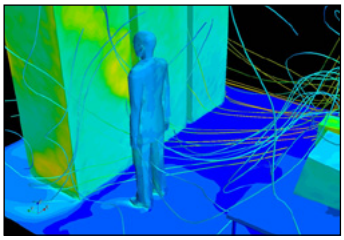
CASE STUDY



INDUSTRY:
Defense and Commercial Electronics

PROJECT NAME:
Thermal Analysis and Ventilation Sizing for an Electronic Equipment Room

OVERVIEW

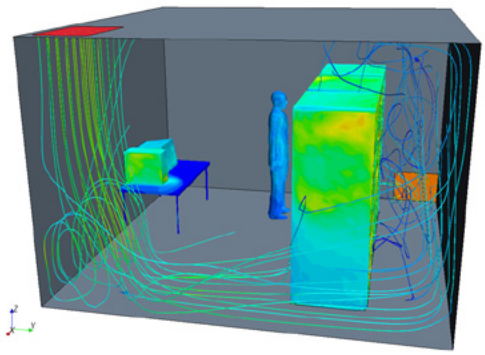
Designing the layout of electronic equipment room interiors and sizing environmental control systems are processes that can vary in complexity depending upon the amount of equipment and the demands of the environment. The goal of this project was to size the cooling system needed to maintain the electronic equipment in their cases at the required operating temperature as well as to assess the overall room temperature for human comfort. Since this room may be occupied during operation, a single person was included as an additional heat source. The ceiling inlet and the floor outlet were defined as boundary conditions that could be resized easily and relocated if necessary. The known heat sources in the equipment racks were also defined as inputs to the simulation.

STAR-CCM+ was used to calculate the airflow throughout the room and the resulting surface temperatures of the equipment. The streamlines in the figures below show the airflow and are colored according to velocity; red and blue indicate higher and lower velocity, respectively. The color contours on the surfaces show the surface temperatures for the equipment; red and blue indicate higher and lower temperatures, respectively.

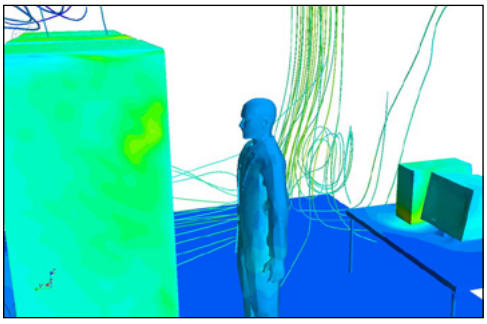
The results of the simulation verified that there was sufficient space behind and between the equipment racks for the selected cooling system to maintain the equipment within its temperature requirements as well as at a comfortable temperature for the personnel in the room. The flow streamlines also showed that the selected ventilation fan would not create a draft at the desk and that a diffuser would be beneficial to avoid recirculation of the airflow below the inlet vent and increase the flow across the tops of the cases.

BENEFITS:

- Analysis-driven optimization of room layout.
- Detailed temperature results for all equipment that can be used for further analysis and/or qualification.
- Visually rich understanding of the air flow in the working environment.
- Ability to correctly size the cooling system prior to installation.



▲ Overview of an electronic equipment room. The flow from the top left vent is colored by velocity (red = higher, blue = lower velocity). The server racks, person, and computer table are colored by temperature (red = higher, blue = lower temperature).



▲ Temperature contours on the exterior of the equipment cases show hot spots caused by the interior electronics.

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