Modine Environmental Room Cooling Analysis

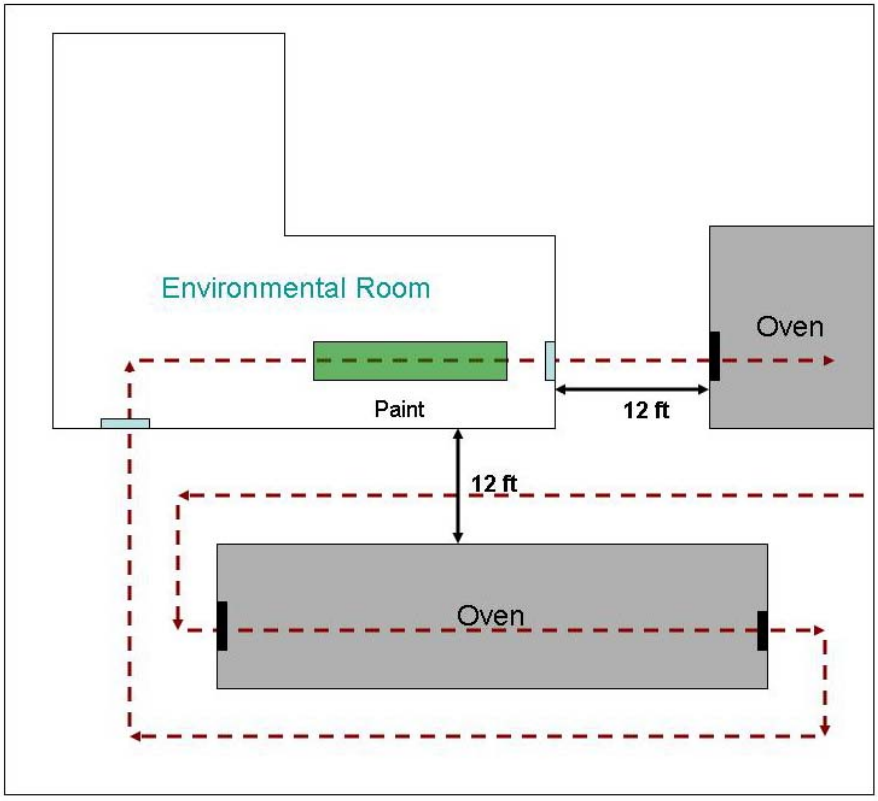
Team Members: Michael D. Lloyd
Erik H. Dupilka
Christopher D. Scott

Faculty Advisor: Captain Sexton

Client: Modine Manufacturing Company: Buena Vista, VA

Client Contact: Andrew Pauley

Modine uses a powder paint system for painting sheet metal parts. The powder paint spray booth is in a room often called the environmental room. Powder paint is stored in this room and per internal process specifications, the temperature and humidity must be maintained within a certain range. A rooftop air conditioning unit is currently being used to maintain the temperature and humidity requirements. The sheet metal parts enter and exit the environmental room through two openings in the room. One current in house project is developing an automatic door opening and closing system to minimize the open area exposed. The system is being developed for minimizing heat loss from the two ovens, but potentially may be applicable to the environmental room.



For this project, we were tasked with a list of objectives. First we had to calculate the annual cooling load and current annual energy costs. Then, we had to determine the potential annual energy savings from using natural ventilation and make a recommendation for implementation. Finally, we were to determine a mathematical relationship between the energy savings from reducing the open area of the entry/exit holes. Overall, we were tasked with reducing energy costs associated with the environmental room.

Through our analysis, the current annual cooling load of the room was determined to be 7.9 tons. The current cost was approximated to be $1,300. We were able to conclude that neither reducing the entry/exit opening areas nor implementing natural ventilation would be cost effective. The essential problem with the room is that cooling is inefficient due to inadequate distribution of air. Our only recommendation would be to implement ducting to properly distribute air in the room.