

Food Chafer

Sponsor: Service Ideas, Inc.

Sponsor's General Mission or Business Statement: Service Ideas, Inc. is an innovative world-wide company that distributes food and beverage products that increase profitability, ensure safety and minimize labor costs.

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Senior Design Clinic I-II (ENGR 480-1) 2005-6 Project Mission Statement: The goal for our team will be to design and build a passive standalone food chafer that adheres to customer safety standards while being independent and maintaining food quality.

Major Design Requirements:

1. Measure and characterize the loss of heat from food in a buffet service.
2. Characterize the heat storage capabilities of some Phase Change Materials (PCM).
3. Characterize the insulating capabilities of some Vacuum Insulated Panel (VIP) and other insulation products.
4. Investigate the application of heat to the PCM modules using induction heating methods.
5. Discover a method and means to remotely display the temperature of a PCM module.
6. Construct a business management model regarding "make or buy" decisions on the key subsystems.
7. Construct a bill of materials for a complete chafer including the stand, insulated pan, cover and PCM insert.

Senior Design Project Summary: The project required mechanical engineers with a vast knowledge in heat transfer and an understanding of the food industry. The customer required a food warming system that does not use a flame or electric heating element. Testing was done to define the cooling characteristics of a food substrate in an un-insulated, unheated food pan. Modeling was then done in ANSYS to do iterations of different design ideas. Physical tests were done along with the iteration process to check the accuracy of the numerical model. Another element of the project included choosing an insulation option based on the thermal resistance characteristics. The first design idea called for a Phase Change Material (PCM) that is heated in an oven to a desired temperature with insulation surrounding the pan and the PCM. Research of a Remote Temperature Device (RTD) to monitor temperatures of the PCM from a remote location was also done. The success of this project required dedication to computer aided design, regular meetings with the sponsor, creativity in design, and expanded knowledge of heat transfer.

