**Title:** Plastic Extrusion Die Heating Element Analysis and Design

**Industry Sponsor:** Trelleborg Sealing Solutions

**Students:** 3 - 4 ME and 2 EE

**Budget = $2,000**

**Project Description**

Electric resistance heating elements are currently used to control the temperature of a plastic extrusion die in one of Trelleborg’s manufacturing processes. The heating elements are attached to the dies with bolts and no thermal paste or interface material currently used. Thermocouples are inserted into the die to monitor temperatures at several places throughout its length. Temperature controllers use this feedback to adjust the electrical output to the heating elements. The process is inefficient with regard to electricity usage due to the large thermal resistance between the heating element and the extrusion die, and the temperature control is inadequate to insure smooth start-up and operation of the process.

**Project Scope**

Trelleborg would like for the team to develop an analytical model of the current heating element system including a heat transfer analysis and determine ways to improve the system. Suggestions for improvements could come from researching alternatives to the electric resistance heating elements and/or looking for ways to improve the current technology. It would be expected that thermal resistances are reduced by 10% and die temperatures maintained throughout the entire length of the die heating zone within +- 10 deg F. A proportional reduction in electricity consumption would be expected with that metric being defined after the system analysis has begun. An electrical analysis of the series/parallel heating element arrangement including a PID control loop would also need developed to insure proper control of the heating elements and temperature control.

**Project Budget**

$2,000 for analysis and testing equipment for use while on IPFW campus. In addition, Trelleborg will supply all other hardware required for implementation and testing at the manufacturing facility.