

Project Title: Plastic Extrusion Die Heating Element Analysis and Design

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Area: Mechanical Engineering, Electrical Engineering and Computer Engineering

Sponsored by: Trelleborg

Trelleborg Sealing Solutions, located in Fort Wayne, IN, is a full service manufacturing facility that specializes in the production of seals composed of plastics, such as polytetrafluoroethylene (PTFE). One of their machines is a plastic extruder that would ideally produce step tape at a rate of 3.6ft/hr. The project aims to improve the current production process by increasing energy efficiency and reducing production lead time. Any alterations to the system must not change any of the dimensions or material properties of the desired final product. This machine is heated with heating elements and the temperature is monitored by eight thermocouples. Trelleborg requested the process be improved by integrating an altered control system which should decrease energy consumption and reduce the amount of poor product produced. Trelleborg has given us an on-campus budget of \$2,000 for testing and other purposes.

The ramp-up process for the heating elements, to heat the die from room temperature to the steady state operating temperature of 700°F, currently takes one hour. The design group aims to reduce or maintain the current ramp-up time of one hour. The steady state operating temperature, once the die has finished the ramp-up process, must remain at 700°±5°F. During the ramp-up process the overshoot temperature must not exceed 715°F and the overshoot period must occur for less than 15 minutes. The company has also requested that the thermal resistance be reduced by 10%, which will be quantifiably determined through reducing the electricity consumption by 10%.