Ignition Research Apparatus

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Project Purpose
- Build an apparatus in which the user is able to vary the power through a kanthal wire. The project will be of independent design and origin to support the ignition research in the Computational Thermodynamics Laboratory at SDSU.
- The purpose of the project is to study the heat flux into solid fuel time delay as well as determine the ignition temperature of various fuels.

Linear Actuation
- Lead screw actuation is to be able to vary the distance away from the sample.
- Using lead screws allowed for independent movement of each ignition wire.

Wire Tension System
- To counteract thermal expansion, compression springs were used to maintain a linear wire profile parallel to the sample.

Testing
- Multisim oscilloscope displayed consistent results of current throughout the circuit after low pass filter was installed.
- PID tuning was further implemented to stabilize the settling time of the initial current of the circuit.

Conclusion and Results
- Matlab collects data of current, voltage, power, and wire resistance and records it into a notepad text file.
- The power variable will be used in research calculations to study ignition with respect to time delay.

Electricity Design
- The circuit utilizes an arduino microcontroller to control the current through the ignition wire by sending a pulse width modulation signal to a bipolar junction transistor.

Ignition System
- Sample holder able to hold samples of cellulose and PMMA with varying thicknesses ranging from 1, 2, 3, and 4 cm.
- A kanthal wire is used as the heating element.