

Senior Design Project Ideas

Tube Furnace

Tube furnaces are often used in many manufacturing processes and are typically expensive. Our group could create a tube furnace much cheaper compared to the current market price of \$3500+. We would need:

1. Quartz glass tube (\$20 - \$200~ depending on the diameter, <https://gm-quartz.com/products/quartz-tubing>)
2. Nichrome wire for heating – (less than 20\$)
3. Insulation to protect the surrounding environment and efficiency. (TBD)
4. Housing (TBD)
5. PID Controller & Heating curve (<\$10)
6. LCD Display (<\$15)
7. Power Supply and Power System: Method of controlling current through the Nichrome wire; either PWM DC current or a TRIAC type solution.
8. Safety shutdown
9. User notification (website, application, mobile, etc.) for important events. Such as progress, annealing status, etc.

Thermal Shock Oven

The thermal shock oven is used for heat stress testing of components and devices. It operates by having a cold and hot chamber, where a rack is quickly transitioned from the cold to the hot chamber via an elevator. This process is repeated as many times as the user desires.

1. Many of the requirements from the tube furnace also transfer here.
2. Cooling element (maybe LN2)
3. Heating element (heating coil with blower fan should suffice)
4. Method of moving the testing rack between chamber (Elevator could be difficult to implement safely in demo).
5. Safety mechanism.