NRI - Custom Piping Loop Unit for Composite Repair Systems Installation Verification at High Temperatures

Overview
NRI is an industry leader in the manufacturing and installation of composite pipe repair systems. NRI has a new composite repair system that is to be used on pipes in excess of 500 °F. They required a test rig that would allow them to heat up a removable pipe section on which they could install their composite wrap system. The final test rig needed to be able to heat a pipe section up to 500 °F, have a removable section of 4” diameter steel pipe, have a footprint no larger than 6’ x 6’, and be controllable so different temperatures could be set.

Objectives
The team’s objective was to design and build a robust testing rig that would allow NRI to fully test their composite wrap system. The team wanted to build a fully functioning prototype by the end of the semester that exceeded the requirements set forth at the onset of the semester.

Approach
• Gathered the customer needs through the project proposal and conference call.
• Did market research and patent searches to develop ideas and see what was currently available.
• Sponsor visited PSU. During meeting a concept for the test rig was mutually decided upon.
• Continued research and settled upon final design after creating CAD prototypes.
• Final design was pipe section supported by stands with an immersion heater placed inside pipe.
• Contacted heater company and coordinated purchase of immersion heater with NRI.
• Purchased other necessary parts using project budget.
• Fabricated prototype test rig. Rig designed was very robust and simple to assemble.
• Did various tests on rig. (Temperature vs. Time, Temperature vs. position on pipe, etc)
• Validated design and results with NRI and determined if customer needs were met.

Outcomes
• Prototype functioned as expected and provides NRI an easy way to test their composite repairs.
• Use of our test rig will allow hands-on training of technicians at NRI.
• Our test rig’s robustness will allow NRI to make future modifications for different tests (pressure testing, higher temperatures, etc)
• Customer needs were met/exceeded.