Grove City Engineering of Microreactors: Heat Pipe Analysis

GROVE CITY COLLEGE

Westinghouse

OVERVIEW

Heat pipes for nuclear microreactor

- **Heat pipes move heat from core block to gas turbine**
- **Limited prior experience in transient applications**

Our Project: Document heat pipe dynamic performance

Figure 1: Westinghouse eVinci™ Microreactor Layout

DESIGN

- **Parts/assembly were modeled in SolidWorks**
- **Parts were either 3D printed or purchased to assemble by hand**

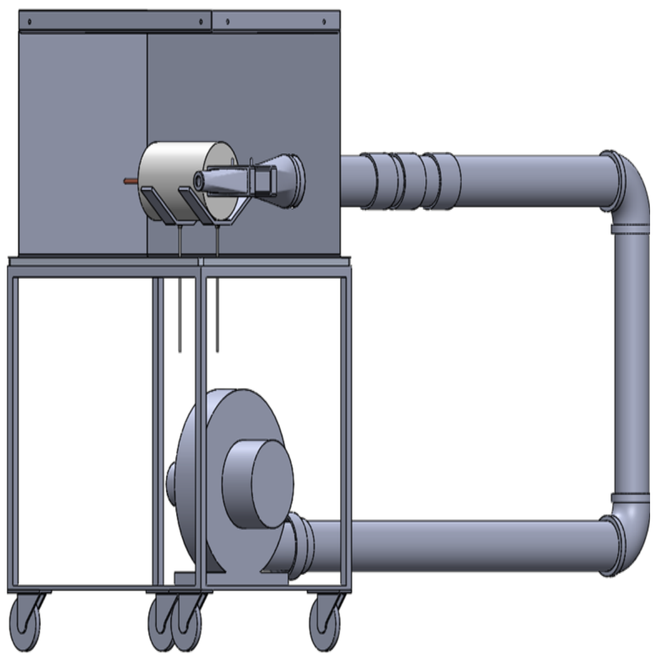

Figure 3: Testing Rig Design

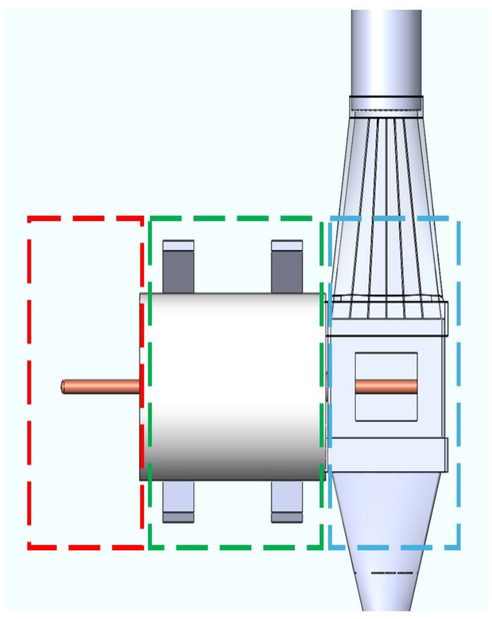

Figure 4: Top view of heat pipe assembly

Advised by: Dr. Richards

EXPERIMENT DESIGN

Lab-scale testing to simulate heat pipe physics:

- **Used commercial, water-based heat pipes**
- **Electrical heating used for dynamic input**
- **Forced-air cooling used for dynamic output**
- **Adiabatic section mimics microreactor layout**
- **Heat flux gages/thermocouples record heat exchange**

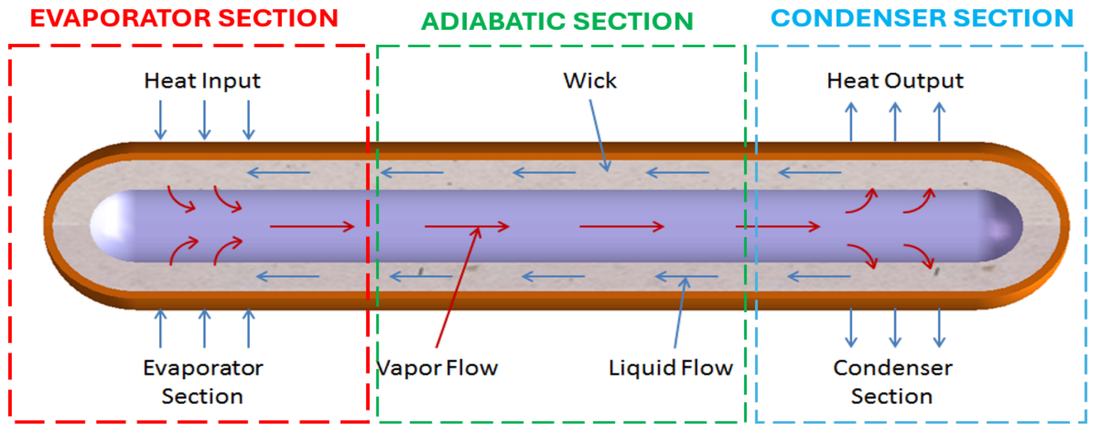

Figure 2: Heat Pipe— heat transfer process diagram

RESULTS

- **No significant dynamic heat transfer complications**
- **Dynamic transitions beyond normal limits easily reversed**
- **Axial temperature profile may be a useful diagnostic**

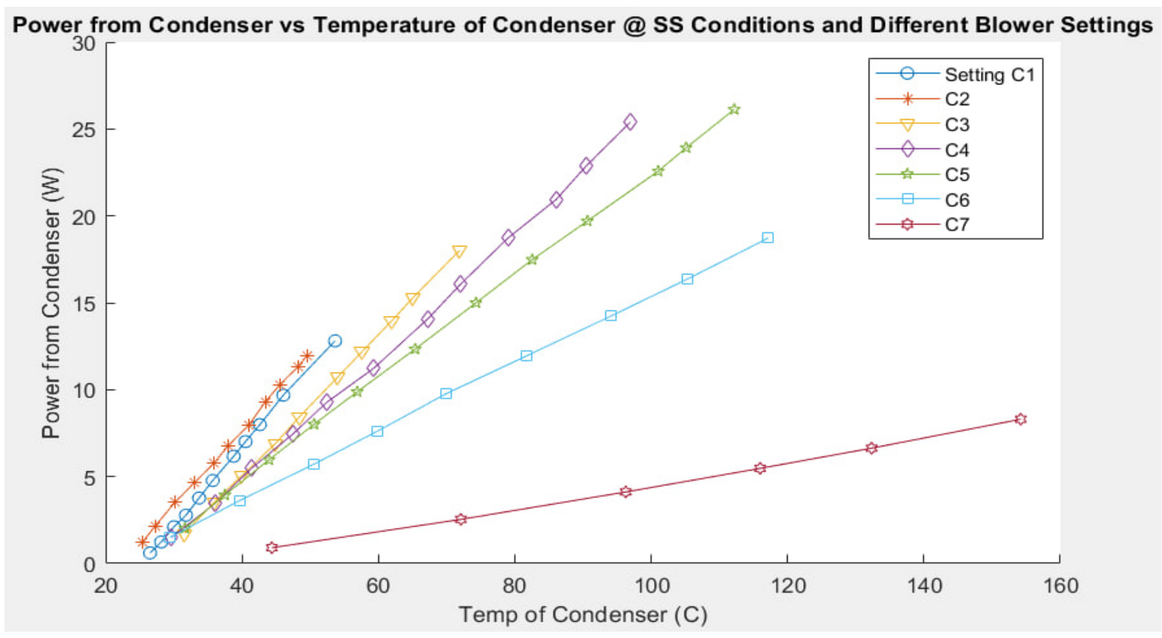

Figure 5: Graph displaying Power from Condenser vs Temperature of Condenser at SS

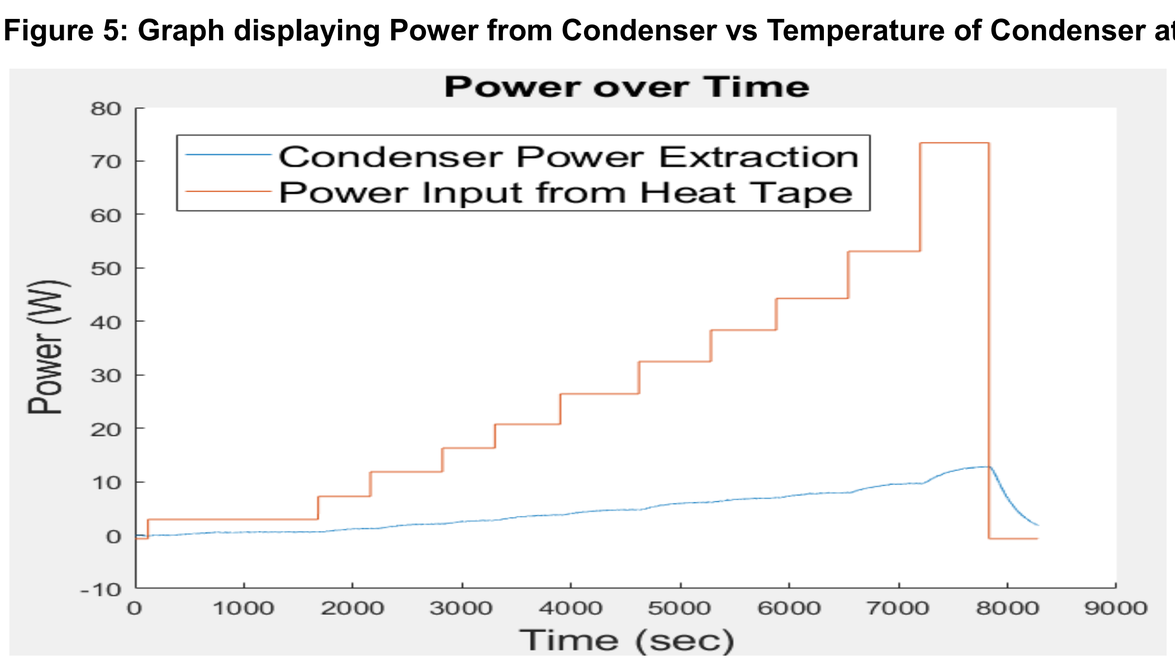

Figure 6: Graph displaying Power vs Time

CONCLUSION

- **The group gained repeatable evidence for steady state and transient physical models of the heat pipes studied**