Becky Sondelski

Master's Student
Mechanical Engineering

Advisors:
Greg Nellis
Sanford Klein

Office: 1337 ERB
Email: sondelski@wisc.edu
Hometown: Mosinee, WI

Research Project: Modeling Supercritical Brayton Power Conversion for a Direct Cooled Reactor

SCIL

College of Engineering
UNIVERSITY OF WISCONSIN–MADISON

Project Background

- To achieve future goals in space travel, a longer lifetime of the onboard power system will be necessary
- It is desired to develop new methods for power generation to satisfy this demand
- Nuclear power has proven to be a promising source for space applications since the power density of nuclear fuel is relatively large in comparison to current fuels
- Research has already been conducted for nuclear powered applications utilizing the Stirling cycle, but the Brayton cycle has shown better energy conversion efficiency
- This project's focus is to explore the potential of Brayton cycle power conversion utilizing a direct cooled nuclear reactor for space applications

College of Engineering
UNIVERSITY OF WISCONSIN–MADISON

Motivation for System Modeling

- Since the power generation system will be space based, optimization of the system requires not only maximizing the system's efficiency but also minimizing the system's mass
- In order to observe these two quantities and how they relate to each other, it is necessary to develop a model of the Brayton cycle capable of handling a wide range of parameters

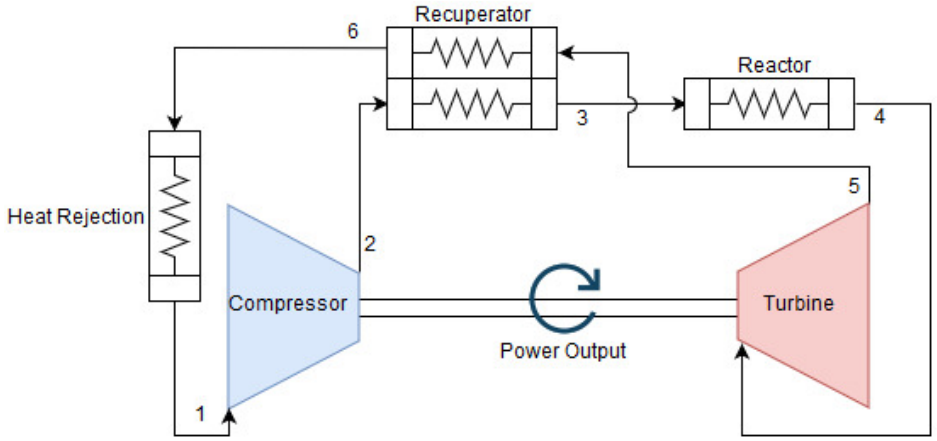

Figure 1: Brayton Cycle Schematic

College of Engineering
UNIVERSITY OF WISCONSIN–MADISON

Modeling Sequence

- Develop models for each component of the cycle
- Form a model of the full cycle which utilizes all component models
- Develop an optimizable model which integrates the cycle efficiency and the mass of the critical components: reactor and heat exchangers
- Observe the cycle parameters for the optimized cycle
- Compare results for several types of working fluids

College of Engineering
UNIVERSITY OF WISCONSIN–MADISON