An EGR System Design for a Diesel Research Engine

Overview
Volvo is conducting combustion research with an 11L diesel engine at the University of Michigan. The tests will require the use of an off-engine Exhaust Gas Recirculation (EGR) Cooler system to test the engine efficiency and the effect that recycled exhaust gas has on emissions.

Objectives
The main three objectives of this project were to design, validate, and build an EGR Cooler system that could function within specific operational parameters, when placed in the test cell environment at the University of Michigan.

Approach
- Collect problem background information and design requirements
- Create system block diagram and primary system analysis for concept verification
- Conduct background analysis on EGR Cooler system design, use, and construction
- Create strategic design plan, ask remaining questions
- Finalize deliverable expectations and organize division of labor
- Design major system components
- Create CAD model of EGR Cooler system and components in Solidworks
- Verify design with calculations
- Purchase all system components and subcomponents
- Cut, Weld, Clamp, and fit all components together
- Deliver system to sponsor

Outcomes
- Penn State’s capstone work has saved Volvo and the University of Michigan critical time and money.
- Simultaneously while the capstone team worked on the design of the system, the Michigan team was able to install the engine in the test cell, allowing the project to progress much faster.
- All calculations validated that the design would work as intended.
- The capstone team effectively delivered built system to the Volvo and the University of Michigan.