Split Cycle Engine Concept

Overview: Volvo Powertrain has been one of the main developers and producers of heavy engines that fulfill the latest environmental requirements. Volvo Powertrain’s driving design factor is the need for increased fuel economy. The goal is to look at the current 13L US10 engine line and improve the engine’s fuel efficiency through incorporating split cycle engine technology, liquid nitrogen injection and a waste heat recovery system.

Objectives:

- Size split cycle engine to exceed baseline BMEP
- Strategize liquid nitrogen feasibility looking at on/off board costs
- Achieve isothermal compression using recuperator heat exchanger
- Provide concept packaging to prove fit inside VNL engine bay
- Perform failure mode analysis to address safety risks

Approach & Outcomes:

- Incorporated customer needs from Volvo Powertrain, conducted research on previous theoretical concepts, generated numerous concepts, devised CAD models, passed final selections onto other team to perform data acquisition of selected assembly
- Exceeded baseline BMEP with 26.7 bar & 12.8 L displacement
- Concluded liquid Nitrogen to be refueled at a station & stored on-board
- Designed heat exchanger that increases temperature for combustion and fits between cylinders of inline 8 engine
- Provided concept packaging demonstrating components fitting inside current VNL engine bay