Overview
The injector yoke is a component included on many of Volvo Group’s heavy duty diesel engines, and exists in many variants. The injector yoke clamps the diesel injector in place during combustion to prevent loss of efficiency. The part was originally produced in large quantities by means of pressing and sintering with a large amount of stock set aside. Due to the low failure rate and sole demand from the aftermarket, the need for these parts is very low. The current stock has run out and parts are manufactured by means of subtractive manufacturing in large runs. An investigation into Additive manufacturing for on demand production was conducted in order to help maximize the efficiency of this part.

Objectives
The objectives for this project included:
- Conducting a cost analysis for Additive Manufacturing
- Optimize injector yoke design for 3D printing while meeting stress and load requirements
- Choose appropriate material and process for Additive Manufacturing

Approach
- FEA analysis was completed for the current injector yoke in ANSYS and ABAQUS with specifications given by contacts at Volvo Group
- Multiple designs were created through ANSYS topology optimization
- Concept selection methods were used to decide on which designs to move forward with
- Iterations of the selected components were made removing as much material as possible while retaining the required mechanical properties
- Finalized models were 3D printed in plastic to better understand the production of the part
- Different Additive Manufacturing methods were researched to choose a suitable process
- Cost analysis performed for current means of manufacturing and Additive Manufacturing to compare and contrast costs of each method
- Materials were researched, with regard to mechanical properties and availability for Additive Manufacturing

Outcomes
- Part volume was decreased by ~36% while only obtaining a ~9% increase in stresses
- 316 Stainless Steel was chosen as a suitable material for this part
- Selective Laser Melting was chosen as the best 3D printing method
- Current costs of AM methods and the simplicity of the part resulted in no benefits of choosing AM as the production method for this part
- A heuristic model was created to help deduce if Additive Manufacturing would be viable for future parts, before conducting a full scale project for the part