Redesign for Additive Manufacturing of Hydraulic Pump

Overview
Naval Air Command tasked the team with redesigning a custom-built hydraulic pump. One of the primary issues with the design was the interference between the needle valve and the lever arm that would cause future damage on the pump. Another adjustment to be made of the pump was creating a protective cover for the pump to address the potential issue with engineers stepping on the pump while they are performing maintenance on the engine. Other needed modifications included realigning ports in the design, creating new valve handle, and generate a placard concept to guide pump operators.

Objectives
The team’s objective was to make modifications to a hydraulic pump used by Naval Air Command in an engine trailer to raise and lower jet engines using CAD to allow the design to be additively manufactured.

Approach
- Understand the problem statement through weekly meetings with Naval Air Command
- Spoke with sponsors to gather customer needs
- Performed patent search to gain background knowledge on hydraulic pumps
- Rank the customer needs to determine the priority modifications of the pump design
- Gathered specifications of the dimensions of the pump
- Generated multiple concept designs then selected the most efficient designs
- Created final system level design through SolidWorks modeling and 3D printed prototypes utilizing the ObJet printer in the Learning Factory
- Simulated Finite Element Analysis stress tests through SolidWorks on the protective cover
- Testing showed there needed to be a redistribution of the valves in the design to support the forces placed on the pump
- Modified final design based on testing data

Outcomes
- The new pump design will be additively manufactured in 15-5 Stainless Steel
- Naval Air will be able to print as many hydraulic pumps as needed
- Design recycles pump components such as valves, placard, handles, and pistons saving overall cost of project.