Ford Motor-Pump Maintenance Apparatus Design

Overview
Ford uses a motor-pump system in a housing on certain press lines in their factories. Every few months the pumps need to be serviced for maintenance, which takes away valuable production time. Ford believes that the current process is taking too long, and would like to devise a new method to help remove the pump so that it can be serviced more efficiently.

Objectives
- Design an apparatus and process for removing the 1500 lbf pump from the structure that is safe, time efficient, and ergonomic.
- Create a prototype of the apparatus and motor-pump assembly to demonstrate how the process works.

Approach
- Gathered customer needs from Ford.
- Designed an AHP matrix to weigh customer needs.
- Reviewed patents that relate to the project.
- Visited Rexroth Bosch Group to see similar pumps and talk to employees about how they do maintenance on the pumps.
- Generated multiple concepts and design in SolidWorks.
- Narrowed down to one best concept. This concept was picked because it was the safest and required the least amount of parts.
- Performed Finite Element Analysis (FEA) on SolidWorks to make sure the design will work.
- Results of FEA: max working stress = 27.22 ksi per individual clamp, material yield stress = 53.7 ksi for 1018 steel, and resultant safety factor = 1.97.
- 3D printed a scaled prototype.
- Created a full-scale prototype out of wood.

Outcomes
The outcomes of this project are as follows:
- The sponsor will save money as a result of this project.
- The process time will be cut in half because of this project.
- The project makes the process more ergonomically friendly.
- The project makes the process safer.
- The project was a unique design for Ford Motor Company.