Functioning Pump Station Scale Model Design - Phase 3

Overview
The project is phase three of a four phase project to design a scaled down model of a crude oil pump station. The purpose of the Functional Pump Station Scale Model is to showcase change control and optimization algorithms and compare results to high-resolution simulation results.

Objectives
The mechanical team will work with the electrical team to design the pump station that consists of 4 pumps, 4 motors and 4 variable speed drives. The pump station must include three tanks, each filled with a liquid of different viscosity where the liquids will be used through a pipeline that is long enough to apply adequate load on the pump. The scale model must be able to be shipped across the country by truck to be showcased at trade show events.

Approach
- Determined liquids that will be used and their mixing instructions.
- Developed a design to meet Siemen’s specifications and created the design in CAD.
- Determined valves that will be used.
- Calculated net positive suction head available, maximum headloss across pipe and fittings, required pump power, maximum flowrate and velocity of pump station with pumps running, maximum differential discharge head and pressure and the temperature increase in system due to pumps.
- Created a Process Flow Diagram and a Process and Instrumentation Diagram.
- Added valve and pipe supports.
- Added air pressure system to cleanout pipeline.
- Performed a FEA analysis on design.
- Determined crating and shipping instructions for model.
- Created a scale downed model of pump station with 3D printed components.

Outcomes
With this design, Siemens will be able to showcase change control and optimization algorithms and compare results to high-resolution simulation results and ship the scale model throughout the country.