Pump Station Simulation and Optimization – Optimization

Overview
Much energy is required to transport crude oil over long distances. Annually, these costs are in the millions of dollars. Current methods operate pumps inefficiently. Best-efficiency selection of pumps and using variable speed drives to control pump operating points reduces the power required to transport oil and increases overall efficiency.

Objectives
Use Siemens hardware and software to control and optimize a pump station.

Approach
- Create logic diagrams to outline control process of pump station
- Code Step 7 (software) PLC (programmable logic controller) subroutines
- Design HMI (Human Machine Interface) user interface displays
- Integrate and test design with simulation team to ensure functionality
- Use controller to regulate pressure of flow based on incoming fluid properties

Outcomes
- Developed TIA (Totally Integrated Automation) Portal PLC (software) subroutines to control pump valves and pump speed set points
- Combined subroutines into ladder logic to create graphical diagram of underlying software processes
- Designed interactive HMI display for easy user control and monitoring
- Our control solution allows for:
  - Flow and pressure to be regulated through a length of pipeline
  - Scheduled batch changes (changes fluid properties such as viscosity, density, pressure)
  - Additional screens with output of suction and discharge pressure graphs and graphs for pump speeds for time-based evaluation
  - Analyzing pump efficiency values to determine pump assignments and speed for optimization