Team 23: Rebuilding a Nozzle Flow Stand

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Introduction

Goal: Redesign a machine to test the quality of nozzles used for aerospace fuel injection.

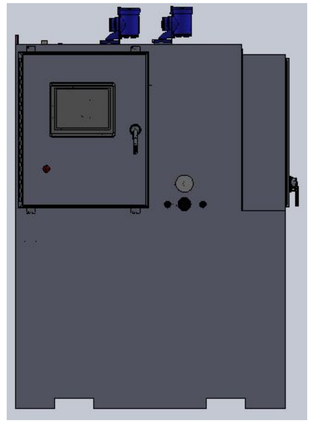
Testing Parameters:

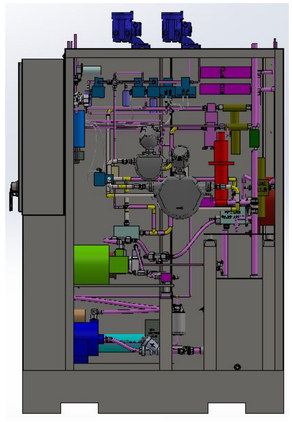
1. Temperature of Test Fluid
2. Pressure of Test Fluid into Nozzle
3. Flow Rate of Test Fluid into Nozzle
4. Spray Quality of Nozzle (Angle Measurement)

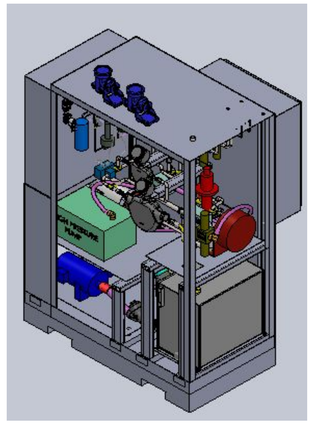
Specifications

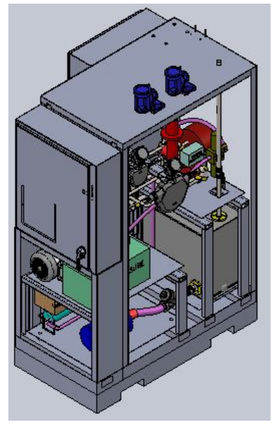
1. Decrease footprint of the machine.
2. Reorganize layout to increase ease of maintenance. This includes
   a. Improving ease of access to routinely accessed equipment such as RTDs and filters.
   b. Proper labeling of equipment.
   c. Complete mechanical, hydraulic, pneumatic, and electrical schematics.
3. Integration of a PLC and HMI with machine controls and measurement devices.
4. Complete redesign of electrical panel with new components.
5. Adhere to NFPA 79 Electrical Standard for Industrial Machinery.
6. Temperature of Test Fluid is maintained between 78℉ an 82℉.
7. Pressure of Test Fluid can be controlled between 0-1000 psi.
8. Flow Rate of Tesst Fluid can be controlled between 0-3500 lbs/hr.

Design





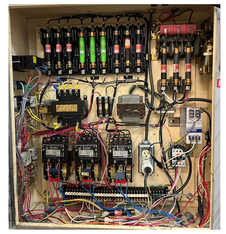


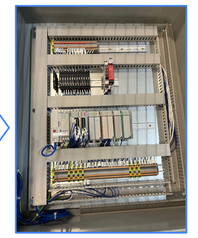


A design was constructed to minimize the footprint of the machine while also allowing for easy maintenance.All components used were to meet the requirements of temperature, pressure, and flow rate.

Results

Electric Panel





Cabinet

Front Panel

Acknowledgments

Woodward's Paul Armes was an essential part of understanding how the test stand functioned and assembling the redesigned test stand.