



Oxygen Enrichment System for Copper Refining Process

Project Sponsor: SDI LaFarga LLC, New Haven, IN

By Blake Herb, ECET 491 Senior Design Project II, May 5, 2017

Faculty Advisor: Gary Steffen and Paul Lin, <http://www.etcs.ipfw.edu/~lin>

Department of Computer, Electrical and Information Technology

College of Engineering, Technology and Computer Science

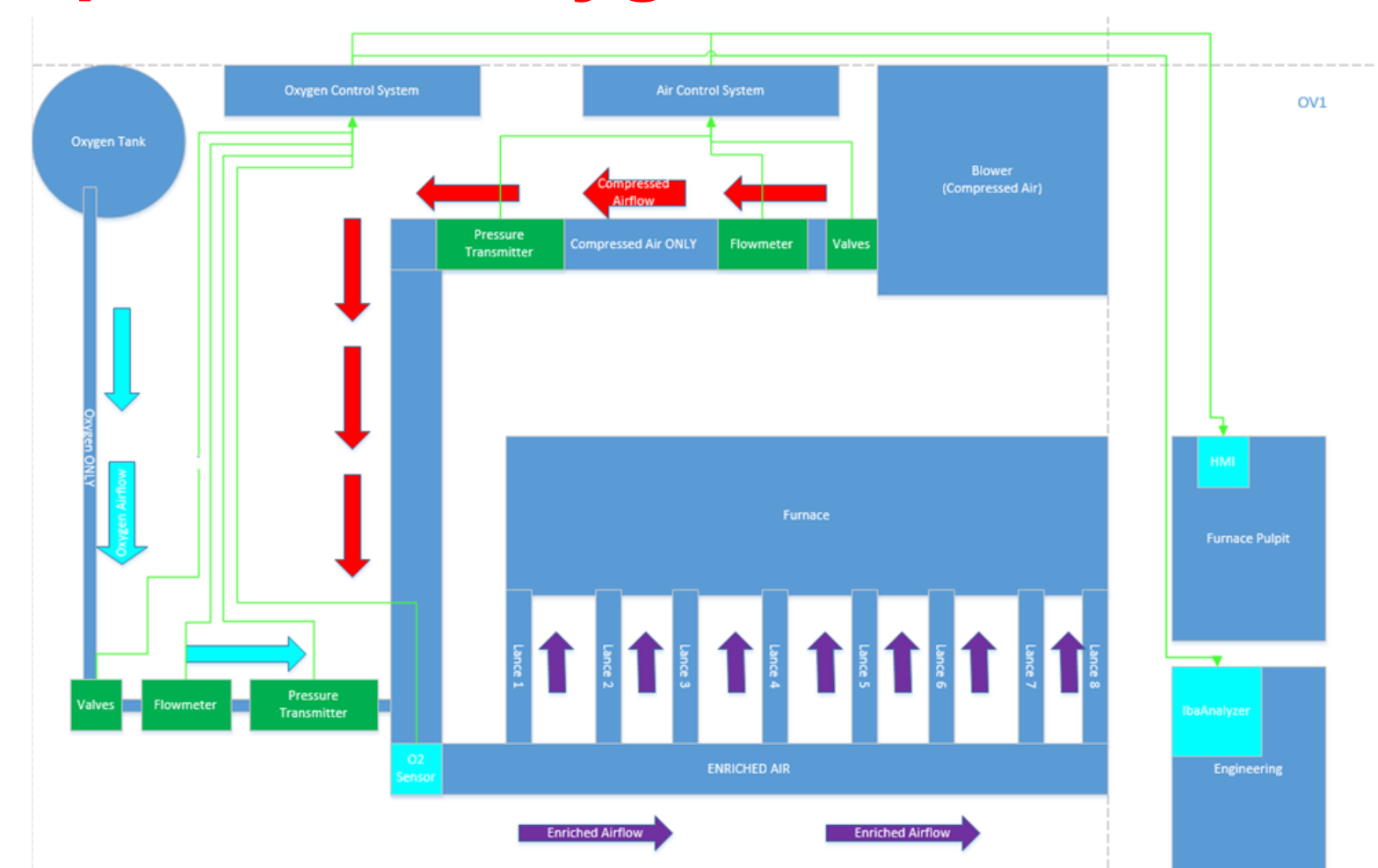
Abstract

A PLC-based Oxygen enrichment system to improve process efficiency of a copper refining facility was designed and tested. Major components of the system include a PLC, and flowmeter, pressure transmitter, oxygen sensor, solenoid valves, and control valves.

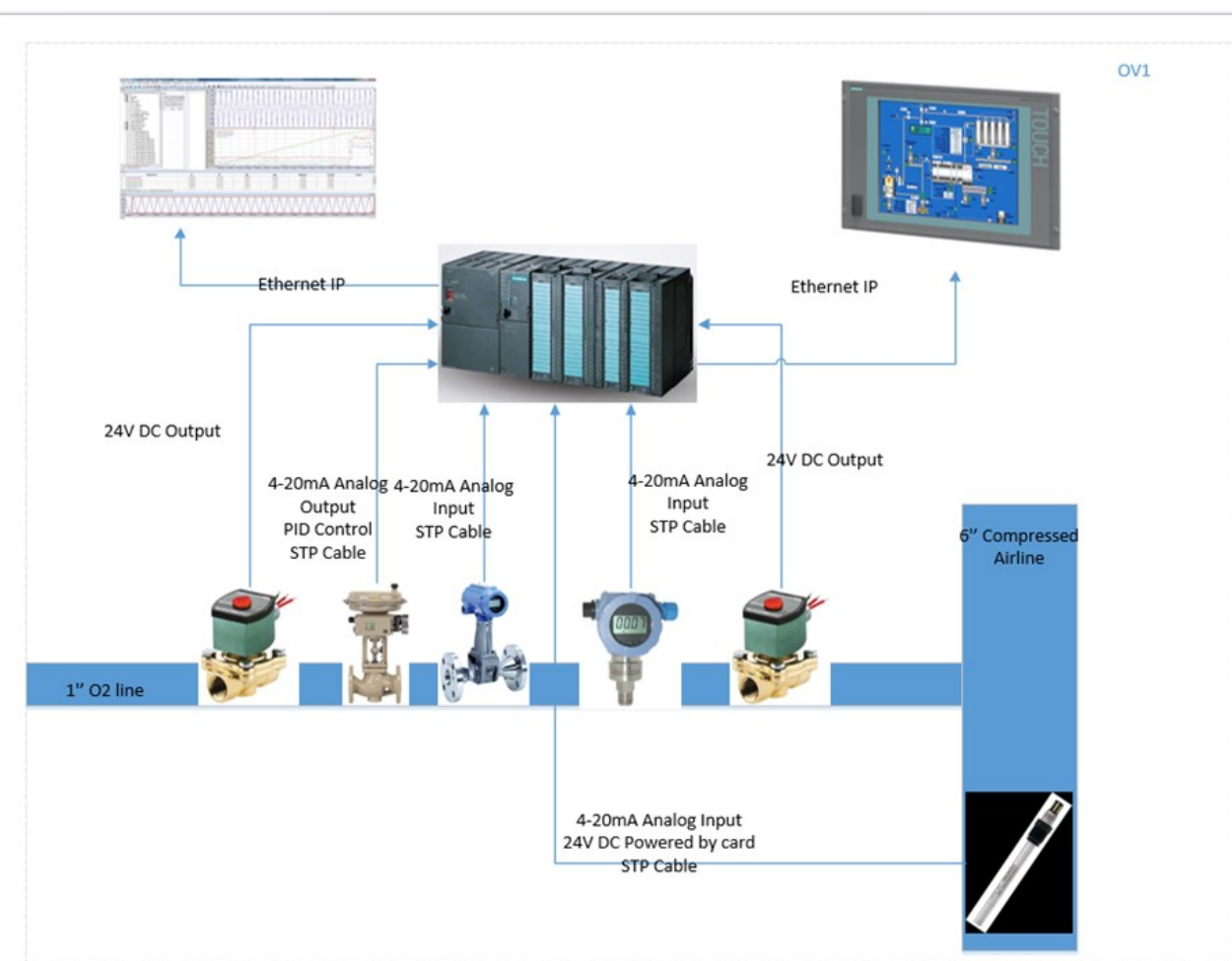
Purpose

The primary goal of oxygen enrichment project is to design, construct, test, and finally automate the enrichment system to provide a regulated amount of oxygen gas into the compressed air system for copper refining process. This system will maintain a percentage of 30% in the compressed air at all times and allow maximum efficiency during the oxidation period of the refining phase.

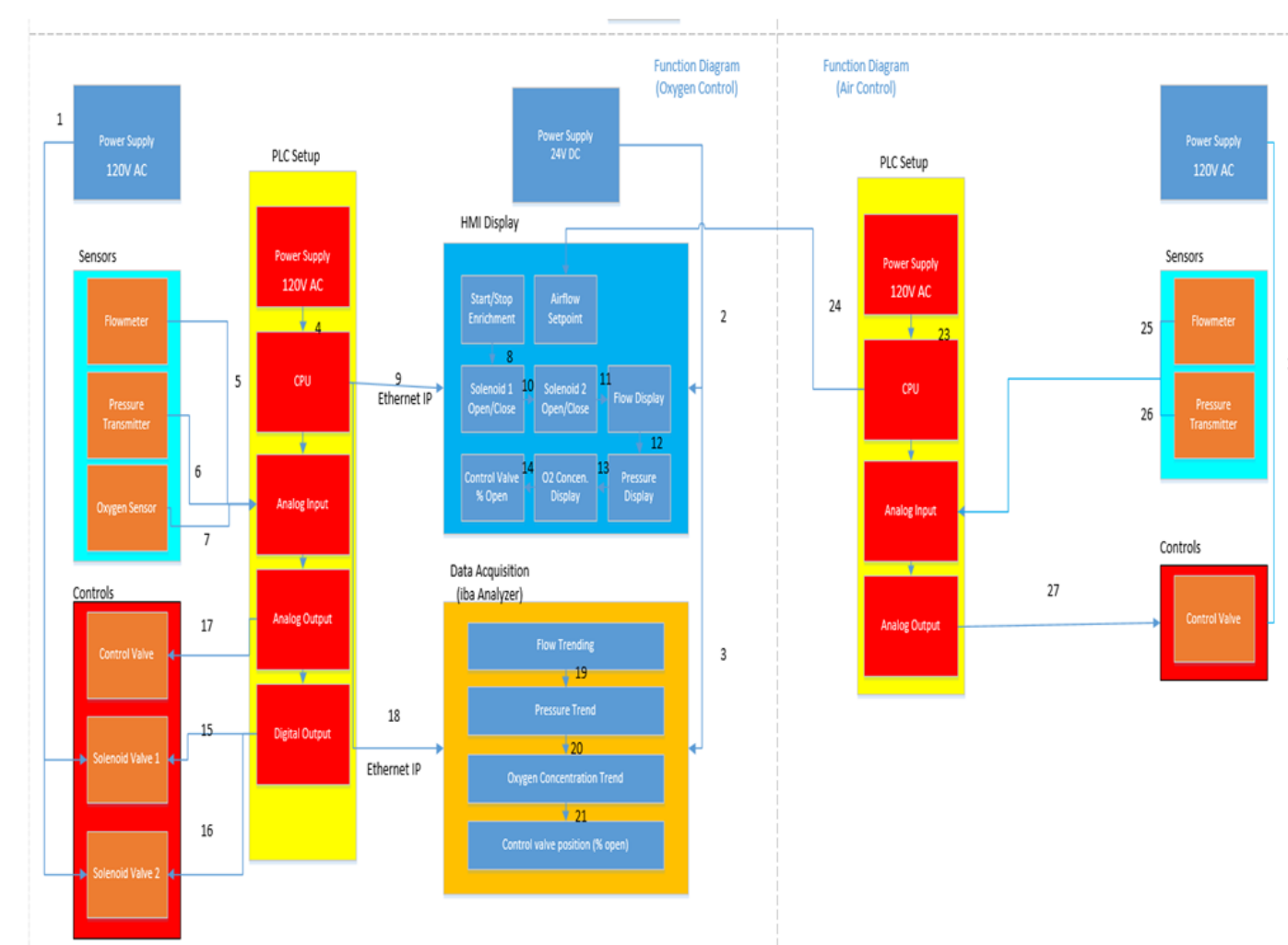
Theory of Operation: Oxygen Enrichment Process



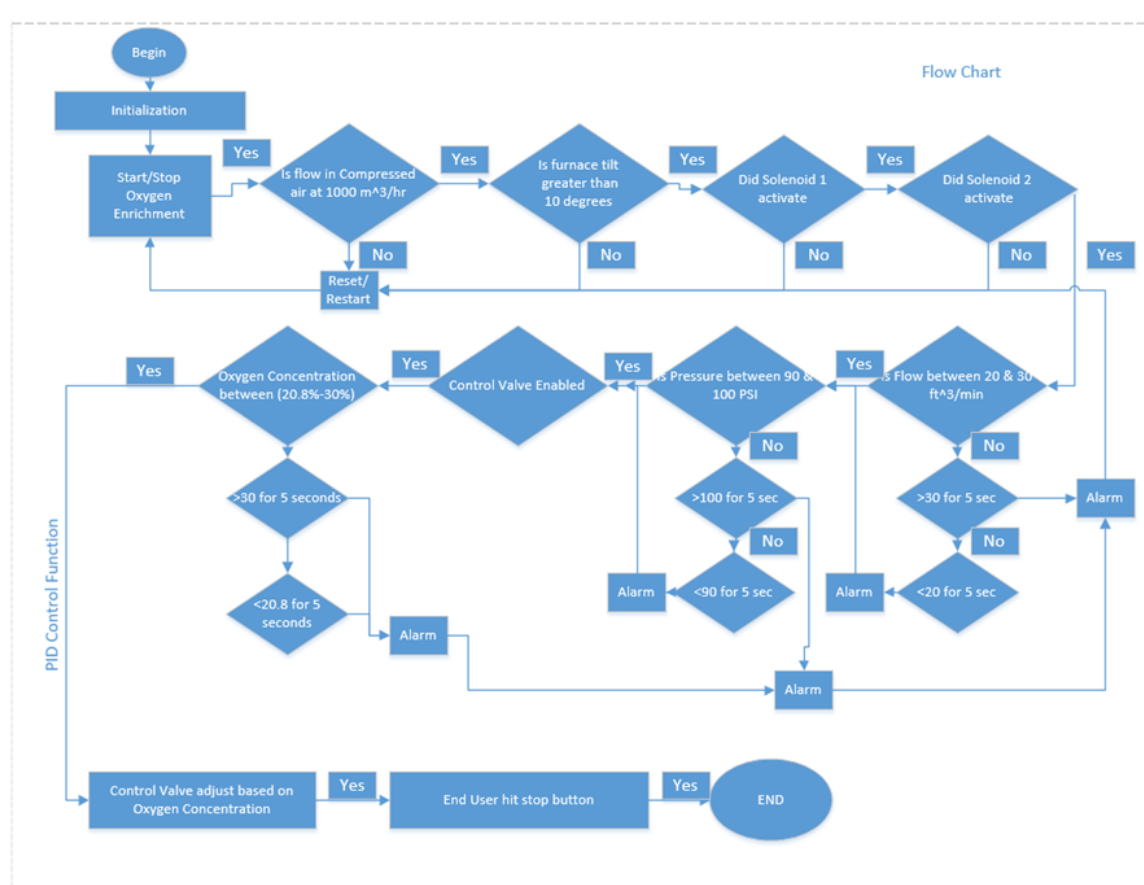
Design for Automated Oxygen Enrichment Process



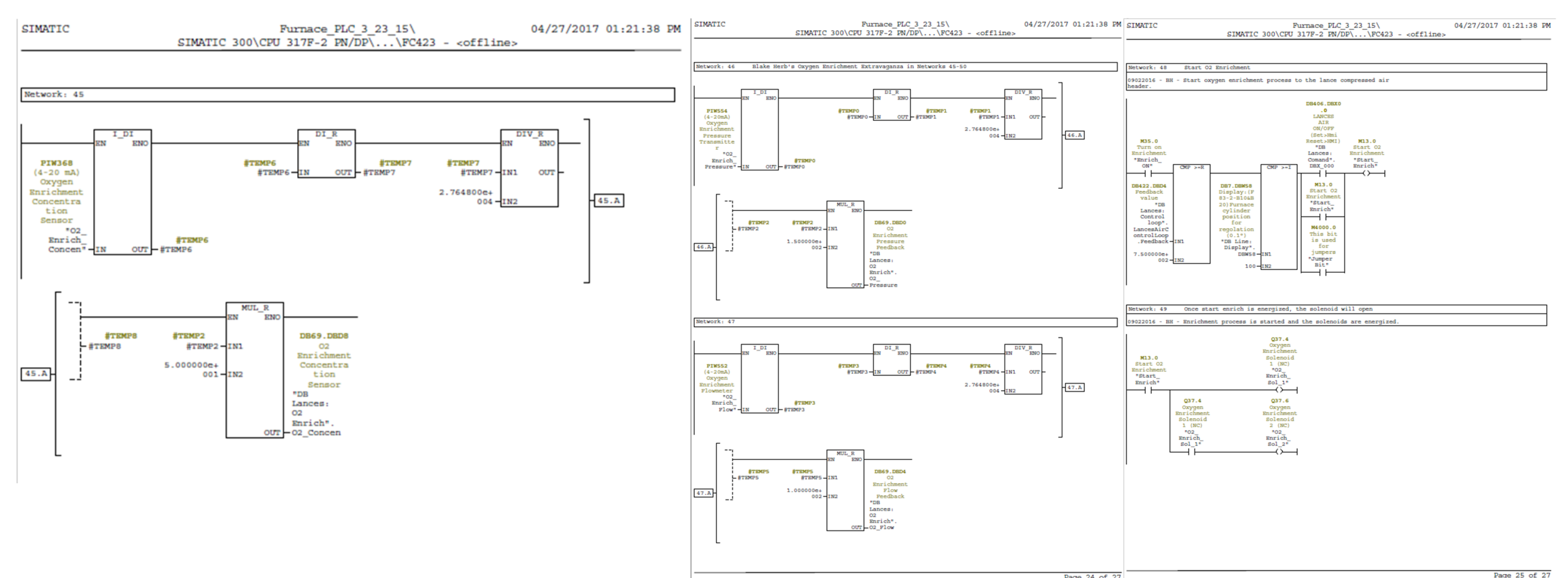
System Function Diagram



System Flow Chart



PLC Ladder Logic Diagram



Conclusion

Overall the system is operational. For manual oxygen enrichment operation, a restrictor plate with a 3/4" diameter hole was put in to keep the oxygen gas regulated with a fixed amount flowing into the compressed airline. A sample was then taken at the pressure release valves of the lances. An oxygen analyzing device was used and showed a 27% oxygen level, therefore enrichment is still taking place. The oxygen sensor for automated design is not functional and is currently being install.