Tech Expo, Spring 2026 – Team 3

PLC Training Station

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Cummins

Problem Statement

This standardized, modular training workbench accelerates workforce readiness at Cummins by providing a dedicated, hands-on platform that directly equips new technicians with practical industrial controls experience. By enabling transitioning employees to practice safely on an offline system, the station bridges the industrial skills gap. Ultimately, this solution strengthens overall employee competency, streamlines the onboarding process, and effectively prevents costly live production downtime for the company.

Customer Background

Cummins is a global power leader that designs, manufactures, and distributes engines, filtration, and power generation products. Founded in 1919, the company is a major producer of diesel and natural gas engines for trucks, construction, mining, and marine industries, alongside producing hydrogen engines and zero-emissions solutions.

Requirements

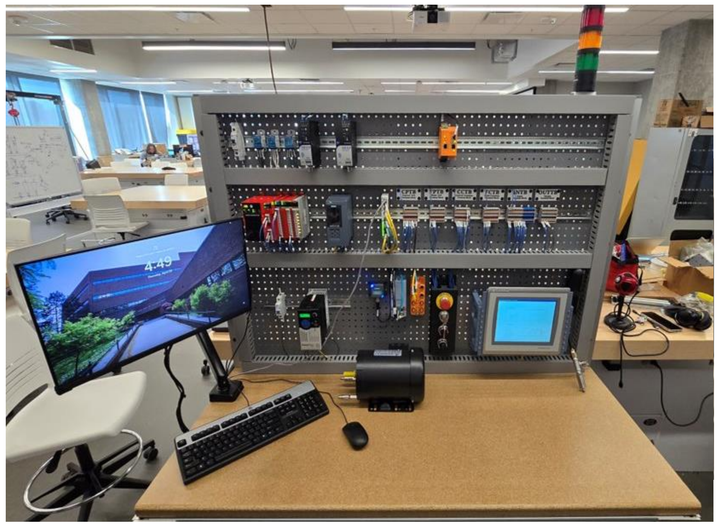
- Develop a portable, modular training station
- Provide a safe learning environment to reduce risks associated with on-the-job training
- Include IO-Link devices and hubs.
- Utilize both Siemens and Allen-Bradley PLCs, and incorporate HMIs.
- Implement smart sensors.
- Operate the Training station with 120 V
- Create a comprehensive training manual that incorporates practice problems, step-by-step solutions, visual aids, and detailed wiring diagrams.
- Incorporate user-interactive I/O.

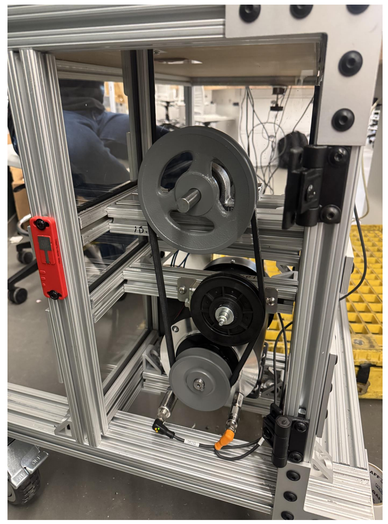
Experimentation and Concepts

- Verified discrete I/O functionality by wiring and testing push-button inputs and indicator light outputs.
- Validated the operational response and signal accuracy of the temperature, pressure, and vibration sensors.
- Confirmed Human-Machine Interface (HMI) communication and interface performance.
- Executed functional testing of the Variable Frequency Drive (VFD) and motor assembly to ensure proper operation.

Final Design

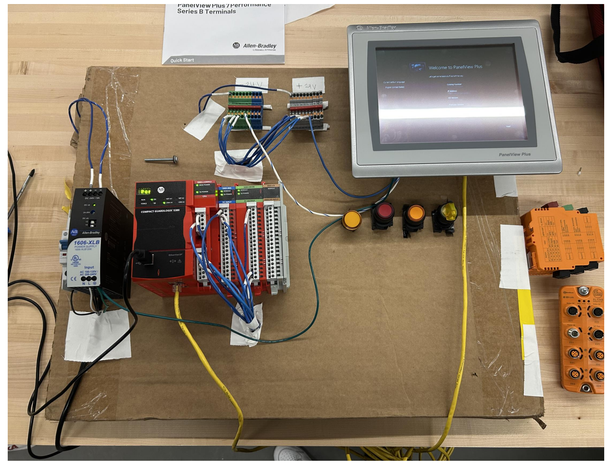
- **Size**: Workbench-sized (approx. 2.5'x5'), **portable** with casters, workbench for computer
- **Training:** PLC programming and physical wiring
- **Safety**: Includes E-stop, Door interlock, Light Curtain, 10A circuit breaker
- **Wiring**: 16AWG wire. Solid blue for +24V, blue/white stripe for Neutral
- **Power**: Operates on a 120V (15-20 Amp) power source. +24V throughout circuit
- **Future Expansion**: IO-Link Master allows for more sensors, extra space on backplate for other components
- **Capacity**: Accommodates **1-2 users** simultaneously
- **Sensors:** Pressure, Vibration, Accelerometer, Temperature, photoelectric, and proximity
- **Motor – Pulley System**: A safe and enclosed motor pulley system

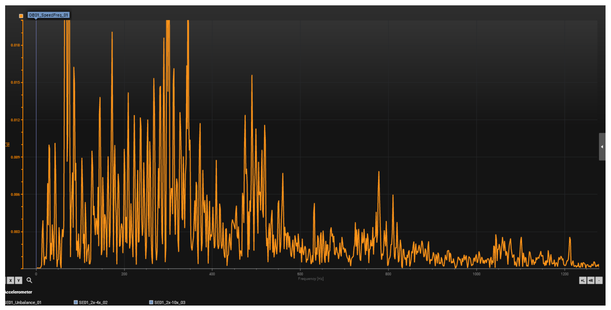




Testing and Results

Electrical testing for the Manufacturing Controls Development & Training Station is broken down into two phases: individual hardware components and software integration. Hardware testing was completed using visual inspections and a multimeter. Major components—including the circuit breaker, 24V power supplies, Allen-Bradley and Siemens PLCs, stack lights, Ethernet switch, IO-Link hub, and HMI. With the individual hardware mostly verified, the next steps were to fully assemble the system to test the software integrated with the components(Studio5000 and FactoryTalk View).





Components Testing