

Virtual Conveyor System Simulation - Austin Shelton

Project Overview

Modern manufacturing relies heavily on conveyor systems for efficient product movement.

However, physical testing and operator training can be expensive and risky.

This project proposes a **fully virtual conveyor system** that allows users to:

- Safely control conveyors through virtual control stations
- Monitor operations using a real-time HMI
- Simulate complex conveyor interactions
- Synchronize multiple applications to achieve full system integration

Project Objectives

The virtual conveyor system will enable:

- Safe and cost-effective testing
- Real-time system monitoring
- Operator training in a simulated environment
- Integration of PLC logic, simulation, and HMI platforms

Key Features

1. PLC-Based Conveyor Control

- Develop ladder logic % structuredText using Studio 5000
- Control motors, sensors, and safety interlocks
- Ensure proper sequencing of conveyor operations

2. Conveyor Emulation

- Model the conveyor system in Emulate3D
- Simulate motors, sensors, and material flow
- Synchronize simulation with PLC ladder logic

3. Virtual Control Stations

Key Features (4–6)

4. Real-Time HMI Dashboard

- Design an Ignition-based HMI
- Display motor status, sensor values, and alarms
- Provide a visual system overview

5. Conveyor Sequencing

- Implement multiple conveyor lines and junctions
- Automate product routing between conveyors
- Validate sequencing logic using Emulate3D simulation

6. Emergency Stop & Safety Logic

Key Features (7–9)

7. System Integration

- Synchronize PLC logic, Emulate3D, FactoryTalk, and Ignition
- Ensure real-time communication across platforms
- Test system reliability under different scenarios

8. Documentation & Reporting

- Maintain full project documentation
- Include PLC logic diagrams and HMI screenshots
- Prepare presentation and demo materials

Development Roadmap

The project will be completed over two main sprints:

- Sprint 1: Core system functionality
- Sprint 2: Advanced logic, safety, and full integration

Sprint 1 Deliverables

PLC Ladder Logic

- Implement basic start/stop control
- Configure motor and sensor logic
- Define I/O addresses for integration

Emulate3D Conveyor Model

- Build an initial 3D conveyor system
- Connect motors and sensors to PLC I/O
- Run initial simulations

Virtual Control Stations

Sprint 2 Deliverables

Conveyor Sequencing

- Implement multi-line routing logic
- Test automated product flow

Emergency Stop & Safety Logic

- Add E-stop buttons and safety interlocks
- Integrate alarms into HMI
- Verify fault response behavior

User Interaction Enhancements

- Enable switching between control stations

Final Phase

Testing, Documentation & Polishing

- Perform full system testing
- Fix bugs and optimize performance
- Prepare:
 - Technical documentation
 - Diagrams and screenshots
 - Final demo and presentation materials

Questions?

Thank you for your time!