Migrating a New Batch Control System

Overview

Avanceon's customer tasked us with helping to design and build both an enhanced solvent system and a more efficient batching process for their roofing adhesive product. Avanceon engineers designed an integrated system to run the SCADA (Supervisory Control and Data Acquisition) process, control the product batching system, run the product recipe, and manage the throughput of solvent deliveries.

The Challenge

The customer project required rebuilding a legacy system with extended functionality while ensuring continuity throughout the batch control process. All aspects of the system needed to work in unison from the system operator's perspective.

However, working with a system that has multiple purposes can become difficult for engineers and operators alike. In view of that, the customer requested we rebuild the entire system from scratch rather than modify the existing batch system.

Analysis

Learning the complex legacy system and then recreating it with new functionality was a significant challenge, especially considering the project's aggressive timeline. Upon analyzing the situation, we determined to create process diagrams and tables to show the customer our thought processes before we began actual development -- these helped us thoroughly understand customer requirements and objectives.

We also determined we would present our proposed PLC modifications to the customer by developing phase transition tables showing how our proposed batch system would work. These would allow the customer to ensure all the system's batch components would function as intended. We also worked together with the customer to set the HMI standards we used to design the new system.

Given the project's complexity and the time available, Avanceon decided to split the work between two engineers so that the PLC and HMI perspectives could be worked on simultaneously before meshing the two together.

The Avanceon Solution

As the customer had no system such as InBatch in place, Avanceon created the new batch system logic using Wonderware System Platform's scripting capability. Using System Platform to implement a batching system reduces costs and gives the customer the ability to control the batch process directly from the HMI – the objects we used in the Platform could communicate with the HMI graphics and the SQL database and led to a significantly improved interface.

Some of the key components that went into the new system include:

- Batch Tracking: Across all HMI screens, operators can now see the batch currently running and batches that previously ran.

- Compound weighing: The customer wanted the ability to pre-weigh compound ingredients into small plastic vessels for later addition into the mixers. The new solution lists possible ingredients and prompts the operator to weigh them and accept the weights based on pre-defined tolerances. After the system stores all data associated with the vessel, the ingredients can be added to the batch process when needed, alleviating downtime. This is a vast improvement over the old manual system, which provided no data logging.

- Batch Recording: By using an SQL transaction manager, the new system allows batch data to be uploaded from the PLC to a database for storage and application. In case of defects, the customer can now go back through the database to see what went wrong and troubleshoot the process using previously collected data.

- Recipe builder: Avanceon modified the recipe creation infrastructure to allow separate tracks for creating and editing recipes. Avanceon also provided a final checksum to verify that all recipe builder process steps completed correctly, an impossible task in the legacy system.

- Solvent delivery: By using logic from the PLC and interfacing it with the HMI touchscreen, we allowed the system to simultaneously deliver any solvent to any receiving vessels across the system. We also provided new functionality for queuing both manual and automatic requests for a given solvent.

Before completing the project, the Avanceon team provided the customer with validation of approved SAT and FAT documents and presented thorough system demonstrations and complete operator training prior to go-live.

Project Team

As mentioned earlier, while working on both the PLC and new HMI objects with the same personnel might have been ideal, time limitations prevented us from doing so. Our division of the work allowed us to complete the project successfully in time for the customer's go-live date. The customer's engineering

manager, who oversaw the batching system's development and ensured the validity of the overall concept and the initial plan of action, played a critical part in the team's success.

Conclusion

The new system eliminates defects and vastly improves the quality and efficiency of the batching process – it takes less time to create the product, and the product is created with far fewer defects. In addition, the new compound-weighing functionality reduces the plant's downtime, as vessels can now be created while the current batch runs – it is no longer necessary to wait for it to be finished. And the entire system now provides more comprehensive data, which improves overall efficiency. The newly integrated system is faster, more stable, and more reliable.