



CASE STUDY ABSTRACT: E2i helped a local company with the revision of the control systems on 20 identical plastic molding machines. Revisions included wiring of all primary I/O's to a single HMI screen, integrated 3-axis servo control, and recipe storage, rendering, and user configuration abilities. Revisions resulted in increased productivity, highly reduced operator configuration time, and a remarkable project ROI.

PROBLEM STATEMENT:

E2i was tasked with assisting a local packaging company in expediting and optimizing their Kirkhof plastic molding machinery. The system utilizes heat and pressure to press plastic into containers of different size and shape parameters. Container parameters are controlled via alterations in accordance to specific machine "recipes." Specifically, E2i was in charge of remodeling the current relay-based control system to a faster and more efficient PLC control system which incorporated a PanelView Plus touchscreen. The new system would include pre-stored recipe specifications for faster configuration time.

SOLUTIONS:

Recipe storage was previously impossible in the relay-based control system, forcing system operators to manually set all pressure, temperature, position, and other miscellaneous controls for each molding sequence. This was a significantly time consuming task given the extensive number of parameters for each molding recipe.

Thus, integration of a PLC-based recipe storage system was a highly efficient means of reducing operator configuration time.

The PanelView Plus HMI uploaded recipe specification from the PLC to populate the screen with appropriate, recipe-based setpoints. Recipe specifications were then automatically integrated with machine sequencing for effortless container molding changes.

This system almost entirely automated a system that previously required full manual direction.

All maintenance controls, alarms, pressure and temperature setpoints, and position parameters could also be accessed and changed from the HMI depending on user security clearance level. Parameters could be adjusted for a given recipe with this method, and new recipes could be configured and saved as presets to be uploaded for later use. This not only significantly reduced configuration time but worked to unclutter and simplify control inputs and system indicator outputs.

One major issue encountered by the E2i team during implementation was space conservation. The team was in charge of accounting for all I/O's including the central vacuum and exhaust system, power distribution, heat sinks, pressure and temperature sensors, air flow controls/gages, servo motors, alarms, and recipe

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Figure 05287



Figure 05294

downloading and history. With such a demanding I/O count, placing all components neatly within a single control board became a working challenge. As can be seen in figure 05287 & 05294, final system revisions were evidence of the team's determination to make spatial organization and optimization a top priority.

Motion control was also a significantly difficult component of the project, given the heavy weight of the machine and the high amount of precision required by all motors to correctly follow recipe specifications. E2i implemented motion control via a ControlLogix PLC linked to the Ultra 3000 SERCOS servo drive. This device allowed integration of precise, 3-axis servo control. All motion was directed via input through the PanelView Plus. Each recipe specified machine positions and indexing which could be adjusted through the HMI and communicated to the servo motors.

Throughout the course of development, E2i optimized the design process to manufacture control panels for 20 identical Kirkhof machines. These machines did notably well in execution with a payoff period of roughly one year, resulting in a remarkably high return of investment. The E2i team accomplished its overall goal of minimizing working time and effort and consequently increasing client productivity.