



ProcessLogix Provides Barrel Temperature Control, Automates Machine Start-Up, Shutdown, and Product Transitions

Coherent Technologies, Inc., an Authorized Rockwell Automation Application Solution Provider, improves extruder operation with Process Logix

Application Profile

Industry Overview

Plastic manufacturers rely on the extruder as the workhorse for their product densification, compounding, blending and coloring operations, with the resulting product taking the form of sheet, film or pellets to be sold to the end-product manufacturer. High quality and maximum throughput are prime objectives and both are significantly affected by the operation of the extruder. Moreover, blend properties, ratios, grades, colors and melt flow indexes must be frequently changed in some operations. Such transitions between products on a given extruder must be quick and reliable to minimize off-grade product and downtime between grades.

Specific Application Problem

Product properties affected by the operation of the extruder are product dimension, molecular orientation and crystalline structure. Control adjustments on the extruder which affect these characteristics are barrel, screw and die temperatures, die opening and screw speed. Adjustments to the feed of the extruder such as feed zone temperature preheat temperature and extruder fill rate also have an impact. These controls are highly interactive and affect product throughput as well as quality. The controls on such a system must be able to respond to changes in feed material composition and grade, wear on the extruder, and ambient conditions. And it is desirable in some cases to automate startups, shutdowns and product transitions to minimize waste.

The Previous Control System

Barrel temperature control has most often been accomplished by on-off control of power to the electric heater and on-off control of cooling water on the barrel or screw. This produces a response, which never achieves setpoint, but rather oscillates around it. This and other control loops have been handled with single-loop controllers, manually adjusted in the field. Startup, shutdown and transition adjustments have also been a manual operation.

Potential Solutions

Rockwell Automation's ProcessLogix control system provides the control algorithms needed for PID control of barrel temperature, as well as the other extruder control loops. In addition, it provides an easy to use tool for building the logic required for control of the sequences of operations (Sequence Control Modules) required for automation of startups, shutdowns and transitions.

Simple models can be built with the ProcessLogix function blocks within control modules for feed-forward control to aid with product transitions or other known or planned disturbances to the extruder operation.



Bringing Together Leading Brands in Industrial Automation

To achieve total extruder control, interaction between control loops and nonlinearities in the process can be handled with multivariable adaptive controllers running on the ProcessLogix server and incorporated in the control scheme through the API on the ProcessLogix server.

Specific Architecture

The system consists of a ProcessLogix Server which maintains the operator interface, global database, and all reports and system messages. Adding workstations is simple, involving the addition of another PC on an Ethernet link interfaced to the system server, which supplies client software to the new workstation. Redundant servers are available for critical process units.

A single 1757 controller communicates to the server via ControlNet. Redundant cabling and redundant CPUs can be incorporated for critical processes. The I/O modules are located on the same rack as the controller. The controller takes the space of a dual wide module on the system.

Integrator-Specific Expertise

Coherent Technologies Inc. is a Rockwell Applications Solution Provider, with experience implementing extruder controls on DCS platforms.

Anticipated Results of the New System

The ProcessLogix system can achieve tighter control of the barrel temperature through PID control than can be achieved with the traditional on-off control schemes.

The ProcessLogix control system can be programmed to respond to anticipated changes in the extrusion process, permitting the system

to accommodate changes in weather, feed rates or feed compositions.

The ProcessLogix system can be easily programmed to automate sequence of operations associated with the extruder, such as startup, shutdowns and product transitions, helping to minimize product waste and downtime.

The ProcessLogix system provides the ease and convenience afforded by its Windows NT based operating system while providing the ruggedness and reliability of a PLC controller. Operators have access to recipes through graphics provided on the Windows NT operator station. Engineers can easily modify or add to the controls configuration through the Control Builder software running on an NT server and download it to the 1757 controller.

The ProcessLogix controller's equipment chassis has a footprint the size of a traditional MMI/PLC system, considerably smaller than that of a DCS system. The 1757 PLX-52 controller occupies two slots in a standard Allen-Bradley ControlLogix equipment chassis.

Coherent Technologies Inc. - Rockwell Applications Solution Provider

CTI specializes in control systems integration for the process industries. Incorporated in 1985, Coherent Technologies, Inc. is an engineering consulting firm specializing in the design and configuration of control and enterprise-wide information systems for industrial facilities. Coherent's engineers have worked for operating companies and have extensive experience in automation projects, process operations and

system configuration. Coherent offers a complete range of services including project scope development and justification, engineering, project and installation management, commissioning (start-up and hot cut-overs) and system documentation. CTI services our worldwide customers from our headquarters in Houston, Texas.

The mission of the Control Systems Engineering (CSE) group at Coherent is to provide a comprehensive controls solution including control design, automation design and configuration services. We focus on the end user approach, highly flexible and proficient in all aspects of an automation project.

Rockwell Automation

Rockwell Automation/Allen-Bradley has developed and marketed a variety of process control products and services. Beginning with the introduction of analog I/O in the mid-1970's, Rockwell's controllers have been enhanced over time with the introduction of industrial networking, expanded instruction sets for PLC controllers, improved MMI packages, and process-oriented software packages for the family of PLC 5 products.

Today, Rockwell Automation/Allen-Bradley plays an even more important role in the process control industry. The seamless integration of PLC functions with ProcessLogix's DCS functionality provides a hybrid solution that offers the best of sequential control, the most advanced continuous process control, information management, and connectivity to the enterprise management systems. The solutions are not only cost effective, but also easy to implement and use.

Reach us now at www.rockwellautomation.com

Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software. Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors and system integrators around the world.

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