Major Plastics Manufacturer Increases Production and Reduces Operator Workload through Advanced Process Control (APC)

A European manufacturer of high-value engineering plastics needed to boost its production rate to meet increased demand for Bisphenol A (BPA), a key intermediate, and the final product, a high-value polycarbonate resin. Although there were no immediate plans to install new equipment, and all other debottlenecking steps had already been performed, the manufacturer had to find a way to maximize its production of BPA.

Main Objective

The client required a set of APCs to increase production in the BPA unit, which consisted of several important, complex process operations. To complete the project, constraints in each part of the process had to be identified, and throughput had to be pushed against the most constraining limitation while maintaining overall unit stability. The customer-preferred solution was to use model predictive control (MPC) technology.

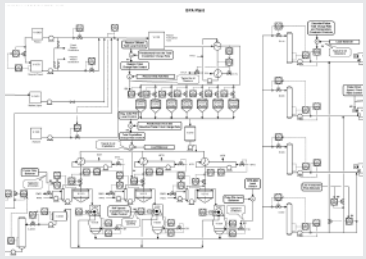
Customer Results

An internal, post-project audit identified a BPA production rate increase of 7 percent. In addition, the manufacturer's raw material usage decreased, and operator workload dropped by 50 percent. The project won a company award for one of the best productivity improvement projects for the year in which it was implemented.

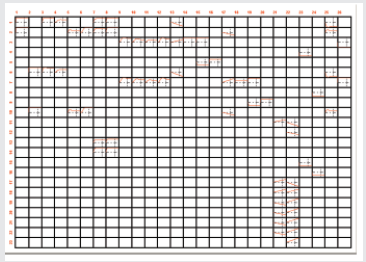
Application Description

- APC Analysis: MAVERICK APC engineers worked with the customer to identify the variables that should be included in the scope of the controller design. MAVERICK also recommended inclusion of an important composition variable. Since this variable was not measured directly by the control system and only by lab analysis, MAVERICK suggested the development of an inferred property, also known as a soft sensor. This is a correlation developed from process and lab data that can be used as a good estimate of the composition in real-time, closed-loop control applications.
- APC Design and Implementation: A preliminary plant step test solidified the MPC controller design:
  - A total of 12 manipulated variables (MVs) to control 24 control variables (CVs)
  - A subcontroller to handle the inferred property variable

  Then plant operations and control personnel conducted a formal plant test. MAVERICK analyzed the test data, developed the controller models and simulated the controller to establish initial tuning constants. After the customer installed the controllers, MAVERICK commissioned them and provided final project documentation.
- Control Platform: The MPCs were implemented using AspenTech's DMCplus™ software. A Fisher PROVOX distributed control system (DCS) provided the control platform. Operating displays for the controllers were also built on this DCS.



Control Strategy Diagram



APC BPA Main Loop

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CL030 | 07/08