Manufacturer of Specialty Engineering Plastics Improves Process Yields through Advanced Process Control (APC)

A major plastics manufacturer was producing multiple grades of plastic on the same production lines and needed a more efficient method of transitioning from one grade to another. The company's existing manual transition process was slow and inconsistent, and resulted in wastage and downgrading of valuable product.

Main Objective

The client required a set of automation tools, or advanced process controls, to standardize and speed the transition process, thereby reducing yield losses. The old manual transition process had proven ineffective because process operators followed the transition guidelines with varying degrees of success, as measured by how much time was required to get "on spec" with the next grade of plastic. During each transition, operators had to change the operating conditions for several production lines, which included processes such as formulation, reaction, purification and extrusion.

Customer Results

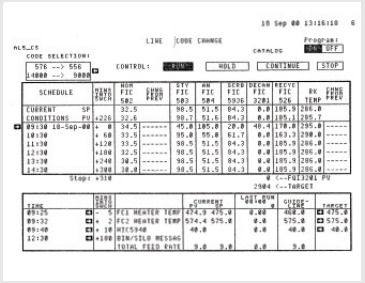
A post-project audit revealed a reduction in yield losses of 25 percent (from a long-term annual average of 2 percent to a post-project loss of 1.5 percent). The improvement resulted in a recurring annual savings of approximately $300,000. The total investment in the APC design and engineering services to achieve this result was $170,000 — yielding a payback period of just more than six months. The controls were commissioned in 2000 and are still in use in 2008.

Application Description

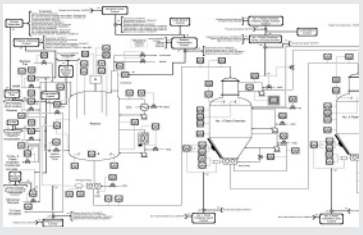
- **Analysis and Control Platform:** MAVERICK APC engineers determined that a set of hierarchically designed APCs would best meet the long-term needs of the client. In other words, the set of APCs was built from the bottom up so that the highest-level controls adjust the lower-level controls, which ultimately adjust the setpoints of the basic DCS PID controllers. In this case, the highest-level controls were the grade transition controls — those that smoothly adjust many important process variables during the transition and therefore minimize the transition time.

- **APC Design and Implementation:** Lower-level controls were implemented in order to stabilize and smoothly adjust important variables, such as the flow rates for all feed materials fed to the formulation areas, the reactor temperatures and the purification section temperatures. These lower-level controls were utilized 24 hours a day, while the grade transition controls were designed to be active only during the transitions.

  The process operator was provided with a separate display for each of 15 or 20 different transitions. The timing and magnitude of the ramping of each process variable were unique for each transition. The operator had the ability to change any of the targets and times for any of the variables at his final discretion. The operator activated the transition with only two or three screen touches, and then the entire transition process took place in fully automated fashion. The operator could intervene at any time, pausing or stopping the transition process.



Stock Switch



Process Control Diagram

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CL030 | 07/08