

# Covestro Increases Efficiency of Polyester Production Using Advanced Process Control

## RESULTS

- 1% throughput increase
- Water consumption reduced
- 2-3 days a year of unplanned downtime eliminated
- Energy efficiency increased



## APPLICATION

Control esterification process using DeltaV™ PredictPro

## CUSTOMER

Covestro – Barcelona, Spain

Covestro is a world-leading producer of high-tech polymer materials, including polyester for use in resins.

## CHALLENGE

Covestro produces polyester from its facility in Barcelona, which is sold as solid flakes to plastics manufacturers. The plant utilizes four reactors to produce polyester by esterification of different polyols and carboxylic acids. The process operates in batches. Steam, produced as a subproduct and later condensed, drags part of the unreacted glycol with it into a rectifying column. To extract the glycol, the steam is rectified using the condensed water.

Determining the appropriate reflux flow was challenging for process engineers, with several variables involved including the temperature and pressure in the reactor, as well as temperatures in the rectifying column. It is important to maintain the appropriate level of glycol in the column while minimizing the amount of water used. Should the overhead level exceed parameters, glycol leaves from the top of the rectification column, which causes plugging of the downstream overhead condenser. The gradual build-up is not something that can be monitored. When the condenser becomes completely plugged, this causes an unplanned outage required to perform maintenance, with a loss of production availability during that period. Covestro wanted to improve the control of the entire batch process to maximize efficiency, ensure product quality, reduce the amount of reflux water used, and prevent glycol from moving up the column and causing downstream damage. Covestro attempted to make improvements by adjusting the batch recipe and adapting regulatory control. However, because of the many multi variables involved, this was difficult and results were unsatisfactory.

*“The model predictive control from Emerson is a tailored solution that provides the optimal control profile for our batch process.”*

**Adrian Belda**  
Manufacturing Engineer  
Covestro

### SOLUTION

Covestro approached Emerson to find a solution and its consultants determined that an advanced process control solution would enable the company to meet its objectives. Emerson's DeltaV PredictPro multivariable, model predictive control (MPC) and optimization software module was implemented. Typically, multivariable control solutions are used to enhance the efficiency of continuous production processes. When applied to a batch process, it usually requires operators to manually deploy the MPC at various points during the batch process and also to define limits. Covestro wanted the MPC to be fully integrated into the batch process control sequences, with the existing DeltaV system controlling all aspects of the MPC. In doing so, this would eliminate the need for operator intervention that could potentially lead to batch variations.

This was the first time that an MPC module had been fully integrated with a DeltaV system operating a batch process. To achieve this, Emerson engineers reprogrammed the batch process configuration to ensure that each sequence operated correctly and seamlessly with the MPC. The batch sequences in the DeltaV system batch defines the limits and performs start and stop operations for the MPC. The MPC utilizes a number of different controlled variables related to temperature and some uncontrolled variables related to pressure.

Since the MPC was deployed, glycol at the top of the column has been minimized and Covestro has reduced the amount of water refluxed. Another major benefit has been a reduction in the reaction duration and overall time to complete a batch. This has increased energy efficiency and will allow more batches to be completed every year, helping to increase throughput by an estimated 1% annually. Operators now intervene only when a specific issue arises, enabling them to perform other value-added tasks. Covestro is now looking at the possibility of replicating the MPC approach to similar reactors and integrating boiler control into the MPC solution, which will provide further opportunities to reduce energy consumption in support of its sustainability goals.

### RESOURCES

#### DeltaV Advanced Control

[www.emerson.com/en-us/automation/control-and-safety-systems/distributed-control-systems-dcs/deltav-distributed-control-system/deltav-advanced-control](http://www.emerson.com/en-us/automation/control-and-safety-systems/distributed-control-systems-dcs/deltav-distributed-control-system/deltav-advanced-control)

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*"MPC provides us with the flexibility to increase process efficiency, while considering process safety conditions and guaranteeing product quality."*

**Óscar Montalban**  
Process Control Engineer  
Covestro