

## Basell Optimizes Ethylene Plant with Honeywell MPC and RTO



“MPC and RTO significantly improved the quality of control in our plant and helped us to operate the plant at the economic optimum.”

Advanced Process Control Technologist, Ethylene Plant 4, Basell

### Benefits

Basell Polyolefins GmbH was looking to optimize operating conditions to maximize profits from its ethylene plant. This was not possible to do with basic regulatory controls since the plant throughput could be limited by different constraints depending upon rates, external conditions, economics and feedstock quality. Basell chose Honeywell to implement a multivariable control solution with integrated dynamic optimization because it offered the most cost-effective and practical approach to solving the problem.

Basell successfully implemented Honeywell Model Predictive Control (MPC) and Real-Time Optimization (RTO) solutions to achieve these key business benefits:

- 3 percent increase in ethylene production.
- Improved quality control on key units as a result of reduced control-variable standard deviation, including a 52 percent reduction in standard deviation of top quality on the PP-Splitter and 58 percent reduction in standard deviation of bottoms quality on the PP-Splitter
- Increased uptime—Basell achieved an Advanced Process Control online time of greater than 90 percent

### Challenges

Basell is the world's largest producer of polypropylene and advanced polyolefins products, a leading supplier of polyethylene and catalysts, and a global leader in the development and licensing of polypropylene and polyethylene processes. Basell, together with its joint ventures, has manufacturing facilities around the world and sells products in more than 120 countries.

Basell owns and operates two ethylene plants in Wesseling, Germany. Basell wanted to maximize profits from its MG4 ethylene plant by optimizing throughput and minimizing losses due to poor quality control. However the plant was both



Basell's ethylene complex in Wesseling, Germany

front-end and back-end constrained throughout the year, and had no online feedstock and furnace effluent analyzers installed. Regulatory controls could not effectively overcome these obstacles so Basell recommended implementing a large-scale advanced process control (APC) and optimization project (later named Schmetterling) to cover the following units:

- Six furnaces
- Quench water tower
- Cracked gas compression
- Deethanizer
- Acetylene converter
- Demethanizer
- Ethylene fractionator
- Ethylene and propylene refrigeration
- Depropanizer
- MAPD converter
- Propylene fractionator

## Solution

Honeywell proposed a unique combination of model predictive control and integrated dynamic optimizer to cover the plant, incorporating a furnace model to provide accurate furnace yield and constraint information.

The Schmetterling project includes 16 multivariable model predictive controllers:

- Six for the furnaces
- One for the quench water tower
- One for the dilution steam generator
- Six for the cold side separation
- One each for the acetylene converters

Honeywell's Profit<sup>®</sup> Controller (Robust Multivariable Predictive Controller - RMPCT), Profit Optimizer and Profit Bridge technologies were used to implement the solution.

Profit Controller's model process dynamics predict future behavior of the process and adjust the controllers' outputs to bring all process variables to set points or within limits. If any degrees of freedom remain, the controller adjusts the process to optimize operations.

Profit Optimizer, a dynamic optimizer receiving gain updates from an ethylene furnace simulation model (Technip's SPYRO), coordinated the targets for all of the underlying controllers. SPYRO provided calculations for per pass conversion, coking rates and tube metal temperatures, as well as a rigorous cracking model used to provide yield predictions of key products.

Profit Bridge uses the model-predicted furnace yields and conditions to update gains every minute in the furnace Profit Controllers and the bridge models in Profit Optimizer. This configuration allows the optimizer to respond directly to changes.

Profit<sup>®</sup> is a registered trademark of Honeywell International Inc.

## More Information

For more information about Honeywell's advanced control solutions, visit [www.honeywell.com/ps](http://www.honeywell.com/ps) or contact your Honeywell account manager.

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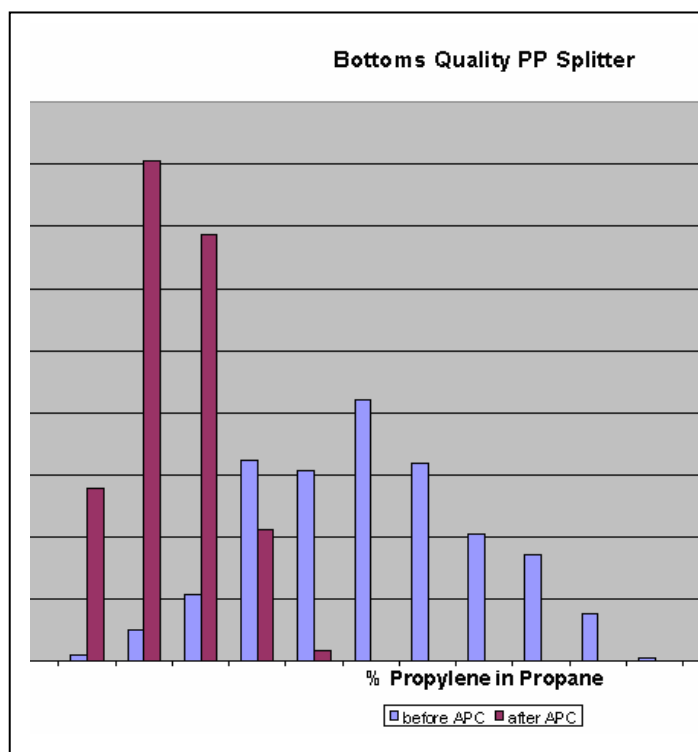
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The overall project took around 18 months to complete, although some benefits were achieved earlier than that when the first Profit Controller applications went online. Once the complete optimization solution was implemented, Basell was able to realize a consistent 3 percent increase in ethylene production. In addition, improved multivariable control on the cold side separation towers showed improved quality of olefin products, as shown below.



Honeywell's integrated solution of Profit Controller, Profit Optimizer and Profit Bridge resulted in higher ethylene production, improvement in quality and minimized propylene loss.

**Honeywell**