**Challenge**

The goal is to make products that have the most value in the marketplace while controlling costs. To do that, olefins producers need to maintain throughput without interruption and match the output of ethylene, propylene, butylene, etc. to downstream demand. That requires the ability to react as rapidly as possible to an ever-changing operating environment, including the variability of feedstocks coming from the cracking furnaces and cracked gas compressor, market prices, and fluctuating energy prices.

**The path to improved distillation performance**

Safe, reliable, and energy efficient – it’s not a goal, it’s a necessity. And it’s achievable. The key is implementing various advanced control applications based on continuous monitoring with smart, highly accurate instrumentation – such as state-of-the-art online analyzers – that allow the columns to operate closer to known constraints.

Emerson’s SmartProcess™ Distillation Column Optimizer for recovery encompasses a range of technologies and best practices that can be tailored to improve distillation operations in any olefins plant. Potential results include 5-10% additional capacity, 40-80% reduction in standard deviation, 2-5% energy reduction, more stable operations, or a combination of these.

<table>
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<th>Performance Challenges</th>
<th>Business Consequence</th>
<th>Improvement Opportunities</th>
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<td>Yield/Throughput impacted by:</td>
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<td>• Recovery loss when capacity exceeded</td>
<td>Reduced Profitability</td>
<td>Operate closer to your constraints because of reduced process</td>
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<td>• High “quality giveaway” due to poor composition control</td>
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<td>variability and achieve higher product quality because of</td>
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<td>• Off-spec material lost in flaring</td>
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<td>improved composition control.</td>
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<td>Maintenance Cost impacted by:</td>
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<tr>
<td>• Equipment degradation and failure</td>
<td>Increased Maintenance Cost</td>
<td>Avoid costly shutdowns and keep critical assets operating</td>
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<td>• Damage due to excess vapor flow (jet flooding)</td>
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<td>longer by implementing a predictive maintenance strategy with</td>
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<td>the help of enhanced diagnostics.</td>
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<td>Energy Management impacted by:</td>
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<tr>
<td>• Inefficient heat recovery</td>
<td>Increased Energy Cost</td>
<td>Operate at minimum reflux to optimize product recovery versus</td>
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<tr>
<td>• Poor composition control</td>
<td>Reduced Productivity</td>
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<td>• Excessive reflux to avoid off-spec material</td>
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<td>reflux.</td>
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<tr>
<td>Safety, Health, and Environment impacted by:</td>
<td>Increased SH&amp;E Risk</td>
<td>Performance diagnostics identify faulty valves, and vibration</td>
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<tr>
<td>• Leakage at feed pumps and/or reflux valves</td>
<td></td>
<td>monitoring helps you to prevent pump failures.</td>
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<td>• Fires caused by hydrocarbon leaks</td>
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</tbody>
</table>

*Chemical Application Solutions Guides are available on the following applications:*

- Furnace
- Cracked Gas Compressors
- Recovery Section
Improving the performance of recovery section operations can save a company millions of dollars. For example, at Huntsman Corporation, advanced process controls on six distillation columns were updated, resulting in 18% per year reduced energy usage, improved product quality, and a 10% increase in throughput.

After an outmoded control system was replaced with Emerson’s state-of-the-art DeltaV™ automation system, the company also needed to replace the existing multivariable advanced controller, which had been applied on top of the legacy control system for the distillation columns. While advanced controls for this critical part of the process might have been obtained from other sources, the advanced control package embedded in the DeltaV system offered the greatest potential for improving the distillation process with the least cost to implement.

Huntsman engaged two Emerson process control consultants to study deficiencies and opportunities for improvement in the existing distillation control scheme. They were challenged to determine if greater energy efficiency and increased throughput could be achieved. Following the study, the consultants’ recommendations were accepted, and Huntsman chose to implement Emerson’s SmartProcess distillation control package which utilizes model predictive control (MPC) embedded in the DeltaV system.

One immediate benefit of this solution was a faster, easier, and less expensive deployment of their advanced process control strategy, implemented by a close-knit Emerson/Huntsman partnership. The PlantWeb™ architecture also includes Micro Motion® mass flow meters, Fisher® valves and FIELDVUE™ digital valve controllers, Rosemount® instrumentation, and AMS™ Suite: Intelligent Device Manager predictive maintenance software.

The combination of advanced process control and other Emerson technologies and services is enabling Huntsman to meet their goals for improving their recovery operations.

“We implemented Emerson’s SmartProcess distillation application and the embedded MPC with the help of their control experts. In the first phase, MPC helps us maintain a project accomplishment of about 18% energy savings over past performance. The second phase is currently underway, and the project effort has achieved about 6% improvement on some of our biggest energy users so far. Although the performance of the system in the long term remains to be seen, we are hopeful the SmartProcess distillation application and MPC will help us maintain these savings – without other adverse impacts.”

David Johnson
Maintenance and Engineering Manager
Huntsman Corporation
Emerson can help you achieve operational excellence through our OpX Advantage Program—a proven method for applying a combination of process automation technologies that increase recovery, reduce energy, lower maintenance costs, and make your people more productive in their jobs. Improvement may be achieved by correcting faulty field instruments, tuning controllers, implementing better control schemes or advanced process control, and utilizing asset optimization and information systems.

Working closely with plant personnel, Emerson’s chemical process control experts assess your recovery section, the way it is operated, and its performance compared with industry benchmarks. Our consultants evaluate current operating and maintenance practices, collect data, identify improvement possibilities, and estimate the financial impact of possible automation investments. Prospective projects are prioritized according to need and potential.

Each selected project is defined in a functional design specification, including a more rigorous analysis of costs versus benefits. Detailed discussions with department managers, engineers, and operators about current operating practices, process upsets, off-spec incidents, process efficiencies, and reliability issues provide a basis for designing an automation system addressing your specific requirements and objectives. Our consultants examine performance records and test data to find opportunities to maximize recovery, reduce energy usage, operate against multiple equipment limits, and improve quality control. Their recommendations always include detailed estimates of costs and benefits.

We’ll then help you implement an effective program, often beginning with loop optimization to be certain the control foundation is sound, eliminating excess variability and stabilizing column operation. Any changes to process control strategies are done in a way that minimizes the risk of disrupting the process. Results are tracked and used to manage and fine-tune the system, and Key Performance Indicators (KPIs) are built into every solution so supervisors can watch unit performance to be certain the benefits are not lost.

A formal post audit is recommended to confirm that the expected benefits were achieved. Of course, your Emerson team stands ready to return and make whatever adjustments are necessary to maintain operational excellence.
You can achieve greater separation efficiency by using Emerson’s automation solutions.

Emerson Process Management has the technology and experience to meet and overcome your olefin plant challenges.
It uses open standards at every level of the architecture. It’s the only digital architecture with proven success in thousands of projects.

At the same time, asset health diagnostics give you clear direction on which other systems.

Emerson’s PlantWeb digital smart recovery section

• Minimize product loss by monitoring ethylene on top of the demethanizer and butane on the bottom of the debutanizer
• Optimize column bottom loops to minimize reboiler energy consumption
• Verify meter performance easily with in-situ meter verification during periodic shutdowns
• Provide high accuracy mass balance around the column, improving mass recovery.
• Optimize plant-wide ethylene recovery, and energy consumption.

Improved Recovery

With PlantWeb you can continuously optimize the recovery section operation. This means that the maximum capacity of the recovery section is always available, reducing the frequency and duration of periods when the recovery section is unavailable, plant throughput.

Online computer analysis and best-in-class measurement capabilities enable more consistent operations and reliable responses to disturbances.

With PlantWeb, you can maximize your investment by harvesting rich process data to achieve outstanding performance.

PlantWeb enables you to maximize the recovery of olefins by monitoring essentially all key variables to improve recovery, reduce energy consumption.

PlantWeb provides a unified infrastructure across the enterprise, enabling the seamless exchange of information.

This means that the maximum capacity of the recovery section is always available, reducing the frequency and duration of periods when the recovery section is unavailable, plant throughput.

Emerson’s SmartProcess Distillation application uses the DeltaV embedded advanced process control (APC) solution, enabling you to extract rich and reliable process information from intelligent field devices. The DeltaV software is designed to provide real-time access to process variables with feedback into the control system.

SMART SAFETY

The key to maintaining safe operation is visibility to detecting conditions – faulty or misread – that can lead to a hazardous situation. Emerson's intelligent field devices and advanced process control solution, DeltaV, provide visibility to detect and prevent potential hazards. With the DeltaV software, you can continuously analyze the data to identify potential issues and take corrective actions.

SMART DIGITAL CONTROL

Emerson’s embedded advanced process control (APC) solution, DeltaV, leverages rich, reliable process information from intelligent field devices to improve plant reliability, recovery, and energy consumption.

SMART WIRELESS

Wireless technology is ideally suited to the process environment, improving your overall view of the process and improving your ability to detect and respond to potential hazards.

Field Intelligence

With the right intelligence, your field assets not only provide more reliable information and feedback, but they also diagnose their own health and assess potential problems.

What makes PlantWeb better?

• It’s the only digital architecture with proven success in thousands of projects.
• Predictive intelligence enables detection of anomalies and potential problems.
• PlantWeb can be deployed at any level of the architecture.
• It prevents process control, plus asset optimization and integration with other systems.

Field Intelligence

• Design, engineering, and systems design with best-in-class intelligent power PlantWeb by enabling optimization and monitoring.
• Improved visibility and reliability for the health of the installation.

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