Achieving safe, reliable, and profitable furnace operation presents Olefins producers with multiple challenges. Rarely can these challenges be easily addressed because poor performance is often caused by a number of contributing factors. Understanding the relationship between these factors is the first step toward gaining immediate and long-term performance improvements.

**The path to improved furnace performance.**
Building on Emerson’s unique PlantWeb® digital plant architecture, we are able to offer a set of complementary solutions to protect, control, and reliably manage your furnace operations.

Because safety is your highest priority, Emerson’s smart safety solutions ensure that start-up, routine operation, abnormal situations, and shutdowns are safely and robustly executed.

With safety of the furnace operations ensured, Emerson’s smart performance management capabilities can go to work, providing you with valuable data and effective controls that allow you to economically optimize performance.

Add the predictive capabilities of Emerson’s asset optimization offerings and you have laid the groundwork for ensuring you run your furnaces at their maximum capacities – with optimal product yields, while minimizing the rate of coking.

<table>
<thead>
<tr>
<th>Performance Challenges</th>
<th>Business Consequence</th>
<th>Improvement Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Furnace Coking</strong> impacted by:</td>
<td></td>
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<tr>
<td>• Control variability on feed, steam, and coil outlet temperature (COT)</td>
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<tr>
<td>• Steam/hydrocarbon ratio imbalance</td>
<td>Reduced Unit Availability</td>
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<tr>
<td>• Poor operator visibility to coking rate</td>
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<tr>
<td>• Poor flame distribution</td>
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<tr>
<td><strong>Maintenance Cost</strong> impacted by:</td>
<td></td>
<td>Extend intervals between decoking and furnace maintenance with the help of advanced diagnostics, key performance calculations, and optimal analyzer design.</td>
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<tr>
<td>• Frequent decoking</td>
<td>Increased Maintenance Cost</td>
<td></td>
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<tr>
<td>• Cracking tube replacement</td>
<td></td>
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<tr>
<td>• Frequent low and ultra-low NOx burner maintenance</td>
<td></td>
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<tr>
<td>• Analyzer maintenance</td>
<td></td>
<td></td>
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<tr>
<td>• Transfer line exchanger cleaning</td>
<td></td>
<td></td>
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<tr>
<td><strong>Energy Management</strong> impacted by:</td>
<td></td>
<td>Reduce energy cost through better combustion control, tightly controlling stack O₂, and improved response to fuel disturbances.</td>
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<tr>
<td>• Excessive fuel consumption</td>
<td>Increased Energy Cost</td>
<td></td>
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<tr>
<td>• Fluctuating fuel gas composition</td>
<td></td>
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<tr>
<td>• Poor combustion control</td>
<td></td>
<td></td>
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<tr>
<td>• Steam system operation</td>
<td></td>
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</tr>
<tr>
<td><strong>Safety, Health, and Environment</strong> impacted by:</td>
<td></td>
<td>Reduce safety, health, and environmental risks with improved control and better visibility to asset health and process variabilities.</td>
</tr>
<tr>
<td>• Thermal shock from emergency shutdown</td>
<td>Increased SH &amp; E Risk</td>
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<tr>
<td>• Spalling, which creates transfer line exchanger issues</td>
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<tr>
<td>• Insufficient emissions monitoring (CO₂, CO, NOx, SOx)</td>
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<tr>
<td>• Inconsistent startup and shutdown</td>
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<tr>
<td>• Boiler feedwater and steam loss</td>
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</tbody>
</table>

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

- **Furnace**
- Cracked Gas Compressors
- Recovery Section
“When we looked at the functionality provided by the SmartProcess® Ethylene Furnace, it was a no-brainer for us. You either have to develop similar functionality yourself from scratch or you use a standard application that is developed and supported by Emerson. And the additional opportunity for using some of the advanced control features that are embedded in DeltaV™ adds icing on the cake. Why wouldn’t you do it?”

Michael Polasek, Technical Staff Engineer, Eastman Chemical Company

“When you look at the complexity of building 10 units at one time, and asking all of them to start up in a short timeframe with minimum disruption, it’s pretty amazing. At the beginning, we saw no probability of finishing in early 2005, but we were able to finish three months earlier than originally planned, and Emerson deserves much of the credit for making that happen.”

Jack Brinly, Deputy Project Director, SECCO

“EP-rich cracked gas is not only our number-one source of furnace BTU but very tricky to control due to large BTU/scf variations. Mass measurement eliminates the majority of the variation.”

Principal I&CS Engineer, Major Global Olefins Producer

“With so many contractors, SECCO realized that partnering with one main automation supplier early – that is, using the MIV approach – would be critical for the success of the project.”

Danny McHugh, Process Control Manager, SECCO
SERVICES & SUPPORT

Whether you are upgrading to a modern digital control system, expanding your plant, or building a new one, Emerson’s consultants can help you design, justify, and implement improved cracking furnace control.

FEED SERVICES
Many customers involve Emerson from the conceptual design phase when building a new plant so that best practices – across all aspects of the control platform – can be specified early.

Our engineers have performed Front End Engineering Design (FEED) to automate some of the world’s largest ethylene complexes, specifying a complete set of deliverables, a detailed project plan, and costs within ±10% accuracy. Emerson’s comprehensive set of deliverables can include field devices, control systems, safety systems, advanced control and optimization, mass balancing, and interfaces to Enterprise Resource Planning (ERP) systems.

OPTIMIZATION AND LIFE CYCLE SERVICES
When building a new plant or upgrading or expanding an existing plant, Emerson’s experienced Advanced Applied Technologies consultants and the SureService™ portfolio of services can help you optimize furnace performance while reducing maintenance costs. Emerson provides the best technologies to improve your competitive advantage and help you protect your investment by ensuring your system is routinely supported and serviced.

Our consultants can customize a solution tailored to address your furnace challenges, including:

• **Project-to-Operations Transition Support**
  Introducing new technologies and work practices can often strain site resources. Emerson’s experts can help you ensure seamless commissioning and start-up of your process units. And we can help you make sure your plant personnel is ready to adopt the new technology. With our complete operator training solutions we can bring your plant personnel to the required level of expertise – without the complexity and cost associated with typical simulation systems.

• **Control Performance Improvement**
  Through control loop troubleshooting and process diagnosis, our experts help you stabilize your furnace operations and eliminate excursions that cause excess fouling and poor yields.

• **Safety Services**
  Emerson’s functional safety engineers, the highest number certified in the industry, use our TÜV-certified safety process to help you properly design safety systems and burner management systems to minimize spurious trips.

• **Reliability Maintenance Services**
  Assets deteriorate over time. That can’t be avoided – but you can plan for it. Emerson can audit your furnaces and other assets and provide recommendations to help you avoid unplanned outages and extend the life of your assets.

With Emerson’s experienced consultants and comprehensive set of services, combined with pre-engineered SmartProcess application packages, you’ll see immediate results on your company’s bottom line.
FURNACE CHALLENGES

You can achieve greater efficiency in your furnace with less downtime.

Emerson Process Management has the expertise, technology, and experience to make it happen.
**Smart Digital Control**

Smart digital control can detect, diagnose, and avoid excess coking by balancing passes, compensating for process disturbances, predicting constraint violations, and automatically calculating optimal tuning parameters for all process control loops.

**Smart Safety**

The key to maintaining safe operations is identifying hazards before they happen. And when hazards do happen, digital control systems allow you to detect and avoid problems before an incident occurs. This helps you avoid unnecessary equipment outages, reduces costs, and increases safety.

**Smart Asset Optimization**

Avoid routine calibrating of field devices via easy-to-use, Web-based user interface. With a user-friendly interface, you can view the status of your field devices, monitor performance, and maintain your field devices remotely.

**Field Intelligence**

Field intelligence, your field assets not only provide more precise and reliable information about your process, but they also self-diagnose their health and provide clear direction on which assets – including automation, electrical, process and rotating equipment – are in most need of attention, and how to avoid operational interrupts.

**PlantWeb in Action**

- Reduced Energy Costs and Environmental Impacts
- Improved Yield
- Increased Uptime
- Smart Safety
- Smart Asset Optimization

**Smart Wireless**

Monitor the health of rotating assets – including motors, pumps, fans, and blowers – from your smartphone or computer without additional I/O.

**Smart Measurement**

- Real-time, quality performance information
- Instantaneous field wiring with no need for a control room connection
- Flexibility to operate in control or monitor mode
- Optimized performance
- Reduced wiring cost and time
- Enhanced reliability

**Smart Analytical**

- Enhanced data analytics for proactive maintenance
- Improved accuracy
- Increased speed

**Smart Final Control**

- Increased uptime
- Reduced maintenance
- Enhanced safety

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With over 600 major sales, project execution, and support locations in more than 85 countries, we are here for you.

Please contact your local Emerson Process Management sales office or representative, or visit our website at www.EmersonProcess.com