OPTIMIZING THERMAL PROCESS PRODUCTION AND BUSINESS RESULTS THROUGH IMPROVED COMBUSTION VISIBILITY

White Paper

Introduction

In most thermal process systems, performance data gets trapped at the equipment level. To grab readings or catch alerts, a plant worker needs to physically stand next to the equipment – and stay there. That's impractical at a time when the thermal processing industry is under pressure to be more productive.

Facility owners and operators know that to maximize productivity, they need to minimize unplanned downtime. To this end, they require production and process systems that operate in a smart, efficient and sustainable manner.

Fortunately, cloud-based solutions are available that improve the visibility of thermal processes help staff troubleshoot problems more effectively, and make critical asset data available anytime, anywhere. Using these next-generation remote monitoring systems, plant workers can view and share data before they get to the equipment; get real-time alerts when parameters exceed limits; and track historical data to see when and why issues occurred.

This white paper explores the market requirement for thermal process monitoring solutions and the benefit of next-generation systems on both users and the wider business.

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The industry need for improved thermal process visibility and analytics

In most thermal process systems, performance data gets trapped at the equipment level. A plant worker needs to physically stand next to the equipment – and that's impractical when the thermal processing industry is under pressure to be more productive.

With a diminishing number of combustion specialists, rising energy costs, reduced profit margins, and increased demand for better product quality, manufacturers with thermal processing operations are striving to increase productivity and reduce operating expenses. Their concerns include:

- Diminishing number of thermal process experts due to ageing workforce
- Increasing plant efficiency to extend ROI, reduce energy costs, and meet customer demand
- Reducing maintenance costs
- Minimizing unplanned downtime to increase the availability of combustion systems
- Lowering emissions to reduce taxes and potential fines
- Enhancing safety

They also need better ways to obtain vital information about their boilers, ovens and furnaces. Why? Thermal process data related to efficiency and reliability has historically been trapped at the equipment level. This means that unless a worker is physically standing next to the equipment, they won't get the information – and won't be able to use it proactively to address issues.

Another issue is that maintenance technicians who are called to troubleshoot and diagnose equipment problems typically don't know which tools or parts they need until they're on site. This can result in multiple return trips to address an asset issue.

Meanwhile, the knowledge of how to maintain and optimize thermal process equipment is diminishing as engineers, operators and technicians familiar with industrial process heating systems retire. This problem is compounded by the fact their Millennial replacements tend to switch jobs more frequently, thus preventing knowledge accrual. As a result, there are fewer combustion specialists across the industry, and those that remain are responsible for more tasks than never before.

Addressing unplanned downtime and process control challenges with connected technology

When fewer personnel serve more areas of responsibility, it is crucial to optimize process control, which means meeting certain parameters over time using inputs from processes and controlling outputs for desired results. Manufacturers must implement real-time controls to measure and control thermal process variables, develop methods to remotely monitor these variables, and find ways to predict future behavior.

The trouble is, many thermal processing companies rely on disparate, purpose-built solutions to run their production processes. These often incorporate components from multiple vendors, different platforms and protocols, and complicated wiring schematics and programming sequences. The disparate nature of these solutions makes it difficult to exchange data between them, which increases processing times and the risk of failure.

However, by taking an integrated system approach that embraces a single, connected architecture, manufacturers can realize the benefits of improved operator effectiveness, increased plant availability, reduced maintenance costs and lower lifecycle costs. They can also leverage the Industrial Internet of Things (IIoT) to improve the safety, efficiency and reliability of operations across single or multiple plants.

IIoT infrastructure provides a secure method to capture and aggregate data, and to apply advanced analytics by leveraging the tribal knowledge of plant personnel and combustion domain experts. Furthermore, it allows end users to determine how to reduce, or even eliminate, manufacturing upsets and inefficiencies. With a larger, consolidated set of useful data provided by experts who understand the unique characteristics of thermal processing applications, manufacturers can apply analytics for more detailed insight, and scale data to meet the needs of single-site or enterprise-wide operations.

Making data visible – whenever and wherever it's needed

In addition to analytics, manufacturers need thermal process data to be visible and available to plant personnel anytime, anywhere.
For example, most maintenance managers are acquainted with the panic of handling a critical thermal process failure and investigating its causes after the fact. In many cases, the issues might require repairs or lead to unplanned downtime that can result in tens of thousands of dollars in lost revenue per hour. Shutdowns can also lead to substantial response and recovery costs, labor and overhead costs and customer service impact.

What plant workers need is an effective way to view and share data before they get to the equipment. This includes mobility tools that enable them to receive real-time alerts when operating parameters exceed limits, and to track historical data to see when and why issues occurred.

Putting technology to work

Thermal processing companies can harness the power of connectivity and information sharing to transform their operations. They can use connected devices and integrated systems to capture real-time process information to:

- Understand their equipment to improve asset productivity
- Identify variability across production processes
- Establish remote monitoring and operations capabilities
- Implement manufacturing best practices
- Enhance safety and regulatory compliance

Industrial heating operations now have access to innovative automation solutions that turn data into insight, from edge to enterprise, to help improve their bottom line.

For example, Honeywell's new SLATE™ Integrated Combustion Equipment Manager combines configurable safety features with programmable logic in a single, modular burner control platform. This type of system reduces the footprint on control room panels and can be easily customized for virtually any combustion application – in less time, and with far less complexity than traditional solutions.

Instead of using separate controllers for different functions, plants can purchase only the modules they need for combustion control and choose how to use them with simple wiring commands. With fewer assets to support and maintain, they benefit from lower total cost of ownership.

In conventional control systems, a control panel often contains a programmable logic controller (PLC) combined with separate safety devices such as burner controls. In this case, the safety devices are responsible for the operation and safety of critical equipment. Previously, data produced by safety devices was connected to what the control is doing. If the control function included communication, then the PLC captured and interpreted this information using specialized customer software.

In the latest generation of combustion control systems, all safety module status data and all non-safety control of safety

modules are fully integrated into the programmable logic. The base module provides communication and user-programmable logic, and non-safety digital and analog I/O modules provide inputs and outputs for that logic. The programmable logic can be used to create any non-safety features needed by the equipment that the combustion control system is controlling. This allows an application designer to implement customized and differentiating features in their controller using a configurable touch screen display.

SLATE also has the option of employing microprocessor-based burner control platforms, including SIL-3 capable solutions for sequencing multiple burners. Additionally, it can incorporate DIN-mounted universal digital controllers, which provide functionality for set point programming, fast scanning and on-board diagnostics. Users can even install intelligent valves designed to communicate with industrial automation systems for enhanced monitoring, reporting and optimization.

Current approaches to data visibility challenges

Today, some combustion management solutions can be configured for remote monitoring. It is possible to connect thermal process equipment in a secure cloud environment, making critical data, historical trends, and performance analytics available when and where they're needed. This enables engineers and operators to receive real-time alerts on a smart phone or tablet when key parameters are outside normal limits, and to track historical data over time to identify when and why something happened.

The visualization of operating values in both text and graphic form ensures there is a comprehensive overview of the thermal process asset, as well as convenient and cost-effective remote monitoring. The availability of insightful, actionable, combustion-focused data helps less experienced staff troubleshoot problems more effectively. In contrast, many of today's remote monitoring solutions provide only non-contextualized data.

Getting the right thermal-specific information into the right hands via remote monitoring helps to keep thermal processes running safely and efficiently; while troubleshooting is more effective since maintenance technicians can take the right parts and tools, the first time, before leaving their work stations. Furthermore, technical experts can more easily provide remote guidance and stay ahead of problems by identifying nuisance fault trends and predicting failures.

Finally, some automation suppliers now provide

engineered-to-order offerings, which include thermal process systems

and expert services – all incorporated in a turnkey solution, from start to commissioning – while ensuring compliance with local codes and standards. This allows heat treatment and other facilities to focus on core competencies while saving valuable in-house resources.

## What connectivity means for end users

The deployment of integrated control and monitoring solutions for thermal processing applications, delivered by a single competent supplier, makes combustion part of an overall connected strategy aimed at creating a smarter and safer facility. Industrial organizations can now see, analyze and improve the competency and productivity of their people, the efficiency of their processes and the performance of their assets.

With a connected plant solution, manufacturers are able to bring together historical and real-time process data from different systems in one place; and connect it to the cloud. The data can then be easily accessed, retrieved and analyzed by the stakeholders.

Using this approach, end users can reduce the complexity of their thermal process control installation and realize benefits such as:

- Lower energy and environmental costs
- Reduced risk of related taxes and fines
- Increased availability of heating systems
- Reduced likelihood of process downtime
- Increased productivity to meet customer demand
- Faster ROI due to significant operational savings

And, in an age where there are fewer skilled resources to engineer, operate and maintain combustion controls, a connected approach provides manufacturers with a system that is more intuitive, less complex, easier to maintain and more integrated across the enterprise.
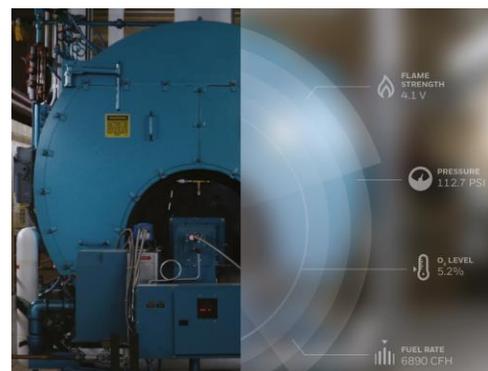
Thermal IQ™: Honeywell's solution

One such connected solution is Honeywell's Thermal IQ. Part of Honeywell's cyber-secure portfolio, Thermal IQ turns data into actionable insight so that manufacturers can optimize operations, predict plant failures, and prevent unplanned downtime.

Remote monitoring enables organizations to closely monitor the operation of thermal processes, see real-time and trending data, and receive alerts when parameters stray outside normal limits. Meanwhile, users can maximize their thermal intelligence quotient by connecting everyone from management to maintenance group with insights that drive smarter decisions.

The result is that maintenance managers no longer have to wait for faults or failures that can lead to shutdowns – instead, they can get ahead of trouble and take proactive steps to maximize uptime.


Thermal IQ Operate
An equipment and process level remote monitoring solution for plant operators, providing real time combustion processes data onto smart devices

Thermal IQ Optimize
An enterprise level, desktop based remote monitoring solution providing real time plant, equipment, & process level combustion data to plant managers
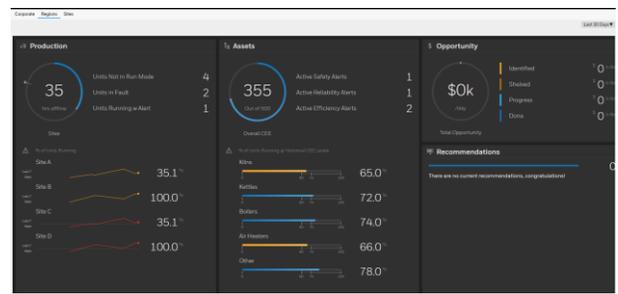
How Thermal IQ™ works

Plant combustion equipment management systems and edge devices such as Honeywell Combustion Controls communicate key parameters and alerts to cellular gateways, which, in turn, transfer data to a secure cloud platform.
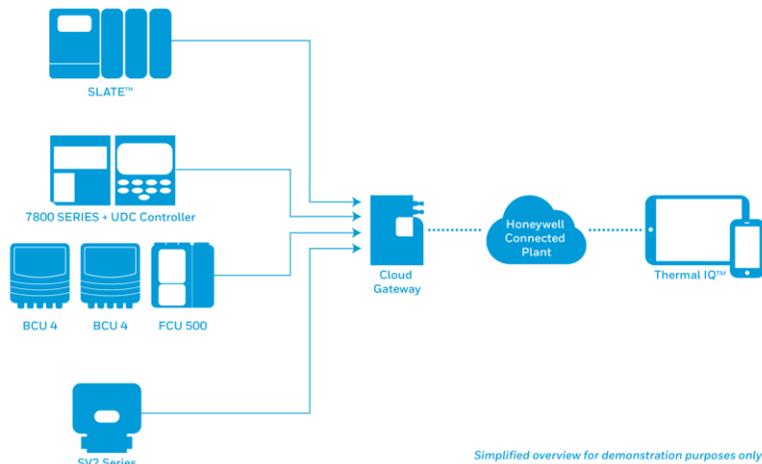
Personnel receive alerts via push notifications and can see at a glance the status of all connected thermal process equipment on their smart phone or tablet. Templates within the mobile app allow them to drill down to see additional data.

In addition, a remote-monitoring tool gives users a snapshot of how each piece of equipment is performing. This allows personnel to monitor key parameters such as fuel consumption and O2 levels. to ensure the process is running optimally. They can see all active alarm states, get specific alerts and know immediately when action needs to be taken. They also can track historical data by day, week or month to identify trends and opportunities for improvement. Datasets are customized, based on the current control configuration and refreshed in real-time (or as often as the user chooses) – so they are always up to date.

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Use case

Customer:

An Americas-based industrial manufacturer

Situation:

For over 50 years, this customer operated two boilers with on/off cycles in which the boiler ran until a set point was achieved, then cycled off until the set point fell below a certain value. Although the boilers served the customer well, they were costly to run, and the thermal process data they generated was cumbersome for plant personnel to gather. The only way to read the data was literally by standing in front of the equipment. With maintenance budgets tightening, the customer decided to seek help from Honeywell.

Solution:

Honeywell recommended the deployment of its SLATE™ Combustion Management System – replacing the boilers' on/off action with modulation, in which the boilers never shut off. This change alone saved the customer substantial amounts of money. In addition, stable hot water temperature – achieved via modulation – enabled the facility's HVAC system to maintain proper temperature and be more efficient.

SLATE, however, could only monitor and control the thermal portion of the boiler, so following consultation with Honeywell, the customer decided to implement Honeywell Thermal IQ, which enabled monitoring through a cellular gateway.

The monitoring was achieved by examining 10 Modbus addresses from SLATE – taking data points every 10 seconds. Data monitored included: pressure set point, fuel rate, flame strength, control state, 02 level, firing rate/fuel flow, lockout status, interlock and limit status, stack temperature and flame state.

While examining the data, the customer traced the root of several longstanding performance issues and faults, including:

- The repeated achievement of high set point immediately after start-up was caused by a steam valve that was left isolated following recent maintenance work
- Continuous on/off cycling was triggered by a leak in the feedwater tank
- Historical trends revealed that the O2 sensor had a fault in which it displayed the same reading continuously

The on/off cycling of the boiler was traced to the faulty wiring of a new feed water pump

The event data and history collected by Thermal IQ enabled stakeholders to clearly visualize and track key thermal process issues at the facility for the first time. Based on the findings, the customer decided to implement Thermal IQ data monitoring as a part of its ongoing maintenance program – transforming it into a preventative maintenance program.

Results:

Not only did the customer implement preventative maintenance that allowed it to troubleshoot and investigate data and take action before an unplanned breakdown occurred; the Honeywell SLATE- and Thermal IQ-equipped boilers yielded total operational savings of $40,000 annually.

Conclusion

Technological developments in remote monitoring are finally freeing plant workers from the burden of local equipment monitoring and unleashing a facility's thermal process performance and productivity potential, by connecting people, assets, and information across the enterprise.

From viewing asset data on smart phone or laptop to more sophisticated uses – such as sending a text message when an alarm occurs – connected thermal process solutions such as Honeywell Thermal IQ are revolutionizing the way process industry operations run and maintain their vital thermal process systems. Crucially, the availability of insightful, actionable, combustion-focused data is helping less experienced staff to troubleshoot problems more effectively.

Today, rather than having to integrate, support, and maintain purpose-built solutions for combustion control and monitoring, thermal processing operations can be run more efficiently to optimize production and business results.

For More Information

Learn more about how Honeywell's Thermal IQ™ can improve thermal process production and business results, visit combustion.honeywell.com/thermal-iq or contact your Honeywell Account Manager.

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