

Process Solutions

Solution Note

Scalable and Reliable Control Solution For Furnace OEMs



Honeywell's HC900 process controller helps industrial furnace manufacturers improve the performance, efficiency and regulatory compliance of heat treatment operations.

Furnace Original Equipment Manufacturers (OEMs) serving the heat treatment industry are under constant pressure to provide customers with control equipment that is highly robust and reliable. Failure of this equipment can result in higher operating and maintenance costs, as well as a loss of production and revenue.



Figure 1. Furnaces used in heat treatment applications require accurate and reliable control system performance.

Today's Business Challenges

Industrial furnace manufacturers must proactively invest in advanced technology to help make their equipment more energy efficient, easier to operate and maintain, and environmentally friendly. This investment includes not only automation and control solutions, but also the highly skilled personnel, engineering tools and support resources needed to meet uncompromising performance, customer satisfaction and efficiency objectives.

The primary business drivers for furnace OEMs include:

- Reduce energy consumption
- Achieve zero emissions
- Reduce production costs

- Increase furnace life
- Achieve maximum quality in heat-treated parts
- Ensure greater return on assets

Choosing a Control Solution

When evaluating new automation technology, furnace manufacturers not only consider the functional requirements for control equipment, but also its reliability, ease of use and maintainability. In addition, they try to select solutions that will enable them to remotely diagnose problems with their furnaces.

Specific criteria for furnace control systems include:

- Precision control capabilities
- Ease of use
- Reliability
- Scalability
- Simple configuration, startup and implementation
- Operator friendliness
- Set point (SP) programming and scheduling
- Multiple control loops
- Intuitive human-machine interface (HMI)
- Preformatted displays
- Simple "drag and drop" programming

Furnace OEMs also seek automation suppliers with good supply chain management. The supplier should provide quality training and support for the manufacturer's engineering teams, particularly during the early development stage of a new furnace control system, as well as excellent pre- and post-sales support.

Finally, it is important to choose a brand name automation supplier with proven global coverage. Furnace OEMs want technology building added customer value into their furnace controls and differentiating their offerings from the competition.

HC900: Designed for Demanding Applications

The Honeywell HC900 is an advanced process and logic controller based on a modular, scalable design that is sized to meet the automation needs of a wide range of furnace equipment. The HC900 can be used for a host of diverse control tasks – from process programmable logic controllers (PLCs) to low-end distributed control system (DCS) applications. The controller's touch screen operator interface provides user-friendly pre-built or custom displays, along with trending, data archiving and a host of other capabilities.

The HC900 is a superior solution to most PLCs for furnace industry applications. It offers a selection of controller CPU modules, multiple I/O rack sizes, and local or remote I/O racks providing a flexible architecture that can accommodate the most demanding application. Modularity, built-in redundancy, versatile I/O configuration and connectivity, plus the ability to configure complete process solutions and archive their program parameters for easy retrieval and implementation, permit customized, pinpoint control.

The HC900 utilizes a secure engineering software tool that minimizes project development and commissioning time, and helps to protect intellectual property of OEMs. This Windows™ based application uses graphic objects to represent function blocks, greatly simplifying control strategy development and improving configuration record keeping. The software is license free, allowing OEMs to obtain free updates via the Honeywell website at no charge. In addition, Honeywell's PC-based Station Designer software enables fast implementation of the controller HMI.

The HC900 includes a number of key technology features not commonly offered by PLC suppliers.



Figure 2. Honeywell HC900 Process Control System.

Accurate PID Control

The HC900 provides precision PID control for single- or multi-loop furnaces. It also supports duplex control for heating and cooling applications with individual sets of tuning constants.

Position-proportional control for motorized valves and actuators is standard and no special I/O module is required. The unit's process measurement and control accuracy is $\pm 0.5\%$ of configured sensor input range. Additionally, the HC900's algorithm set is tailored for analog control applications where set point programming, carbon potential, cascade, feed forward and ratio control are common requirements.

Universal Analog Input Modules

Inputs may be mixed on a module and can include multiple thermocouple types, RTDs, ohms, voltage or milli voltage types – all easily assigned using the HC900's Designer Software. High point-to-point isolation simplifies installation and saves the expense of external isolation hardware.

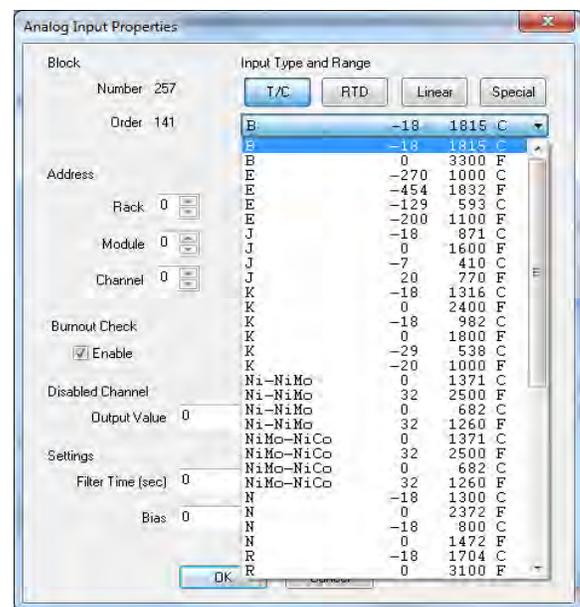


Figure 3. Universal Analog Input Modules

Local Data Archiving

Local data archiving can be provided by the HC900 to ensure process history is maintained even in the event of a supervisory system or HMI failure. This is especially valuable for regulated industries where accurate process record keeping is critical.

E-mail Alarm Notification

Furnace alarm conditions can be sent by the HC900 via e-mail to a remote PC or pager, providing simpler and faster notification of a process upset.

Automatic Self-tuning

The Accutune III automatic tuning algorithm accurately identifies and tunes any process. This speeds up and simplifies start-up and allows retuning at any setpoint. At the end of the tuning process, the controller immediately calculates new tuning

constants and stores them in the PID block. Control resumes with the new tuning parameters.

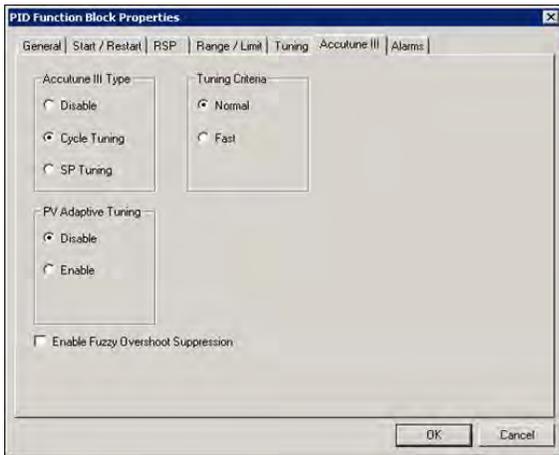


Figure 4. Automatic Self-tuning.

Overshoot Suppression

Fuzzy overshoot suppression minimizes the Process Variable (PV) overshoot following an SP change or a process disturbance. This is especially useful in processes that experience load changes or where even a small overshoot beyond the SP may result in damage or product loss.

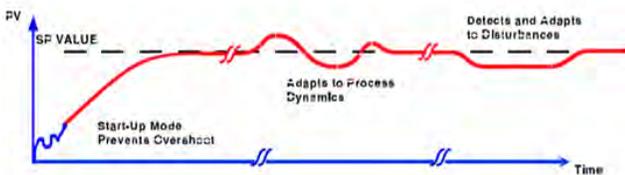


Figure 5. Overshoot Suppression.

Cascade Control

The HC900's cascade loop uses two PID blocks with the back calculation pin of the secondary loop connected to the primary loop. This transfers values back to the primary loop to adjust the PID for changes in mode of the secondary loop.

Setpoint Programmer

An SP programmer block is used to vary the SP values with a time-based profile. This block is a part of the SP program category. The setpoint program containing ramp and soak segments are loaded to the block. Depending upon the segments, the SP value is increased or decreased with time. A single program or profile can contain 2 to 50 ramp/soak segments in length. Up to 1,310 profiles can be loaded to the controller's memory. Each segment in the profile can be ramp or soak, but the last segment must be soak.

Along with ramp/soak SP value, auxiliary analog value output is provided in SP programmer. For each ramp and soak segment,

auxiliary output value can be configured. It is the fixed soak value and can be used to provide an SP value for a secondary control loop in the process.

The SP programmer block contains the setpoint guarantee function. It holds the program and the SP value if the process variable exceeds the predefined deviation from SP. Up to three process variables can be configured as inputs to block, which can be used by the guarantee hold function.

The HC900 also provides furnace-specific features, including:

Carbon Potential

The ability of a furnace's atmosphere to supply carbon to heated steel is called its "carbon potential." There are several ways to determine the carbon potential of a furnace atmosphere, but one of the most popular approaches employs a zirconium oxide sensor to generate a milli-voltage signal based on the measured carbon potential. This signal is used by the HC900 to control the enrichment gas and dilution air into the furnace. The controller also provides an anti-sooting alarm and automatic probe cleaning.

Dew Point Control

For furnace atmospheres designed to run "neutral," avoiding decarburization and/or carburization is critical to the proper functionality of the component. In simplest terms, a dew point analysis measures the amount of water vapor present in the furnace atmosphere – and thus the carbon potential of the atmosphere. In this application, the HC900 uses a dew point function block to calculate dew point based on a carbon probe receiving inputs from an O₂ sensor. A typical example is control of an endothermic atmosphere generator where the user requires a dew point measurement for PV.

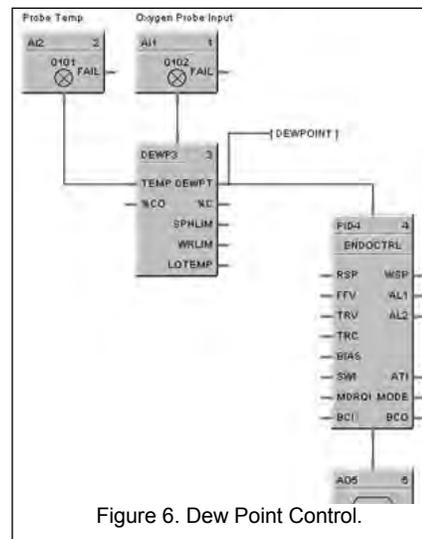


Figure 6. Dew Point Control.

Advantages for Furnace OEMs

Scalable System Configuration

The HC900 process controller's scalability makes it ideal for controlling either a single heat treatment furnace or a multiple furnace operation. The controller can also be provided with redundant and non-redundant CPUs, power supplies and communications, helping to minimize process downtime.

Powerful SCADA Support

The HC900 is easily integrated with Honeywell's world class Experion® supervisory control and data acquisition (SCADA) solution. Experion provides a server- and client-based architecture, and server redundancy is also available. It offers custom displays and over 300 preconfigured standard displays to reduce implementation time. The user displays allow operators to securely interact with the process via the HC900 controller. Temperature set point profiles and recipes can quickly be selected and edited as needed. Additionally, users can determine the status of process control loops; record alarms, events and history; and generate reports.

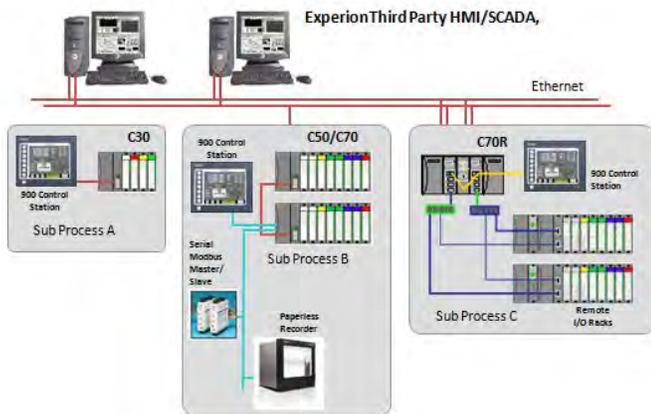


Figure 7. SCADA Support

Seamless Third-party Integration

The HC900 can be integrated into new or existing third-party systems via the Matrikon OPC server. This allows connectivity to non-Honeywell programmable logic controllers (PLCs), distributed control systems (DCSs), HMIs and SCADA systems, as well as a host of business applications. The Matrikon OPC Server reduces engineering costs and enables data to be shared across different platforms.

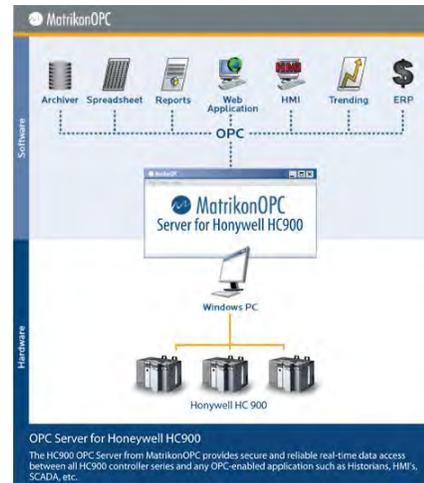


Figure 8. Seamless Third-party Integration

Improved Operator Effectiveness

The HC900 Control Station offers a number of key features to improve operator effectiveness. These include:

- Rugged NEMA Type 4X operator interface
- Easy-to-operate 10" touch screen display
- Standard and custom graphic elements
- Custom graphics tools
- Function block widgets
- Controller status displays
- Intuitive recipe selection
- Trending and data logging
- Multi-level log-on security feature
- Alarm/event logging with e-mail notification
- Ethernet or serial connectivity
- Embedded web server
- Multiple interfaces
- Lexicon Multi-language support



Figure 9. HC900 Control Station.

HC900's 10- or 15-inch touch screen HMI includes an extensive array of standard operator displays and pre-built display "widgets" to complement robust control function blocks. Display widgets are intelligent graphic objects that bind display and controller function block parameters through a single reference. This eliminates the time-consuming process of uniquely identifying the data source for each display parameter. The HC900 control station also provides trending objects that can be integrated into displays to provide a recent history of process performance.

Honeywell's Station Designer software integrates with the HC900 software engineering tool to streamline configuration tasks. The software's intuitive development environment offers more than 4,000 pre-built process graphic symbols, widgets, animation, hide object, if-then-else scripting, and much more.

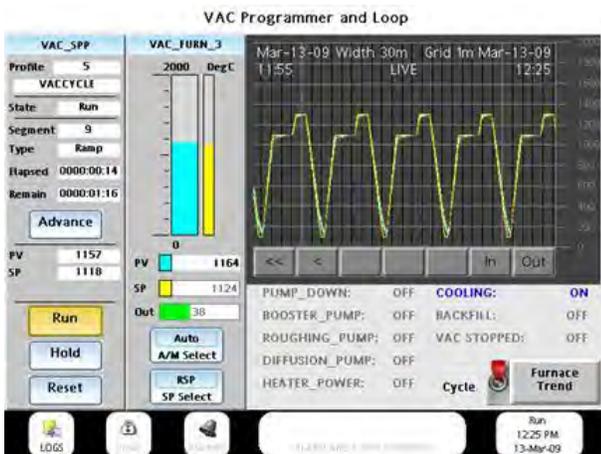


Figure 10. HC900 Touch Screen HMI.

Additionally, data logging to an internal compact flash card is supported with the HC900, allowing access via a network connection and Web server, or a USB memory module. Logs may either be continuous or batch, and stored at specified frequencies using single or multiple file partitions.

Greater Ease of Use

During startup, users are able to monitor the operation of the HC900 and change implemented configurations without having to

stop the process. The controller's I/O modules can be removed and inserted without shutting down operations – eliminating downtime and associated costs. Furthermore, the HC900 provides open and secure communications via Ethernet and the Modbus/TCP protocol. The controller is Web-enabled with e-mail alarming and Web server technology.

Enhanced Regulatory Compliance

The HC900 meets AMS 2750D, which is the aerospace material specification covering pyrometric requirement for thermal processing equipment. AMS 2750D is the basis for the Nadcap (National Aerospace and Defense Contractors Accreditation) certification program.

Benefits of the Technology

Both furnace OEMs and end-users can realize substantial benefits for the HC900 solution:

- Improve project efficiency for up to 15% savings
- Save weeks of delay during late-stage design changes
- Improve production by up to 12-15%
- Lower total cost of ownership by up to 20-25%

Global Support from an Industry Leader

Honeywell understands the unique demands of furnace manufacturers. Our process automation solutions can help OEMs maximize revenue, increase profits and reduce design and implementation costs. We also provide comprehensive pre- and post-sales support, as well as value-based solutions that help drive business success.

With unsurpassed technology and domain expertise, Honeywell is recognized as a quality brand with a long history of working with OEMs. Our control systems are reliable, field proven and designed to help improve process safety, reliability and efficiency.

Honeywell is a pioneer in process control and today, more than 8,000 technicians use collective expertise to work for customers in 67 countries around the world. Our global development teams are driven to the highest standards to meet customer product requirements for ease of use and maintenance.

Honeywell also provides world-class customer support via our Global Technical Assistance Center (TAC).

Experion® is registered trademark of Honeywell International Inc.

For more information

To learn more about HC900 PLC systems, visit

www.honeywellprocess.com

Or contact your Honeywell Channel Partner

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