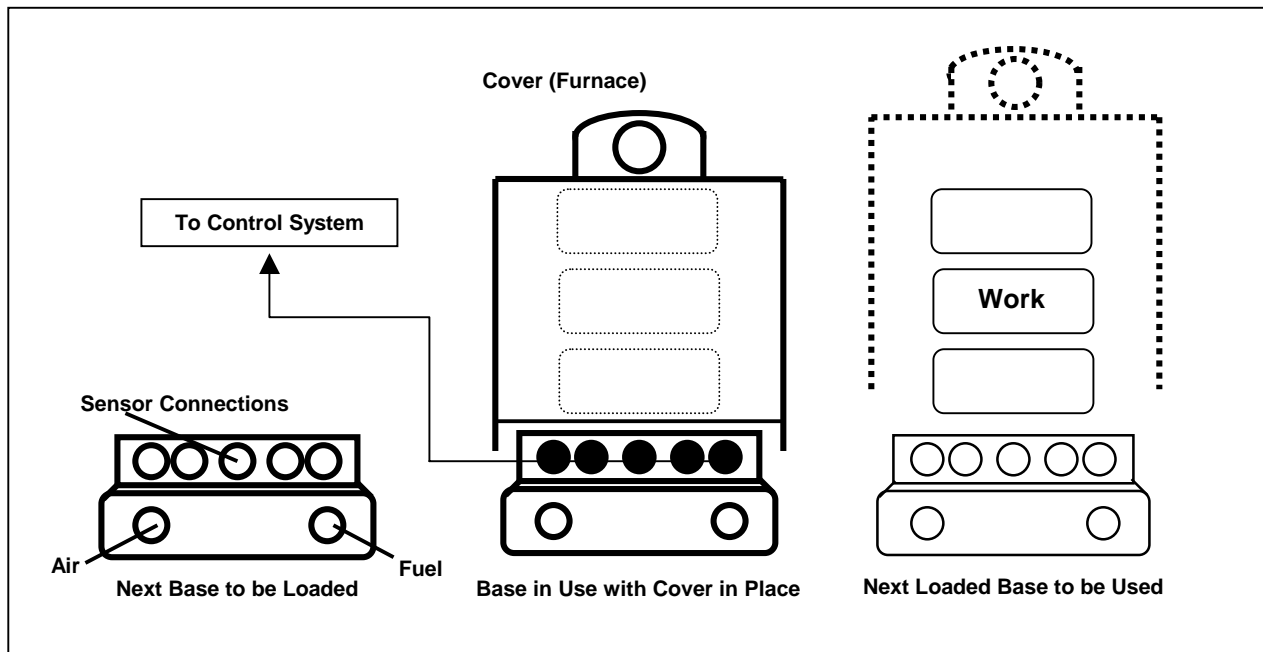


HC900 Annealing Furnace Control

Application Brief

Industry: Thermal



Problem

The products treated in these furnaces constitute a large mass of material that must be heated uniformly – as rapidly as possible without product damage – and then maintained (soaked) at a constant temperature for many hours.

Thermocouples are used to measure base and furnace temperatures and are also placed on the work. Furnaces typically have from one to four zones of control with furnace, base and work thermocouples in each zone. It is desirable to use the work thermocouples for control because they provide a better indication of product temperature and product uniformity. If the work thermocouples are used during the heat-up portion of the cycle, the cycle could be lengthened or the furnace could overheat before the large mass of work is uniformly brought to its proper temperature.

The traditional solution has been to use the furnace thermocouple(s) for control during initial heat-up, switching to the work thermocouple(s) when the work reaches setpoint to control the soak portion of the cycle. The base thermocouple(s) are monitored throughout for equipment protection and to assure uniformity of the work temperature.

Because the covers that comprise a furnace are portable, and since there are more bases than covers, switch panels with cables and plugs

are traditionally used to connect the control system with the base(s) in use. Chart recorders, used for data acquisition, are connected the same way. This reduces the size of the control system, but the switch panels are awkward to use and require high maintenance.

The challenge is to execute the sensor transfers with minimum effect on the process and provide status indication to the operator.

The HC900 Solution

The HC900 may be used to eliminate the switch panels for multiple furnaces.

A “Load Follower” cascade configuration is used to execute the control transfer requirements. This configuration eliminates the need for transfer relays, switches and their associated wiring. The “Load Follower” uses a separate controller function in the HC900 for both furnace and work. The furnace controller regulates the energy into the furnace; the work controller regulates the setpoint of the furnace controller to satisfy the desired temperature of the work.

The soak period is controlled with a Setpoint programmer in the HC900. Discrete I/O provides status indication to the operator, and the time remaining in the soak period is displayed on the Setpoint Program screen.

HC900 Annealing Furnace

Solution, continued

The 1042 Operator Interface provides trend displays for furnace and work temperature monitoring plus “recipe” selection. Process data is stored on disk for analysis and process documentation.

Benefit Summary

The Honeywell HC900 provides the following benefits when used in annealing furnace applications:

- Extensive set of advanced algorithms for maximum process performance
- Open Ethernet connectivity via Modbus/TCP protocol provides plant wide process access and data acquisition.
- Extensive equipment diagnostic and monitoring to maximize process availability
- A common configuration tool for both control and OI minimizing engineering costs.
- Autotuning and fuzzy overshoot protection for quick startup and proper control operation.
- Storage of up to 50 recipes for fast, error-free product selection.
- Storage of up to 99 time/temperature profiles. Each profile may be part of a recipe.

Implementation

Overview. The HC900 as shown in Figure 2 consists of a panel-mounted controller, available in 3 rack sizes along with remote I/O, connected to a dedicated Operator Interface (OI).



Figure 2: HC900 Hybrid Controller, Model 1042 OI and Hybrid Control Designer Software

All field signals terminate at the controller. The controller has universal analog inputs, analog outputs and a wide variety of digital input and output types. This controller will provide all the annealing furnace control functions.

Configuration. The Hybrid Control Designer tool provides advanced configuration techniques allow a variety of strategies to be easily implemented. The run-mode configuration monitoring and editing capability allows these strategies to be tested and refined as process knowledge is gained

Monitoring. The complete operation can be monitored and controlled from the easy to use, familiar displays of the Model 1042 OI.

Data Storage. The data storage feature of the OI can be used to log process information during the cycle to an integral floppy disk for a permanent record.

Open Connectivity Over Ethernet – Use popular HMI, data acquisition, OPC server, and HC900’s HC Designer configuration software over an Ethernet LAN concurrently to access HC900 controllers