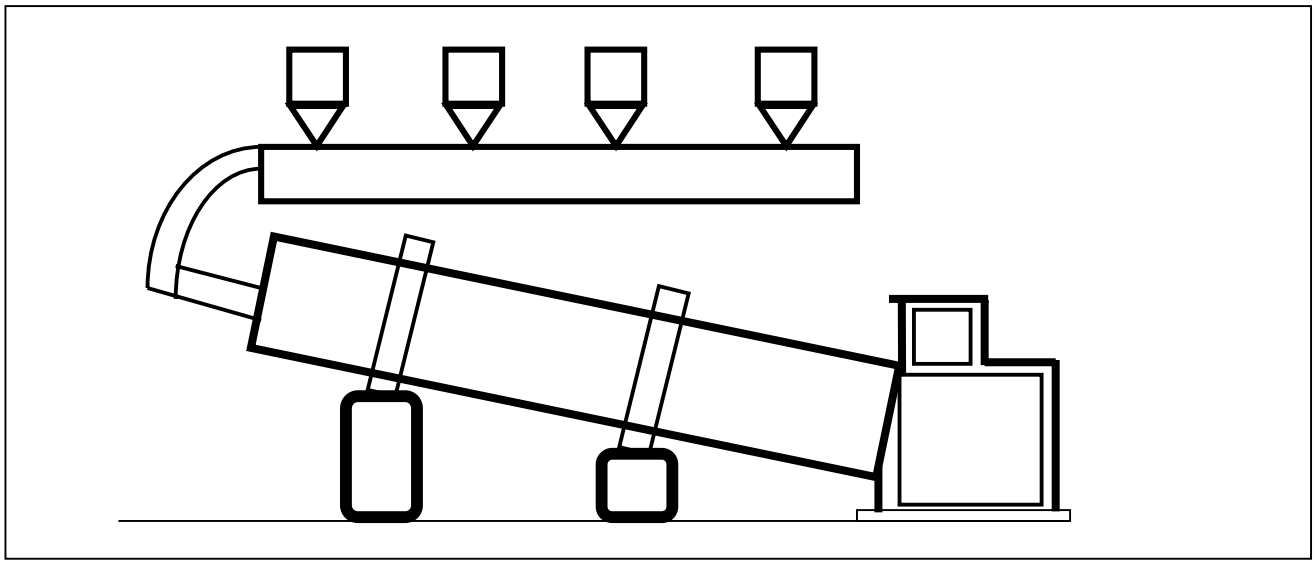
Honeywell

HC900 Cement Plant Kiln Control

Application Brief

Industry: Cement



Problem

Cement plants use large amounts of energy to produce acceptable clinker. Improved kiln control can lead to substantial energy savings while maintaining high production of quality clinker.

Efficient operation of a modern cement plant is dependent on many factors relating to personnel safety, equipment protection, quality control, and energy usage. Control strategies must account for changes in material chemistry, load and process response times.

Control equipment must be capable of sophisticated continuous control functions for variables such as temperature and pressure, as well as logic functions for materials handling and other discrete applications.

Control equipment must survive in the severe environment of the cement plant, and be economical because of the large number of control points. The plants are extensive, so wiring and other installation costs are a consideration.

The HC900 Solution

Implementation of a comprehensive automation strategy requires control equipment flexible enough to go beyond the generally accepted control algorithms; algorithms must be available to monitor kiln performance continuously and to maintain the desired stable kiln operation.

The primary aim of a kiln control strategy is to maintain a stable burning zone temperature. This can be accomplished by monitoring burning zone temperature, preheater/precalciner temperatures and pressures, exit gas analysis, and kiln drive power. Based on changes in these variables, adjustments can be made systematically to fuel rate, kiln feed, kiln speed, and the ID fan.

The choice of measured and controlled variables is based upon ongoing analysis of the process for severity of disturbances and effectiveness of adjustments

With the HC900 Hybrid Controller key process measurements are brought in to a Control Action Selector function. Burning zone temperature is compared with the operator's specified setpoint, and an appropriate control actin is initiated if there is any deviation.

For example:

A falling temperature initiates examination of fuel rate, oxygen and the ID fan. If these variables are within acceptable limits, HC900 Hybrid Controller logic selects fuel increase as the appropriate control action. With this selection, Dynamic compensation is applied to regulate the rate of fuel increase and simultaneously, the ID fan is adjusted to maintain safe oxygen levels.

Solution, continued

If the ID fan and oxygen have been at marginal levels, HC900 logic would have selected kiln speed as the appropriate control action. With this selection, kiln speed is reduced to offset the burning zone temperature deviation, and then increased incrementally to maintain a high rate of production.

During high demand periods, the control strategy can invoke forced kiln speed control that continuously increases kiln speed while all variables are monitored continuously to ensure that no unsafe conditions occur. If approach to a limiting condition such as low oxygen level or high ID fan speed is detected, the forced increase of kiln speed is discontinued.

Precalciner temperature changes are fed forward in an adaptive form to bias fuel flow to compensate for the temperature of incoming material. The measurement is also feed to the Logic block to affect the adjustment of other control outputs affected by incoming material temperature.

The data acquisition and control capability of the HC900 permits ongoing process analysis to define and implement the control strategies while maintaining high production with safety and at low cost.

Benefit Summary

The Honeywell HC900 provides the following benefits when used in kiln control applications:

- Extensive set of advanced algorithms for maximum process performance
- Ethernet connectivity for easy plant wide integration.
- Extensive equipment diagnostic and monitoring to maximize process availability
- A common configuration tool for both control and OI minimizing engineering costs.
- Isolated, universal analog inputs allow mix of analog input types on same card, saving I/O cost

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 racks, connected to a dedicated Operator Interface (OI).

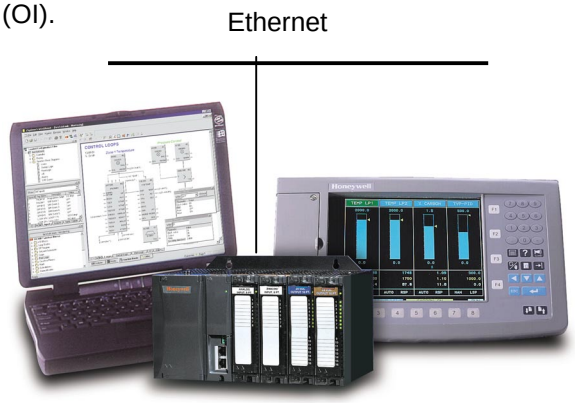


Figure 2 HC900 Controller, OI and Control Designer

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 kiln control functions.

Configuration. Control Designer provides advanced configuration techniques allow a variety of strategies to be easily implemented. The online 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 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

Peer to Peer Communications - Any HC900 can support up to 8 peer controllers for exchange of analog or digital data over Ethernet