Phillips 66 Uses Profit® Controller to Improve Furnace Transition Control

"The overall control of reactor inlet temperature is much better with Profit Controller than with just DCS control, especially during the transition of burner switches."

- Yangdong Pan, Phillips 66

Background

In May 2012, Phillips 66 debuted as an independent downstream energy company with refining, marketing, midstream and chemicals businesses operating across the globe.

The name Phillips 66 reflects the company's rich history and has strong brand recognition and value as it has been one of the leading fuel brand names in the United States for decades.

Phillips 66 enjoys a rich and complex history through its many predecessor companies, most notably Conoco and Phillips Petroleum Company. These two companies had long and successful businesses before merging in 2002 to form ConocoPhillips. In 2012, ConocoPhillips repositioned into two stand-alone publicly traded companies, one of which is the Phillips 66 of today.

One of 15 Phillips 66 refineries.

Benefits

When Phillips 66 determined they needed better control of reactor inlet temperature in their coker naphtha hydrotreater unit at the Wood River Refinery, they decided that Honeywell's Profit Controller was the solution.

With a goal of controlling reactor inlet temperature tightly, Phillips 66 knew that a small variation in the inlet temperature leads to large variations in the reactor.

With a process that is highly interactive, variations in Hydrotreatment (HDT) reactor inlet temperature can be reported back as a disturbance to the heater – a typical multivariable control problem.

Complex and highly interactive industrial processes require more than traditional process control strategies. Honeywell's Profit® Controller application allows easy implementation of multivariable control and optimization strategies and provides safe control of complex industrial processes. As a result, users benefit from increased throughput and improved production of high-value products at lower costs.

Challenge

Throughput changes occur frequently due to coker operations. The pre-heat furnace has four burners, and furnace burners are routinely taken in and out of service by operations as throughput and reactivity changes.

Process dynamics change after a burner switch, and knowledge of the number of burners in-service is helpful.

The challenge is two-fold – control and optimization. It is important to maintain the HDT reactor inlet temperature within operator-specified low and high limits, and to maintain the pre-heat furnace inlet temperature above an operator-specified low limit.

From an optimization perspective, the challenge is to maximize the HDT reactor inlet temperature and maintain the pre-heat furnace burner pressure at an engineer-specified desired value.

Solution

Profit Controller models were developed and are automatically updated based on the calculated number of burners in service. This control is accomplished through a custom function that allows for multiple Profit Controller model files to be selected and read in "on the fly".

Four Profit Controller model files have been pre-built for the application. Each Profit Controller differs in the steady-state gain that has been assigned to the burner pressure sub-models.

The calculated "number of burners in service" has been included as a disturbance variable (DV) to the Profit Controller application, giving Profit Controller advance notice that the heat input to the furnace is about to undergo a step change as a result of a change in the number of burners.

Results

The overall control of the reactor inlet temperature is much better with Profit Controller than with just DCS control, especially during the transition of burner switches.

About Honeywell Profit Controller

Profit Controller is an integrated component of Honeywell's Profit Suite for advanced control and optimization. It includes the tools necessary to design, implement and maintain multiple input/multiple-output (MIMO) advanced process control applications. It has the unique ability to maintain superior process control even with significant model mismatches that result from underlying process changes.

Profit Controller utilizes a dynamic process control model to drive maximum value by predicting future process behavior. It delivers optimal process control response by using the minimum manipulated variable movement necessary to bring all variables within limits or to set points. With Profit Controller, users not only benefit from project payback periods of less than a year but also from sustained benefits that exceed the industry norm.

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