

Hydrotreater Advanced Process Control (APC) Improves Control of Product Sulfur Content, Reduces Fuel Gas and Hydrogen Consumption, and Extends Catalyst Life

Due to frequent changes in the compositions and charge rates of mixed middle-distillate streams, the final product sulfur content of a diesel hydrotreating unit was subject to major upsets, thereby jeopardizing the ability of the refinery to maintain final blended diesel within mandated sulfur specification limits. Control of this most important process variable was a constant challenge for the process operators and a source of major frustration.

Objective

An operations task force identified lack of stable control of the hydrotreater–product sulfur content as one of the most bothersome operating problems in the refinery. Under “ultra low sulfur diesel” operation mandates, the operators were forced to maintain a very low product sulfur content under normal operating conditions because of the high risk of severe off-spec excursions under upset conditions, particularly when increasing unit charge rate or the sulfur content of the feed. Consequently, hydrogen and fuel gas consumption was excessive, and catalyst operating conditions were severe. MAVERICK was challenged to develop a set of APCs that eliminated this source of operating inefficiency.

Results

Operators are more than satisfied with the results. The operators' attitude toward the effort went from, “You're wasting your time—it can't be done” to “I'm impressed—this is a significant improvement.”

Solution

This APC package consists of three separate controls working in integrated, cascade fashion to stabilize and regulate the product sulfur content (analyzer input with lab data updating), reactor weighted average bed temperature, and charge heater outlet temperature. There is an additional control to minimize heater–fuel gas consumption by maximizing product heat recovery.

Feed-forward action is included for total charge rate changes, heater–inlet temperature changes and for changes in the mix of the streams being fed to the unit.



Controller tuning is adaptive — tuning constants are adjusted as a function of unit charge rate.

This set of controls is applicable to other hydrotreaters, such as gasoline hydrotreating units.

The MAVERICK Difference

MAVERICK's team of advanced process control experts were able to stabilize and regulate the product sulfur content, reduce fuel gas and hydrogen consumption and extend catalyst life. See what our experts can do for you!



A Rockwell Automation Company

MAVERICK Technologies, LLC

265 Admiral Trost Drive | Columbia, IL 62236 USA

+1.888.917.9100 | Fax +1.618.281.9191

info@mavtechglobal.com | mavtechglobal.com