Micro Motion® Enables Controlled Catalyst Injection via Inline Measurement of % Solids

BENEFITS

- Better control of catalyst delivery
- Fewer unplanned shutdowns
- Eliminated production losses of 80000€ per year

Customized concentration measurement enables precise control of reaction

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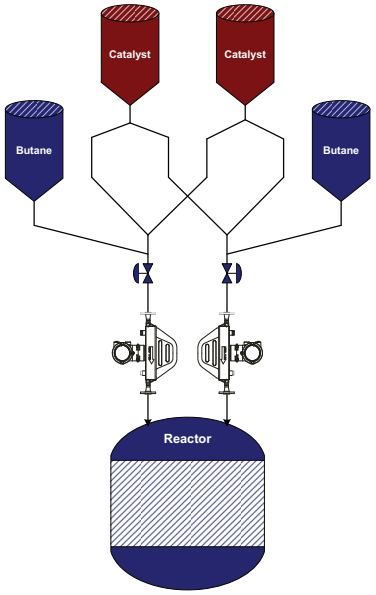
PROCESS

Total Petrochemicals Antwerpen produces high-density polyethylene (HDPE) from petroleum (butane), hydrogen, and two chrome catalysts in a continuous process. The process is pressurized and operates at a stable temperature. Different catalyst flow rates are used to produce different grades of HDPE. Small amounts of hydrogen are added to the reactor to control the molecular weight and fine-tune the grade of the product.

HDPE is used in pipes, industrial packaging (e.g., drums, bottles, and film), toys, electrical cable sheathing (e.g., submarine cables), and so on — anywhere a high-tensile-strength plastic is required. The plant has an overall capacity of 510000 tons of HDPE per year.

CHALLENGE

To control the amount of catalyst delivered to the reactor, Total Petrochemicals relied on a stable flow from the catalyst feeders. No verification method was in place. This system suffered from two ongoing problems: the concentration of the catalyst varied, and occasional blocks or leaks occurred in the catalyst feedlines. If the catalyst content of the reactor is too low, the reaction does not occur. If the catalyst content is too high, the temperature of the reaction goes too high. In either case the process must be shut down, resulting in a production loss of 20000€. Unplanned shutdowns due to catalyst problems occurred an average of four times a year: an annual loss of 80000€.



Micro Motion F-Series meters on catalyst feedline

Micro Motion®

For more information:
www.EmersonProcess.com/solutions/chemical
www.micromotion.com

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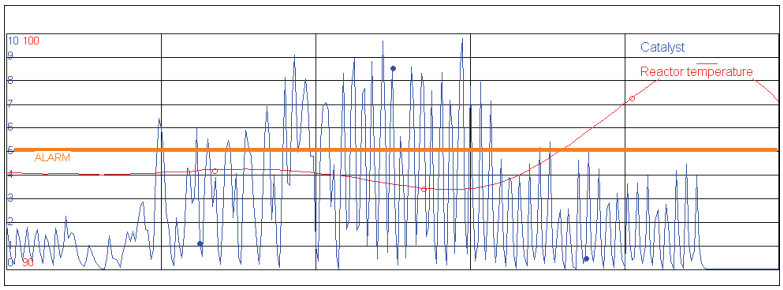
Total Petrochemicals requested a system that provided accurate real-time measurement of catalyst delivery, and that was relatively immune to the corrosive and erosive properties of the catalysts.

SOLUTION

Total Petrochemicals installed a Micro Motion® F-Series sensor and a Model 2700 transmitter on each reactor feedline. The system was purchased with the concentration measurement (enhanced density) option, which uses inline density and temperature data and the known behavior of the process fluid to calculate real-time concentration data. Predefined concentration matrices are available for several common process fluids, and custom matrices can be defined for other fluids.

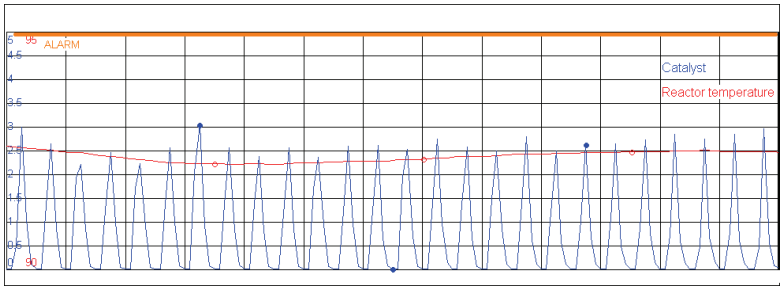
By defining a concentration matrix for butane, Total Petrochemicals obtained a real-time measurement of the amount of catalyst in the fluid from the catalyst feeder, represented as % solids. Because both the process temperature and the process pressure are very stable, Total Petrochemicals chose to use temperature data from the sensor and to omit pressure compensation from the installation.

When real-time % solids data is supplied to the control system, catalyst content and temperature of the reactor can be precisely controlled. Additionally, the system can detect sudden drops in catalyst flow that indicate problems with a catalyst feeder, and switch the process to a second feeder. The Micro Motion solution enables continuous production and a savings of 80000€ per year.



Unstable catalyst feeder (DCS data)

Alarm set to 5 kg/hr
Unstable catalyst content causes temperature swings and production shutdowns



Controlled catalyst feeder (DCS data)

Alarm set to 5 kg/hr
Controlled catalyst content enables continuous production

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