Chemical Company Reduces Uncertainty in Critical Ethylene Flow Measurement

RESULTS

- Temperature uncertainty reduced from ±0.7° F to 0.25° F
- Flow measurement uncertainty reduced by 65%
- Immediate payback on instrument investment

Gas flow rate uncertainty can be drastically improved when temperature error is reduced.

APPLICATION

Custody transfer of ethylene

CUSTOMER

Chemical company in Texas, USA

CHALLENGE

A chemical company in Texas needed to improve their flow measurement on a 6 inch (150 mm) ethylene line. Ethylene is a valuable feedstock, representing a sizeable investment. The annual throughput on the line was approximately 442,000,000 lb/yr (200,000,000 kg/yr) with a financial value of $250,000,000. It was critical that the flow measurement be as accurate as possible because even a small error could have a large financial impact.

Mass flow measurement was accomplished through pressure and temperature compensation of an orifice meter. A Rosemount 3144P temperature transmitter and a standard class B thin film RTD provided the temperature compensation for this meter. The sensor interchangeability error for this RTD is about ±0.7° F (0.4° C) at the flowing temperature of 68° F (20° C). Under normal flow conditions (100 inches H_2O (248 mbar) DP and 500 psig (34.5 bar)), the flow rate was 50,493 lb/hr (22,900 kg/hr). Because the indicated temperature could be up to ±0.7° F (0.4° C) in error, the flow measurement would be impacted by as much as ±2%. This would translate into $4,790,000 of measurement error per year.

SOLUTION

In order to improve the temperature measurement in this flow application, the company decided to take advantage of the transmitter-sensor matching capability of the Rosemount 3144P. The existing RTD was replaced with a Rosemount Series 68 RTD that included Callendar-Van Dusen constants specific to that sensor. By simply programming the four provided constants into the Rosemount 3144P, the temperature

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measurement error was reduced by a factor of three - to an uncertainty of ±0.25° F (±0.15° C).

This simple change reduced the flow uncertainty due to temperature uncertainty from ±2% to ±0.675%. The financial implication of this measurement improvement totalled $3,100,000 over a one year period. Payback on the instrumentation investment was almost instantaneous.

By simply programming the four provided constants into the 3144P, the temperature measurement error was improved by a factor of four.

RESOURCES

Rosemount 3144P

http://www.emersonprocess.com/rosemount/products/temperature/3144p.html

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