

Chemical Company Reduces Uncertainty in Critical Ethylene Flow Measurement

RESULTS

- Temperature uncertainty reduced from $\pm 0.7^\circ\text{F}$ to 0.25°F
- Flow measurement uncertainty reduced by 65%
- Immediate payback on instrument investment

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 $\pm 0.7^\circ\text{F}$ (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 $\pm 0.7^\circ\text{F}$ (0.4°C) in error, the flow measurement would be impacted by as much as $\pm 2\%$. 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



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

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measurement error was reduced by a factor of three - to an uncertainty of $\pm 0.25^\circ\text{F}$ ($\pm 0.15^\circ\text{C}$).

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

RESOURCES

Rosemount 3144P

<http://www2.emersonprocess.com/en-US/brands/rosemount/Temperature/Single-Point-Measurement/Pages/index.aspx>

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

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