Application Note

Industry: Chemical
Market Niche: Urethane
Product: HP-I Positive Displacement Flowmeters
Fluid: Polyols and Isocyanates
Service: Ratio Control • **Viscosity:** 150–3000 cP

Overview

Polyurethane foam is used in various applications. A common use is in home insulation; it's the porous, yellow material with the aluminum foil exterior covering. Polyurethane foam manufacturing plants, as well as plants at which other reaction/injection urethane products are made, are another opportunity to apply Flow Technology positive displacement flowmeters.

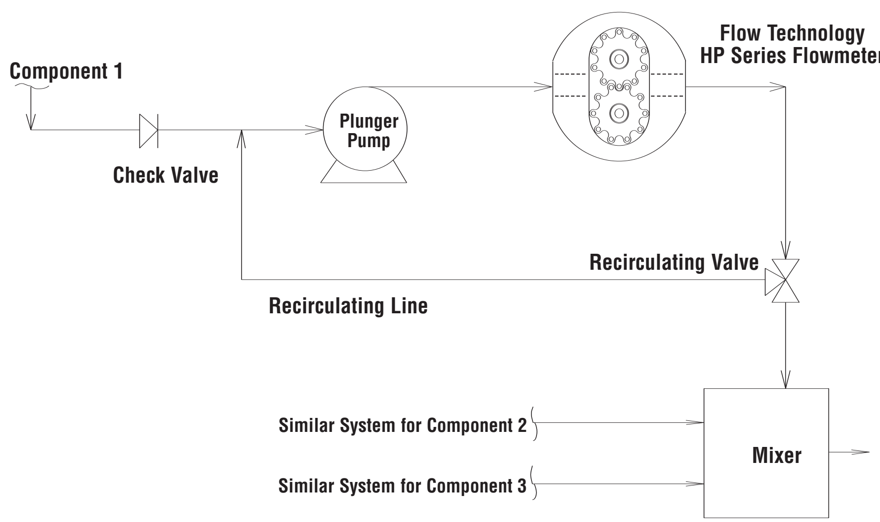
In the manufacture of polyurethane foam, several chemicals, such as polyols and isocyanates, are combined in a reaction mixing process. If precise ratios are not maintained, the product will be unsatisfactory and can only be discarded. Flowmeters are used to assure the correct ratio is maintained.

Situation

There were problems with the coriolis type mass flowmeters at a midwestern polyurethane foam plant. The high-pressure plunger pumps created system vibrations that caused severe meter inaccuracies. The three high-pressure meters were replaced with Flow Technology HP series meters and the system is now operating properly.

System Description

The system was set up as shown to the right. Components were mixed and sprayed under high pressure to produce the final product. There were manufacturing periods and recycling periods. The system had to be kept in tune during the recycle period so that it would be ready for mixing. The meter, therefore, was located ahead of the mix/recycle valve.



In such a system, polyol viscosity could be in the 500–3000 cP range. Isocyanates would have a low viscosity of 5–25 cP, medium viscosity of 150–250 cP, or a high viscosity of 900–1300 cP. Flow rates were generally under a few gpm, but could be up to 50 gpm.

This system had a control system that was a little more complex than typical for Flow Technology meters. A primary controller provided continuous flow rate monitoring in pounds per minute. There was another controller in parallel with the primary controller that provided totalization for just the flow of chemical that was made into product. It was able to do this because in the signal wire there was a relay that closed when the mix/recycle valve was in the mix position.

There was also transmission from each controller through an RS-232 port to a central computer, and a frequency-to-analog transmitter that provided a 4–20 mA signal to a strip chart recorder for continuous flow rate monitoring of product flow.

Application Note

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Analysis

A coriolis mass flowmeter could not do the application because of its basic operating characteristics. In the coriolis meter, the fluid is passed through two tubes which are formed to make a curved path. As the fluid is passed through the tubes they are vibrated and a coriolis component of acceleration, proportional to the mass flow rate, is created.

The coriolis mass flowmeter has its best applications when mass flow is the desired unit of measure and when the product density and viscosity are variable. It is not, however, a universal answer to flowmetering.

Mass meters have a reputation of being susceptible to external vibration which the control system interprets as coriolis acceleration which results in inaccuracies. Also important is that mass meters are expensive — often several times the price of a Flow Technology flowmeter.

Sales Information

A sales representative followed up a trade magazine sales lead. Flow Technology solved a problem where a coriolis mass meter had failed.

Technical Data

Component 1 System:
Flowmeter: HP10I-6119-5110000, Teflon® alloy impellers
Flow Rate: 2.7–15.7 gpm (30–170 lbs./min.)
Fluid: 150–460 cP, 50°–70° F, 125–3000 psi

Component 2 System:
Flowmeter: HP10I-6119-5110000, Teflon® alloy impellers
Flow rate: 1.0–5.4 gpm (9–50 lbs./min.)
Fluid: 1000–3000 cP, 65°–90° F, 125–3000 psi

Component 3 System:
Flowmeter: HP02I-6119-5102000, Teflon® alloy impellers
Flow rate: 0.08–0.8 gpm (0.7–7 lbs./min.)
Fluid: 250–400 cP, 60°–90° F, 125–3000 psi

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