

Effective Distillation Control with Honeywell Smart Multivariable Transmitters

Hydrocarbon Vapor Flow Measurement in the Chemical Industry



Problem: Accurate measurement of hydrocarbon vapor flow in distillation

In many chemical plants, there is a need for recovery of low boiling point solvents using vacuum distillation. In vacuum distillation, the pressure over a liquid is greatly reduced in order to permit distillation at relatively low temperatures. The resultant vapor is flowed to receivers in which fractional distillation can take place and the individual solvents recovered for reuse. Over a year's time many thousands of dollars can be saved by the plant through this process. Additionally, a significant amount of money can be saved by avoiding release of fugitive emissions regulated by the Environmental Protection Agency.

Overall control of the distillation process means that plant engineers need a method for accurate measurement of the rate of hydrocarbon or other vapors at low pressures and elevated temperatures. This method of flow measurement must be able to generate data on both mass and volume flow depending on the requirements of the individual process.

Solution: The SMV3000 with Preso Pitot Tube

The SMV3000 is a four in one transmitter. The device provides measurement of differential pressure across a primary flow element such as an orifice or pitot tube, a process (static) pressure measurement and a process temperature using either an RTD, or thermocouple detector. As the fourth process variable, the SMV3000 provides a flow measurement based on the three process variables of differential pressure, static pressure and process temperature. To meet the needs of the vacuum distillation processes in chemical plants, the SMV3000 has a variety of flow units available including cubic feet per minute (CFM) for volumetric readings and kilograms per minute (Kg/min) for mass flow measurements.

For the low pressure measurement, the SMV3000 is available as a low differential pressure, low absolute pressure measurement device. The SMA110 has a minimum differential pressure span of 0-1 inch of water with an operating pressure range of 0-100 psia.

When used for flow measurement of low pressure vapors, large process piping is typically used in the 10 to 26 inch range of internal diameter. For this type of measurement, a Preso Ellipse pitot tube is ideal. The combination of low pressure drop across the element plus the economical price for larger sizes make the Preso pitot tube the primary flow element of choice for large pipe diameter flow rate measurement. In addition, the Preso Ellipse pitot tube is available with an integral RTD temperature measurement sensor. This feature reduces the number of pipe intrusions to ONE!

In an actual measurement in the chemical industry, a hexane/acetone vapor flows through a 24 inch pipe at an estimated flow of 8000 lb per hr. The static pressure is 6.1 psia and the operating temperature is 105 degrees F. The Preso Ellipse pitot tube used as the primary flow element is calculated to have a differential pressure of 2.7 inches of water (at 60 degrees F) at the 8000 lb./hr flow. Since the vapor is extremely flammable, both the integral RTD for the Preso tube and the SMA110 are available in explosion proof, Class 1 Div 1 certified versions. The SMA110 is integrally mounted on the Preso Ellipse pitot tube through an integral 3 valve manifold. The Preso pitot tube itself is mounted to the process in a flange configuration. Other mounting configurations are available upon request depending on the nature of the process and the customer requirement.

For the above actual application, the SMA110 is configured by means of the SCT (Smart Configuration Toolkit) computer interface for the following ranges:

PV1 (DP)	PV2 (static pressure)	PV3 (process temperature)	PV4 (process flow)
0-3.0 " H ₂ O	0-10 psia	0-200 degrees F	0-8000 lb/hr

Using the *FLOW WIZARD* feature of the SCT, the SMA110 can be set up for a flow measurement in a matter of minutes. This configuration information can then be rapidly downloaded into the SMA110 directly and an on-line check of the setup accuracy made in a few additional minutes.

Accuracy of the flow measurement is vital since tight process control is the method by which money is saved in the chemical plant. The accuracy of the SMA110 in the above application is 0.1% of calibrated span with the overall accuracy of the transmitter/pitot tube system being +/-1% of the mass flow rate.

Benefits

Installation of the SMA110 with a Preso Ellipse pitot tube provides:

- Single pipe intrusion for all three process variable measurements with consequent savings in installation cost.
- Rapid, and effective configuration of the SMA110 using the SCT.

- Accurate measurement of the process flow through compensation for pressure and temperature variations.
- Significant dollar savings through the use of a single transmitter to provide three process variable measurements plus a calculated flow.
- Digital integration to the Honeywell TPS provides the security of digital integration plus a wide range of diagnostic and configuration capabilities.

Other SMV3000 Uses

The SMV3000 can be used to measure the flow of virtually any liquid, gas or slurry for which a primary flow element exists to provide differential pressure measurement. Examples for the chemical industry include gas flows (nitrogen, hydrogen, steam and natural gas), liquid flows (acids, bases, solvents, monomers, polymers) and slurries (chemical suspensions).

More Information

For more information Smart Multivariable Transmitters, visit www.honeywellprocess.com, or contact your Honeywell account manager.

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