Technical Article

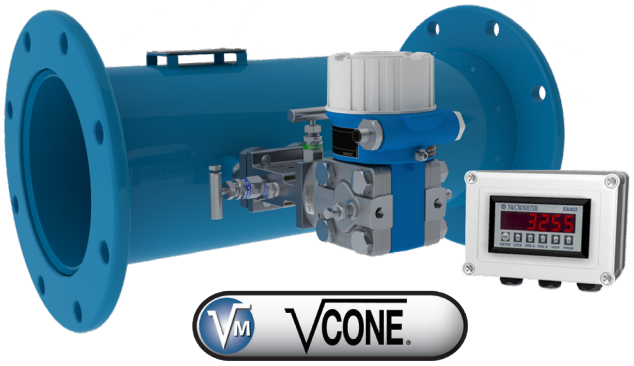
Compact Flow Meter Operates In Tight Spaces To Reduce Installation Headaches and Costs

Sooner or later every water and wastewater plant runs into a real estate problem. The issue usually surfaces during facility retrofits or expansions when installing flow meters or other equipment that require a prescribed straight run of pipe to operate accurately or efficiently. If the new flow meter requires a straight run of pipe that isn't available, there is going to be an accuracy problem that can be very expensive to solve.

Facility layouts normally tend to create less than optimum piping conditions for flow measurement because flow meters require an obstructed straight run of pipe both upstream and downstream from the meter. Inserting pumps, elbows, valves and other equipment in the pipeline near the flow meter causes liquid media swirling and other effects that can result in irregular flow profiles that reduce measurement accuracy and repeatability. For this reason, flow meter manufacturers typically specify anywhere from 5 to 10 or even 20 to 30 pipe diameters of straight pipe run upstream and downstream of the flow meter—depending on the flow sensing technology in use.

Preventing or Avoiding Problems

In this case, an ounce of prevention is worth a pound of cure. The easy answer is to know your flow meter and its straight run pipe requirements to achieve accurate, consistent measurement. That being said, many times in expansion or retrofit projects there simply isn't enough space to accommodate the required straight run of pipe. There is a temptation to hope for the best because it looks "close". If there is a problem, however, then changing the pipeline layout or moving other devices often becomes impractical and too costly.



One answer to this problem can be flow conditioners or straighteners. Several different types of straighteners and conditioners are available, such as perforated plates, tube bundles, etc. The purpose of these devices is to eliminate swirl and provide a stable velocity flow profile. One drawback to add-on flow conditioners and straighteners is they inevitably increase head loss.

A New Solution To Crowded Installations

With this common problem in mind, McCrometer has developed its new VM V-Cone system flow meter, which features built-in flow conditioning and requires a very short straight run of pipe. The VM V-Cone system is a space-saver flow meter that is ready to install right out of the box. It comes from the factory in a pre-calibrated configuration that matches the customer facility's flow measurement requirements, and it includes a transmitter and flow computer.

The VM V-Cone flow meter conditions fluid flow to provide a stable flow profile that increases accuracy. The flow meter's design features a centrally located cone inside a tube. The cone interacts with the fluid

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flow and reshapes the velocity profile to create a lower pressure region immediately downstream. The pressure difference, which is exhibited between the static line pressure and the low pressure created downstream of the cone, can be measured via two pressure sensing taps. One tap is placed slightly upstream of the cone and the other is located in the downstream face of the cone itself. The pressure difference can then be incorporated into a derivation of the Bernoulli equation to determine the fluid flow rate.

The cone's central position in the line optimizes the velocity of the liquid flow at the point of measurement. It forms very short vortices as the flow passes the cone. These short vortices create a low-amplitude, high-frequency signal for excellent signal stability. The result is a highly stable flow profile for measurement accuracy to ±1% over a wide flow range of 10:1 All of this is possible with a minimal straight pipe run of 0 to 3 diameters upstream and 0 to 1 diameters downstream from the flow meter depending upon placement relative to valves and other control devices.

With a new flow computer added to its built-in flow transmitter, the VM V-Cone system provides secure password-protected lock-out access. The standard configuration flow computer has easy front panel access via its membrane-type touchpad display and can be remote-mounted. Dual engineering units capability means rate and total flow functions are independent, allowing for different combinations of flow units.

The VM V-Cone system comes pre-packaged and ready to install with a new built-in 3-way valve that isolates the transmitter from the process fluid flow for easy maintenance without shutting down the pipeline. It arrives wet-flow calibrated directly from the factory, taking away many of the headaches from adding a flow meter to any flow installation.

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