Accurate steam measurement: From start up to full Operation.

Introduction

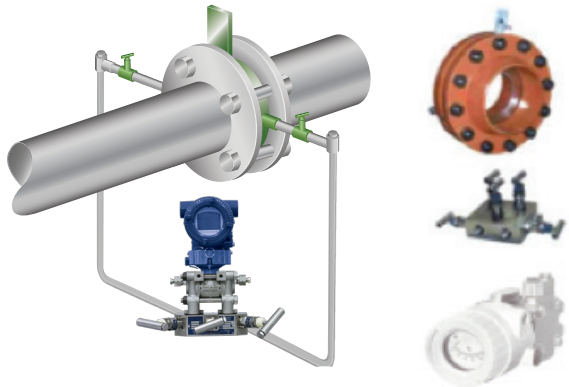
Steam has often been described as the 'lifeblood' of industry. It is the medium by which heat from a boiler is converted into an easily transportable form that can provide diverse services from office heating to the mechanical energy that drives turbine generators. Steam is still one of the most popular methods of providing an energy source to a process and its associated operations.

It is now a well-accepted fact that measuring energy consumption is an important factor in the quest to improve energy efficiency. Efficient and accurate metering is paramount to determining excess use, along with an accurate picture of where the steam is being used. A sound energy management policy can only have a positive effect on the 'bottom line' profitability.

The Challenges

Most boiler systems are scalable to the plant's needs, meaning steam generation can be ramped up or down depending on the need from the facility. This can range from low flows during start up, to higher flows during full operation and back down to low flows during downtimes of maintenance. It is important however that accurate measurement of steam is essential in controlling boiler efficiency and safety. The more accurate and reliable measurements that are made, the more informed decisions can be taken that affect costs and product quality.

Traditionally the most common method of steam metering is the orifice plare and differential pressure transmitter technique. General areas of concern with this type of measurement are the orifice plate's susceptibility to wear introducing immediate inaccuracies, the relatively high permanent pressure losses introduced into the system by the orifice plate and the small measuring range, typically 3:1.

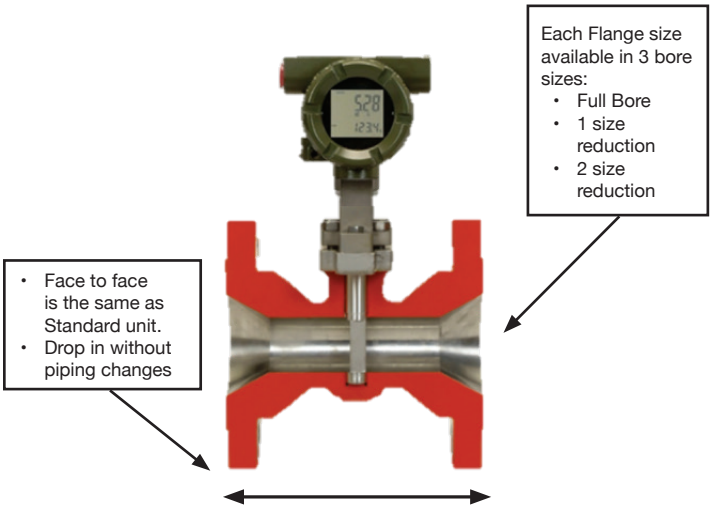


The orifice flow meter is not suitable for low-flow measurement, and can develop zero drift and span drift when the temperature/pressure conditions fluctuate beyond the design specifications. In order to measure larger turn downs with a orifice, the plates must be changed periodically and the pressure transmitters re-calibrated and spanned.

Vortex meters are known to be superior devices for steam flow measurement due to their inherent linear measurement, large turndown, low pressure drop and high accuracy. It is often thought that it is no problem to install a line size meter to capture a wide range of flows but that is not always the case. This practice can lead to losing a lot of the low end measurement. When sizing a vortex meter, it is common to have to reduce the line size using concentric reducers to increase the velocity through the meter for optimum performance. unfortunately piping changes need to be made and this can increase the installation costs.

Solution

To meet the customers' needs, Yokogawa introduced the digitalYEWFLO Reduced Bore Type Vortex Flow meter featuring a cast stainless steel body and a concentric reducer and expander that enable stable flow rate measurements in low-flow conditions. This expands the range of measurements that can be performed, from the higher flow rates down to the lower end of the flow span, which is normally difficult for Vortex Flow meters, and ensures stable and accurate flow rate output.



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While formerly two to three different types of orifice plates had to be changed to adapt to fluctuations in the line flow rate, this is no longer necessary with the digital YEWFLO reduced bore type. This model reduces installation cost and expands the range of applications available to end user.

The flow meter is available with a single reduction or a double reduction in bore size, while still keeping the same face to face dimension of a standard full bore vortex. This makes installations on new projects simplified with no need for additional reducers or piping, and it makes swapping already installed Vortex units simple, as there are no piping changes required.

Reduced bore digitalYEWFLO vortex meters are flow tested with the reducers; this ensures the accuracy of the unit is not compromised by reductions in the line. Manual reductions in piping cannot guarantee this accuracy.

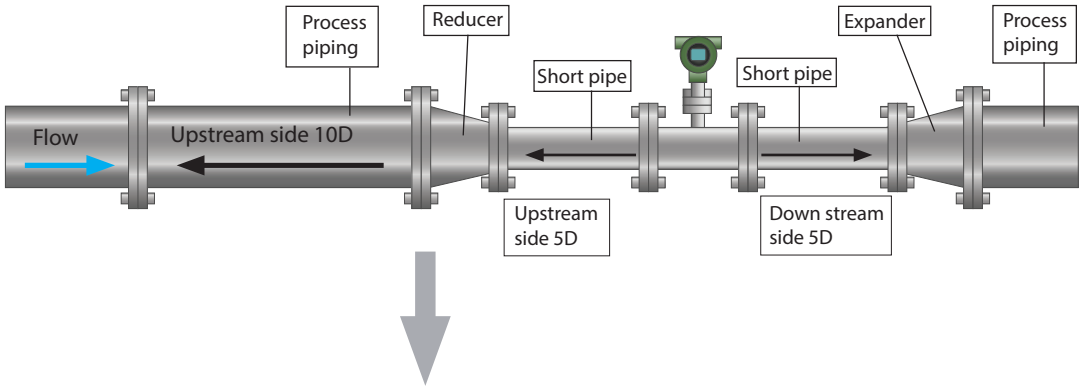
The main benefits of Yokogawa's reduced bore type vortex flow meter:

- Minimum measurable flow up to five times lower than conventional vortex flow meter.
- Integrated construction with reducers built into the flow meter body.
- The same face-to-face dimensions ease the task of installing other sizes or types of digitalYEWFLO flow meters.
- No need for costly piping modifications such as reducers/ expanders or short pipes to achieve the required straight pipe length.
- Increases the space for installation of additional instrumentation

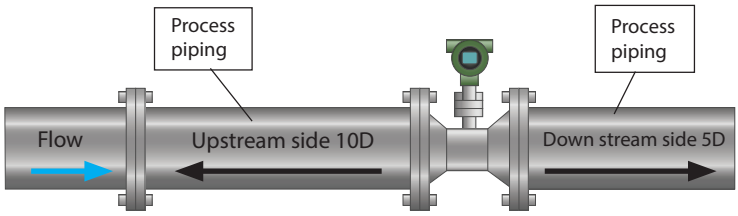
Yokogawa vortex flowmeters are also well suited to high temperature applications, and the quality of flow management can be improved even further through the use of anti-vibrating efficiency and self diagnostic functions that rely on the digitalYEWFLO's SSP system.

A multi-variable design is also available. With the multivariable option, a built-in integral temperature sensor allows the meter to make a true mass flow measurement of saturated steam by referring to steam tables embedded in the software. This eliminates the need for separate pressure and temperature sensors and a flow computer.

Traditional Instrumentation



New Instrumentation Using Reduced Bore Type



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