The Right Choice of Flowmeter

The "flow" value is part of the standard values in modern measurement and control technology. As a result, many processes can be implemented, depending on the measurement medium used, the required accuracy, and the process conditions. The right choice depends on a number of parameters. This means that sometimes devices may not work satisfactorily in certain applications. Experts estimate that around three quarters of all flowmeters are not being used to their full potential. 90 % of them blame problems on improper design.

A few important design criteria are:

- Flow area
- Nominal width
- Installation conditions
- Accuracy
- Pressure loss
- Choice of material on the basis of corrosion and abrasion resistance, etc.

As several suitable measuring principles are available, however, an optimum measuring point can be found on the basis of further criteria such as purchase prices, user friendliness, or maintenance.

The devices are permanently evolving. Turning to the past can often be deceptive as other measuring principles are outdated and other materials or design types have been established that are more suited to the application.

Every principle and every design type has its pros and cons. A satisfactory performance depends entirely on meeting the challenge of application.

Cost considerations

The costs associated with a flowmeter differ greatly. They start with a minimal amount and can reach six figures. The most costly aspects are the materials and desired accuracy. But there's not just the costs of the device itself to consider. The type of installation and periphery can drive up costs as well. Plug-in sensors, for example, can be used for nominal widths instead of inline sensors. In this case, it's clear that the purchase price is lower because of the design type and the installation costs are also brought down. It's much easier to drill a hole in a pipe than cut it off and weld on a flange. So it doesn't always have to be absolute "top of the range" devices. On the other hand, however, it is important not to lose sight of future challenges. Because, as always, you get what you pay for.

Maintenance

Several factors influence a flowmeter's maintenance requirements and operating life. Often, the main issue is that the wrong system is chosen for the application. Also, sensors with moving parts require a lot more attention than other moving parts. But every device will need maintenance sooner or later.

Because they wear out, flowmeters with moving parts require more regular maintenance. If solid particles can still be found in the liquid, maintenance should be planned accordingly. This can be counteracted with an abrasion filter or a coating in the measuring tube.

Even measuring systems without moving parts, such as an electromagnetic flowmeter, may need regular maintenance due to the buildup of deposits, if this insulates the electrodes. As this greatly affects the accuracy. Depending on the quality of the coating, the device can show more or fewer incorrect values.

This makes it clear that the maintenance costs can be optimized by the right choice of flowmeter. Of course, this optimization can lead to a measuring system in which the total cost is higher than a sensor including high maintenance costs. If plant availability is also taken into consideration, a reduction in maintenance times can justify these higher overall costs. Each plant operator must make their own judgment.

Summary

From this short consideration, it is evident that the framework conditions of the application must be understood inside out, as they are essential for choosing the right flowmeter. With application data, you're often spoilt for choice with a plethora of systems. All too often, unsuitable systems are used because people rely on the "tried and tested". New developments are not taken into consideration even though they could save time and money. For this reason, a general overview of the system that also considers maintenance costs is important. If in doubt, it always helps to include an external expert consultation.

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Selection chart for flow applications with JUMO products as an example.

Technology	JUMO	Installation	Accuracy	Expenses	In/outlet conditions	Wear
Calorimetric	JUMO flowTRANS CM I01	Insertion	10 % of MRE.	+	-	0
Paddle wheel	JUMO flowTRANS PW I01	Insertion	2.5 % of m.v.	+	-	-
Magnetic-inductive	JUMO flowTRANS MAG I01	Insertion	3.5 % of m.v.	0	-	0
Magnetic-inductive	JUMO flowTRANS MAG S01	Inline	0.2 % of m.v.	-	+	+
Differential pressure with orifice plate	JUMO flowTRANS DP R01	Inline	0.5 % of m.v.	-	-	0
Differential pressure with pitot tube	JUMO flowTRANS DP P01	Insertion	1 % of m.v.	-	0	0

Product definitions

JUMO flowTRANS CM I01

The JUMO flowTRANS CM I01 flow sensor works according to the calorimetric measuring principle. It distinguishes itself through its simple, direction-independent mounting, and easy-to-use operation. It can, for example, be used to control cooling circuits, compressors, pumps, and heat exchangers. The device can also be used for leak detection, for dry-run protection of pumps, or in lubrication circuits.

JUMO flowTRANS PW I01

The JUMO flowTRANS PW I01 paddle-wheel flow sensor is suited for the continuous flow speed measurement of neutral or slightly aggressive liquids carrying a low amount of solid matter. Flow velocities from 0.3 to 10 m/s can be measured.

JUMO flowTRANS MAG I01
This magnetic inductive flow transmitter can be used in liquids with a conductivity from 20 µS/cm. Flow velocities from 0.2 to 10 m/s can be measured.

JUMO flowTRANS MAG S01
The electromagnetic flow measurement is one of the most common measurement methods in the world. The JUMO flowTRANS MAG S01 is available for nominal widths ranging from DN 10 to DN 300. The minimum conductivity of the measurement medium must be greater than 5 µS/cm. Depending on the version, the maximum temperature is up to 130 °C. The JUMO flowTRANS MAG S01 is available either as a compact device or with a separate transmitter.

JUMO flowTRANS DP R01

When measuring the flow on the basis of the differential pressure, both a pressure transmitter and a primary element are required for a complete measuring point. JUMO has two systems available in its product line. In both versions the core element is the JUMO flowTRANS DP R flowmeter, which can be used in liquids, gases, and steam. It is available in numerous nominal widths, for a temperature range between -200 and +1,000 °C, and for a pressure up to 420 bar. The differential pressure is acquired with the JUMO dTRANS p02/p20 DELTA differential pressure transmitter and converted into a proportional flow signal.

JUMO flowTRANS DP P01

The measuring principle of the pitot tube uses the pressure difference between the dynamic pressure building up upstream of an obstacle blocking the flow and the static pressure immediately at the rear of the probe. Pitot tubes have cost advantages compared to flanged devices – particularly with large nominal widths. The key element of the JUMO system is the JUMO dTRANS p02/p20 DELTA differential pressure transmitter.