

Swirl versus vortex flowmeter technology

Swirl flowmeter challenges established vortex technology



Measurement made easy

—
VortexMaster
SwirlMaster

Introduction

The Swirl flowmeter advances Vortex flowmeter technology by simplifying installation, improving accuracy and reducing cost of ownership.

Additional Information

Additional documentation on SwirlMaster FSS400 is available for download free of charge at www.abb.com/flow. Alternatively simply scan this code:



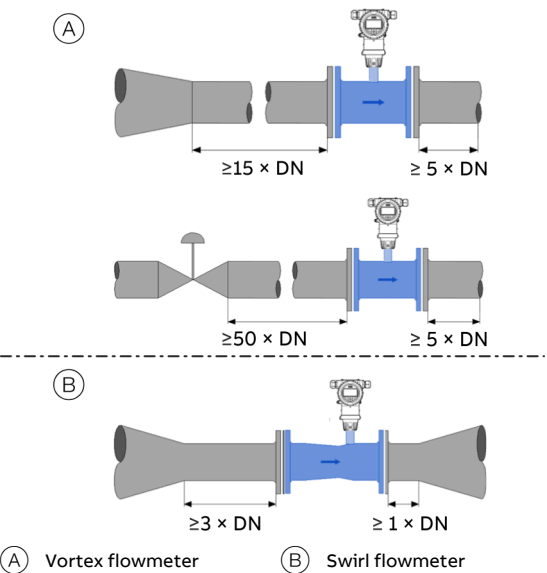
... Introduction

Over the last 30 years, Vortex flowmeters have become standard flow meters for many industrial process applications, especially for measurement of gas and steam flowrates.

The ABB Swirl flowmeter SwirlMaster FSS430 / FSS450 operate on similar principles, but have certain advantages.

- As Swirl flowmeters create their own flow profile within the meter, they require only 3 diameter upstream straight pipe run after a pipe reduction and 5 diameter after a control valve plus 1 diameter downstream.

Vortex flowmeters typically require a minimum of 15 diameter upstream and 5 downstream to develop a proper flow profile for accurate measurements after a reduction. After a control valve 50 diameter are required.



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So the Swirl flowmeter better fits applications with tight piping requirements, sometimes SwirlMaster is the only suitable flow meter solution.

- When applying vortex flowmeters, the user typically have to choose a flowmeter reduced by one or two pipe sizes from the process pipeline size. This ensures that the flowmeter experiences the higher velocities required across the desired flow range, but adds piping reduction and expansion costs. Swirl flowmeters work at lower flow velocities for proper operation, and so usually may be sized the same as the process pipe size - no pipe change necessary.
- Swirl flowmeters offer a higher degree of accuracy, up to 0.5 % which is better than all vortex flowmeters in all applications.

Cost of ownership

Based on the higher cost of the primary element, the capex for SwirlMaster is higher than a traditional Vortex meter. But when it comes to a cost of ownership calculation, the higher initial cost can turn quickly into significant savings over the lifetime:

Example 1, Savings due to higher accuracy

Application:

50 t/day saturated steam at 6 bar (a)
FSS430 DN 80 (3")

Cost:

50€/t

Accuracy improvement 0,5 % because of Swirl employment.

50 t/day × 50€/t × 360 days = 900,000€
900,000€ × 0.5 % = 4500€ savings p.a.

Additional capex because of Swirl employment:

1000€ (Swirl DN 80 – Vortex DN 80, at list price)
Return of invest: < 0.2 Years!

Example 2, Savings of pipe run and reduction:

Installation:

Swirl DN 80, installed after a control valve

Required straight pipe run Vortex:

50 × DN 80 = 4 m

Required straight pipe run Swirl:

5 × DN 80 = 40 cm

Capex	Vortex flowmeter	Swirl flowmeter
Add. invest	0€	1000€
Add.pipe run	1250€	0€
Reducer incl. welding	1250€	0€
Total capex	2500€	1000€
Capex Savings		1500€

Measuring principle

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02 Measuring principle
swirl flowmeter

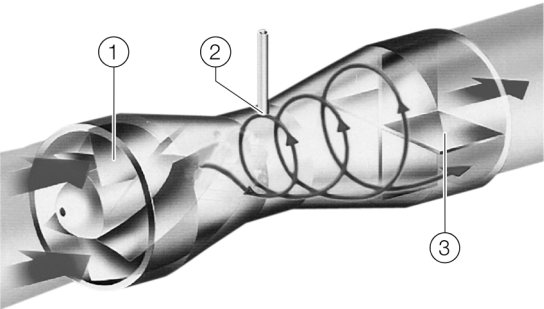
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03 SwirlMaster FSS430
installed without straight
pipe runs

The swirl flowmeter operates under the same technology as the vortex flowmeter. It takes advantage of vortex shedding principles that occur when a flowing fluid comes up against a bluff obstacle in its path.

Additionally, the swirl flowmeter adds a ‘twist’ in conditioning the fluid, which results in the reduced installation considerations mentioned above, while improving performance.

The swirl flowmeter forces incoming fluid through a fixed swirl-inducing element (Swirler) located at the upstream inlet of the meter body. The Swirler imparts a tangential velocity to the fluid, and then accelerates the flow via a reduction in the meter body bore. The primary fluid rotation caused by the Swirler has at its core a low-pressure zone.

This low pressure zone is thrown into a secondary rotation proportional to flow rate. The same piezoelectric sensor as used in ABB’s vortex flowmeters measures the frequency of this phenomenon at the point of maximum.



- ① Swirler
- ② Piezo sensor
- ③ Deswirler

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An increase in the flowmeter’s bore as the fluid approaches the meter outlet decelerates the fluid to its original velocity.

A ‘Deswirler’ welded to the flowmeter body near the outlet eliminates the tangential velocity imparted to the fluid at the inlet. This avoids affecting operation of other downstream instrumentation.

Typical applications

Industry	Applications
Chemical	Acids, solvents, specialty gases, vinyl chloride, steam
Petrochemical	Additives, petrol, ethylene, TiO ₂ , anti-fouling agents, steam
Plant engineering	Compressed air, steam
Food	CO ₂ , sludge water, steam
Pulp and paper	Compressed air, steam
Metal	Coolant circuits, air, protection gases
Pharmaceutical	Deionized water
Power plants	Steam, condensate, natural gas



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For more product information, visit:
www.abb.com/flow

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