Back to Basics

Selecting a flowmeter: The paradigm case method

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With so many types of flowmeters available, how do users decide which type to use? When replacing a failed or worn flowmeter with a like flowmeter, the decision is easy. This approach offers the advantage of buying from an existing manufacturer and not having to learn a new technology.
However, suppose it's a new flowmeter application? What are the important criteria in choosing one flowmeter type over another?

Paradigm case method

In its simplest form, the paradigm case method consists of selecting the type of flowmeter whose paradigm case application most resembles application criteria. Once a flowmeter type has been selected, other questions, such as manufacturer and costs, remain. Applying the following six steps helps ensure the best flowmeter is selected.

1. Develop a list of characteristics and criteria relevant to the flow measurement application, including such items as type of fluid (liquid, steam, or gas), type of measurement (volumetric or mass), pipe size, fluid viscosity, fluid condition (clean or dirty), Reynold's number, process pressure, process temperature, fluid density, and flow profile (two or three phase).
2. List the application's performance requirements, including accuracy, turndown, reliability, and repeatability.
3. Evaluate the flow measurement application characteristics and criteria against the paradigm case applications for each flowmeter technology, selecting the one that provides the best application match.
   Paradigm case applications for flowmeter types are shown for new-technology flowmeters and for traditional-technology flowmeters in the tables.
4. Using the one or more flowmeter choices identified in step 3, develop a list of life-cycle costs including purchase, installation, calibration, maintenance, estimated life expectancy, and other ownership costs.
5. Identify manufacturers offering suitable flowmeters and evaluate pre- and post-sale support capabilities, including manufacturer and distributor location, local site service capabilities, available training, spare parts availability, and customer support responsiveness.
6. Review requirements for application, performance, costs, manufacturer, and local supplier and compare against identified flowmeter types, selecting the one that best meets all requirements and criteria.

Occasionally, a flow measurement application arises that can't be completely resolved using the six steps described above; however, applying the paradigm case method always narrows the choices and makes it much easier to intelligently discuss options with flowmeter experts.

Paradigm Case Applications for New-Technology Flowmeters **Technology**	**Paradigm case applications**	**Disadvantages**
Coriolis	Clean liquids and gases flowing fast enough to operate the meter in pipes of two inches and less.	Becomes expensive and unwieldy at four inches and above; High purchase cost, though some lower-cost models now available.
Magnetic	Conductive liquids that do not damage the liner or coat the electrodes and when flowing keep the pipe full.	Cannot meter hydrocarbons, nonconductive fluids, gases, or steam.
Ultrasonic	Clean, swirl-free liquids or gases of known profile.	A multipath meter may be required for high accuracy; Most clamp-on meters are less accurate than spoolpiece meters.
Vortex	Clean, non-viscous, swirl-free liquids, gases, or steams flowing at medium to high speed.	Difficulty measuring fluids at low flowrates; Vibration and noise have traditionally been an issue, but manufacturers are developing solutions.

Paradigm Case Applications for Traditional-Technology Flowmeters **Flowmeter type**	**Paradigm case applications**	**Disadvantages**
Differential pressure	Clean liquids, steams, and gases with low to medium accuracy requirements.	Pressure drop; orifice plates are subject to damage and wear.
Positive displacement	Clean, non-corrosive liquids, viscous liquids, and gases requiring low flowrates.	Moving parts are subject to wear.
Turbine	Clean, steady, medium to high speed flowing liquids and gases.	Bearings are subject to wear; limited ability to handle entrained impurities.
Open channel	Free flowing rivers and streams or temporary measurement of partially filled pipes.	Medium accuracy and not suited for full pipe measurements.
Thermal	Clean gases of known heat capacity and low flow rates.	Low to medium accuracy with limited ability to handle liquids.
Variable area	Clean liquids and gases where low accuracy is acceptable.	Low accuracy, many provide only local readouts.

Author Information

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