by Jesse Yoder, Ph.D.

Vortex Flowmeters Gaining Traction (Finally)

Technology Enhancements, Standardization Efforts Are Reason for Optimism

Since vortex flowmeter technology was first introduced in the late 1960s, the number of worldwide suppliers has grown to at least 35. During this time, many technology evolutions have taken place, including anti-vibration software and electronics, multivariable meters, reduced-bore meters, plastic vortex meters, etc. As such, users now have a wide variety of choices when specifying or purchasing vortex flowmeters.

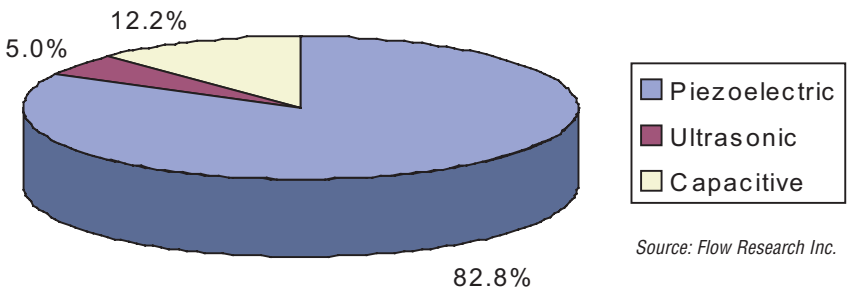
Principle of Operation

Vortex flowmeters operate on a principle called the von Karman effect. This principle concerns the behavior of fluids when an obstacle is placed in the path of flow. Under the right conditions, the presence of the obstacle generates a series of alternative vortices called the von Karman street. This phenomenon occurs in liquid, gas, and steam and has been observed in many diverse contexts.

In vortex flowmeters, the obstacle takes the form of an object with a broad, flat front called a bluff body. The bluff body is mounted at right angles to the flowstream. Flow velocity is proportional to the frequency of the vortices. Flowrate is calculated by multiplying the area of the pipe times the velocity of the flow.

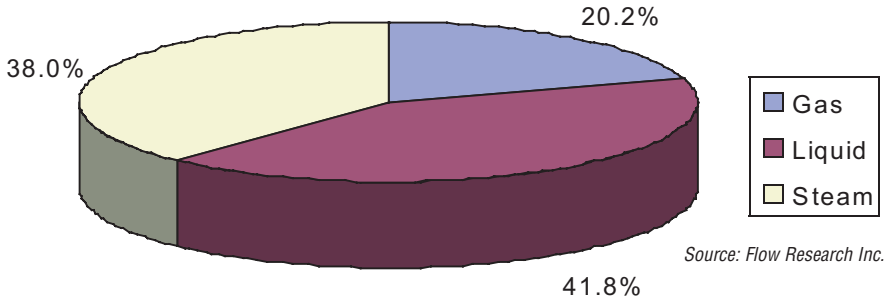
In order to compute the flowrate, vortex flowmeters count the number of vortices generated by the bluff body. They use a variety of techniques for sensing the presence of a vortex. The majority of vortex flowmeters use a piezoelectric sensor; however, some use a capacitive sensor, while others use an ultrasonic sensor to detect vortices (Figure 1).

Figure 1
Shipments of Vortex Flowmeters in North America by Sensing Technology in 2005 (Percent of Dollars)



Source: Flow Research Inc.

Figure 2
Shipments of Vortex Flowmeters in North America by Fluid Type in 2005 (Percent of Dollars)



Source: Flow Research Inc.

Early Problems Limit Uptake

Vortex flowmeters are among the most versatile type of flowmeter. They can measure liquid, gas, and steam (Figure 2). They tolerate high pressures and high temperatures better than many flowmeters, and they provide good accuracy levels and reliability. So, the question arises, why does the vortex flowmeter market remain relatively small as compared to the size of the Coriolis, magnetic, and differential-pressure (DP) markets?

Even though vortex flowmeters were introduced before 1970, this technology is not studied nearly as much or understood as well as differential-pressure (DP) flow technology. Early problems with vibration issues and with providing an accurate measurement of low flows gave some people a negative impression of vortex flowmeters. And for many years there was no attempt to create industry-wide standards for using vortex flowmeters. These factors have held back growth.

Product Enhancements Boost Growth

Despite slow growth in the vortex flowmeter market, there are signs that the technology may finally be catching on. One sign is the major product enhancements that have occurred in the past five years. One perennial problem with vortex flowmeters has been susceptibility to vibration error. Vibrations in the line can cause a vortex flowmeter to falsely generate a vortex signal or to incorrectly read an existing vortex. Suppliers have responded to issues surrounding vibration by implementing software and electronics, including digital sig-

nal processing, that have reduced the susceptibility of vortex meters to interference from vibration.

Another important product enhancement is the introduction of reducer vortex flowmeters. Reducer vortex meters have a reduced diameter in the center of the pipe, where the bluff body generates vortices. This reduced diameter results in an accelerated flowstream, where the pipe narrows. The introduction of reducer vortex models has simplified vortex flowmeter installation and has improved the ability of vortex flowmeters to provide accurate measurement at low flowrates.

Another positive sign is the growing availability of multivariable vortex flowmeters. Sierra Instruments (*www.sierrainstruments.com*) introduced the first multivariable vortex flowmeter in 1997. This flowmeter includes an RTD temperature sensor and a pressure transducer. By using information from these sensors, together with detection of vortices generated, the flowmeter can output volumetric flow, temperature, pressure, fluid density, and mass flow. Multivariable flowmeters measure more than one process variable and typically use this information to compute mass flow. This makes the flowmeter measurement more accurate in changing temperature and pressure conditions.

RESPONDING TO THE EXPRESSED NEEDS OF BOTH END-USERS AND MANUFACTURERS OF VORTEX FLOWMETERS, THE AMERICAN PETROLEUM INSTITUTE HAS CREATED A PROPOSED STANDARD FOR THE USE OF VORTEX FLOWMETERS FOR CUSTODY-TRANSFER OPERATIONS.

In the past five years, a number of new suppliers have brought out their own multivariable vortex flowmeters. These include ABB (*www.abb.com*), Yokogawa (*www.yokogawa.com*), Krohne (*www.krohne-mar.com*), and Endress+Hauser (*www.endress.com*). Even though multivariable flowmeters are somewhat more expensive than their single-variable counterparts, they enable users to obtain significantly more information about the process than single-variable volumetric meters. This additional information can result in increased efficiencies that more than make up for the additional cost of the multivariable flowmeter.

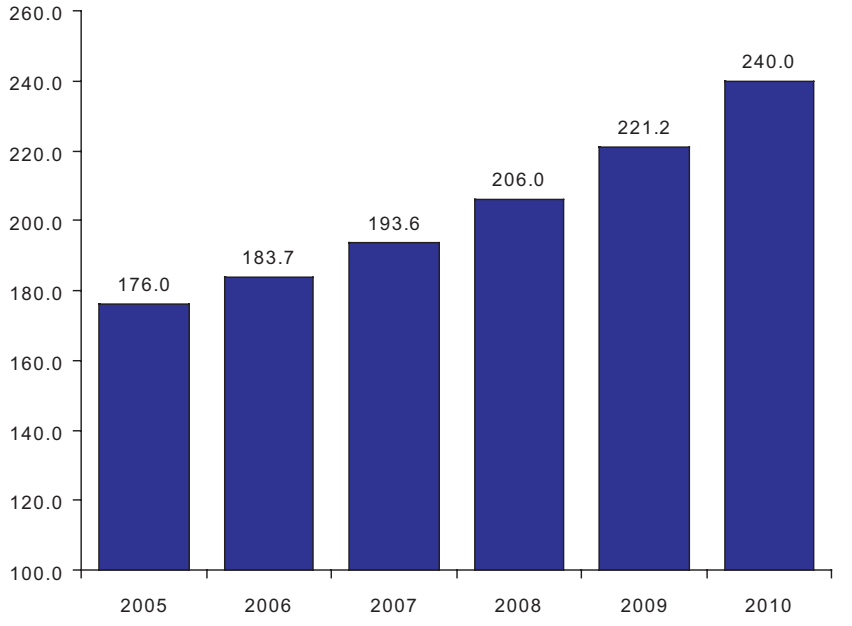
A Spirit of Innovation

Significant changes among vortex suppliers in the past few years are also helping boost growth in the vortex flowmeter market. Aalborg *(www.aalborg.com*) purchased the vortex flowmeter line from Venture Measurement (*www.venture-meas.com*). Racine Federated (*www.racinefed.com*) acquired the industrial vortex flowmeter line from J-Tec Associates (*www.j-tecassociates.com*), and Yamatake Corp. (*www.yamatake.com*) brought out a new

Circle 32 or Request Info Instantly at *www.FlowControlNetwork.com*

Figure 3
Forecast of Total Shipments of Vortex Flowmeters Worldwide
(Millions of Dollars)

Source: Flow Research Inc.



line of vortex flowmeters for gas flows late in 2005.

Major suppliers, including Yokogawa, Emerson Process Management (*www.emersonprocess.com*), and Endress+Hauser have all announced significant upgrades to their vortex flowmeters in the past several years. The spirit of innovation that pervades the vortex flowmeter suppliers is resulting in more choice and in higher quality products. This is good news for customers who are looking at vortex flowmeters for the first time, and for those who have been waiting for the right moment to try out this technology.

Standards On the Way

The creation of standards for the use of flowmeters has been an important catalyst in the growth of many metering technologies. These standards typically lay out conditions that need to be met if a flowmeter is being used for certain applications, such as custody transfer. Recently, standards efforts have figured in the increased demand for ultrasonic and Coriolis flowmeters. Standards bodies involved in flowmeter technology include the American Petroleum Institute (API, *www.api.org*) and the American Gas

You've Just Been Upgraded!

Introducing Type 57 Butterfly Valve

Your Upgrade Package Includes:

-Flange Stopper
-Absorption Channel
-Plasgear TM
Plastic Gear Operator
-Spherical Disc

To learn more visit www.asahi-america.com

ASAHI/AMERICA

To locate your nearest Asahi distributor visit us on the web or call us at: 1-800-343-3618

Circle 33 or Request Info Instantly at *www.FlowControlNetwork.com*

A New Market Study from Flow Research

The Global Market for Magnetic Flowmeters, 3rd Edition

Flow Research has just released a brand new study on magnetic flowmeters that includes market shares, forecasts, product analysis, strategies, and company profiles. Its 450+ pages bring you up to speed on all the important aspects of this market.

This study contains new segmentation not included in earlier studies. Segments include:

Wafer, Flanged, Insertion
Smart/Conventional
Single/Multivariable
Coil Power Type
Configuration
Wiring type
Accuracy Level
Communication Protocol
Line Size
Industry
Application
Distribution Channel
Customer Type

Don't guess at market data. Get your data from the industry leader in market research on flow, pressure, and temperature products.

Why You Must Have this Study

- Find out current market size by geographic region
- Learn strategies to help you build your product line
- Assess your company's position with 51 detailed company profiles
- Find out what applications magnetic flowmeters are used for
- Learn which companies are the leaders in each segment

FLOW RESEARCH

For more information, contact
Flow Research, Inc.
27 Water Street
Wakefield, MA 01880
(781) 245-3200; Fax: (781) 224-7552.
www.flowresearch.com

Circle 34 or Request Info Instantly at *www.FlowControlNetwork.com*

Association (AGA, *www.aga.org*). The International Organization for Standards (ISO, *www.iso.org*) operates to develop and approve standards that are accepted in Europe, although ISO standards are also used elsewhere.

Responding to the expressed needs of both end-users and manufacturers of vortex flowmeters, the American Petroleum Institute has created a proposed standard for the use of vortex flowmeters for custody-transfer operations. Work on the standard has been underway for about two years. The standard applies to both liquid and gas flowmeter applications, and the standardization effort is being performed under the direction of the API's Committee on Petroleum Measurement (COPM), which is made up of representatives of both the supplier and end-user communities. The standard is due to be voted on in the fall of 2006.

Experience shows that the presence of a custody-transfer standard can have a significant impact on the market. Sales of Coriolis and ultrasonic flowmeters increased substantially after the approval of industry standards or reports, particularly for gas flow measurement. The absence of such a standard for vortex flowmeters has hindered market penetration, especially in the oil, gas, and refining industries. If a vortex standard is approved, it is likely to provide a major boost in uptake for this technology.

End-Users Have the Final Say

Whether the vortex flowmeter market is able to match the rapid growth shown by some other types of new-technology flowmeters depends on end-user decisions. Here there are also positive signs of change. End-users are gaining a better understanding and appreciation for vortex flowmeters. This is partly because suppliers have addressed some of the problems associated with vortex flow measurement, using enhanced technologies. It is also because new suppliers have entered the market, and existing suppliers have expanded their vortex flowmeter product lines. As a result, more users are becoming familiar with the technology and coming to understand it well enough to use it with confidence. And as an increased number of customers select vortex meters, their success stories are likely to generate increased enthusiasm for this versatile technology. FC

***Jesse Yoder, Ph.D.**, is a regular contributor to* Flow Control *magazine. He has been a leading analyst in the process control industry since 1986. He specializes in flowmeters and other field devices, including pressure, level, and temperature technologies. He has written more than 60 market research studies in industrial automation and process control and has published numerous journal articles. Dr. Yoder is currently president of Flow Research Inc., a market research firm specializing in flow-related technology. He can be reached at* jesse@flowresearch.com *or 781 245-3200.*

www.flowresearch.com

Circle 35 or Request Info Instantly at *www.FlowControlNetwork.com*

Circle 36 or Request Info Instantly at *www.FlowControlNetwork.com*