by Jesse Yoder, Ph.D.

Measuring a 1% Gain In a $4.5 Billion Market

Newer Technologies Continue Upward Trend in Flowmeter Space

Many claims have been made about the extent to which new-technology flowmeters are replacing traditional forms of flow measurement. The markets for ultrasonic, Coriolis, and vortex flowmeters, some say, are growing far faster than those for positive-displacement and turbine flowmeters, as end-users choose reliability and accuracy over the moving-parts designs and periodic maintenance that goes along with such systems. All this is true, but how fast is the transition from old to new occurring?

It is difficult to evaluate claims about a trend as broad-based as the replacement of traditional technology flowmeters with new-technology flowmeters without looking at the entire flowmeter market over time. Taking a snapshot of this market in one year is not enough, even if it includes all flowmeter types, since this does not provide growth information. Only by taking two snapshots of the entire flowmeter market in different years is it possible to begin to accurately determine the growth of the markets for individual types of flowmeters, as well as the entire market itself.

Flow Research (*www.flowresearch.com*) has just completed its second snapshot of the entire flowmeter market, taken early in 2008 for the 2007 flowmeter market. Flow Research took a similar snapshot of the entire flowmeter market in 2002, so hereafter we will attempt to draw some conclusions about trends in flowmeter technology adoption rates from the first snapshot to the second.

Defining 'New' vs. 'Traditional' Flowmeters

New-technology flowmeters are defined by the following characteristics:

1. The core technology has been introduced during the last 60 years.
2. They incorporate technological advances that avoid some of the problems inherent in earlier flowmeters.
3. They receive more focus in terms of new product development than older technologies.
4. Their performance, including criteria such as accuracy, is at a higher level than that of traditional technology meters.

Generally, flowmeters that fit in the "new-technology" category include Coriolis, magnetic, ultrasonic, vortex, and thermal.

Traditional technology flowmeters share the following characteristics:

1. As a group, these meters were introduced before 1950.
2. They are less the focus of new product development than new-technology meters.
3. Their performance, including criteria such as accuracy, is not at the same level as the performance of newer flowmeters.
4. They generally have higher maintenance requirements than new-technology flowmeters.
5. They are slow to incorporate recent advances in communication protocols, such as HART, Foundation Fieldbus, and Profibus.

Generally, traditional technology meters include differential-pressure (DP) transmitters used with primary elements to measure flow, positive-displacement, turbine, open-channel, variable-area, and target flowmeters.

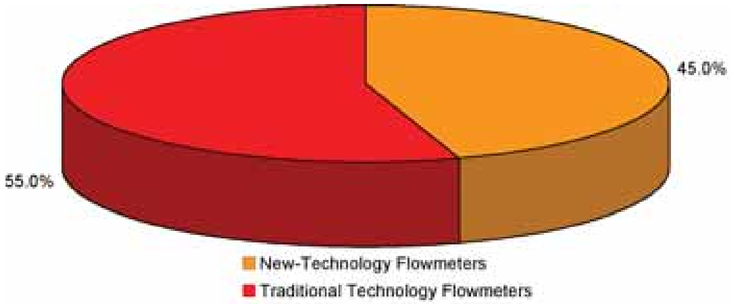
In addition to new and traditional technology flowmeters, a third category has become apparent. This is the category of emerging-technology flowmeters. These flowmeters have been introduced in the past 10 years and are still in the early stages of development. This category includes flowmeter types, such as sonar and optical. As these technologies mature, Flow Research believes they will have a more pronounced impact on the flowmeter market.

Flowmeter Market Trends: 2002 vs. 2007

In attempting to determine just how quickly new-technology flowmeters are supplanting traditional forms of flow measurement, here we will now compare the market as it stood in 2002 to our study results for 2007.

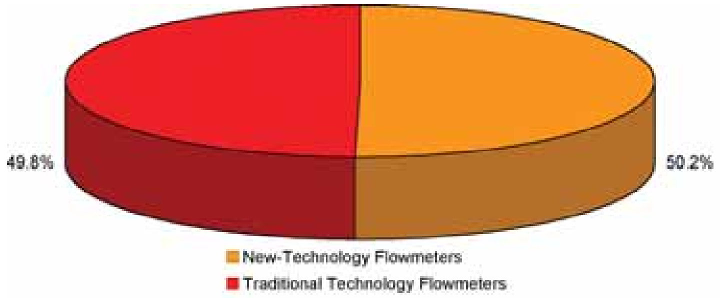
In 2002, the total value of the worldwide flowmeter market, including primary elements, was $3.3 billion. At that time, revenues from new-technology flowmeters totaled 45 percent of the market, while revenues from traditional flowmeter types, including primary elements, equaled 55 percent (Chart 1).

2002 Worldwide Flowmeter Market: New vs. Traditional Technologies

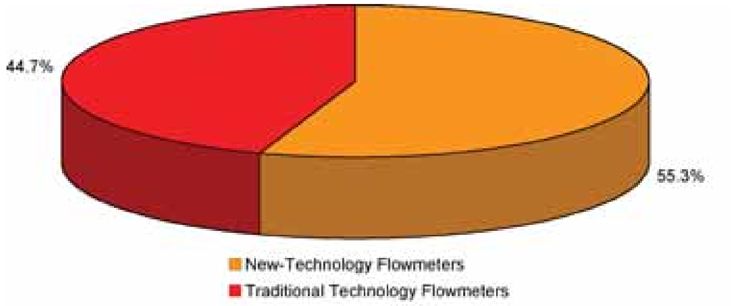


In 2007, the total value of the worldwide flowmeter market, including primary elements, was $4.5 billion. Revenues from new-technology flowmeters totaled 50.2 percent of the market. In the same year, revenues from traditional flowmeter types, including primary elements, equaled 49.8 percent of the market (Chart 2). So revenues from new-technology flowmeters slightly exceeded revenues from traditional flowmeter technologies in 2007.

2007 Worldwide Flowmeter Market: New vs. Traditional Technologies



2012 Worldwide Flowmeter Market: New vs. Traditional Technologies



Thus, Flow Research's analysis shows new-technology flowmeters are taking market share from traditional technologies at an average rate of one percent per year. Flow Research projects that this trend will continue over the next five years. In 2012, revenues from new-technology flowmeters are forecast to account for 55.3 percent of the worldwide flowmeter market, while revenues from traditional technology meters are forecast to be 44.7 percent of the total market (Chart 3).

What accounts for these changes? This question is best answered by looking at trends affecting individual flowmeters, but the broad answer is that end-users are choosing the enhanced reliability and accuracy offered by many new-technology flowmeters. Most new-technology meters generate less pressure drop than traditional technology meters, and they have no moving parts, which means less maintenance.

Key Trends in Flowmeter Technology

Coriolis Flowmeters

Coriolis flowmeters are the most accurate type of flowmeter made. While many magnetic flowmeters have accuracies in the range of +/-0.5 percent, many Coriolis meters have accuracies in the range of +/-0.1 percent. They also are highly reliable and have no moving parts, although they do have a vibrating flowtube. Accuracy and reliability are the top two drivers of the flowmeter market, and Coriolis flowmeters rank very high on both counts. Coriolis flowmeter are also benefiting from industry approvals. The American Petroleum Institute (API, *www.api.org*) published several standards for the use of Coriolis flowmeters in liquid petroleum custody-transfer applications.

One limitation of Coriolis flowmeters is line size. Coriolis flowmeters can become expensive and unwieldy in line sizes over three inches. It used to be that the largest Coriolis flowmeter available was six inches in diameter. In the past several years, however, suppliers have introduced Coriolis meters for line sizes of 10 and even 12 inches.

Magnetic Flowmeters

Magnetic flowmeters are the workhorses of water and liquid flow measurement. They have no moving parts and cause minimal pressure loss. They are widely used in the water & wastewater and pulp & paper industries. The availability of many types of sanitary linings also makes them useful in food & beverage and pharmaceutical applications. Magnetic flowmeters are especially popular in Europe, where a great deal of water and liquid flow measurement occurs.

Ultrasonic Flowmeters

Ultrasonic flowmeters are the fastest growing type of flowmeter. Much of this growth comes from the use of ultrasonic meters for custody-transfer applications of natural gas. Here ultrasonic flowmeters are displacing turbine and differential-pressure meters. Unlike DP flowmeters, ultrasonic meters cause minimal pressure loss, and multipath ultrasonic meters have very high accuracy. These meters also offer a unique choice to end-users, since they are available in clamp-on, spool piece, and insertion models.

Like Coriolis meters, ultrasonic flowmeters have benefited from the publication of standards for their use in custody-transfer applications from both the API and the American Gas Association (AGA, *www.aga.org*).

Vortex Flowmeters

While growth in vortex flowmeters has lagged behind growth in the Coriolis and ultrasonic segments, these meters show signs of promise going forward. More companies are becoming familiar with the vortex concept, and suppliers are offering a more diverse range of products. Vortex meters are the most versatile of flowmeters, in that they can reliably measure liquid, gas, and steam flow. For many years, vortex meters suffered from a lack of industry standards. However, the API fixed this problem in January 2007 when it published a draft standard for the use of vortex flowmeters in custody-transfer applications.

Broad-Based Flow Measurement Trends

One major factor influencing the growth in the flowmeter market over the past five years has been increases in the price of crude oil and natural gas. These price increases have generated a major uptick in the amount of exploration and production of both oil and natural gas. Also, as a commodity becomes more valuable, end-users are willing to pay more to measure it, as the desire for accuracy often reflects the value of the product being measured. Much of the growth in both Coriolis and ultrasonic flowmeters is a result of increased activity in the energy sector, including the oil & gas, refining, and power industries.

What's ahead for the next five years? It seems very likely that the new-technology flowmeter market will continue to outpace the traditional technology flowmeter market worldwide by at least one percent per year. However, several factors could cause this growth to exceed the one percent value. One is that more and more suppliers are adding new-technology flowmeters to their product lines, either by reselling them or by introducing their own new-technology meters. Some suppliers may choose to drop their traditional technology flowmeters, if those meters are no longer competitive.

Another possibility is that emerging technology flowmeters could become more popular and add their own influence to the market. They would be counted with new-technology flowmeters in this case.

Of course, total market growth also depends on the overall health of the world's economies and on continued spending on capital equipment and construction. So stay tuned — there's a lot more to tell in the fascinating story of the worldwide flowmeter market. FC

***Jesse Yoder**, Ph.D., is president of Flow Research, Inc. in Wakefield, Massachusetts (www.flowresearch.com), a company he founded in 1998. He has 20 years' experience as an analyst and writer in process control. Dr. Yoder specializes in flowmeters and other field devices, including pressure and temperature products. He has written over 100 market research studies in industrial automation and process control and has published more than 70 journal articles. Dr. Yoder can be reached at jesse@flowresearch.com or 781 245-3200.*

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Differential-Pressure Flowmeters

DP flowmeters are made up of a DP flow transmitter together with a primary element. The primary element creates a required pressure drop so the flowmeter can calculate flowrate. Types of primary elements include orifice plates, Venturi tubes, Pitot tubes, flow nozzles, and wedge elements. Orifice plates are still the most widely used type of primary element, although Venturi tubes, averaging Pitot tubes, and flow nozzles are gaining in popularity.

DP flowmeters have been around for more than 100 years, and have the largest installed base of any type of flowmeter. While they are used in every process industry, they are especially strong in the oil & gas, chemical, refining, and power industries. The DP flowmeter market has shown significant growth since 2002, due in part to the increased availability of multivariable DP flowmeters. Multivariable DP meters can be used to measure mass flow and are widely used to measure the flow of steam and gas.

Positive-Displacement Flowmeters

Positive-displacement (PD) flowmeters are widely used for custody-transfer and billing applications. They are used to measure the flow of water, oil, gas, and industrial liquids. PD meters are unique in that they capture the fluid in multiple small compartments and then count how many times this is done.

There are at least six main types of PD meters, including oval gear, nutating disc, and diaphragm meters. While they are widely used in commercial and industrial gas and liquid applications, they are one of the most popular types of residential flowmeters. The PD flowmeter market declined modestly over the period from 2002 to 2007. One area where they are losing ground to Coriolis meters is in the downstream measurement of oil, refined fuels, and hydrocarbon products. Coriolis meters are gaining ground over PD meters in the measurement of petroleum liquids in the loading and unloading of trucks, tankers, airplanes, and ships.

Turbine Flowmeters

Turbine flowmeters have a rotor that spins in proportion to flowrate. Like PD meters, they are used for water, oil, gas, and industrial liquid applications. The market size of turbine meters declined slightly from 2002 to 2007. However, they do not compete so much with PD meters as complement them. PD meters are widely used for line sizes of two inches and less, and they excel in low-flow applications. Turbine meters do especially well in line sizes of four inches and above, and they excel in measuring high-speed flows.

Turbine meters are still used to measure custody transfer of natural gas, but in this application they are losing ground to ultrasonic flowmeters. Turbine meters cause a pressure drop because their spinning rotors are placed in the flowstream. The presence of a rotor creates the potential for mechanical wear. Some suppliers have addressed this issue by making the rotor out of a more heavy-duty material, such as ceramic.