by Jesse Yoder, Ph.D.

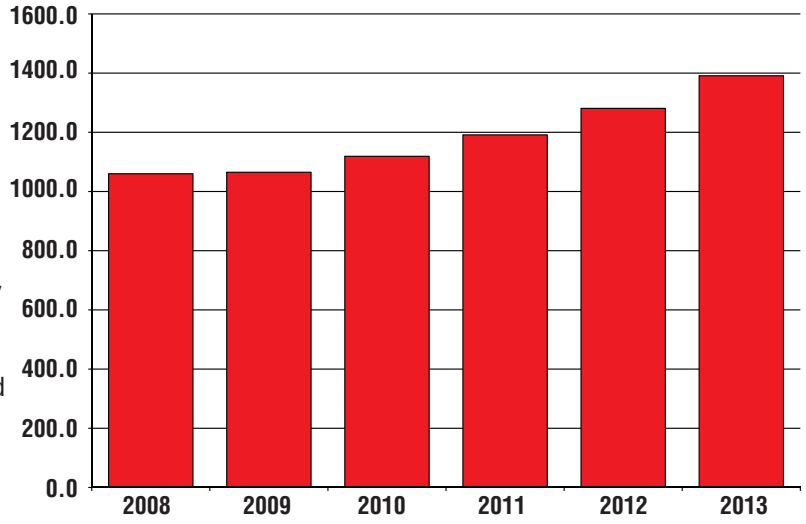
Magmeter Market Rising

Application Flexibility Drives Demand for Magnetic Flowmeters

Magnetic flowmeters stand out in a worldwide flowmeter market that is valued at about $5 billion in 2009. As the leading type of flowmeter for liquid flow measurement, magnetic flowmeters are heavily concentrated in the water & wastewater industry. Other major industries for magnetic flowmeters are food & beverage, pulp & paper, and chemical. In terms of dollars and units, magnetic flowmeters are number one among new-technology flowmeters worldwide.

The origins of magnetic flowmeters go back to 1952, when they were first introduced in Holland by the Tobinmeter Company. In 1954, Foxboro (now part of Invensys Process Systems, *ips.invensys.com*) brought magmeters to the United States. Today there are more than 50 suppliers selling magnetic flowmeters, offering a wide variety of meters of different sizes and with different types of liners. As such, the magnetic flowmeter market has become highly competitive, with suppliers competing on both price and product features.

Shipments of Magnetic Flowmeters Worldwide 2008 - 2013 (Millions of Dollars)



Source: Flow Research Inc., "The World Market for Magnetic Flowmeters, 4th Edition," (www.flowmags.com)

Magnetic flowmeters are based on the principle that voltage is generated when a conductive medium passes through a magnetic field. This resulting voltage is directly proportional to the velocity of the liquid, providing the value used to calculate the flowrate in magnetic flowmeters. This operating principle shows the basis for one limitation on magnetic flowmeters — they can only be used to measure the flow of conductive liquids.

Key Advantages

Magnetic flowmeters have some important advantages that are leading users to select them over more traditional technologies, such as differential pressure (DP), positive displacement and turbine flowmeters. One important advantage of magnetic flowmeters is they are minimally invasive, resulting in minimal pressure loss. DP flowmeters with an orifice plate, for example, force the flowstream through a small opening in the plate, resulting in significant loss of pressure. Turbine meters are another example of a flow measurement system that causes pressure loss as the flow passes over the rotor. Most magnetic flowmeters, by contrast, have an inside diameter that is close in size to the pipe diameter, allowing liquids to flow freely through them.

With relatively high accuracy, magnetic flowmeters are suited for billing and even some custody-transfer applications. Published accuracies for magnetic flowmeters are in the 0.5 percent range or better. While magnetic flowmeters are not typically capable of the accuracy levels of multipath ultrasonic flowmeters, or of the most accurate Coriolis meters, their accuracy levels are high enough to handle most applications. Other common applications for magnetic flowmeters include measuring water flow, water-based chemicals, slurries, process control, sanitary applications, and filling machines.

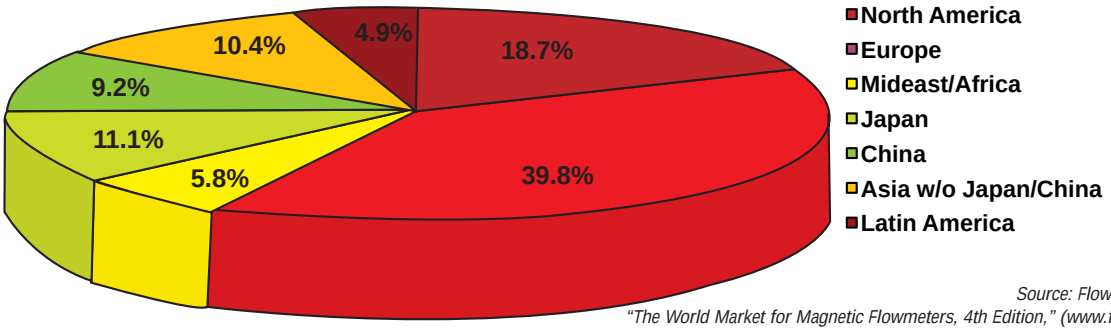
Sanitary and hygienic applications are a good fit for magnetic flowmeters. This is because they can be fitted with liners that handle almost any type of liquid, including food and beverages. PFA and PTFE are used for liquids containing chemicals, while hard rubber is widely used for water applications. Magnetic flowmeters are the only flowmeter type with such a choice of liners, and determining the type of liner is a standard feature of most magnetic flowmeter orders.

New Product Developments

A steady stream of new products from suppliers has also kept the magnetic flowmeter market vibrant with growth. Suppliers have focused their attention on a number of areas. One is in the area of power. When magnetic flowmeters were first brought to market, many of them were powered with continuous alternating current (AC). The AC method was subject to noise that interfered with proper reading of the meter. To compensate for this issue, these meters had to be calibrated regularly against an on-site hydraulic zero.

Suppliers introduced pulsed direct current (DC) magnetic flowmeters in 1974 to compensate for the calibration issues related to AC magnetic flowmeters. While these DC flowmeters have been successful in handling noise problems, they have not always been able to successfully handle hard-to-measure fluids, such as slurries and dirty liquids. As a result, suppliers have

Shipments of Magnetic Flowmeters Worldwide by Geographic Region in 2008
(Millions of Dollars)



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developed "high-strength" DC flowmeters that do a better job with noisy applications. These high-strength DC meters produce a stronger signal, which results from a higher coil current.

Another way that suppliers have responded to user needs is through the development of insertion flowmeters. Magnetic flowmeters range in size from less than ½ inch to more than 100 inches. Inline magnetic flowmeters with diameters above 24 inches can be very expensive. Insertion flowmeters are designed to handle applications where less accuracy is required, but a reliable measurement is still needed. Whether to select an inline or insertion flowmeter is mainly based on questions of cost, accuracy, reliability, and application requirements.

Another area for new product development is in liners. There are at least nine different liners that are commonly used with magnetic flowmeters. Suppliers have regularly brought out new meters with different liner types, designed for different applications. These liners enable magnetic flowmeters to handle a range of applications, from dirty liquids and slurries common to pulp & paper to the hygienic requirements of the pharmaceutical and food & beverage industries. Liners are one of the distinguishing features of magnetic flowmeters, and they help provide versatility in liquid applications.

Two-wire magnetic flowmeters are another area where new products have been developed. Four-wire meters have a dedicated power supply, Two-wire meters use the power available from the loop-power supply. This reduces wiring requirements and can result in lower installation costs. While the large majority of magnetic flowmeters are still of the four-wire type, there is a growing interest in two-wire meters.

Advanced diagnostics is a trend for many types of instrumentation, including pressure transmitters and many other types of flowmeters. End-users are particularly interested in knowing when an instrument may fail, and in being aware of any functional abnormalities. Diagnostic capabilities on magnetic flowmeters include leak detection, wire fault, high process noise, loop verification, and calibration verification. These capabilities enhance the reliability of magnetic flowmeters, and they are a growing trend.

Limitations

Limitations of magnetic flowmeters mainly derive from their requirement for conductive fluids. While suppliers have pushed the lower limit on conductivity, they have not succeeded in eliminating it. As a result, magnetic flowmeters cannot measure the flow of hydrocarbons, and they have a limited use in the oil & gas and refining industries. Ultrasonic and Coriolis flowmeters are a more likely choice for these applications. Also, magnetic flowmeters cannot be used to measure gas or steam flow; their use is limited to liquids.

Geographic Distribution

Magnetic flowmeters are particularly popular in Europe. Water is a highly valued resource in Europe, and magnetic flowmeters are widely used to measure the flow of water. Magnetic flowmeters are widely used in the water & wastewater, food processing, and pulp & paper industries, all of which are strong industries in Europe. As a result, three of the top magnetic flowmeter suppliers are based in Europe: Endress+Hauser (*www.endress.com*), ABB (*www.abb.com*), and KROHNE (*www.krohne.com*). In addition to Europe, magnetic flowmeters are also widely used in North America, South America, Japan, China, and Asia.

What the Future Holds

In the past, there has been a great deal of price competition among suppliers for magnetic flowmeters. Expect this to continue, although the presence of advanced diagnostics and new communication protocols may have the effect of pushing up prices. As the industrial world becomes more global, regional suppliers in countries like China and Russia will become more important to the market as a whole. Expect suppliers to continue to push the envelope on lower conductivity limits, and to continue to release new products with added features, many designed for specific markets and industries. All in all, the future is bright for magnetic flowmeters, as users opt for reliability and accuracy in their liquid flow measurements. FC

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