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WHAT THE FUTURE HOLDS

TRENDS IN PRESSURE TRANSMITTER TECHNOLOGY

GRAND VIEW MEDIA GROUP

by Jesse Yoder, Ph.D.

Future Looks Bright for Pressure Transmitters

Technology Development & Large Installed Base to Drive Uptake

The history of pressure measurement goes back to the 17th century, when both Evangelista Torricelli and Blaise Pascal experimented with early versions of the barometer. Torricelli is generally credited with inventing the barometer. In 1643, he filled a tube one meter long with mercury and set it vertically into a basin of mercury. The tube was sealed at the top. The height of the mercury fell to 760 mm. As we realize now, the height of the mercury was responding to atmospheric pressure. The torr is a unit of pressure named after Torricelli.

For many years, pressure was measured with a manometer. A manometer is a U-shaped tube partially filled with mercury, oil, or some other liquid. When gas pressure is introduced into one end of the tube, the liquid is displaced. The amount of displacement is relative to the amount of gas pressure. The history of the manometer dates back to the work of Torricelli, Pascal, and Robert Boyle.

Pressure Transducer & Transmitters

Early methods of pressure measurement have been replaced in today's environment with pressure transducers and transmitters. Pressure transducers are typically smaller and lower in cost than pressure transmitters. They are widely used in discrete industries, such as automotive and plastics. Pressure transducers often have loose wires at one end and do not perform at the same level as pressure transmitters.

Pressure transmitters are typically made up of a pressure sensor, an amplifier or conditioning element, and an output signal. The output signal is used to transmit the pressure reading to a flow computer, controller, or distributed control system (DCS). One advantage of today's electronic pressure transmitters is that certain actions may need to be taken, depending on the pressure reading of a gas, liquid, or steam. The electronic signal from a pressure transmitter allows it to be integrated into a control system, unlike earlier mechanical methods, such as pressure gages, which had to be manually read.

While pressure transmitters are used to measure pressure, they also have an important relation to two other widely measured variables — flow and temperature. Differential-pressure (DP) transmitters are used to measure flow, and some pressure transmitters have temperature sensors on board to measure temperature. In some cases, this temperature measurement is used along with a pressure and volumetric flow measurement to compute mass flow.

Differential-Pressure Transmitters

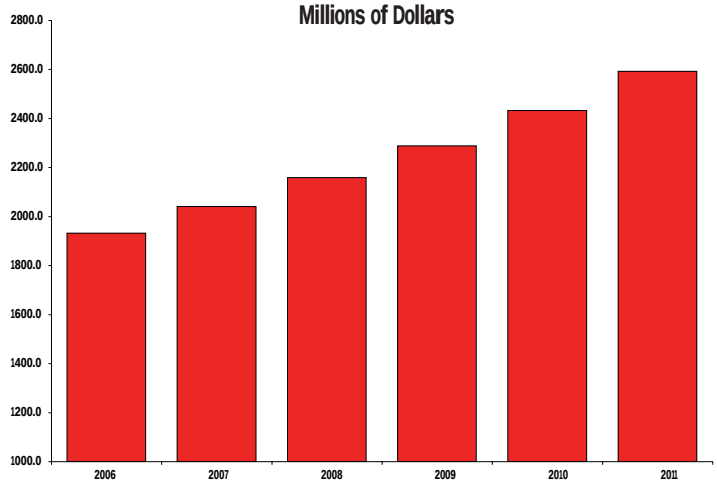
Differential-pressure transmitters rely on a constriction placed in the flow line that creates reduced pressure in the line after the constriction. Pressure transmitters sense the difference in pressure upstream and downstream from the constriction in the flow line. They then use the difference in pressure to compute flowrate.

The constrictions placed in the flow line to create a pressure drop are called primary elements. Orifice plates are the most commonly used type of primary element. Other types include Venturi types, flow nozzles, and Pitot tubes. The use of DP transmitters with orifice plates to measure flow is one of the most traditional forms of flow measurement, dating back at least 100 years.

In addition to differential-pressure transmitters, there are three other types — multivariable, gauge, and absolute. Multivariable pressure transmitters measure two or more process variables in a single device. Typically these variables are pressure and temperature, and sometimes differential-pressure. Gauge pressure transmitters provide a pressure reading that is relative to atmospheric conditions. Absolute pressure transmitters provide a pressure reading that is independent of atmospheric conditions.

The pressure transmitter market has grown substantially in the past five years, and in 2007, its worldwide value exceeded two billion dollars. Some of this growth is due to growth in the multivariable transmitter market. Some multivariable pressure transmitters use the values of pressure, differential-pressure, and temperature to compute mass flow. Others output their variables to a flow computer, which does the mass flow computation.

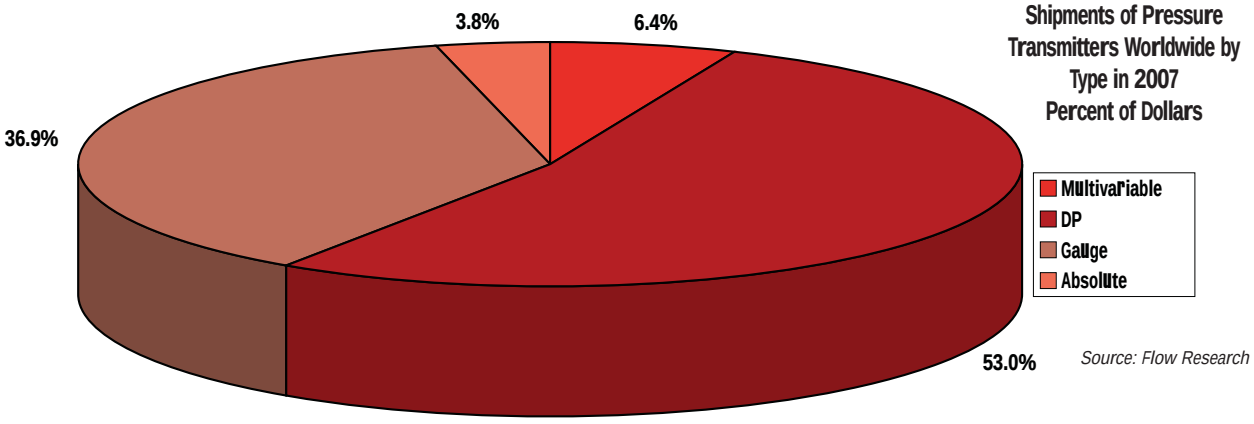
Total Shipments of Pressure Transmitters Worldwide
Millions of Dollars



Source: Flow Research Inc.

Multivariable Pressure Transmitters

Multivariable pressure transmitters were first introduced in 1992 by Bristol Babcock (*www.bristolbabcock.com*). For many years, Emerson Process Management (*www.emersonprocess.com*) and Honeywell (*www.honeywell.com*) were the main suppliers of multivariable pressure transmitters. Later, ABB (*www.abb.com*), Foxboro (*www.foxboro.com*), and Yokogawa (*www.yokogawa.com*) also



Source: Flow Research Inc.

entered the multivariable pressure transmitter market.

Multivariable pressure transmitters cost more than DP transmitters, but are usually less expensive than the sum total cost of a DP transmitter, a pressure transmitter, and a temperature transmitter. Some companies, such as Emerson Process Management, have created a multivariable pressure transmitter with an integrated primary element. Emerson's Rosemount 3095MFA Mass ProBar contains an integrated Annubar averaging Pitot tube. It continuously measures differential-pressure, pressure, and temperature and uses these variables to calculate compensated mass flow. Multivariable transmitters are widely used to measure gas and steam flow.

Product Enhancements

Over the past several years, pressure transmitter suppliers have released a number of new products with advanced features. These features promise higher accuracy, greater reliability, enhanced self-diagnostics, and more advanced communication protocols. The promise of greater reliability is perhaps the strongest driving force behind the pressure transmitter market. While some products may have a higher initial purchase price, end-users cite a number of reasons for shifting to higher performing products. These include the need to conform to regulatory requirements, the need for reliability, a desire to standardize pressure products, and the need for custody transfer.

Some new transmitters also offer greater accuracy. End-users seem to be willing to pay for higher performance, although this varies with application and features. Along with these improvements, suppliers are also offering a wider variety of communication protocols, including Foundation Fieldbus and Profibus. The changeover to fieldbus has occurred more slowly than many predicted, however, and HART is still far and away the most popular communication protocol for pressure transmitters.

Installed Base a Key Factor

The total size of the worldwide pressure transmitter market is a little less than half the size of the worldwide flowmeter market in terms of revenues. At just over $2 billion, this is a very large instrumentation market, but annual sales do not tell the whole story of the pressure transmitter market. The size of the installed base is a major reason why the pressure transmitter market will continue to hold its own within the instrumentation world.

DP flow transmitters have been around for more than 100 years, and this has resulted in a very large installed base for DP flow within the process industries. Because of the tendency to "replace like with like," many end-users can be counted on to continue to rely on pressure transmitters to make DP flow measurements. This means users will continue to order new DP flow transmitters to replace DP flowmeters even where alternative technologies are available. In some cases, they will also order new primary elements, as needed, to maintain a DP flow measurement system.

In addition to the wide use of DP flow transmitters for measuring flow, the use of gauge and absolute-pressure transmitters is increasing. A drive for increased plant efficiency and safety will promote more use of gauge and absolute-pressure transmitters. In addition, users are looking for pressure transmitters with increased diagnostic capabilities, which means they are likely to opt for more high-end pressure transmitters when replacing existing transmitters.

Today, the major suppliers of pressure transmitters include Emerson Process Management, Yokogawa, ABB, Siemens, Honeywell, and Foxboro. Expect these companies to continue to do research and development in pressure transmitters and to develop new products and product enhancements. These new products and enhancements will keep end-users enthusiastically ordering pressure transmitters, either for replacement purposes or for new plants. As a result, the future looks bright for the pressure transmitter market. FC

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

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The material for this article was abstracted from Flow Research's "The World Market for Pressure Transmitters, 2nd Edition." For more information on this study, visit www.WorldPressure.com.