



# The Ultrasonic Boom

## New Technology Development Brings Niche Solution to the Mainstream

One of the most pronounced trends in the flowmeter market today is the move from traditional meter types to new technologies. As a result, Coriolis, magnetic, ultrasonic, vortex, and thermal flowmeters are supplanting differential-pressure (DP), positive-displacement (PD), and turbine systems in many applications. This trend has been ongoing for at least 10 years.

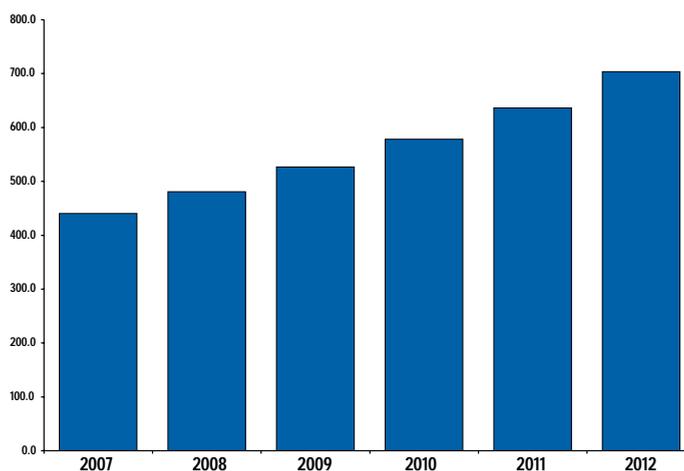
What new-technology flowmeters have in common is that they are less intrusive, more accurate, and more reliable than most traditional-technology meters. During a time when some companies are facing engineering staff reductions, end-users are increasingly looking for "set it and forget it" flow measurement systems. Even though some new-technology flowmeters, such as Coriolis and ultrasonic, have a higher purchase price than many traditional meters, end-users recognize the payoff such systems offer in terms of higher performance and reduced maintenance. When specifying new flow measurement equipment, end-users have come to realize that it is more important to look at total cost of ownership rather than just purchase price, and this is leading to the use of new-technology flowmeters in more applications.

### The Ultrasonic Flowmeter Boom

The ultrasonic and Coriolis flowmeter markets are two of the fastest growing flowmeter segments. The ultrasonic market in particular has shown rapid growth over the past five years. In 2002, the size of the worldwide ultrasonic flowmeter market was \$255 million, according to a study by Flow Research ([www.flowresearch.com](http://www.flowresearch.com)). By 2007, this market had increased to \$440 million, and statistics compiled by Flow Research show ultrasonic meters now account for more than 10 percent of the revenues generated by the entire worldwide flowmeter market.

There are multiple reasons for the growth in the ultrasonic flowmeter market.

### Projected Revenue Growth for Ultrasonic Flowmeters Worldwide (Millions of Dollars)



Source: Flow Research, Inc.

One is that some of the leading suppliers in this market have been acquired by larger companies with deeper pockets. For example, in July 2002, GE Power Systems acquired Panametrics. The Panametrics product line is now part of GE's GE Sensing ([www.gesensing.com](http://www.gesensing.com)) business unit. In May 2006, Siemens ([www.siemens.com](http://www.siemens.com)) purchased Controlotron, a supplier of clamp-on ultrasonic meters. Instromet ([www.instromet.com](http://www.instromet.com)), a supplier of ultrasonic flowmeters for custody transfer of natural gas, was acquired by Ruhrgas ([www.eon-ruhrgas.com](http://www.eon-ruhrgas.com)), a German company, and subsequently absorbed into the Elster Group ([www.elster.com](http://www.elster.com)) along with American Meter ([www.americanmeter.com](http://www.americanmeter.com)). More recently, in January 2007, Cameron Measurement Systems ([www.c-a-m.com](http://www.c-a-m.com)) purchased Caldon, a recognized supplier of ultrasonic flowmeters to the nuclear industry.

The net result of all this acquisition activity is that a large number of new ultrasonic flowmeter products have been brought into the market in the past several years. This is true both in gas flow measurement

and liquid flow measurement. There has especially been a lot of activity in the market for custody transfer of natural gas. The leading suppliers to this market include Instromet, Emerson Process Management, Daniel Division ([www.daniel.com](http://www.daniel.com)), and SICK MAIHAK ([www.sickmaihak.com](http://www.sickmaihak.com)). FMC Technologies ([www.fmctechnologies.com](http://www.fmctechnologies.com)) is also active in this space.

The upswing in use of ultrasonic flowmeters for custody-transfer applications is due in large part to a June 1998 report by the American Gas Association ([www.aga.org](http://www.aga.org)). This report, called AGA-9, details criteria for the use of multipath ultrasonic flowmeters for custody transfer of natural gas. AGA-9 provides objective guidelines for both buyers and sellers to employ when transferring ownership of natural gas. The ultrasonic flowmeter market is still benefiting from the publication of this standard, which was first published 10 years ago.

On the liquid side, approvals for ultrasonic flowmeters have taken longer to materialize. However, the American Petroleum Institute (API, [www.api.org](http://www.api.org)) has issued a draft standard for the use of ultra-

sonic flowmeters in the custody transfer of hydrocarbon liquids. This has helped spur new product development around ultrasonic flowmeters for liquid applications. One example is KROHNE ([www.krohne.com](http://www.krohne.com)), which previously manufactured the ALTOSONIC V, a five-path meter for liquid flow measurement, and has since released the ALTOSONIC III, a more economical meter with three paths.

Another company that is active in the liquid ultrasonic market is Faure Herman ([www.faureherman.com](http://www.faureherman.com)). Faure Herman supplies an 18-path ultrasonic flowmeter for liquid applications. Faure Herman was acquired by IDEX Corporation ([www.idexcorp.com](http://www.idexcorp.com)) in February 2007. Other companies that are active in the liquid ultrasonic market include Emerson Daniel, FMC Technologies, and Thermo Fisher Scientific ([www.thermofisher.com](http://www.thermofisher.com)).

### Unique Advantages

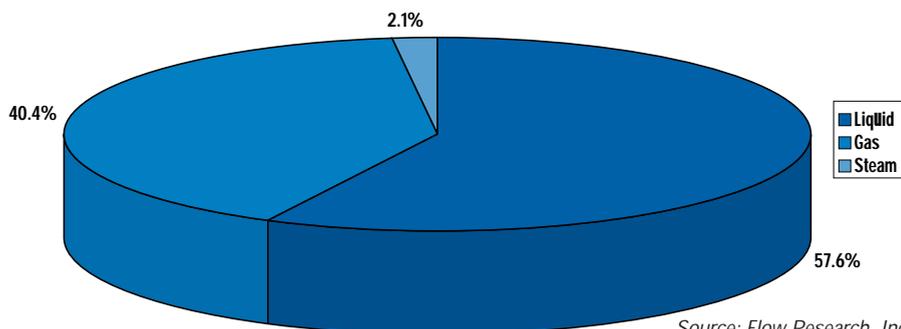
Ultrasonic flowmeters have some unique

advantages that set them apart from other flowmeters. One advantage is that many ultrasonic flowmeters come in a clamp-on style. Clamp-on meters are mounted on the outside of the pipe, meaning there is no intrusion into the pipe. A disadvantage of this method is that the pipe wall can have an impact on the ultrasonic signal, and the properties of the pipe wall may not always be known. While this can reduce the accu-

racy of the measurement, clamp-on meters are popular for check metering, which uses one flowmeter to check the performance of another. Clamp-on meters can easily be moved from place to place as needed.

Ultrasonic flowmeters are also unique in that they have one or more paths. Typically, ultrasonic flowmeters operate by sending a signal from one side of a pipe to the other and back again. When the signal travels

**Ultrasonic Flowmeters by Fluid Type Worldwide in 2007**  
(Millions of Dollars)



Source: Flow Research, Inc.

## Ultrasonic Milestones: 2003 to 2008

**GE Sensing:** GE Sensing has continued to improve its clamp-on ultrasonic flowmeter for gas applications. This technology was first introduced in September 2001. In March 2004, GE Infrastructure (now GE Sensing) released a major update to this meter. The company also released the Sentinel, a multi-path ultrasonic meter designed for custody transfer of natural gas, in October 2004.

At the ISA show in October 2007, GE Sensing introduced its PanaFlow™ ISX, the newest technology in GE's ultrasonic lineup. These devices are designed for applications in the oil & gas, power generation, and water industries, as well as in a wide variety of liquids, including chemicals, solvents, weak acids, water, petroleum products, lubricating oils, and hydrocarbons. According to GE Sensing, the meter's compact design makes it easier, and thus less costly, to install in hazardous locations. Bidirectional flows can be measured in pipe sizes ranging from four to 24 inches, with a stated accuracy of +/-0.5 percent. Two-wire loop powered.

**Controlotron:** During this period, Controlotron maintained its focus on the

clamp-on, transit-time ultrasonic flowmeter market. More significantly, however, Controlotron was acquired by Siemens in May 2006 and has since been renamed Siemens Energy & Automation, Process Instrumentation.

**Instromet:** Instromet expanded its Q-Sonic 3 and Q-Sonic 4 models, both of which are used for custody transfer of natural gas. These improvements include relocating the transducers to the upper side of the meter and introducing a Coded Multiple Burst (CMD) signal that is designed to improve meter performance in hostile situations.

**KROHNE:** While KROHNE has not traditionally expanded its product line through acquisition, the company was very active in introducing new products during this period. In August 2003, KROHNE brought out the Altosonic III, a three-path meter designed for liquid applications. The Altosonic III is a cousin of the Altosonic V, which is designed for custody transfer of liquids. Early in 2004, KROHNE formed an alliance with SICK, allowing it to bring out

the Altosonic IV, a meter designed for gas applications. The Altosonic IV is a version of the SICK MAIHAK ultrasonic flowmeter.

**Emerson Process Management:** Emerson Process Management's ultrasonic flowmeters are part of the Daniel division. Emerson Process is a leading supplier of ultrasonic flowmeters for custody transfer of natural gas. In November 2004, Emerson Process announced a series of upgrades to its line of SeniorSonic and JuniorSonic ultrasonic flowmeters for gas flow measurement. The upgrades include capability for acquiring live gas composition data from a gas chromatograph and the real-time calculation of speed of sound. In June 2006, Emerson Process launched the Model 3804, a liquid ultrasonic meter designed for fiscal metering applications.

**Siemens:** Siemens first introduced its ultrasonic flowmeter, the FUS, in 1997. In September 2003, it acquired the flow division of Danfoss, including Danfoss's series of SONOFLO ultrasonic flowmeters. In May 2006, Siemens completed the acquisition of Controlotron, a leading sup-

with the flow, it moves more rapidly than it would under conditions of no flow. When the signal travels against the flow, the signal slows down. The difference between the two transit times is proportional to flowrate. Ultrasonic flowmeter suppliers have been able to improve on measurement accuracy by building flowmeters with more than one path. Highly accurate results can be obtained with four, five, or six paths. However, some suppliers offer meters with more paths. Cameron Measurement Systems, formerly Caldon, offers an eight-path meter for liquid applications. And, as noted earlier, Faure Herman's ultrasonic flowmeter features 18 paths.

### Looking Ahead

While transit-time meters account for the vast majority of ultrasonic measurement systems on the market today, Doppler meters remain a good fit for measuring the flow of dirty liquids. Doppler meters do not typically achieve the same accuracy as transit-time meters, but they offer an

important solution, as measuring dirty liquids, or liquids with entrained particles, is difficult. Recognizing the importance of this measurement, suppliers of transit-time meters are working to improve their technology to better support dirty flow applications. This could further diminish the role of Doppler technology in the coming years.

Besides liquid and gas, ultrasonic flowmeters are now also used for steam flow measurement. Steam flow measurement is a new frontier for both ultrasonic and Coriolis flowmeters. Currently, the large majority of steam flows are measured with DP and vortex flowmeters. Going forward, look for more product development in the area for ultrasonic and Coriolis.

Over the past 10 years, ultrasonic flowmeters have evolved from niche flow measurement solution to the mainstream. Ultrasonic meters are now produced by some of the largest flowmeter manufacturers. Look for continued dramatic growth in this market, along with a steady stream of new products for liquid, gas, and steam flow applications. 

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[www.flowresearch.com](http://www.flowresearch.com)

*The material for this article was abstracted from Flow Research's "The World Market for Ultrasonic Flowmeters, 3rd Edition." For more information on this study, visit [www.FlowUltrasonic.com](http://www.FlowUltrasonic.com).*

plier of ultrasonic clamp-on flowmeters. Siemens is now selling all of these flowmeters, including the Controlotron meters, as part of its F US Series brand name.

**Other notables:** The acquisition of Caldon by Cameron Measurement Systems is very significant. Cameron is one of the world's leading suppliers of valves and a major supplier to the oil & gas industry. It is also significant that Sierra Instruments and George Fischer have entered the ultrasonic flowmeter market. Because the ultrasonic flowmeter market is growing so rapidly, more new suppliers can be expected to enter this market in the coming years.

**August 2003** Krohne launches three-path ultrasonic flowmeter for liquid measurement, the Altosonic III.

**September 2003** Siemens acquires Danfoss' flow division, including Danfoss' ultrasonic, ultrasonic energy, magnetic, and Coriolis flowmeters.

**March 2004** GE Infrastructure (now

GE Sensing) updates its clamp-on ultrasonic flowmeter for gas applications, the GC868. Included in the update are new clamp-on transducers and new signal processing algorithms, allowing the meter to be used on line sizes as small as ¾". Steam tables are also added to this version.

**April 2004** KROHNE forms an alliance with SICK on gas flow measurement; releases the Altosonic IV.

**July 2004** Faure Herman releases two models of its ultrasonic flowmeters for liquid applications: the FH8300 and the FH8500. The FH8300 is a one-path, two-path, or three-path meter designed for process applications. The FH8500 is an 18-path meter for custody transfer.

**October 2004** GE Infrastructure (now GE Sensing) introduces the Sentinel, a multi-path meter for custody transfer of natural gas.

**September 2005** Sierra Instruments releases its Innova-Sonic transit-time ultrasonic flowmeter for liquid applications.

**December 2005** George Fischer debuts its 3350/3550 clamp-on ultrasonic flowmeter for clean water applications.

**January 2006** NuFlo Measurement Systems of Houston, Texas, a division of Cameron, acquires Caldon, Inc. of Pittsburgh, Pennsylvania.

**May 2006** Siemens acquires Controlotron.

**June 2006** Emerson Process Management enters liquid ultrasonic flowmeter market with the release of the Daniel Model 3804. The Model 3804 is part of a new 3800 Series of liquid ultrasonic meters for fiscal metering applications.

**February 2007** IDEX Corporation acquires Faure Herman, manufacturer of an 18-path ultrasonic flowmeter for liquid applications.

**January 2008** IDEX Corporation acquires ADS LLC, including its Accusonic Division, a manufacturer of transit-time, clamp-on ultrasonic flowmeters.