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Sydney, Australia – photo by Flow Research

Q4 2012

Focus this Quarter:

- **Flying with the Wind: Around the World in Eleven Days**
- **Worldwide Flowmeter Market**
- **Azbil Group Acquires 70% Stake in VorTek**

René Descartes

A Worldflow publication

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Market Barometer
Q4 2012

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Table of Contents

(Continued on page 4)

Table of Contents

(Continued from page 3)

Magnetic

Ultrasonic

Vortex

Thermal/MFC

Products & Technologies — Traditional Technology Flowmeters 37

Pressure/DP Flow/Primary Elements

(Continued on page 5)

Table of Contents

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Boulder Canyon, Boulder, Colorado Photo by Flow Research

Market Barometer is part of the Worldflow Monitoring Service. Other publications in this service include the **Energy Monitor** and **Flash Reports**. The **Living Database** provides more in-depth information and analysis about the instrumentation business.

Here is the **Worldflow** publication schedule for the next few quarters:

Q4 2012

Energy Monitor—March 2013

Q1 2013

Market Barometer—April 2013

Energy Monitor—May 2013

Q2 2013

Market Barometer—June 2013

Energy Monitor—July 2013

Q3 2013

Market Barometer—August 2013

Energy Monitor—September 2013

Flying with the wind: Around the world in eleven days

By Jesse Yoder, PhD, Flow Research

In late November, I traveled to Perth, Australia to give the keynote speech at the Flow Measurement Forum. The Forum was held on November 28 and 29, 2012. I also gave a four-hour workshop on flowmeters. The focus of both presentations was on flowmeters used in the oil and gas business, and the energy markets more generally. This is an important topic in Australia, since they are a major provider of natural gas and LNG and also have significant supplies of crude oil.

Just getting there is half the battle

In case you have been to Australia, you know that getting there is a lengthy process. I left my house at 2:00 pm on Saturday for a flight from Boston to New York. This was to catch a New York flight at midnight to Dubai. After waiting in line for 1½ hours, I was able to check in with Emirates airlines. Needless to say, I was in plenty of time. I then boarded the flight about 45 minutes before departure for Dubai. The flight to Dubai lasted 13 hours. Then I had a 6-hour layover in Dubai before boarding a 12-hour Emirates flight to Perth. All told, it took me 39 hours to get to Perth from Boston. Since I can't sleep on planes, I was beyond exhausted by the time I got there. I arrived in Perth around 7:30 pm on Monday evening, November 26.

The Flow Measurement Forum

Fortunately, I was well-prepared for my four-hour workshop, which I gave the morning of November 28. With a sufficient number of slides, I was able to get through with about ten minutes for questions. Mostly I talked about the different flow technologies, their advantages and disad-

(Continued on page 8)

(Continued from page 7)

vantages, and their applications in energy environments. The audience was a mixture of people from process plants and universities, along with engineers and technicians. I was also asked to chair the afternoon sessions.

The following day (November 29) I gave the keynote speech first thing. The keynote speech was a more high-level look at flow measurement trends in energy along with trends in oil and gas production and exploration. This is such an exciting topic because so much is happening both in natural gas and crude oil production. More and more attention is shifting to natural gas because it is cheaper, cleaner, and more plentiful than crude oil.

Australia is the epicenter for a great deal of natural gas development. The Gorgon Project is located in a couple of islands offshore of northwest Australia. The Gorgon Gas Fields are about 130 kilometers off the coast of northwest Australia. Near the fields is Barrow Island, where a liquefied natural gas (LNG) plant is being built. This plant is expected to produce 15.6 metric tons of LNG per year. Australia hopes to supply LNG to the entire region, with India being a major destination. The project, which is costing an estimated $54 billion, is a joint venture of Chevron Australia, Shell Development Australia, and Mobil Australia Resources.

(Continued on page 9)

(Continued from page 8)

A rare day off: sushi and sleep, plus the zoo

On Friday I had a free day, and spent most of the time looking for sushi restaurants and walking around the shops. I also took the chance to get some sleep. Having just been through the conference, I wasn't feeling overly ambitious. I did manage to make it to the zoo where I saw some koalas and kangaroos.

Visiting Sydney

The next day I flew to Sydney for three days. I actually had only one free day there, since most of Saturday was taken up in flying east to Sydney. Though the flight took only four hours, I was flying east and lost three hours of time in the meantime. So I left in the morning and got there in the evening. On Sunday, I checked out the downtown and took a ferry around the harbor. After about an hour of shopping, I headed back to my hotel.

Visiting Macnaught

Since I can't seem to go anywhere without visiting a flow company, I had set up a meeting with Macnaught Industries for Monday, December 3. This proved very interesting. Macnaught is the largest positive displacement flowmeter supplier in Australia, and they are a lot larger than I realized.

L–R: Bob Hill, CEO; Jesse Yoder; Neville Proctor

After leaving Macnaught, I left for the hotel and headed for the airport at 5:00pm. The return trip was a little easier than the trip to Perth. I had only one stopover – in Dallas – and then flew straight to Boston. This took closer to 28 hours than the 39 hours I spent going from Boston to Perth. The only glitch was that I missed my connecting flight in Dallas, because the baggage claim people took forever, and so I had to wait an extra two hours for my return flight to Boston.

(Continued on page 10)

(Continued from page 9)

What was most significant about my route is that I flew east the entire way, instead of heading east and then returning the way I came. Because I continued east to Dallas from Sydney instead of returning through Dubai, I saved at least eight hours of flying time. I logged over 25,000 miles of flying time in a unique opportunity to fly around the world.

Sydney, Australia – photo by Flow Research

Flying with the wind at your back has definite advantages.

I've been to Dubai, Abu Dhabi, Oman, Qatar, Switzerland, Germany, Norway, Amsterdam, London, and, in the United States, I've been to Boulder, Minneapolis and countless other places. I love all these places, but what I love most is the truly wonderful people I meet on these trips. My trip to Australia ranks up there among my very best trips – even though I was sleep-deprived most of the time – and I wouldn't trade the experience for anything I can imagine. I am grateful to Sarah Montgomery and IDC Technologies for giving me the opportunity to make this trip. If you ever have a chance to go to Australia, don't hesitate!

Market Research: Worldwide Flowmeter Market

Overview of the Worldwide Flowmeter Market

We have just completed our new study, **Volume X: The World Market for Flowmeters, 4th Edition**. This study covers 13 flowmeter types, including new-technology, traditional technology, and emerging technology flowmeters. The following is a thumbnail sketch of what is happening with each flowmeter type.

New-Technology Flowmeters

Defining New-Technology Flowmeters

New-technology flowmeters are defined by the following characteristics:

1. The technology was introduced after the end of World War II.

2. They incorporate technological advances that avoid some of the problems in earlier flowmeters.

3. They receive more focus in terms of new product development than older technologies.

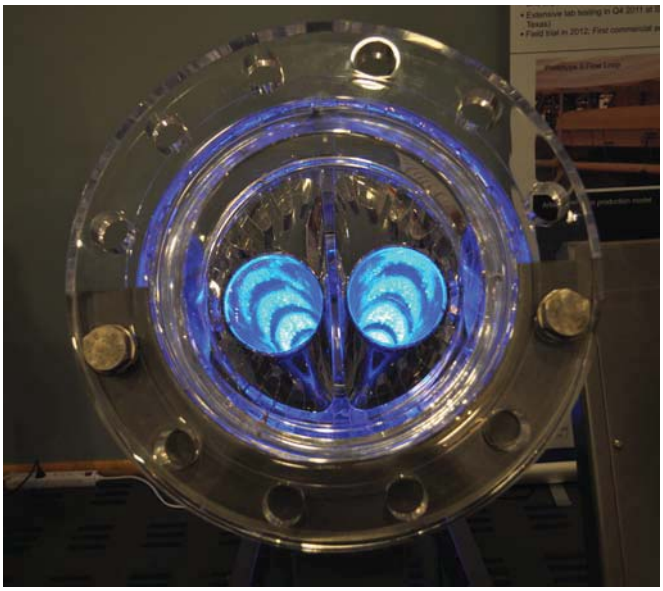
4. Their performance, including criteria such as accuracy, is at a higher level than that of traditional technology flowmeters.

They are quicker to incorporate recent advances in communication protocols such as HART, Foundation Fieldbus, and Profibus than traditional technology meters.

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

Coriolis

We found the Coriolis flowmeter market to be the fastest growing market of any flowmeter type considered in this study. There are a number of reasons for this. One is that Coriolis flowmeters remain the most accurate flowmeter, and they are highly reliable with little need for maintenance. Coriolis meters do not place any obstruction in the flowstream, although bent-tube meters can slow down flow velocity. However, straight-tube meters have been developed that do not have this effect and that are widely used for sanitary applications. Fluid can build up around the curvatures of bent tube meters.



(Continued on page 12)

(Continued from page 11)

Certainly the biggest news in the Coriolis market is the development of Coriolis meters for line sizes above six inches. Rheonik, now part of GE Measurement, used to be the only company offering large line size Coriolis meters. In the past five years, Micro Motion, Endress+Hauser, and KROHNE have all entered this market. Many of these meters sell in the range of $75,000. They are primarily targeting oil & gas applications. Many, though not all, of them are designed for custody transfer applications.

Coriolis meters, along with ultrasonic, are getting a substantial portion of the research & development dollars from the major flowmeter companies. As a result, a steady stream of new products and new features for existing products are entering the market. This is clearly one of the driving forces behind the rapid growth in the Coriolis flowmeter market.

Magnetic

The growth rate of the magnetic flowmeter market is not as great as that of Coriolis, but the magnetic flowmeter market is already one of the largest of any flowmeter type. This is true despite the fact that magnetic flowmeters can only measure conductive liquids. This means they cannot measure steam, gas, or hydrocarbon liquids. However, suppliers have made some progress in enabling magnetic flowmeters to measure low conductivity liquids.

Magnetic flowmeters are widely used in the chemical, food & beverage, and pharmaceutical industries. There is a wide variety of linings used for sanitary applications. PFA and PTFE are the two most popular types of liners. PTFE is a combination of fluorine and carbon that is also known as teflon. Other popular types of liners are hard rubber, ceramic, and polyurethane. A significant percentage of magnetic flowmeters come in sizes of one inch or less, and they can measure very low flows.

The most popular industry for magnetic flowmeters is the water & wastewater industry. They excel at measuring any kind of water, whether clean or dirty, and can measure slurries that few other flowmeters can tolerate. For clean water, they are relatively inexpensive, although inline magnetic flowmeters can fit line sizes of 108 inches or more. These meters are quite expensive. As a result, a number of suppliers have introduced insertion meters that are not as accurate but are significantly less expensive than their inline counterparts.

Ultrasonic

It used to be conventional to segment the ultrasonic market into transit time, Doppler, and hybrid. While this is still valid, transit time meters have become capable of measuring many of the fluids that formerly only Doppler meters could measure. As a result, they have cut significantly into the market share of Doppler meters. As a result, it is more useful now to segment the ultrasonic market into inline (spoolpiece), clamp-on, and insertion.

(Continued on page 13)

Market Research: Worldwide Flowmeter Market

(Continued from page 12)

Inline ultrasonic meters have two or more transducers embedded into the flowmeter (sensor tube) body. They are installed by cutting into a pipe and have either wafer or flange style fittings. Inline ultrasonic meters are distinguished according to whether they have single path, dual path, or multipath configurations, meaning three or more paths. Custody transfer applications require three or more paths. Ultrasonic meters for liquids are built differently than ultrasonic meters for gas. The market for inline ultrasonic meters for custody transfer of natural gas is one of the fastest growing niches in the entire flowmeter market. However, companies such as Caldon (now part of Cameron) and KROHNE have introduced ultrasonic flowmeters for custody transfer of petroleum liquids.

Clamp-on meters have the advantage of portability (though some are fixed), and are widely used for check metering. However, they cannot achieve the same accuracy levels as inline meters for several reasons. One is that they are mounted outside of a pipe and the ultrasonic signal has to go through the pipe wall. This can attenuate the signal. The amount of attenuation depends on the type of material the pipe wall is made from. Build-up on the side of the pipe wall can also have an effect on the ultrasonic signal, introducing another level of uncertainty.

Insertion ultrasonic meters are mounted in a pipe by cutting a hole in the pipe and inserting the flowmeter into the pipe. Insertion meters are significantly less expensive than inline meters because the cost of the meter body is eliminated. However, they cannot achieve the same levels of accuracy as inline meters. One of the chief applications for insertion ultrasonic meters is for measurement of stack gas and exhaust gas emissions. Here they compete with averaging Pitot tubes and thermal flowmeters.

Vortex

In many ways, vortex meters are the most versatile type of meter. They can reliably measure all types of fluids, including liquid, steam, and gas. They are somewhat more intrusive than ultrasonic meters since they require inserting a bluff body into the flowstream. This bluff body is required so that the meter can generate they required vortices whose frequency is proportional to flowrate. While the bluff body can get knocked out of position, vortex meters are far less intrusive than differential pressure meters with orifice plates, turbine meters, or positive displacement meters.

(Continued on page 14)

(Continued from page 13)

For many years, vortex meters did not have the same types of industry approvals as differential pressure, turbine, ultrasonic, and Coriolis meters. This changed in 2007, when the American Petroleum Institute (API) approved a draft standard for the use of vortex flowmeters for custody transfer applications. This approval was reaffirmed in 2010. However, up to this point it does not seem to have had much impact on the measurement of petroleum liquids or gases for custody transfer purposes. However, the draft standard has been used in the custody transfer of steam. It is likely that, as the standard becomes more widely accepted, it will also impact the use of vortex meters for hydrocarbon liquids.

Thermal

Thermal flowmeters are used almost exclusively for gas. For many years, they have been associated with environmental applications. In the early 1990s, multipoint thermal flowmeters were developed to handle continuous emissions monitoring (CEM). At that time, the Environmental Protection Agency (EPA) developed regulations designed to reduce the amount of sulfuric oxide (SO_X) and nitrous oxide (NO_X) in the air. Multipoint thermal flowmeters were developed for these applications. Multipoint averaging Pitot tubes and ultrasonic flowmeters were also used for this purpose.

While thermal flowmeters are still used today for CEM applications, they are also used for a variety of other environmental applications as well. Under the Obama administration, their use for flare gas, biogas, biomass, coalbed methane, and landfill gas has become more prominent. Other popular applications for thermal flowmeters include submetering, compressed air, boiler inlet, and wastewater treatment.

Many of the environmental applications for thermal meters involve insertion meters. However, inline thermal meters are also widely used for a variety of gas applications. One disadvantage of thermal flowmeters is that it is necessary to know what type of gas is being measured. Thermal flowmeters have also not achieved the accuracy levels of Coriolis or ultrasonic meters, and their accuracy is typically less than one percent. However, suppliers have made important strides in the areas of thermal flowmeter accuracy and reliability. Expect to see continued developments and improvements in this area for thermal flowmeters.

(Continued on page 15)

(Continued from page 14)

Traditional Technology Flowmeters

Despite the growth of new-technology flowmeters such as Coriolis and ultrasonic over the past few years, traditional technology flowmeters are holding their own. Many users are still selecting differential pressure (DP), turbine, positive displacement, and other more traditional meters as their flowmeter solutions. This section describes some of the important, recent developments for traditional technology flowmeters.

Defining Traditional Technology Flowmeters

Traditional technology flowmeters share the following characteristics:

1. As a group, these meters were introduced before the end of World War II.

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 new-technology flowmeters.

4. They generally have higher maintenance requirements than new-technology flowmeters.

They are slow to incorporate recent advances in communication protocols such as HART, Foundation Fieldbus, and Profibus.

Traditional technology flowmeters include DP, positive displacement, turbine, open channel, and variable area. Business is brisk with many of these meters. Why are customers still so loyal to them?

Differential Pressure (DP) Transmitters

DP transmitters have been in use to measure flow for more than a century. DP transmitters rely on a constriction called a primary element in the flowstream to create a pressure drop in the line. They measure the difference between downstream and upstream pressure to compute flow, using Bernoulli's theorem. DP transmitters rely on a variety of primary elements to create the constriction in the line.

DP transmitters are part of a family of pressure products. Other types of pressure transmitters include absolute and gage. Absolute pressure transmitters measure pressure without taking atmospheric pressure into account. Gage pressure transmitters include atmospheric pressure in their pressure measurement. Between the two, gage pressure transmitters are more common than the absolute variety.

One of the most important developments in pressure transmitters with implications for flow has been the development of multivariable pressure transmitters. Multivariable transmitters measure

(Continued on page 16)

(Continued from page 15)

two or more process variables. In the context of flow, they have differential pressure capability to enable them to compute volumetric flow. In addition to this measurement, they contain a pressure and temperature sensor and/or transmitter to make a temperature and/or pressure measurement. Multivariable pressure transmitters that measure differential pressure, temperature, and gauge or absolute pressure can compute mass flow. This makes them capable of measuring steam and gas, which are mass flow measurement.

Primary Elements

While there are many types of primary elements, orifice plates are the most common type. Orifice plates consist of a usually round usually metal (typically steel) plate with a hole or "orifice" in it. The purpose of the hole in the plate is to force fluid in a pipe to pass through it, thereby creating a pressure drop downstream of the plate. There are many types or orifice plates with different shaped openings positioned at different locations on the plate. Some of the more common types include concentric, eccentric, and segmental.

Experiments with DP transmitters using orifice plates to measure gas flow took place in the late 1920s, culminating with the publication of AGA-1 in 1930. This was a report by the American Gas Association (AGA) that constituted the first "industry standard" for orifice plate meters. Further testing resulted in the publication of AGA-2 in 1935 and AGA-3 in 1955. These reports gave orifice plate meters a dramatic lead in installed base among flowmeters. It wasn't until 1981 that the AGA published a similar report for turbine meters, called AGA-7 In 1998 the AGA published AGA-9, a report on the use of ultrasonic flowmeters for custody transfer of natural gas.

Other types of primary elements include Venturi tubes, flow nozzles, Pitot tubes, wedge elements, and laminar flow elements. Of these types, Venturi tubes, flow nozzles, and Pitot tubes are the most common. Venturi tubes bend up at one end and are elongated at the other end. They are often used for large pipe applications, including water and wastewater. Flow nozzles are often used to measure steam flow. The most popular form of Pitot tubes are averaging Pitot tubes, and they are used to measure airflow and other forms of gas flow. They are also used to measure stack and exhaust gas emissions.

Positive Displacement

The history of positive displacement (PD) flowmeters goes back to 1815, when Samuel Clegg invented the first PD gas meter. This first meter was a water sealed rotating drum meter. In 1843, Thomas Glover invented the first "dry" PD meter. Glover's meter contained a sliding valve and two diaphragms. Today's diaphragm meters are similar in design, but are made of cast aluminum with synthetic rubber-on-cloth diaphragms. Bopp & Reuther of Germany holds the first patent on oval gear meters, which it obtained in 1932.

One of the main uses today for PD meters is for gas utility billing applications. There are two main types of PD meters used for this purpose: diaphragm meters and rotary meters. Rotary me-

(Continued on page 17)

(Continued from page 16)

ters are replacing diaphragm meters in many cases. Rotary meters are smaller and lighter than diaphragm meters. This replacement is occurring for other gas applications as well. Elster is the dominant supplier in this market.

Oval gear meters are quite popular for oil applications, especially for downstream oil distribution involving custody transfer. Here they compete with Coriolis meters, which are gaining market share in downstream oil measurement.

Positive displacement meters do best in line sizes between 1 1/2 inches and 10 inches. It is unusual to find PD meters in line sizes above 10 inches. One strength of PD meters is high accuracy. Positive displacement meters actually capture the fluid in compartments of known quantity and measure how often they do this. They are also very good at measuring fluid with low flowrates. Downsides of positive displacement meters include causing pressure drop and being essentially a mechanical meter with moving parts.

Turbine

The first turbine flowmeter was invented by Reinhard Woltman in 1790. This makes turbine the earliest meter invented among the flowmeters used in the modern era. Turbine meters precede DP flowmeters by at least 100 years. Despite their early invention, it wasn't until after World War II that they began making an impact on industrial markets. During World War II, they were used to measure fuel consumption on military aircraft. Soon after this period, they began to be used in the petroleum industry to measure the flow of hydrocarbons.

In 1953, turbine meters began to be used to measure gas flow. Rockwell introduced turbine meters to the gas industry in 1963. Within ten years, they were widely used in the gas industry for measuring gas flow. In 1981, the American Gas Association published its Report #7, "Measurement of Fuel Gas by Turbine Meters." Since that time, turbine meters have become firmly entrenched in the gas industry, especially for custody transfer applications.

Turbine meters compete with ultrasonic and DP flowmeters for measuring custody transfer of natural gas. They are widely used for custody transfer of natural gas in large natural gas pipelines. Turbine meters remain a viable choice for measuring steady, medium to high-speed flows. They are more complementary than competing with positive displacement meters, since they do best in large line sizes. The drawbacks for turbine meters are that they have moving parts (mainly the rotors) and they cause pressure drop.

Open Channel

Open channel flow occurs when liquid flows in a conduit or channel with a free surface. Rivers, streams, canals, and irrigation ditches provide examples of open channel flow. What is slightly confusing about this terminology is that that the flow of liquids in partially filled pipes, when not under pressure, is also considered open channel flow. For example, water flowing through a culvert running underneath a street is considered open channel flow. Likewise, flows in sewers and tunnels are classified as open channel flows, along with other closed channels that flow partly

(Continued on page 18)

(Continued from page 17)

filled. Other examples of open channel flow include flow in water treatment plants, storm and sanitary sewer systems, industrial waste applications, sewage treatment plants, and irrigation systems.

Use of Weirs and Flumes. A very common method of open channel flow involves the use of a hydraulic structure such as a weir or flume. These hydraulic structures are called primary devices. A primary device is a restriction placed in an open channel that has a known depth-to-flow relationship. Once a weir or flume is installed, a measurement of the depth of the water is used to calculate flowrate. Charts are available that correlate various water depths with flow rates, taking into account different types and sizes of weirs and flumes.

Area Velocity. Flow can be measured without a hydraulic structure such as a weir or flume. In the area velocity method, the mean velocity of the flow is calculated at a cross-section, and this value is multiplied by the flow area. Normally, this method requires that two measurements be made: one to determine mean velocity, and another measurement to determine depth of flow. Flow rate Q is determined according to the continuity equation:

$Q = V \times A$

The area velocity method is used when it is not practical to use a weir or flume, and for temporary flow measurements. Examples include influx and infiltration studies and sewer flow monitoring.

Variable Area

Most variable area (VA) flowmeters consist of a tapered tube that contains a float. The upward force of the fluid is counterbalanced by the force of gravity. The point at which the float stays constant indicates the volumetric flowrate, which can be often read on a scale on the meter tube. VA meter tubes are made of metal, glass, and plastic. Metal tubes are the most expensive type, while the plastic tubes are lower in cost. Metal tubes are used for high-pressure applications.

While most VA meters can be read manually, some also contain transmitters that generate an output signal that can be sent to a controller or recorder. While VA meters should not be selected when high accuracy is a requirement, they do very well when a visual indication of flow is sufficient. They are very effective at measuring low flowrates, and can also serve as flow/no-flow indicators. VA meters do not require electric power, and can safely be used in flammable environments.

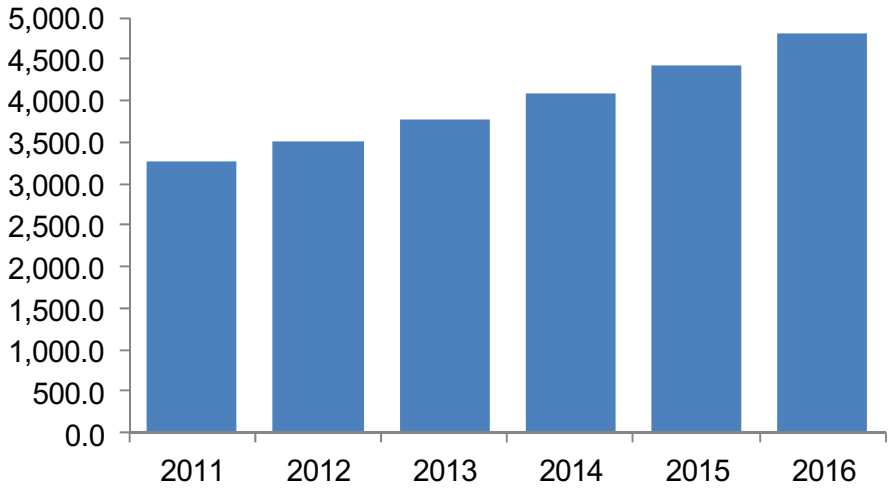
One important development for variable area flowmeters is the development of meters with a transmitter output. The HART protocol is available on some meters. This turns the VA meter into more than a visual indicator, and makes it possible to do control and recording. A class of VA meters called purgemeters have been developed to handle a variety of low flow applications. Other areas of research include float design and materials of tube construction, especially metal.

(Continued on page 19)

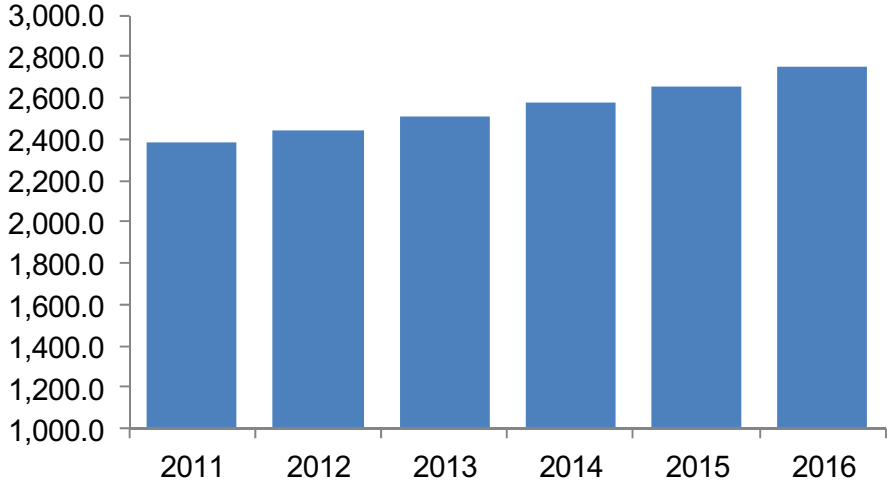
Market Research: Worldwide Flowmeter Market

(Continued from page 18)

Shipments of New-Technology Flowmeters Worldwide 2011 – 2016
(Millions of Dollars)



Shipments of Traditional Technology Flowmeters Worldwide 2011 – 2016
(Millions of Dollars)



Brooks Instrument announces new General Manager

Hatfield, Pa. (January 3, 2013) – Brooks Instrument, a world-leading provider of advanced flow, pressure, vacuum and level solutions, announced that Scott Amsbaugh has been appointed as general manager. In his new role, Amsbaugh will be responsible for overseeing Brooks' global business operations.

"Brooks is a stable company with strong growth plans," said Yahya Gharagozlou, Group President of ITW. "Scott will provide the leadership necessary to ensure that Brooks achieves its strategic objectives today and grows the business in the future."

Prior to assuming the role of vice president and general manager, Amsbaugh served as vice president of sales and marketing, where he led Brooks' global marketing and industrial sales efforts. Under his leadership, Brooks developed a robust product roadmap, successfully launched several products, and strengthened the company's sales and marketing talent worldwide. Amsbaugh has also held the positions of managing director for the Asia Pacific region, product marketing director and product marketing manager at Brooks.

"Brooks is focused on growth and the development of new products to serve our global markets" Scott Amsbaugh said. "I look forward to leading the charge to foster technology development, operational excellence and revenue growth, which are the foundation of the success of Brooks Instrument."

Earlier in his career, Amsbaugh developed a unique understanding of the instrumentation marketplace by working at prominent Brooks customers, JDS Uniphase and Emcore. He holds a Bachelor of Science in chemical engineering from Lehigh University, and a Master of Business Administration and Master of Engineering from the Kellogg School at Northwestern University.

www.brooksinstrument.com

Scott Amsbaugh

Endress+Hauser sets up a new subsidiary in Indonesia

January 1, 2013 – In over two decades since it entered the market, Endress+Hauser has established itself in Indonesia as a supplier of high-quality measuring instruments and solutions. To strengthen this position, its longtime sales partner in Jakarta will join the Endress+Hauser Group as an independent Endress+Hauser company as of 1 January 2013. "We are convinced that our own distribution company will allow us to serve our customers even better," said Michael Ziesemer, COO of the Endress+Hauser Group. "Indonesia offers an interesting framework for future growth."

Indonesia is the world's largest archipelago country consisting of more than 17,000 islands stretching from Sumatra to Papua and is the fourth largest populated country in the world with more than 240 million people. The country's economic growth has consistently been above six percent in the past years, one of the highest in the region. Endress+Hauser is active in all areas of process technology in Indonesia with focus on chemicals, mining, oil & gas, water & wastewater, power & energy, as well as the food & beverage and the pulp & paper industry.

Successful partnership

Endress+Hauser's presence in Indonesia stretches back to 1991 when the company entered a partnership with local representative, Grama Bazita, for the sales of its products, services and solutions. Today, what was once a small business has grown into a company with 100 employees. The head office in Jakarta, branches in Medan and Surabaya and offices in Pakanbaru, Bontang, Balikpapan and Semarang guarantee a strong support network.

"With its first-class range of products and services as well as a consistent focus on the needs of the customer, Endress+Hauser has set new standards in Indonesia," said Rajesh Malhotra, Managing Director of the new Endress+Hauser sales center. "The right time has come for us to continue to grow as a part of the Endress+Hauser Group."

www.endress.com

Rajesh Malhotra,
Managing Director of Endress+Hauser Indonesia.

Yokogawa to Join Board of Directors of HART Communication Foundation

Amersfoort, The Netherlands - 1 November, 2012 – Yokogawa Electric Corporation announces that it will join the Board of Directors of the HART Communication Foundation to further contribute to the Foundation and HART Communication technology.

Yokogawa has had a long standing commitment to support HART technology since its first HART device was launched in May 1993, and has been investing substantial resources into supporting HART technology-based hosts and devices. The most recent product launch was wired HART 7 compliant pressure/ differential pressure transmitters in April 2010. Yokogawa is one of the leading suppliers of HART devices and is the second largest HART pressure/differential pressure transmitter supplier worldwide.

"Yokogawa appreciates the opportunity to join the Board of Directors of the HART Communication Foundation. We will take a more active leadership role to promote and advance the use of HART Communication in Japan and the Asia-Pacific Region," said Kimikazu Takahashi, a Yokogawa Corporate Fellow.

“Yokogawa is eager to participate and make positive contributions to advancing the Compliance Testing and Registration Program for HART host systems. We also believe Yokogawa could be a good driving force to move forward Wireless Convergence by fully utilizing our expertise of two technologies, WirelessHART and ISA100.11a, as we have unique experience in developing and early adapting both of these technologies to our products and recognize that both WirelessHART and ISA100.11a are important and relevant to the market."

Chiaki Itoh, Division Manager of the IA Marketing Headquarters' Business Planning Division, added that "Being in such a responsible position in the HART Communication Foundation enables Yokogawa to further contribute to the Foundation and the HART Communication technology from both the device and host system perspective."

www.yokogawa.com

Kimikazu Yakagashi,
Corporate Fellow,
Yokogawa Electric Corp.

In their own press release, Hart Communication Foundation Executive Director Ron Helson said “We are very pleased to have Yokogawa participate on our Board of Directors and contribute their valuable expertise and support to advance HART technology and Foundation programs. We are confident they will be a positive and effective member of our leadership team.”

www.hartcomm.org

Ron Helson,
Executive Director,
HART Communication
Foundation

Upcoming Trade Shows: 2013

South East Asia Flow Measurement Conference 2013

March 4–5, 2013
Kuala Lumpur, Malaysia
events@tuvnel.com www.tuvnel.com

58th Analysis Division Symposium (ISA)

April 14–18, 2013
Hilton Galveston Island, Galveston Convention Center, Galveston, Texas, USA
www.adsymposium.org

Hear the latest in applications, developments, and solutions with analytical technologies from experts in the fields of sampling, chromatography, spectroscopy, chemiluminescence, and other analytical techniques. Sponsored by the ISA Analysis Division.

VSL and CEESI 2013 European Ultrasonic Meter User's Workshop

April 16–18, 2013
Penha Longa Hotel and Golf Resort near Lisbon, Portugal
www.ceesi.com www.vsl.nl

Structured for open discussion from a user's standpoint. Both users and manufacturers will offer presentations on topics such as: Field data; Recent research; Advancements; Recalibration; Diagnostics; Installation effects; Flow conditioning; Clamp-on ultrasonic metering; and Flare metering. Special courses: Fundamentals of Ultrasonic Meters for Natural Gas & Liquid, and Uncertainty Measurement Natural Gas & Liquid.

The Americas Flow Measurement Conference 2013

May 1–2, 2013
Houston, Texas, USA
www.tuvnel.com

59th International Instrumentation Symposium (IIS)

May 13–17, 2013
Wyndham Hotel, Playhouse Square, Cleveland, Ohio, USA
www.isa.org www.mfpt.org

IIS joins The Society for Machinery Failure Prevention Technology (MFPT) to bring you health management and instrumentation-related papers and presentations. Sponsored by the Aerospace Industries, Test Measurement, and Process Measurement and Control Divisions of ISA, and in collaboration with ISA's Automatic Controls and Robotics (ACARD) and Chemical and Petroleum Industries (ChemPID) Divisions, and the Propulsion Instrumentation Working Group (PIWG). This event is co-located with MFPT.

MCAA Industry Forum

May 19- 21, 2013
Monte Carlo Hotel, Las Vegas, Nevada, USA
www.measure.org

Keynote Presentation by Peter Zornio, Chief Strategic Officer, Emerson Process Management. A macroeconomic view of the Industry and insight into how Emerson Process Management views the marketplace, its customers and its technological changes.
Economic Outlook by Jeff Dietrich, Senior Analyst, ITR Economics. Up-to-date information on where the economy is headed.
2030: A Visionary's Perspective on the Process Control Industry by Peter Martin, Vice President Strategic Ventures, Invensys. His vision, derived from discussions with hundreds of industrial executives, for the future of the industry.

CEESI 2013 Ultrasonic Meter User's Workshop (Colorado, USA)

July 16–18, 2013
Denver, Colorado, USA
www.ceesi.com

This event brings together a wealth of information as well as new ideas and new questions regarding flow measurement using ultrasonic meters, and allows for open discussion from a user's standpoint. Special course: Fundamentals of Ultrasonic Meters.

Company Korner: Azbil and VorTek Instruments

Azbil Group Acquires 70% Stake in Vortex Manufacturer VorTek Instruments

Wakefield, MA (February 25, 2013) – Azbil Group, the Japanese-based manufacturer of measurement and control technologies, has announced it has acquired a 70% stake in VorTek Instruments LLC through its U.S. subsidiary, Azbil North America, Inc. With this acquisition, the firm has become an Azbil Group company and will change its name to Azbil VorTek LLC.

VorTek Instruments, established in 1995 and with an employee count of sixteen, has been known as a manufacturer and supplier of vortex and turbine flowmeters, with announced plans to offer ultrasonic flowmeters as well. All of VorTek's manufacturing is performed at their Longmont, Colorado headquarters facility.

In 2008, the Yamatake company began a name transformation from Yamatake to the present use of 'azbil' for both its group and subsidiary components. This process continued into 2012.

Azbil is organized into three major business areas: Building Automation, Advanced Automation, and Life Automation. Azbil has a well-developed flowmeter product portfolio consisting of magnetic, vortex, differential pressure, and open channel technologies. The company measurement and control devices are deployed through all three divisions.

Azbil Group at a glance:
Founded: 1906
HQ: Tokyo, Japan
FY2011 Revenues: US$2.8 billion
Employees: 8,300
Ownership: Public (Tokyo Stock Exchange)
Market Coverage: Worldwide

The azbil Group's flowmeter product line can be described as follows:

Vortex Flowmeters

Azbil's smart ultrasonic vortex flowmeter line, the ULTRA Vortexor, has dual ultrasonic sensors that cancel the effect of temperature on ultrasonic wave transmission speed and offer redundancy in case of failure. If one of the sensor pairs fails, the remaining pair will continue to measure flowrate. The ULTRA Vortexor measures flow in a variety of fluids: pure water, ion exchange water, tap water; organic solvent; and analog and/or pulsed output. The Vortexor outputs a signal of 4-20 mA DC pulse or alarm that is proportional to flowrate.

The company's most recent vortex series, the MVF (Microflow Vortex), offers a greatly expanded measuring range of 100:1, and can measure minute flowrates using a thermal flow sensor. The MVF also has built-in compensation for temperature and pressure, eliminating the need to install separate measuring devices. Azbil claims an accuracy of ±2.0% of flowrate for this series. This vortex series is designed for gas applications including air, natural gas, methane, nitrogen, carbon dioxide, propane, butane and other inert gases outside of the explosion limit range.

Magnetic Flowmeters

Azbil's magnetic flowmeter line includes four fundamental series: MagneW3000 Plus, the MagneW Two-wire PLUS, the MagneW HENRI Plus, and the MagCUBE. Azbil has designed these flowmeter types around particular groups of applications, and each series includes configurations that are geared toward specific application solutions. Examples here include the use of different liner materials, re-

(Continued on page 25)

Company Korner: Azbil and VorTek Instruments

(Continued from page 24)

mote and integral design packages, submersibility, and the availability to purchase sensors and transmitters separately. This ability for end-users to match specific sensors and transmitters is not a unique offering by azbil, but for some is a valued characteristic of the company's product deployment strategy.

The applications that azbil's magnetic flowmeter line are aimed at include the classic sweet spots for this technology. The MagneW3000 Plus Series is focused on applications found in the pulp & paper, chemical, petrochemical, and beverage applications. The MagneW Two-wire PLUS Series is very useful when operators desire to upgrade an existing flowmeter measuring point without incurring the expense of re-wiring to the location. The MagneW HENRI Plus is specifically designed to mitigate the effects of noise in slurries using high frequency pulsed direct current. And the MagCUBE is designed for the special requirements of indoor water utility applications such as chilled water, water filtration, and water usage monitoring.

Azbil also has one of the very few multivariable magnetic flowmeters on the market, the MCJ/MCM. The MTG11/15/18 is two-wire magnetic flowmeter.

Open Channel Flowmeters

The MagneW 3000 PLUS+ Open Channel flowmeter represents another aspect of azbil's product strategy of designing their metering products to specific applications. In this case, the application includes both open channel and closed pipe measurements. The MagneW provides accurate flow measurement even at minimal flow rates, and is not affected by tidal levels or hydrostatic pressure changes. Because the detector is not present in the flowstream and has no moving parts, unnecessary maintenance issues for the user are minimized. Azbil claims that the unlike for other open channel flowmeter designs, the MagneW's output is linear with the flowrate.

Mass Flow Controllers

Azbil's Series MCF is a mass flowmeter specifically engineered for compressed air or nitrogen use. It incorporates azbil's Micro Flow thermal mass-flowrate sensor. The MCF can measure mass flow with an accuracy of ±3% of full scale with a turndown ratio of 50:1. Forward and reverse flow integration functions are provided. The design is focused on air flow measurement, and leak detection in particular using thermal mass flow technology. Other models include the CMS Series and the CMG Series.

Azbil also has two lines of differential pressure transmitters (the ST3000 Series 900, and the AT9000 Advanced Transmitter), as well as a magnetic flowmeter designed for use in open channel applications (the MagneW 3000 Plus).

What It Means

The addition of the VorTek product line to the azbil family of products creates overlap in just one flowmeter technology: vortex. Here, Azbil gains the strength of the VorTek series of multivariable vortex flowmeters that include temperature and pressure compensation. VorTek's available insertion designs make their vortex flowmeters very suitable for both large pipe applications and in the measurement of steam. Both of these measurement strengths are good fits to the Azbil business sectors of Building Automation and Advanced Automation.

Azbil's stated objective is to grow VorTek revenues to 3 billion yen, or about $32 million, in four years time. To reach this ambitious goal, Azbil will have to follow through on its intention of significant investment in vortex technology. Vortex technology has demonstrated strengths in steam measurement for in-

(Continued on page 26)

Company Korner: Azbil and VorTek Instruments

(Continued from page 25)

dustrial and utility applications, but has yet to make significant headway within the fast-growing oil & gas custody transfer market where it was recently approved for use by the American Petroleum Institute.

Flowmeter Type	Series/Modeil
Magnetic	MagneW3000 PLUS+ Series (integral, remote designs), MagneW Two-wire PLUS+ (2-wire, explosion proof), MagneW HENRI Plus+ (**h**igh **e**nergy **n**oise **r**esistant), MagCUBE (water)
Vortex	MVF Microflow Gas Series (Thermal type); Model VRX ULTRA Vortexor
Differential Pressure transmitter	ST3000 Series 900, AT9000 Advanced Transmitter
Open Channel	MagneW 3000 Plus - Model NNK
Mass Flow Controllers	MCF Series, CMS Series, CMG Series

Vortex flowmeters often have a price advantage when compared to competing flowmeter types, and enjoy a special versatility in being able to measure different fluid types. Steam measurement is a good example of an application that other flowmeter technologies have difficulty with. At the same time, the vortex method of measurement includes having a bluff body in the flow stream, and any obstruction placed within the flowstream represents a possible negative to many end-users as it reduces flow throughput.

We believe that the combined strengths of Azbil and VorTek will serve to increase Vortek's resources for new product development, and for penetrating new markets with its flowmeters. In addition, azbil's existing distribution channels should help VorTek penetrate the Asian and Asia-Pacific markets. Considering that many of the research & development dollars today are going into ultrasonic and Coriolis meters, we hope that azbil will use the opportunity to expand a strong product line with additional R&D resources.

Analysts:
Jesse Yoder, PhD (jesse@flowresearch.com)
Norm Weeks (norm@flowresearch.com)

See page 33 for press release.

TRICOR Introduces a Hastelloy Version of the TCM Coriolis Flowmeter

Franksville, Wisconsin- December 18, 2012 – TRICOR has announced their 28K TCM Coriolis Flow Meter is now available in Hastelloy. This 1″ meter is the first in the series to be made available in Hastelloy, with more flow meter sizes to follow in the coming year.

Designed with chemicals in mind, the new material opens a broader application range for this product family, including chemical injection, blending & batching, and chemical processing. The 28K flow meter is extremely accurate and can go up to 5000 PSI with accuracies of 0.10 percent for Liquid and 0.50 percent for Gas. Currently the meter has ATEX Ex IIC TI-T6 certification, with expected approval CSA/cUS Class 1 Div 1 expected February 2013.

TRICOR Coriolis Technology is a brand of AW -Lake Company focused on Coriolis mass flow measurement technology and has manufacturing & engineering facilities in Wisconsin, Colorado and Germany. TRICOR flow meters are available in two styles: the A Series, incorporating a diamond-shaped tube; and the T Series, designed with a u-shaped tube.

www.tricorflow.com

www.aw-lake.com

TRICOR TCM-28K

Endress+Hauser announces the Proline Promass 83O/84O Coriolis flowmeter

October 12, 2012 – Endress+Hauser announces the Proline Promass 83O/84O Coriolis flowmeter for use in corrosive, high pressure and high temperature environments in the oil and gas industry. All materials that can come in contact with gasses and fluids are manufactured from super duplex stainless steel with 25% Cr (25 Cr duplex), which offers high protection against saline seawater, hydrogen sulfide, chloride, carbon dioxide and other corrosive materials found in crude oil and natural gas. The T316L stainless steel external design also resists corrosion from salt and sea water exposure.

The 25 Cr duplex sensing tube fulfils all requirements in accordance with NORSOK M-630 and NACE MR175/MR103; as well as corresponding Pressure Equipment Directives like PED Cat. III, ASME, CRN and AD2000. This makes the 83O/84O suitable for use on offshore drilling platforms, floating production storage and offloading (FPSO) facilities, on-shore well fields, custody transfer systems and refineries.

The 83O and 84O were also designed to handle the increasing pressure and temperature requirements of today's oil and gas exploration environments. As easily-accessible resources are depleted, drilling is moving into deeper and more unfavorable environments. Oil and gas from such holdings often contain poisonous and chemically corrosive substances under very high pressures.

The 83O and 84O handle pressures up to 3,742 psi (258 Bar) and process temperatures from -

(Continued on page 28)

(Continued from page 27)

40 to 392F (-40 to 200C). Both are available in lines sizes of 3, 4 and 6 inch diameters.

Every flowmeter is subjected to rigorous testing on accredited (ISO/IEC 17025) and fully traceable calibration facilities to a maximum measured error of ±0.05%. The 83O is approved for United States custody transfer per API MPMS Chapter 5.6 and AGA 11; NTEP and Measurement Canada weights and measures approvals are pending

Digital and Analog Output Compatibility

Promass 83O output configuration options include digital communications, supporting Foundation Fieldbus, Profibus PA or DP, EtherNet/IP or Modbus RS485 installations. Promass 84O analog outputs for 0-10 kHz phase shifted pulse/frequency are also available when custody transfer proving requirements are mandated.

When using the 4-20mA output with HART, intrinsically safe applications for Class 1 Division 1 and other hazardous locations can be satisfied. Promass O has been submitted for a SIL-2 rating for critical applications and complies with NE43 (NAMUR) safety standards, including operating down to 3.6 mA in a fail-safe condition.

Both have built-in diagnostics, and display clear English text errors and root causes on local displays in case of a fault. The flowmeters can also be commissioned and diagnosed with Endress+Hauser's FieldCare software. If servicing is needed, its DAT function automatic data backup ensures automatic reconfiguration of a repaired or new meter without the need for recalibration.

Promass 83O/84O simultaneously measure mass flow, fluid density and temperature, are highly immune to external disturbances such as pipeline vibration, and are stable under changing process conditions such as pressure, density, temperature or viscosity.

www.us.endress.com

Endress+Hauser's
Promass O Coriolis flowmeter

KROHNE introduces new IFC 050 signal converter for electromagnetic flowmeters

December 12, 2012 – KROHNE introduces the new IFC 050 signal converter for electromagnetic flowmeters. Developed for the growing water markets worldwide, IFC 050 is designed to fit in any basic water or wastewater application.

IFC 050 can be combined with OPTIFLUX and WATERFLUX series of electromagnetic flow sensors. Together with OPTIFLUX 1000, 2000 and WATERFLUX 3000 sensors, it can be used for raw water, potable water, wastewater and seawater, e.g. in water harvesting and purifications plants, sewage or desalination plants. In addition, its features match metering or leak detection in water distribution networks, agriculture or utility applications such as sprinkler/ irrigation, cooling or fire-fighting systems.

To suit the requirements of these applications, IFC 050 outputs reach from 4–20 mA HART, an active pulse output for driving e.g. an electromechanical counter up to an RS485 Modbus output for communication with microcontrollers and PLC`s. As an option, the signal converter can be equipped with all three outputs.

IFC 050 features a sturdy and robust construction: the shockproof aluminum housing is finished with a protective double-layer paint that withstands salty atmospheres. Its electronics have an extra coating against condensed moisture for use in e.g. in tropical areas. For convenient operation, IFC 050 can be ordered as wall-mounted or compact version. As an alternative to the display version, the blind version is the option for applications where the menu needs to be approached only once a time and a permanent display is not required.

www.krohne.com

Siemens Obtains Explosion-Proof Approvals for Sitrans Magnetic Flow Meters

January 29, 2013; Atlanta, Georgia – Siemens has introduced the addition of FM Class 1 Division 1, Groups A, B, C and D, and FM Class 1, Zone 1 AEx d (ia) ia/IIC/T3-T6 approvals for the company's half-inch to 12-inch line of Sitrans magnetic flow meters.

For line sizes larger than 12 inches, Siemens is now offering sensors and transmitters that carry the FM Class 1, Zone 1 AEx d e (ia) ia/IIC/T3-T6 approval.

The approvals are available for Siemens Mag 3100 Series # 7ME6310, Mag 3100 HT Series #7ME6320 and Mag 3100 P Series # 7ME6330 flow sensors.

Siemens Sitrans FM magnetic flow meters (magmeters) are designed to measure the flow of almost any electrically conductive liquid, as well as sludges, pastes and slurries. A prerequisite is that the medium must have a certain minimum conductivity. The temperature, pressure, viscosity and density have little influence on the result.

Siemens Sitrans FM magnetic flow meters are designed for flexibility at the operational level, easy commissioning, simple operation, maintenance and service, expandability and in-depth diagnostics.

The new approvals are relevant to customers in the water/wastewater, chemical and industrial markets, where magnetic flow meters are used in potentially explosive environments.

www.siemens.com