

# *FlowTimes* – April 2023

*Your strategic update on flow, temperature, and pressure measurement  
from Flow Research*

Executive Editor: Dr. Jesse Yoder. Volume 24, Number 1 – ISSN 1350-7204

## 1. Three paragraphs that tell a story

As we began work on the 9th Edition of our Volume X and Module A studies, I decided to take a look at the first edition of this study, published in February 2003 after three years of research.

At the beginning of the third chapter of *Volume X: The World Market for Flowmeters*, I was delighted to find three paragraphs that tell how the idea for Volume X came about, and also explain the origins of the terms “new-technology flowmeter” and “traditional technology flowmeter.”

These three paragraphs go back 23 years to a trip I took that started it all:

### **A Fact-Finding Trip**

The idea for this study originated in the year 2000 when the author took a fact-finding trip around the country to visit flowmeter manufacturers. Companies visited include Rosemount, Honeywell, Southwest Research, FMC, Micro Motion, Sierra Instruments, Fluid Components, Dietrich Standard, DMC, CEESI Colorado, and a number of other companies. The purpose of the trip was to ask companies about their market research needs, and to learn about their products.

The most compelling idea that emerged from this trip was to do a single study that includes all technologies. While this idea originated with Rosemount, a number of other companies endorsed the idea, once it was presented to them. Shortly thereafter, Flow Research and Ducker Worldwide [an early partner of Flow Research] agreed to undertake a study of the entire flowmeter market world, including all flow technologies.

### **The Idea of an All-Technology Flow Study Emerges**

After beginning initial work on a comprehensive study that includes ten flow technologies, it became clear any such study involving all flow technologies would be extremely long. As a result, the project was split into two phases: one phase to cover the newer technologies, and one phase to cover the more traditional technologies. The terms “new-technology flowmeter” and “traditional technology flowmeter” were created as a convenient way to divide the flowmeter family into two groups.



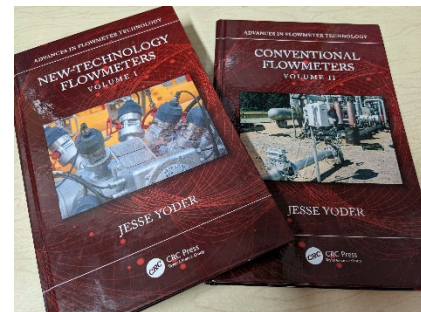
*Jesse Yoder at Instromet in Silvolde,  
the Netherlands back in the day*

So this is how the first edition of Volume X was born. The ‘X’ stands for the ten main flowmeter technologies that are covered in the study. Even though we analyze differential pressure (DP) transmitters separately from primary elements, the two taken together form the DP flowmeter market, for a total of ten technologies: Coriolis, magnetic, ultrasonic, vortex, thermal, differential pressure transmitters, primary elements, positive displacement, turbine, open channel, and variable area.

Even from the beginning, our approach was bottom up. Instead of writing a “top-down” study on the entire market, we spent the next three years studying the ten individual technologies, finding market size, market shares, and writing company profiles. Only after we had data on all ten technologies individually did we put all this data together into our first Volume X study. This is a method we have stayed with and continued to implement over the following 20 years.

Beginning in December 2021 and continuing through October 2022, we published seven flowmeter studies adhering to our bottom-up approach. Of these, four were from the traditional technology group: positive displacement, pressure transmitters, turbine, and variable area. We took the time and did the research on these technologies because they are worth studying in themselves, and also because we need the data for our upcoming 9th Edition of Volume X. This year we are filling out our group of studies with a mass flowmeter series: Coriolis, thermal, and mass flow controllers. We are also doing an ultrasonic study, which itself is three studies in one: the entire ultrasonic market, inline meters, and clamp-on and insertion meters.

The ideas of new-technology flowmeters and traditional technology flowmeters have taken on a life of their own. Last year I was privileged to write two books published by CRC Press: *New-Technology Flowmeters* and *Conventional Flowmeters*. Based on an agreement with the publisher, what we used to call traditional technology flowmeters we now call conventional flowmeters.



Flow Research has data that shows how the new-technology flowmeter market has overtaken the conventional flowmeter market in the past 20 years. We can even show the point when they cross paths. Yet both new-technology and conventional meter markets continue to grow, with new products being introduced among all ten flowmeter types. We invite you to join us as we seek to produce the most comprehensive look yet at the entire flowmeter market!

## 2. Things are hopping at Flow Research

### Ring in spring with our Coriolis report

Spring is almost here in New England, and so is the first study in our first-ever series, *The World Market for Mass Flow Measurement*. We’re now putting the finishing touches on *The World Market for Coriolis Flowmeters, 7th Edition*, ([www.flowcoriolis.com](http://www.flowcoriolis.com)) a perennially popular study.



Then we plan to release a core overview and two other studies that measure mass directly: *The World Market for Thermal Flowmeters, 3rd Edition* ([www.flowthermal.com](http://www.flowthermal.com)) and *The World Market for Mass Flow Controllers, 4th Edition* ([www.flowmfc.com](http://www.flowmfc.com)). Each of these separate, in-depth studies is interesting in its own right, but provide a broader perspective when combined. The core study will compile high-level results from each of the studies to give a comprehensive picture of the entire mass flow market. It will also include data on multivariable mass flowmeters. For more details, check out [www.massflows.com](http://www.massflows.com).

### Relax in the summer sun with Volume X



We are excited to be working toward the 20<sup>th</sup> birthday release of *Volume X: The World Market for Flowmeters, 9<sup>th</sup> Edition* and its standalone companion study, *Module A: Strategies, Industries, & Applications*. Our last edition was published in early 2022 and was based on data and projections from 2019 to 2021. The new study is based on fresh 2022 data we are now collecting. We plan to publish this best-selling study this summer. See [www.flowvolumex.com](http://www.flowvolumex.com) for more details or to preorder your copy now – and be eligible for early data.

### Revel in autumn glory with our ultrasonic study

We plan to wrap things up in the fall with our three-pronged study on the important ultrasonic flowmeter market ([www.flowultrasonic.com](http://www.flowultrasonic.com)):

- *Core Study: The World Market for Ultrasonic Flowmeters, 7th Edition*
- *Module A: The World Market for Inline Ultrasonic Flowmeters*
- *Module B: The World Market for Clamp-on and Insertion Ultrasonic Flowmeters*



To order these and other studies, give us a call at 781-245-3200 or visit [www.flowstudies.com](http://www.flowstudies.com).

## 3. Roper divests FTI and forms Indicor with CD&R

**indicor**<sup>™</sup>

Dubilier & Rice (CD&R).

After the November 2022 sale, the two companies created a new standalone company called Indicor. A January 23, 2023 [press release](#) said the name signifies the

Roper Technologies has sold its majority stake in its industrial businesses – including Flow Technology, Inc. (FTI) – to a private investment firm, Clayton,



*FTI turbine flowmeters*

new company's combined “decades of experience producing dependable, highly engineered solutions delivered with unique performance and value at the core of industry.” Roper owns 49% of the new company.

In addition to FTI, the new Indicor family of companies from the Roper divestiture includes Alpha, AMOT, CCC, Cornell, Dynisco, Hansen, Hardy, Logitech, Metrix, PAC, Roper Pump Company, Struers, Technolog, and Uson. Together, the businesses generated approximately \$1.1 billion of revenue in 2022.

FTI, founded in 1963 and based in Tempe, Arizona, provides specialized, high accuracy flowmeters and flowmetering solutions. The company’s turbine, positive displacement, magnetic, and ultrasonic flowmeters are used in a wide range of liquid and gas flow sensing applications. The company also provides liquid and gas flowmeter calibration equipment and flowmeter calibration, service, and repair.

Roper Technologies, based in Sarasota, Florida, is a \$5.37 billion company now focusing on operating businesses that design and develop vertical software and application-specific products for a variety of niche markets. CD&R, which has offices in New York and London, strives to build stronger, more profitable businesses with the companies in its portfolio.

## 4. Yokogawa announces new OpreX magmeter

Yokogawa Electric Corporation has announced the release of its OpreX™ Magnetic Flowmeter CA Series with new user-friendly functions that enhance maintainability and operational efficiency. The series was released in September as the newest member of the company’s OpreX Field Instruments family.



*Yokogawa's OpreX CA magmeter series*

The new capacitance-type OpreX magnetic meters feature a non-wetted construction that can measure conductive fluids through a tube without contacting the device's electrodes. New functions that improve user-friendliness, maintainability, and operational efficiency include support for the HART communications protocol, a choice of nine languages for the user interface, the ability to save measurement data a microSD card for viewing on a PC, and a backlight function on the display that improves visibility at night and in dark locations.

The meter also incorporates a device soundness analysis function that improves maintainability. The function analyzes and verifies that the meter is in sound operating condition while mounted on a pipe. Inspection of magnetic circuits, excitation circuits, and arithmetic circuits, and the checking of device status alarms and soundness can be performed in as little as six minutes. When used in combination with Yokogawa’s FSA130 software (sold separately) and other maintenance tools, many additional items can be checked while a device is mounted on a pipe, and reports can be easily created.

Easily replaceable measurement tubes – in eight sizes ranging from 15mm to 200mm – suit a wide variety of purposes. They have the same face-to-face lengths as the ADMAG CA Series flowmeters, so no additional work is required to replace an ADMAG CA Series flowmeter with a product from the OpreX Magnetic Flowmeter CA Series.

The new series is available in Japan, Southeast Asia, North and South America, Oceania, the Middle East and Africa, and will be launched in Europe and China after qualifying for CE marking and obtaining the relevant certification for explosion-proof standards.

This release follows the April 2022 announcement of Yokogawa's OpreX™ Vortex Flowmeter VY Series. The company claims that these explosion-proof vortex flowmeters are the first in the industry to support remote maintenance functions for condition-based maintenance. The VY series of vortex meters eliminate the need for external calculation devices by using readings from a built-in temperature sensor and data from pressure gauges and other external instruments to perform precise temperature and pressure-compensated energy calculations. The series also digitizes internal signals to enable self-diagnostics for all components, including the vortex shedder bar and sensor element.

## 5. EPA awards \$2.4B for water infrastructure projects

The U.S. Environmental Protection Agency (EPA) announced in March that it is awarding \$2.4 billion more to states for water infrastructure projects including water, wastewater and stormwater infrastructure. The funding is the second of its kind from the clean water State Revolving Fund (SFR) under the Infrastructure Investment and Jobs Act for clean water projects. The EPA announced initial funding of \$1.9 billion in May 2022. Funding now totals \$44 billion over five years.



The funds are expected to expand access to clean water, safeguard the environment, and improve access to underserved communities. New York plans to use its \$232 million to address untreated sewage discharge emptying into the Hudson River and modernize water systems. California will receive over \$150 million, Ohio over \$118 million, Texas over \$96 million, and Illinois over \$95 million.

## 6. FCI's thermal meters help reduce carbon emissions

ST80 thermal mass flowmeters from Fluid Components International (FCI) are helping process and plant engineers support green fuel cell energy initiatives that produce electricity, hydrogen and water. The meters, coupled with FCI's tab-type Vortab Insertion Pane (VIP) flow conditioners, measure gas flow to provide clean electric power while reducing or eliminating carbon, nitrogen oxides (NOx), sulfur oxides (Sox), and other harmful emissions.

The thermal meter and flow conditioner monitor a variety of fuel cell process applications: 1) fuel gas primary feed; 2) fuel gas pressure relief; 3) deoxidizer relief line flow; 4) cooling tower vent, anode exhaust gas; and 5) fresh air blower discharge. The flow conditioner neutralizes flow profile irregularities caused by elbows, valves, blowers, compressors, and other flow disturbances in piping and duct runs.

The ST80 meter features a patented hybrid sensor drive that combines – for the first time, according to FCI – both constant power (CP) and constant temperature (CT) thermal dispersion sensing technologies in the same instrument.



*FCI's ST80 thermal mass flowmeters*

FCI offers four different flow sensor element designs to ensure best installed performance, including FCI's newest wet gas solution, which ensures steady, reliable measurement by optimizing the sensor head design and installation to prevent condensation droplets, entrained moisture or rain from contacting the thermowells.

The 50+-year-old FCI, based in San Marcos, California, designs and manufactures thermal mass flowmeters, flow switches, and level switches for industrial process measurement applications utilizing patented thermal dispersion flow measurement technologies.

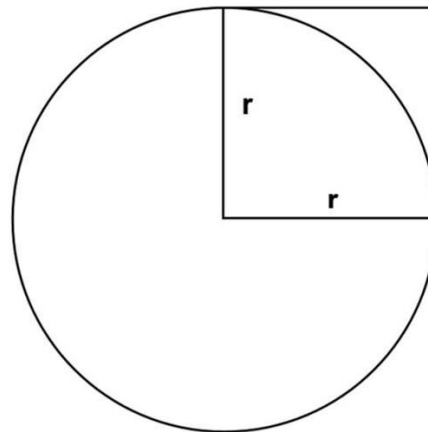
## 7. Happy Pi day!

*We thought you might enjoy this Flow Research social media post on March 14 (3.14) – Pi Day.*

What does geometry have to do with flow measurement? Quite a lot, although it may not be so obvious at first glance. In order to calculate the volume of flow that flows through a pipe, we need to know the area of the pipe. And since most pipes are round, this involves using the formula for circular areas. The formula for the area of a circle is  $\pi(r^2)$ .

The value of  $\pi(r^2)$  gives the geometric area of the square in the diagram. The formula for the area of the circle,  $\pi(r^2)$  tells us that  $\pi$  squares with sides equal to radius  $r$  fit into the area of a circle with radius  $r$ . There is a saying, "You can't fit a square peg into a round hole." The saying embodies an important truth: there is no rational number of squares that will fit into

Figure 11-1 The value  $r^2$  as a unit for measuring the area of a circle



*Reprinted from New-Technology Flowmeters, CRC Press*

a circle. This is why mathematicians have had to invent the idea of  $\pi$ , whose value is approximately equal to 3.14, to give an account of the area of a circle. No wonder it is called an “irrational” number. But  $\pi$  is a non-repeating decimal with no rational value.

Given the above reasoning, it is time to take another look at the formula for the area of a circle. The main problem in determining the area of a circle is with the unit of measurement. As long as this unit is a square, there is no way to give a rational value for the area of a circle. This is because no rational number of squares fit into circular area. Possibly a “round inch” will work. However, if we use a round inch as the unit of measurement, then square area will have an irrational number of round inches. There seems to be no unit of measurement that will work for both circles and squares.

Given the amount of effort that has been put into analyzing circles in terms of squares, Flow Research suggests it is worthwhile exploring the idea of a new unit of measurement for circular area, whether it works for squares or not.

*Jesse cares passionately about this subject. If you have thoughts to share, please drop him an email at [jesse@flowresearch.com](mailto:jesse@flowresearch.com) or call +1 (781) 245-3200.*

## 7. More research data for your marketing decisions

In addition to ordering our exciting upcoming studies, there’s still time to profit from our existing studies that cover nearly every flowmeter technology in depth:

- October 2022 (384 pages): *The World Market for Variable Area Flowmeters*, our first VA study ever, found that the market is holding its own as suppliers introduce improvements to meet the increasingly sophisticated needs of today’s users. ([www.flowva.com](http://www.flowva.com))
- September 2022 (566 pages): *The World Market for Turbine Flowmeters, 3rd Edition* reveals that new product developments are keeping the large and stable turbine meter market competitive. ([www.flowturbine.com](http://www.flowturbine.com))
- July 2022 (526 pages): *The World Market for Magnetic Flowmeters, 7th Edition* finds that magnetic flowmeters are running neck and neck with Coriolis meters as a revenue leader in the global flowmeter market. Magmeters are among the most widely used types of meters for measuring the flow of water and other liquids. ([www.flowmags.com](http://www.flowmags.com))
- June 2022 (460 pages): *The World Market for Pressure Transmitters, 5th Edition* finds that pressure transmitter revenues worldwide equal more than 40% of the worldwide flowmeter market. Pressure is one of the most widely measured variables in the process industries, with an important relation to flow, level, and temperature. Differential



pressure flow measurement overlaps with the worldwide flowmeter market.  
([www.pressureresearch.com](http://www.pressureresearch.com))

- April 2022 (1,316 pages): *Volume X: The World Market for Flowmeters, 8<sup>th</sup> Edition* and *Module A: Strategies, Industries, and Applications* finds that the worldwide flowmeter market is now strong and trending upward following the pandemic slump as the economy regains its footing and rising oil & gas prices drive exploration and production. The two studies cover market share, market size, industries, applications and more for all 11 flowmeter technologies. ([www.FlowVolumeX.com](http://www.FlowVolumeX.com))
- December 2021 (476 pages): *The World Market for Positive Displacement Flowmeters, 3rd Edition*, our first PD study in a decade, finds that despite competition from new-technology meters, positive displacement meters are holding their own, especially in the oil & gas market. PD flowmeters are the workhorses in the flowmeter world. ([www.FlowPD.com](http://www.FlowPD.com))
- May 2021 (1,634 pages): *The World Market for Ultrasonic Flowmeters, 6th Edition* and its companion modules on inline and clamp-on/insertion ultrasonic meters found that the ultrasonic flowmeters is growing faster than expected. ([www.flowultrasonic.com](http://www.flowultrasonic.com))
- September 2020 (536 pages): *The World Market for Coriolis Flowmeters, 6th Edition* found that Coriolis is one of the fastest growing flowmeter markets. Coriolis is also one of the flowmeter technologies that companies invest most on in research & development. ([www.flowcoriolis.com](http://www.flowcoriolis.com))

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