Multiphase Flow Measurement a Main Focus of Norway's North Sea Flow Workshop

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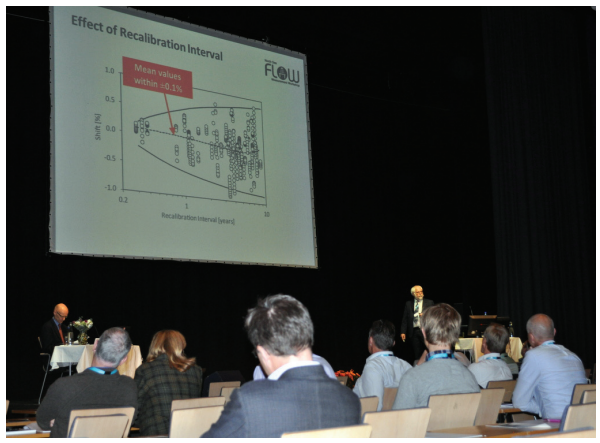
Flow Research recently attended one of the most significant events in the world of flow: the International North Sea Flow Measurement Workshop. The Workshop was held in Tønsberg, Norway, about two hours south of Oslo. This was the 29th edition of this Workshop, which is held annually. It has been alternating between Norway and Scotland, and next year will be held in Scotland. The Workshop featured 330 delegates from 29 countries. While the large majority of attendees were from European countries, other countries represented include Oman, India, Nigeria, Qatar and Singapore. About 25 people attended from the United States.

While the Workshop featured exhibits from a number of flowmeter suppliers and some research institutes, the main focus of the Workshop was the papers delivered on various topics related to flow. Nearly all the papers related to multiphase or ultrasonic flowmeters, although several were given on Coriolis flowmeters as well. The Workshop clearly had the flavor of a conference rather than an exhibition.



Tom Kegel of CEESI delivers a paper on recalibration frequency. Photo by Flow Research.

Multiphase Flow Measurement

Multiphase flowmeters are used in oil and gas production to determine the mixture and amounts of oil, gas and water coming out of the well. This measurement used to only be possible after the fluids were physically separated. Multiphase flow measurement began in the area of the North Sea when the prospective decline in production of the North Sea oil fields made it necessary to find a way to analyze the increasing amounts of gas and water that were becoming a greater part of the fluid from the wells. Several research projects were undertaken at that time to develop multiphase technology that could provide this analysis on fluids as they came out of the wells.

The view from the Quality Hotel Tønsberg, venue for the North Sea Flow Workshop. Photo by Flow Research.

The majority of multiphase flowmeters make a combination of measurements, including temperature, pressure and differential pressure. They also typically use a nuclear source, usually gamma rays, to help determine the properties of the fluid. Some multiphase flowmeters use a high-energy gamma ray source, and others use a low-energy source of gamma rays. Some companies use both high- and low-energy gamma sources in their multiphase meters.

Most multiphase meters have a Venturi tube incorporated into the device. Bernoulli's theorem is then used to compute flowrate, as with other differential pressure (DP) flow devices. Density is determined with a combination of temperature, pressure and DP measurements. The gamma ray technology is used to determine the percent of gas, water and oil that make up the fluid at the point of measurement. By combining these percentages with the DP flowrates, the amount of flow of each fluid type can be determined.

Benefits of Multiphase Flowmeters

Multiphase flowmeters have multiple advantages:

1. They reduce the need for hardware installed on topside (onshore), offshore and subsea applications. Because they reduce or eliminate the need for dedicated test separators by measuring flow at the wellhead, multiphase meters save on platform space and make it possible to drill with a smaller equipment footprint.
2. Multiphase flowmeters make it unnecessary to individually test the performance of each well with test separators, since the data from a multiphase meter can provide similar data. This is especially important for subsea applications where the well testing flowlines can be especially long. Multiphase meters can reduce or eliminate the need for separate well-testing lines.
3. Multiphase meters provide important data about the well itself. Changes in the gas/oil ratio can be detected more quickly in a realtime basis, as opposed to test separators that provide slower response with fewer data points.
4. Multiphase meters are useful for allocation metering situations, where the produced fluids must be commingled and sent to a processing facility. Without multiphase meters, the fluid from each well has to be sent through a test separator before being sent to the processing facility.

The Globalization of Flow Measurement

Attending a conference like the North Sea Flow Workshop in Norway makes it clear how truly international the flowmeter business has become. With 330 delegates from 29 countries as far-flung as Singapore, Oman, Brazil, Slovakia and multiple European countries shows not only the effect of globalization, it also shows the internationalization of flow research and development. In fact, much of the intellectual work being done to develop new products and flowmeter theories is done in multiple locations around the world. Even the develop of the Q.Sonic Plus flowmeter was done by engineers and developers located around the world who communicated virtually by email and on the computer.

Norway has become a center of product and development for multiphase and ultrasonic flowmeters because of the presence of Christian Michelsen Research (CMR) Instrumentation in Norway and the National Engineering Laboratories (NEL) in Scotland. The Christian Michelsen Institute did the research from 1982 to 1985 to create the Fluenta flare gas meter, and in 1985 actually founded Fluenta. Today a number of multiphase companies call Norway home, including Roxar (Stavanger), MultiPhase Meter (MPM) (Stavanger), Framo Engineering (Bergen) and Abbon (Rud). CMR Instrumentation itself is located in Bergen.

Applications Driving Research

Another moral to draw from this conference is that applications are driving the research into flow measurement. In particular, energy applications are driving flow research. With the price of crude oil in the range of $100 a barrel and projected to go higher, companies are pouring millions of dollars into developing flowmeters that can measure both oil and gas with a high degree of accuracy. The flowmeters that can do this best are ultrasonic and Coriolis meters. If variable area meters could measure oil or gas as accurately and reliably as ultrasonic and Coriolis meters, companies would spend millions of dollars to develop them too.

The best advice for end-users or suppliers who would like to see more research and development dollars go into certain "neglected" meters like variable area and vortex is, "Develop some high value applications, and companies will flock to your door." Vortex meters have already done this to some extent with steam flow applications.

Companies are putting money into developing multiphase meters not so much because they do the measurement so well, but because the measurement is so valuable. Multiphase meters are at an early stage of their evolutionary cycle, and no doubt new technologies will emerge over time. In the meantime, companies are working hard to improve the existing technology. We have a long way to go with multiphase meters, and also with ultrasonic and Coriolis meters. Think of how different things looked 10 years ago, then project 10 years ahead. There are many new and exciting discoveries ahead in the flowmeter world.

Jesse Yoder, Ph.D., is president of Flow Research, Inc. (www.flowresearch.com), a company he founded in 1998. He has 22 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 process control and has published numerous journal articles.

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