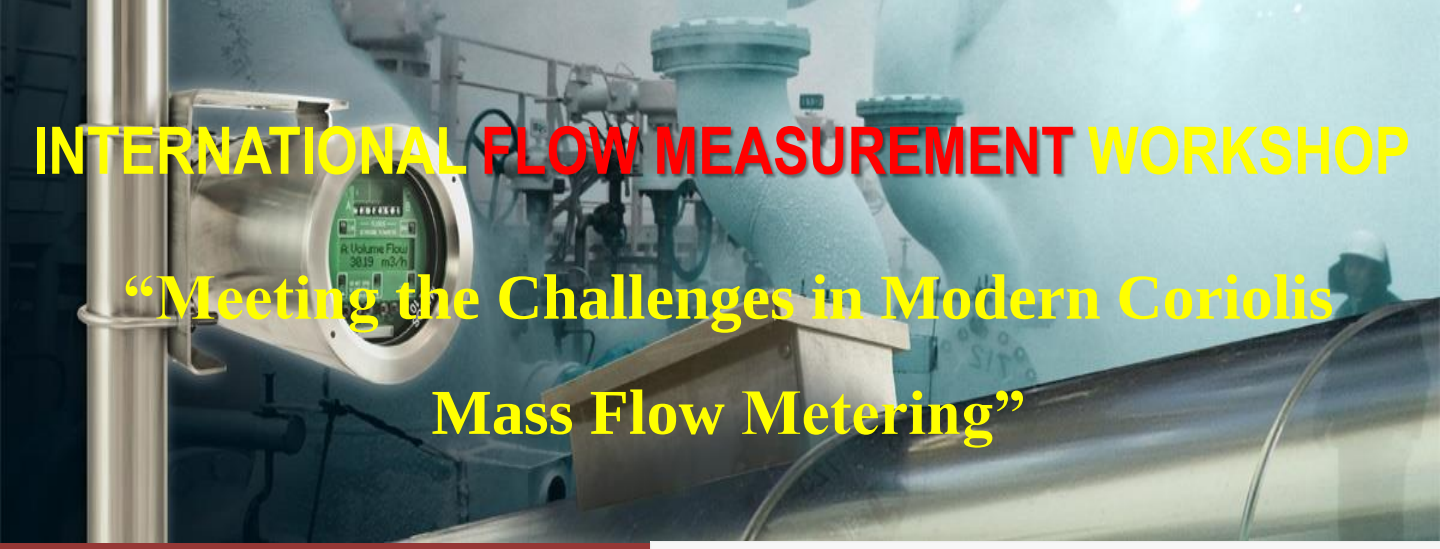
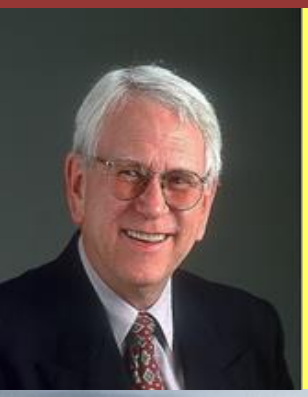


INTERNATIONAL FLOW MEASUREMENT WORKSHOP

"Meeting the Challenges in Modern Coriolis Mass Flow Metering"

YOUR PRINCIPAL WORKSHOP LEADER:



Mr.Mick Crabtree, MSc

- ✓ More Than 50 Years of Industrial Experience in Control Systems and Flow Measurement
- ✓ Author of Eight Technical Books and Hand Books
- ✓ International Instructor and Consultant for Control Systems
- ✓ International Keynote Speaker

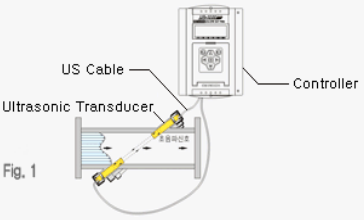


Fig. 1

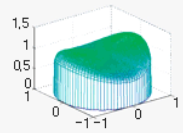
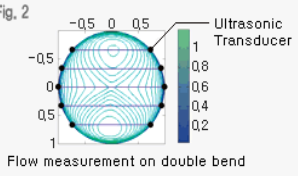


Fig. 2



Flow measurement on double bend

Fig. 3

Flow distribution in various pipe

25 April, 2018

School of Mechanical Engineering
Semnan University
Semnan, Iran

Early Bird Registration: 15 April, 2018

A Unique Opportunity For:

Researchers, Engineers involved in new metering applications, design changes, and improved metering methods and Companies that demand more accurate and reliable metering.

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ISME 2018

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Meeting the Challenges in Modern Coriolis Mass Flow Metering

Objectives:

The Coriolis-based mass flow meter is held by many to be a revolutionary application of technology based on what is a fairly obtuse scientific phenomenon. The Coriolis-based metering system not only measures mass flow directly – but to a very high accuracy (better than ±0.1% for liquids and 0.35% for gases).

Some of the other many benefits include:

- direct, in-line and accurate mass flow measurement of both liquids and gases;
- accuracies as high as 0.05% for liquids and 0.35% for gases
- mass flow measurement ranges covered from less than 5 g/m to more than 350 tons/hr;
- measurement independent of temperature, pressure, viscosity, conductivity and density of the medium;
- direct, in-line and accurate density measurement of both liquids and gases;
- mass flow, density and temperature can be accessed from the one sensor; and
- Can be used for almost any application irrespective of the density of the process.

But many challenges that still remain. Fifteen years ago the pipeline size was limited to 150 mm (6”) and although this is now currently been extended to 400 mm (16”) pipe size diameter is still a limitation – especially in the oil and gas industry. Early Coriolis mass flow meters were based on a dual bent-tube arrangement that produced relatively high pressure drops and, with some materials, the possibility of flashing. Such arrangements were also not conducive to self-draining – an important factor in the chemical, pharmaceutical, and food and beverage industries.

Consequently, the challenge was to produce a straight- tube design whose stiffness did not detract from its sensitivity. But straight tubes brought, in their wake, their own set of problems – high sensitivity to temperature and pressure variations.

Meeting the Challenges in Modern Coriolis Mass Flow Metering

Furthermore, specific measurement applications require specific solutions. For example, custody flow measurement of Liquefied Natural Gas (LNG) requires the system to be capable of operating down to -165°C – a severe challenge in terms of material embrittlement.

In earlier designs the liquid to gas ratio was confined to between 4 and 6%. Newer models, employing a number of innovative designs, have seen these ratios extended to as high as 60%. In batching applications the speed of response is critical. Here again, manufacturers have had to tackle the problem of latency – the processing delay inherent in any microprocessor based system used to generate the output pulses.

This workshop covers the basic theory and working principle of the Coriolis mass flow meter and traces its development over the last few years. In addition it addresses how many of the problems referred to above, together with many others, have been met and overcome.

Who Should Attend:

- ✓ Researchers and Academic People,
- ✓ Laboratory Supervisors
- ✓ Engineers involved in new metering applications, design changes, and improved metering methods
- ✓ Companies that demand more accurate and reliable metering.

What You will Learn:

- ✓ What are the requirements for the perfect flow meter
- ✓ Why measure mass flow measurement over volumetric flow
- ✓ What is the Coriolis effect
- ✓ Basic Coriolis equation
- ✓ How the Coriolis force is harnessed to measure mass flow
- ✓ Working principle of a vibrating tube Coriolis meter
- ✓ The case for a bent tube versus a straight tube design
- ✓ How the vibrating tube concept is used to measure density
- ✓ Extending the limits in terms of temperature, pressure, and pipeline diameter.
- ✓ Designing for LNG measurement
- ✓ Extending the limits for entrained gas
- ✓ Overcoming the problems of latency
- ✓ Perceived application limitations and how they may be overcome