Eureka March 2010

The Site for Engineering Design

http://www.eurekamagazine.co.uk

1 page

Sensors, Test & Measurement: Flowmeters

Head: **Ultrasonic flowmeter appeals to new markets**

Intro: A new high-accuracy, low-cost ultrasonic flowmeter could represent a breakthrough change in a small bore ultrasonic flow metering. Paul Fanning reports.

Due to be launched at MTEC 2010, the Atrato from Titan Enterprise is a direct through meter without a contorted flow path which uses ultrasonic technology. It can handle flows from laminar to turbulent and is therefore largely immune from viscosity. It also offers excellent turndown, linearity and repeatability.

The Atrato is capable of monitoring flow over a range of 200:1 and has accuracy better than ±1.5%. Its simple design makes it extremely marketable, while its USB interface makes it extremely easy to install and use.

This device uses the favoured "time of flight" measurement system where a signal is passed along the pipe with the flow and back up the pipe against the flow. When no flow is present the signals are identical, when there is flow there is a time difference between these signals and this is proportional to the velocity of the liquid. As the pipe geometry is fixed and is known the through-put of the liquid can be calculated.

Titan's founder Trevor Forster has championed the technology for some time. "Fundamentally, my position is that the future of flow measurement is going to be ultrasonic or coreolis. They're the only two long-term viable technologies because they're non-intrusive."

However, until now, both technologies have been seen as expensive and – in the case of small-bore ultrasonic flowmeters – not particularly accurate. For these reasons, small bore ultrasonic flowmeters have tended to be restricted to medical applications. However, the Atrato's ability to achieve timing accuracies equivalent to 200picoseconds at between 25 and 50% the cost of other ultrasonic options could change this.

At the heart of the Atrato are its use of a different sensor arrangement and advanced signal processing to interrogate the flow, ensuring that that it provides high accuracy over a wide turndown range. Although preferring to maintain the (as yet unpatented) signal processing as "a black art", Forster is happy to discuss the (patented) sensor arrangement, saying: "We're using a crystal washer. What we're looking for is to excite the crystal across the radius. Normally when you excite a crystal, you get a natural frequency and the movement goes across the width. We're exciting it in such a way that we're getting

the movement radially, which puts a very, very strong signal directly into the fluid. That's the fundamental part of it: the way we're getting those crystals to oscillate in a way that's not the usual way of making them behave and the resulting signals are entirely symmetrical. At zero flow the upstream and downstream signals cancel each other out"

This process offers the technology a number of advantages. Says Forster: "Because we are introducing the signal radially and receiving it radially, we've effectively got a plane wave travelling down the pipe, so we don't have contorted parts or reflected signals, which also gives us an incredibly high signal to noise ratio of up to 3000:1, which is why we get such a wide flow range."

Because the signals are travelling in a plane wave, they are insensitive to the velocity profile. Indeed, running the meter on a 380 centistoke oil gives almost identical performance to running it on water. Naturally, this makes it adaptable across a number of markets. Applications Forster believes will be of particular interest are pilot plant, research laboratories, medical and low industrial flows.

However, Forster sees another potential market in domestic water meters. He says: "We are looking for partners for the domestic water meter market. We're well within the flow range and performance level for domestic water meter. We're out on cost, but then we're not building 20 million a year, which is the anticipated market in a few years time!"