

ARTICLE TAG Temperature Measurement, Process Control, Sensing

A Non-Invasive Approach To Process Temperature Measurement



IAA INTERVIEWED MELISSA RUTHS, EMERSON PROCESS MANAGEMENT ASIA PACIFIC'S DIRECTOR OF MARKETING FOR ITS ROSEMOUNT PORTFOLIO, AT THE 2016 EDITION OF THEIR PERFORMANCE WITHOUT COMPROMISE TECHNOLOGY CONFERENCE & EXHIBITION, HELD ON APRIL 8, 2016, ON THE COMPANY'S NEW ROSEMOUNT X-WELL TECHNOLOGY. BY MARK JOHNSTON

Emerson Process Management has developed a new non-invasive solution for measuring process temperature. The solution, known as Rosemount X-well™ Technology, provides a Complete Point Solution™ for accurately measuring internal process temperatures. This is done without requiring a lot of preparation in both design and installation.

IAA: This is the first time I have heard about Rosemount X-Well Technology. Could you tell me more about it?

Melissa Ruths (MR): The basic assembly consists of a Rosemount 648 Wireless Temperature Transmitter and a Rosemount 0085 Pipe Clamp Sensor. What we did differently was to develop a special algorithm, built into the Rosemount 648 transmitter, which provides an accurate, repeatable, extrapolated process temperature measurement from a surface measurement. This is what Emerson has called X-well Technology.

The algorithm takes the pipe surface temperature as measured by the Rosemount 0085 Pipe Clamp Sensor and the ambient temperature as measured by the ambient temperature sensor built inside

the Rosemount 648 temperature transmitter as inputs. It combines these inputs with the conductivity properties of the pipe (based on pipe diameter, pipe schedule, and pipe material information) to accurately calculate the process temperature inside the pipe.

What customers care about the most for the majority of applications is an accurate and repeatable process temperature measurement. That is why traditionally they have always had to use a thermowell (T-well) in order to achieve the level of accuracy required.

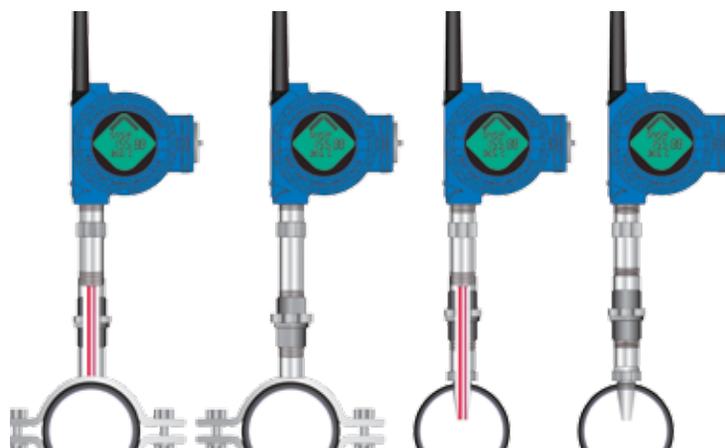
While T-well is the most prevalent method of temperature measurement, it presents several challenges right from design to installation to operation. The design phase requires several considerations such as T-well

stem style, length and material of construction. There is also the need for complex wake frequency calculations to ensure T-well does not fail during operation. Installing T-well is expensive, involving cutting and welding of pipes, and it introduces a potential leak point. During the operation phase, the T-well is subjected to corrosion, abrasion and bending stresses by the fluid flowing around it leading to the potential failure of the T-well.

The Rosemount X-well technology removes the challenges of a T-well assembly, making it a simpler and a cost-effective solution to temperature measurement.

IAA: What does this replace, because measuring surface temperature is not a new thing?

MR: That is correct, measuring the surface temperature with surface sensors is nothing new. This practice has been around for quite some time. Surface sensors do help in avoiding complexity and design issues associated with T-wells. However,



X-well technology is a non-invasive solution to measuring process temperature.

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surface sensors alone give you the temperature of the surface you are measuring, a value that does not provide an accurate or repeatable representation of an in-pipe process temperature.

What is new with Rosemount X-well technology is the ability to calculate an accurate and repeatable process temperature value based on surface temperature and ambient temperature measurement.

IAA: Is the lag time between the process and surface temperatures affected by the thickness of the pipes?

MR: There is definitely some time lag between the process temperature and the Rosemount X-well technology temperature as there is time required for change in process temperature to reflect on the surface temperature of the pipe. However, for the vast majority of pipe line applications this lag is acceptable especially in temperature measurement because temperature is a slow moving variable. Exceptions where we would not recommend Rosemount X-well technology are fast control loops, safety loops, and custody transfer applications.

For several other applications, such as pipeline monitoring, allocation metering applications, retrofit projects that need new points, pipelines requiring frequent cleaning, high velocities, slurries and heavy particulate fluids, wellhead monitoring, Clean-In-Place (CIP) processes, high viscosity fluids, and harsh processes requiring exotic materials, to name but a few, Rosemount X-well technology is an excellent choice.

IAA: So Rosemount X-well technology is targeted towards the majority of applications we see across the process segment?

MR: Yes. We are targeting most pipeline applications. For instance, retrofit projects represent a very good opportunity for this type of technology. This is because sometimes during a retrofit project new measurement points are needed along the pipeline.

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By using Rosemount X-well technology a new measurement point can be set up with relative ease without the need for a thermowell. It is in situations like this that demonstrate the advantages of having a solution that is both non-intrusive and accurate.

There have been trials that were carried out prior to launching



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Rosemount X-well technology. One such trial perfectly demonstrates the need for a non-intrusive yet accurate solution. In this trial there was a mixture of oil, sand, and water which was to be sent to a separator. Previously they did not measure the temperature before the separator because they did not have a suitable solution which could handle the abrasive effect of the mixture of oil, sand, and water mixed together which reduces the lifespan of an installed T-well. Now with the non-intrusive Rosemount X-well technology, they can finally measure the temperature before the separator, without the need for regular maintenance.

The majority of customers today still use T-wells because they require an accurate process temperature. They just put up with all the challenges associated with that. They put up with the time required for design, they put up with the wake frequency calculations, and they put up with the inconvenience associated with changes, which in some cases can require a complete redesign. When it comes to the installation there is pipe cutting and welding required, as well as making sure there are no leaks that can become a safety issue. Over time the industry has just accepted these trade-offs for accurate process temperature measurement.

In comes surface measurement, which in itself is nothing new, but historically has not been accurate enough to satisfy the need for accurate process temperature measurements. Rosemount X-well technology is the first time that we are able to implement a pipe clamp sensor without sacrificing the accuracy associated with the T-well, for the majority of cases.

IAA: What is the breakthrough for this, is it just the software algorithm or are there any architectural changes?

MR: No. It is the software algorithm. Wireless technology is another piece of it that has enabled such an easy to



X-well technology is targeted towards any pipeline application.

The installation is not only about cost, but about saving time.

implement solution because you can just stick it on, you do not have to do any wires and cables, but again we have had discrete wireless for a while. The breakthrough is really the software algorithm and how it works. So it looks at the thermal conductivity of the pipe and basically the temperature assembly itself and it is then able to calculate an accurate process temperature. That is really the new aspect of it.

IAA: Why has it taken until now to come up with this solution?

MR: We came up with it based on customer feedback. One thing that may interest you is our conversation with Engineering, Procurement, and Construction (EPC) companies. EPCs do the calculations needed for T-wells, so we asked them what would be the kind of benefits associated with adopting Rosemount X-well technology in place of a T-well. They said they could cut down their engineering time by 65

percent and then from the installation perspective, they could reduce the installation time by 70 percent. This is just from adopting Rosemount X-well technology instead of a conventional T-well.

The installation is not only about cost, but also about saving time. These are the big drivers. Speaking with our customers, what interests them the most, both from a Capital Expenditure (CAPEX) and Operating Expenditure (OPEX) side, is about how they reduce maintenance. Replacing T-wells is always a challenge. Sometimes you may have to shut down the whole process. Pigging is used on pipelines during clean-up operations, and if that pipe has a T-well, it will need to be removed before the pigging can be done. With the Rosemount X-well technology pigging can be done without the need to remove anything, so the temperature measurement can be maintained on the pipe during the cleanup process.