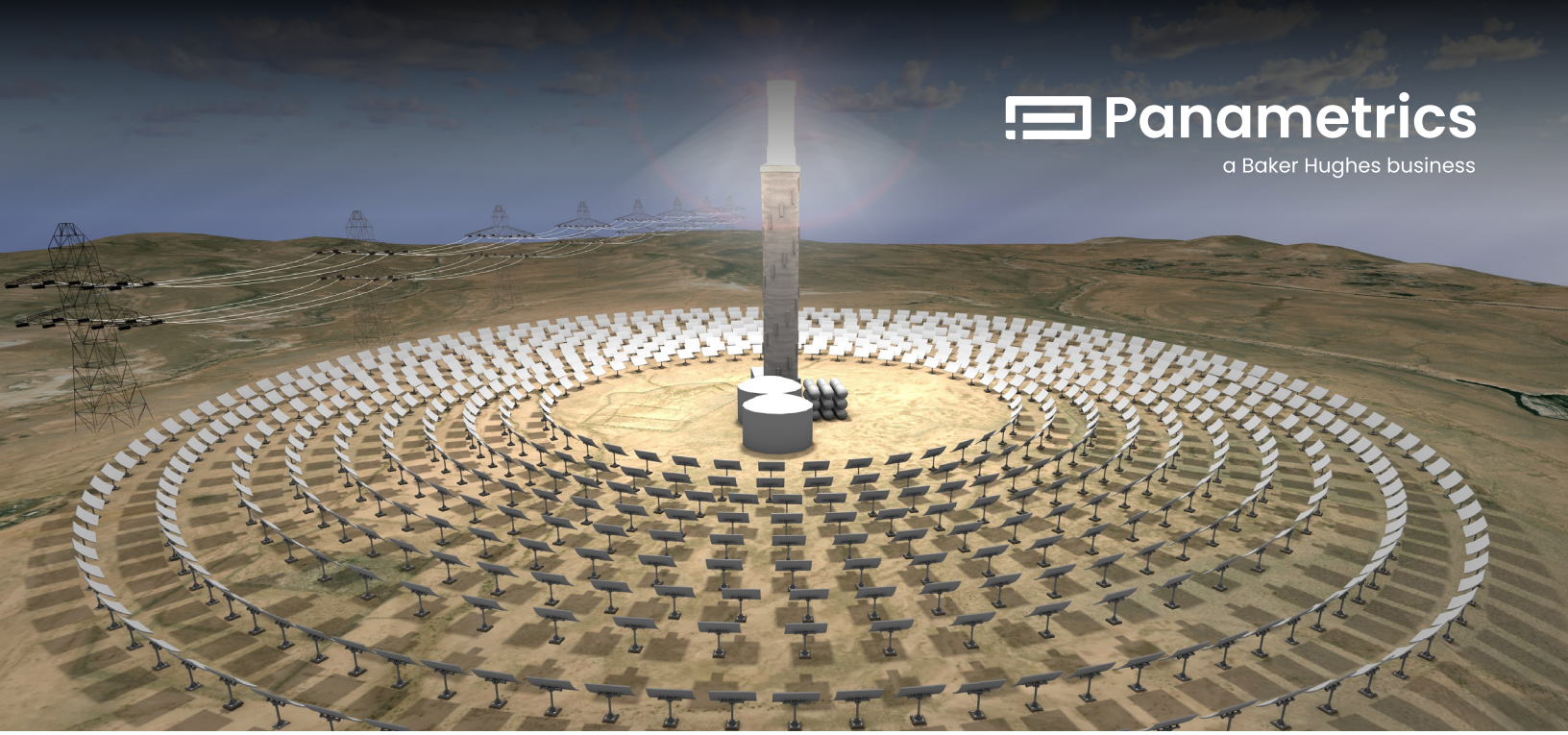


Panametrics
a Baker Hughes business

Application note

PanaFlow meter system helps generate electricity by solar power during the night

A research center uses PanaFlow Meter System to measure flow of high temperature nitrate salts in a thermal storage system

Benefits:

The all-digital XMT868i transmitter has no moving parts, requires minimal maintenance and provides long-term, drift-free operation.

Problem

A European research center for solar technologies in Europe operates a number of projects investigating the application of solar power for the generation of electricity. These solar power systems use computer-controlled mirrors that track the sun and concentrate its radiation onto receivers, where a working medium converts the radiation into thermal energy. This working medium is then passed through a heat exchanger to produce steam and the steams passed to turbines to generate electricity.

The center runs a number of pilot research projects involving the use of molten nitrate salts as a working and heat accumulator medium. The salts are heated up from 290°C to 550°C and pass through a steam generator to create steam that is directly injected to a steam turbine; or is bypassed to an insulated storage tank, to allow electricity to be generated overnight.

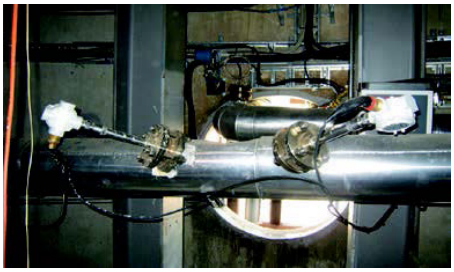
In order to control the generating capacity during the night, it is necessary to control the flow of the nitrate salts into the heat exchanger. At first it was believed that this could be done by controlling the pressure of the salts, but this method failed, which led the team to investigate using ultrasonic flowmeters.

Solution

The only solution to the problem, with the capability of handling the very high temperatures and the temperature cycles, was the PanaFlow Meter System.

PanaFlow consists Bundle Waveguide transducers (BWTs) installed into a pipe section. Transducer signals are transmitted and received by the XMT868i transmitter that is also mounted on the pipe section.

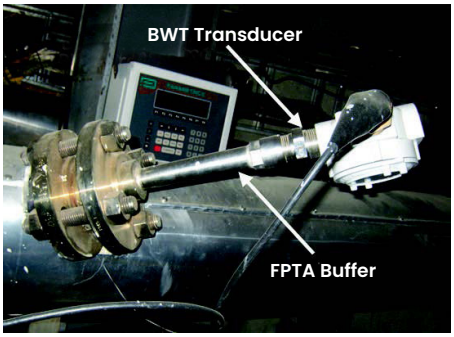
PanaFlow is installed in a spool piece section of the nitrate salts inlet pipe leading to the heat exchanger (see figure, right), where the operating temperatures range from 290°C up to 550°C at an average pressure of 1.5 barg. Bundle Waveguide Transducers (BWTs) are installed using FTPA buffers that allow easy installation or removal of the wetted transducers without interrupting the salts flow or emptying the pipe. The unique BWT transducers use waveguide bundles to efficiently concentrate a greater amount of the transducer ultrasonic signal into the flow. At the same time, the bundles act as buffers to protect the piezoelectric transducers by removing them from extreme temperatures (see figure, below). FTPA extended buffers allow operation in liquid temperatures from -190°C to 600°C. This compares with the upper limit of 260°C offered by most competitors' flowmeters.



PanaFlow, BWT with FTPA buffers installed on pipe inlet

Payback

In this instance, there was simply no other competitive solution to the problem. Only PanaFlow could provide the technology to measure the flow at such high temperatures and over such a wide range. The BWT transducers transmit a signal through the buffer assemblies, which is powerful enough to penetrate all liquids, including molten nitrate salts. The XMT868i's Automatic Tracking Window feature enables accurate flow measurement even when the fluid sound speed is changing due to temperature shifts.



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With a reach that extends across the globe, Panametrics' critical measurement solutions and flare emissions management are enabling customers to drive efficiency and achieve carbon reduction targets across critical industries including: Oil & Gas; Energy; Healthcare; Water and Wastewater; Chemical Processing; Food & Beverage and many others.

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