Panametrics

Application note

Molten salts measurement at a peak-shaving power station

Summary

Panametrics' customer, Energy China, operates a peak-shaving power station in the Shandong Province, China. Its role is to provide additional power during electricity consumption peaks by connecting to the grid and improving the stability and reliability of the power system during spikes in demand.

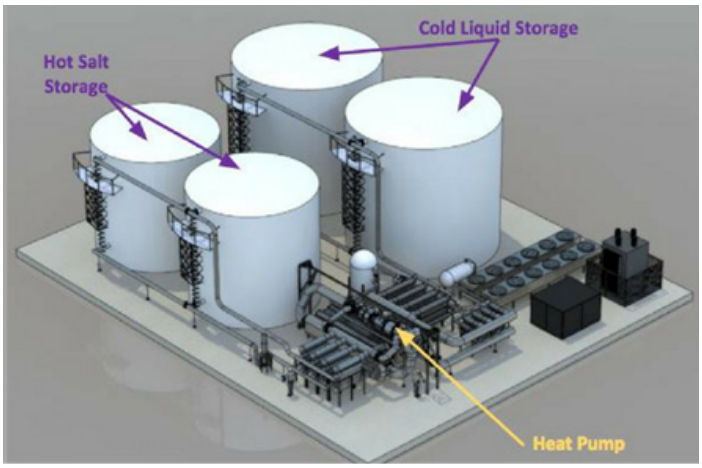
To be able to support demand, the customer uses molten salts as its main energy storage medium.

Molten salts play a crucial role in peak-saving power stations by acting as an efficient thermal energy storage medium. These salts can absorb and retain heat at high temperatures, which is then used to generate electricity during peak demand periods. When electricity demand is low, excess energy from renewable sources like solar or wind is used to heat the molten salts. This stored thermal energy can be quickly converted back into electricity by transferring the heat to a steam generator, which drives a turbine. This process helps balance the grid by providing a reliable power supply during peak times, reducing the need for fossil fuel-based power plants and enhancing the overall efficiency and sustainability of the energy system.

Accurate measurement of molten salt flow is key in monitoring the available stored energy in real time, so that energy production can be quickly controlled. This helps ensure the stability and reliability of the power distribution system.

Benefits:

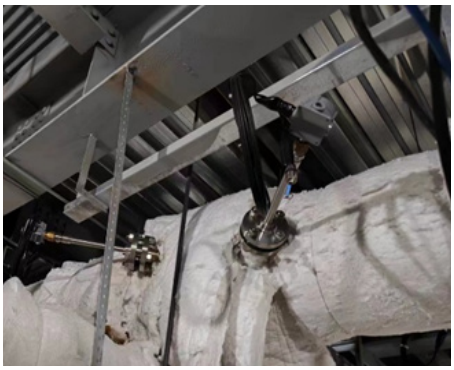
- Low Maintenance
- High efficiency with no pressure drop
- Reliable high temperature measurement
- Virtually no maintenance with long term stability and no drift
- Flow measurement independent of pressure, viscosity, and conductivity.



Challenge

The molten salt is slightly viscous and corrosive and must be handled at high temperature. It is typically pumped at an operating temperature of 360°C and viscosity around 5 mPa·s. It solidifies when the temperature is lower than 210°C.

Many flowmeter technologies struggle to perform in these process conditions and are often too difficult to repair and are costly to replace after being damaged. Therefore, Energy China wanted a solution that can withstand high temperatures, has no pressure loss to keep a high system efficiency, and that is easy to maintain.



Solution

Initially, the customer thought a clamp-on ultrasonic flowmeter would work best. However, the speed of sound of the molten salts changes with the wide operating temperature range. This also brings additional challenges as it would require modifying the spacing of transducers within the clamp-on flowmeter.

As a result, Panametrics recommended the customer use an insertion type ultrasonic flowmeter, which has proven its suitability, reliability and accuracy on similar applications in concentrated solar power plants. At the same time, Panametrics' automatic tracking window technology would address the impact of changing sound speed.

Four XMT1000 flowmeters with BWT (bundle wave technology) transducers were initially installed at the plant. Following a detailed review, the customer concluded that the technology works well, delivering advanced levels of accuracy and reliability and enabling efficiency opportunities. As a result, the customer ordered an additional eight units.

Specifications

Fluid:	Molten salt.(KNO_3+$NaNO_2$)
Pipe OD:	DN200 mm (8″)
Pipe material:	C.S
Flow rate:	150 m^3/h
Process Temperature:	210°C to 360°C (410°F to 716°F)
Process pressure:	1 MPa (145 psig)
Fluid Density:	~1850 kg/m^3 (~115 lb/fr^3)
Fluid sound speed:	~1800 m/s (~5905 ft/s)

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