APPLICATION REPORT

Power Generation

Geothermal brine flow measurement

- Ultrasonic flow measurement of a naturally heated brine fluid from different production wells at a geothermal power plant
- Uninterrupted and reliable operation despite extreme process conditions like exposure to heat, high salinity, scaling, chlorides and H_2S
- Replacement of an unreliable electromagnetic flowmeter

gürmat

1. Background

GÜRMAT ELEKTRİK ÜRETİM A.Ş. operates a geothermal complex in Germencik, Aydın Province, in Turkey. The complex consists of different plant units of which one is a dual-flash plant with a design capacity of 47.4 MWe.

The plant is energized by geothermal fluid (brine) extracted from 22 production wells. Steam is formed by flash evaporation to power the high and low pressure (HP / LP) turbines, the liquid brine is separated and supplied to the next process step.

2. Measurement requirements

Application Data	
Liquid	Geothermal brine
Temperature	+110...+165°C / +230...+329°F
Flow rate	0...1500 m³/h
Pressure	Max. 45 bar / 652.2 psi

The geothermal brine needs to be measured to control the different well pumps and the thermal power input to the plant. It has a high salinity and contains solids and many other dissolved substances like chlorides or H_2S as well as steam and non-condensable gases (NCG). The brine is hot and causes mineral scaling on wetted surfaces. Depending on the installation point, the medium can even create a partial vacuum. Flow measurement of geothermal brine is thus extremely challenging.

The plant had initially been equipped with an electromagnetic flowmeter (EMF) from another manufacturer. However, this device frequently failed due to liner damages caused by the harsh process conditions. The heat and the dissolved substances in the brine led to significant diffusion effects on this flowmeter, which reduced its service life significantly. The customer was therefore looking for a reliable flow instrumentation that guaranteed long-term stability and minimal maintenance under these conditions.

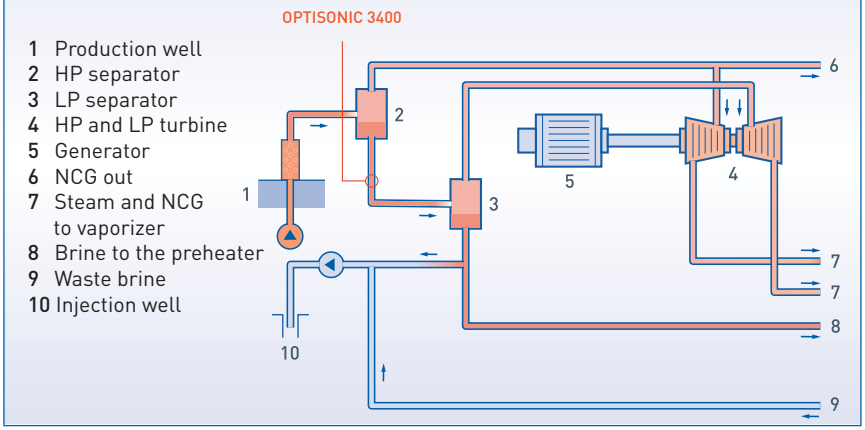
KROHNE

3. KROHNE solution

KROHNE recommended the installation of the OPTISONIC 3400 ultrasonic flowmeter (UFM) for test purposes. Having run a five-month trial to test the ultrasonic device against the existing EMF, the customer decided to replace the electromagnetic flowmeter for geothermal brine measurement with the KROHNE UFM.

For various reasons the OPTISONIC 3400 proved to be the most suitable device in this application: As a full metal device, it is not affected by diffusion or other process effects like vacuum. Scaling is also not an issue. The robust ultrasonic transducers generate a strong signal into the medium that passes through possible scale formation on wetted tube materials.

Simplified flow diagram of a dual-flash geothermal power plant



4. Customer benefits

The OPTISONIC 3400 provides the operator with a reliable and drift-free flow measurement of geothermal brine over a wide dynamic measuring range. In this way it contributes to a stable process to efficiently utilize the geothermal brine for energy production.

Ultrasonic flow measurement of geothermal brine

Process interruptions due to damaged flowmeters and regular maintenance no longer occur. Unlike with the previously used EMF, the wetted parts of the KROHNE flowmeter are resistant to aggressive media components like H_2S or any vacuum effects. There are no scaling effects on any electrodes that can disturb the measurement.

All in all, the design of the ultrasonic inline flowmeter is perfectly suited for the very harsh process conditions in the dual-flash power plant. The OPTISONIC 3400 is but one part of a comprehensive portfolio that KROHNE have on offer for geothermal plants – whether it be binary cycle, dry steam or flash steam power plants.

5. Product used

OPTISONIC 3400 F

- Ultrasonic flowmeter for reliable flow measurement of geothermal brine
- Suitable for vacuum applications
- Stable measurement also in the event of scaling
- Wide temperature range up to +250°C / +482°F
- Wide dynamic flow range
- Extensive sensor and process diagnostics (incl. NE 107)
- Full bore design: No moving parts, no wear, no pressure loss
- Maintenance-free

Contact

Would you like further information about these or other applications?
Do you require technical advice for your application?
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