



APPLICATION REPORT

Power Generation

Level monitoring of condensate for geothermal reinjection

- Control measure for effective discharge of geothermal fluid from a binary cycle power plant
- Reliable and cost-effective level indication of a receiver tank to control a pump
- Prevention of product loss for the sustainable and safe operation of the geothermal system

RSC
Elektrik Üretim İnşaat Turizm A.Ş.

SEKON

1. Background

RSC Elektrik Üretim A.Ş. operates a geothermal power plant in Seferihisar, İzmir Province, in Turkey. The plant consists of different plant units of which one is a binary plant with a design capacity of 12 MWe. This plant type allows cooler geothermal reservoirs to be used for power generation, utilizing geothermal fluid (brine) extracted from 4 production wells. Seferihisar Geothermal Power Plant is the first geothermal power plant established and operated by RSC Elektrik Üretim A.Ş.

2. Measurement requirements

Geothermal reinjection is an important aspect for the sustainable and environmentally friendly operation of the geothermal system. Once energy has been extracted, the produced water is taken out of the binary cycle and gets discharged back into the geothermal field by way of injection wells. To this end, the hot condensate of energy-depleted water is stored in a pressurized and insulated tank, 4 m in height and with a capacity of 10,000 l. If the condensate tank is full, the condensate will accumulate in the system and the safety valves at the back of the tank open to discharge condensate into the atmosphere as steam. This can significantly reduce the amount of water pumped back into the geothermal field which is undesirable for the underground reservoirs and can have an impact on the geothermal resource management of the plant. If the safety valves stay closed, however, it may cause serious mechanical blockages in the system. Therefore, the tank level must be continuously monitored.

Level measurement of hot condensate involving rising vapour is quite challenging for most level technologies. The geothermal energy plant required a reliable solution to control condensate recovery. The readings were to be transferred to a PLC to ensure that the right balance between the collection and the return of the condensate to the reinjection wells can be established automatically. SEKON as a contractor was requested by RSC to select the right level device.

Process parameters

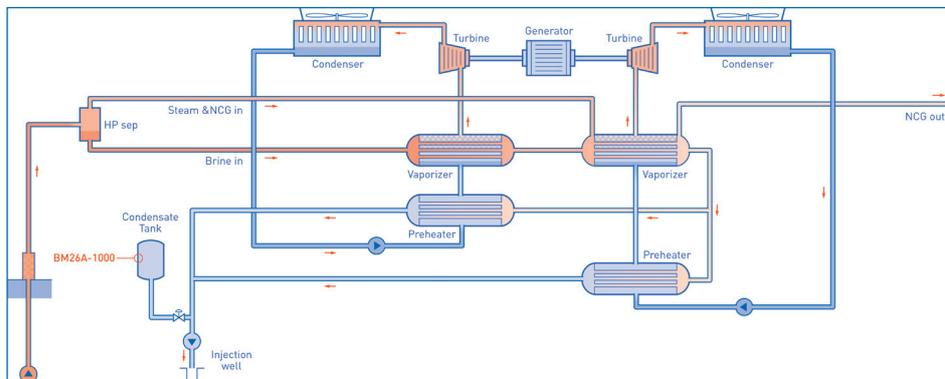
Fluid	Condensate
Density	0.9 kg/l
Pressure max.	10 barg / 145 psig
Temperature max.	123...140°C / 253.4...284°F

KROHNE

3. KROHNE solution

Having made good experience with KROHNE magnetic level indicators for many years, the customer decided on the BM26A-1000 for level measurement in the condensate receiver tank. This cost-effective magnetic level indicator holds all the features that the operator found most important from a technical perspective: It has a rugged design with its flaps housed in a hermetically sealed IP68 rated glass tube. Thanks to the bright flappers, level indication is highly visible from a distance. The level indicator also has Ex approvals and it can be installed into the existing tank infrastructure without commissioning.

In this application the BM26A-1000 with a 500 mm level indication was selected with a titanium float for densities ranging from 0.7 to 0.95 kg/l. The level device was installed close to the tank bottom to ensure that the condensate is discharged early on before the tank level can rise high. As the magnetic level indicator works without power supply, it was additionally equipped with the LT40 reed-chain level transmitter that KROHNE supplied from one source. In this way, the mechanical level indication can be turned into an analogue or digital output signal and provided in the PLC.



Simplified flow sheet of binary cycle power plant with measuring point of condensate tank



Condensate measurement with the BM26A-1000 magnetic level indicator and the LT40 reed-chain transmitter

4. Customer benefits

Using the cost-effective BM26A-1000 helps the customer run an automated process for condensate recovery. The measurement of the KROHNE level indicator enables the operator to manage condensate tank balancing by the PLC. The readings of the level indicator are continuously transmitted to the PLC, which controls a pump to discharge the condensate to the geothermal reservoir. In this way, the condensate can be continuously pumped into the reinjection wells with constant pressure. The safety and sustainability of the geothermal system and the underground reservoirs is maintained. As tank overflow is prevented and a consistent discharge of the condensate line is ensured, mechanical blockages caused by the accumulation of condensate in the system are no longer an issue. In addition, the energy company benefits from reduced operating and maintenance costs as the magnetic level indicator is drift-free and does not require recalibrations.

5. Products used

BM26A-1000

- Magnetic level indicator for basic liquid applications
- Cost-effective level measurement; no power supply needed
- $-70...+200^{\circ}\text{C}$ / $-94...+392^{\circ}\text{F}$; $-1...40$ barg / $-14.5...580$ psig

LT40

- Reed-chain level transmitter for magnetic level indicators
- $4...20$ mA/HART[®]7, FF or Profibus-PA output



Contact

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

Please visit our website for a current list of all KROHNE contacts and addresses.

