APPLICATION NOTE

Refrigeration

Flow measurement of cooling brine in a refrigeration system

- Temporary flow monitoring to collect measurement data for calculation purposes
- Use of ultrasonic clamp-on flowmeter for measuring corrosive salt water
- Flexible, non-invasive installation without process interruption and risk of leakage

1. Background

An industrial services company specialises in supplying energy to industrial users. This also includes the area of refrigeration engineering. Among other things, the service provider operates a central refrigeration plant for the companies in a chemical park in Germany. The refrigerants are transported in a refrigeration circuit to the refrigeration systems of the industrial consumers. The use of the appropriate coolant always depends on the temperature requirement of the consumer.

2. Measurement requirements

A frequently used cooling medium is cooling brine, an aqueous salt solution that has a lower freezing point than water. It is an effective cooling medium when frost protection is required and prevents ice from forming in the pipes and heat exchangers during cold transport.

The service provider was looking for cost-effective and easy-to-operate instrumentation to collect current measurement data on the flow rate of the cooling brine and to be able to use this to perform calculations for a refrigeration system. As the pipe cannot be opened, only a non-invasive and leak-free installation was an option for the operator.

The cooling brine is operated at -12...-14°C / +10.4...+6.8°F and a fluctuating flow rate of 2.5...7 m³/h. The stainless-steel pipe (Ø60 mm / Ø2.36 in) is insulated to prevent heat input. Due to the temperature of the medium, film condensation and frost immediately form on the pipework at uninsulated points. The cooling brine also contains solids, which can pose challenges for some measuring devices.

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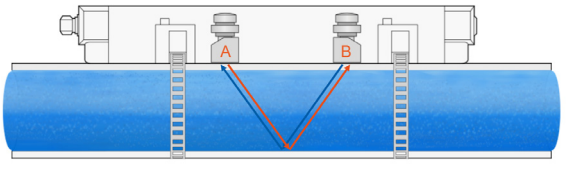
3. KROHNE solution

Having previous good experience with ultrasonic clamp-on flowmeters from KROHNE, the customer decided to use the OPTISONIC 6300. The clamp-on meter is particularly suitable for measuring the flow of liquids at applications where inline measurement is not possible or desired.

In this application, the flowmeter consists of a robust sensor rail with two integrated transducers, designed for V-mode measurement. The sensor can be mounted easily and precisely using the user-friendly rail system. As the OPTISONIC 6300 has a minimum design temperature of -40°C / -40°F the unit can be fully insulated to prevent ice forming on the pipe. The clamp-on device is power-supplied via a remote signal converter. This transmits the measured values to the control centre for evaluation.

The clamp-on meter was immediately able to produce a very good and stable measurement signal despite the solid content. No special settings were necessary. Since the operator uses the measurement data for calculation purposes and wants to analyse the spontaneously occurring flow peaks, damping was deliberately omitted in this application.

Flow measurement of cooling brine with the OPTISONIC 6300



Ultrasonic clamp-on flow measurement in V-mode

4. Customer benefits

The cost-effective ultrasonic clamp-on flowmeter is the ideal measuring instrument for the operator to record process data about the refrigeration circuit quickly and easily so as to carry out calculations and optimise the process. As the measurement is non-invasive, there was no need to visibly change the infra-structure or interrupt the process. Given the non-contact measurement, there is no risk of corrosion or leakage when using the OPTISONIC 6300. Expensive special materials, which might have been necessary with inline measuring devices, are no longer required.

KROHNE offers a comprehensive portfolio for industrial refrigeration and cooling circuits. In addition to ultrasonic clamp-on flowmeters, this includes a wide range of inline flowmeters based on six different flow technologies as well as comprehensive measurement technology for level, pressure, temperature and liquid analytical measurement from a single source.

5. Product used

OPTISONIC 6300

- Ultrasonic clamp-on flowmeter for flow measurement of liquids
- For installation without process interruption or need to cut pipes
- Robust stainless steel sensor rail for pipes DN15...4000 / ½...160"
- 4...20 mA, HART®7, Modbus, FF, Profibus-PA/DP

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Would you like further information about these or other applications?
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