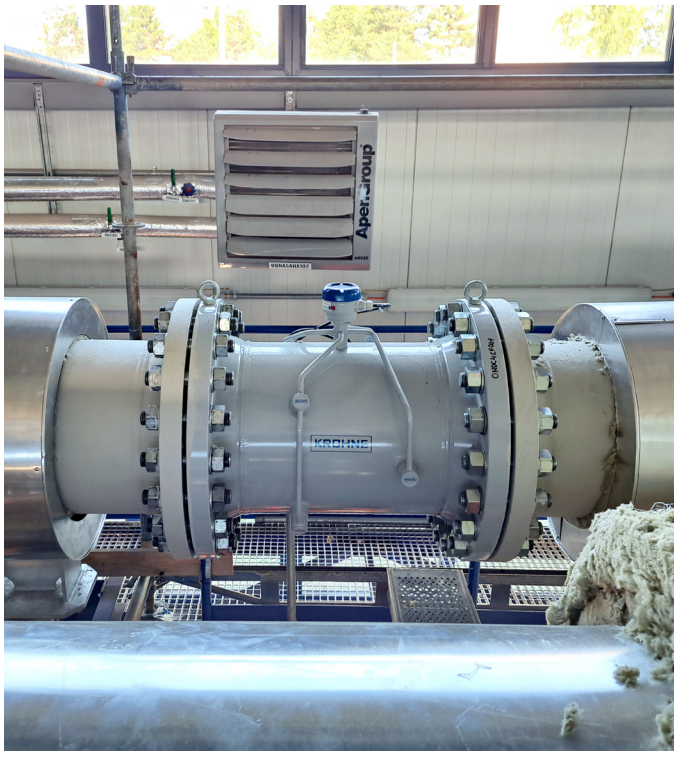


APPLICATION REPORT

Power Generation

Metering and billing of district heating for the city of České Budějovice

- A nuclear power plant supplies CO_2-friendly thermal energy for the municipality
- 3-path ultrasonic flow measurement is used to determine the thermal energy of hot water
- Complete solution provides high accuracy metering and billing of large heat quantities

1. Background

Hot water from nuclear power plants is an almost completely CO_2-neutral energy source for district heating supply of cities and municipalities. In the Czech Republic, the heat generated by the Temelín nuclear power plant is used to supply the South Bohemian city of České Budějovice with thermal energy. The heat is transported via 27 km / 16.7 mi long, mostly underground transport supply and return pipelines.

2. Measurement requirements

After heating to the required temperature in the heating condenser of the nuclear power plant, the water is transported to the circulation pumps in the district heating transfer station. The heated water has a temperature of up to +135°C / +275°F in the insulated DN500 (20") transport supply pipeline. The return line delivers cooled water at +60°C / +140°F.

Since the thermal energy in the water being sold to a utility company is of high fiscal value, the heat quantities must be measured with the lowest possible measurement error over a wide flow and temperature range. The operator was therefore looking for an accurate and repeatable flowmeter that reliably operates with little or no pressure loss.

3. KROHNE solution

The Temelín power plant operator installed several OPTISONIC 3400 District Heating ultrasonic flowmeters for the heat metering system and the efficient operation of the district heating network. The 3-path meter is designed for district heating applications and is also approved for custody transfer metering in accordance with MID MI-004 (accuracy class 1) and OIML R75. A remote field housing (F) for the converter electronics was selected. The two measuring devices are installed on both the supply and return lines at the transfer station of the power plant to measure the amount of heat transferred to the city and the net heat consumed.

KROHNE

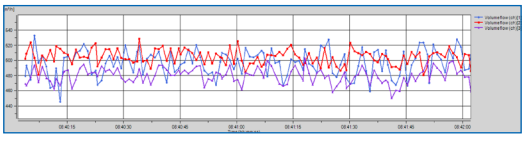
In addition, two more OPTISONIC 3400 District Heating flowmeters were installed in the supply and return lines at the transfer station in České Budějovic. All four flowmeters (DN500) are used for heat metering in combination with paired temperature sensors and a flow computer.

Insulated district heating pipe with flow straightener and ultrasonic flowmeter

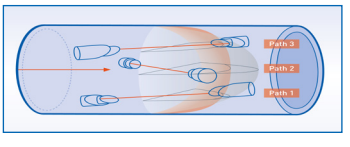
For the billing measurements, upstream of the flowmeters, the customer installed a tube bundle flow straightener in accordance with EN ISO 5167. This reduces flow profile disturbances to a minimum and thus also supports the most accurate measurement possible. Furthermore, the integrity and quality of the measurement can be guaranteed by monitoring the three individual measuring paths of the flowmeter. Considerable differences of up to 100% are possible in individual path velocities due to asymmetries and swirls caused by flow profile disturbances. By using a flow conditioner, the difference is reduced to 5%. Monitoring the path velocities ensures that high measuring accuracy can be maintained and unaffected by blockages, damage or changes in the process.

Field-mounted converters of the OPTISONIC 3400 District Heating next to a flow computer

In addition to these system supply and return flow-meters for heat quantity measurement, an additional 15 ultrasonic flowmeters ranging from DN25 (1") to DN500 (20") were installed throughout the district heating system for heating water flow measurement or pump control at the feed-in points.



Different flow velocities in the measuring tube, recorded by the three measuring paths of the OPTISONIC 3400 District Heating



3-path flow measurement

4. Customer benefits

With such large quantities of heat, even minor measurement errors during operation have a major financial impact. Thanks to the measurement set-up with the OPTISONIC 3400 District Heating, the customer benefits from a reliable, long-term stable measurement that is within a measurement error of just ± 0.3% of the measured value for the flow rate and the transferred thermal energy for all four billing-relevant flowmeters. This enables the customer to accurately bill for the quantities of heat consumed. In addition, heat losses in the system can also be detected. The diagnostic options of the KROHNE meter make critical operating conditions visible, such as unfavourable changes in the flow profile. The flowmeter has no moving parts and measures without pressure loss. All of this contributes to efficient pump control and thus consumption-dependent, energy-saving operation of the overall system. The nuclear power plant operator also appreciates the fully welded construction of the flowmeter. It reflects the high demands for safety and robustness that the customer generally places on its equipment and is familiar with from KROHNE instruments used in other applications.

KROHNE can take on the entire project management for district heating applications – from the initial consultation to the delivery of conformity-assessed instrumentation including flow computers through to commissioning. As part of a complete heat metering package, KROHNE can also offer individualized service level agreements for after-sales services, periodic system validations or legally required recalibrations.

5. Product used

OPTISONIC 3400 District Heating

- 3-path ultrasonic flowmeter for district heating applications
- Approvals: MID MI-004 (class 1, 2, 3), OIML R75

Contact

Would you like further information about these or other applications?
Do you require technical advice for your application?
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Please visit our website for a current list of all KROHNE contacts and addresses.

www.krohne.com