



APPLICATION NOTE

Power Generation

Custody transfer heat quantity measurement at a CHP plant

- MID MI-004 approved billing of heat supplied to the heat grid
- Ultrasonic flow metering in a feed and return line
- Effective detection of product loss for pipeline integrity management

1. Background

The overall efficiency of a conventional thermal power plant can be increased by using its waste heat for municipal or industrial heating purposes. The operator of a brown coal-fired combined heat and power plant (CHP) in the Czech Republic supplies heat to a substation in another city, where it is distributed to the local grid.

2. Measurement requirements

The district heating system used for the heat transport consists of a feed and a return line (DN1200 in size, 35 km / 21.7 mi in length). The hot water is supplied at varying temperatures (60...140°C / 140...284°F) with a wide flow range (ratio: 5:1). This results in a Reynolds number range of >10:1.

For billing purposes, the plant operator was searching for a MID MI-004 approved and calibrated flowmeter as part of a heat metering system. The flowmeter was needed to measure the thermal energy delivered to the substation owner in the heat supply line as well as the cold water in the return line. Another objective of this application was to implement pipeline integrity monitoring so as to detect leakages or product loss during operation.

Given the seasonal changes in flow rates ranging from low flow rates during summer and high flow rates in winter, only a flowmeter with a high turndown and accuracy (also in the event of very low flow rates) was to be considered. It was also demanded that the flowmeter guarantee drift-free measurement because of the challenging flow conditions.



Coal-fired power plant

KROHNE

3. KROHNE solution

KROHNE supplied four OPTISONIC 3400 F District Heating ultrasonic flowmeters for installation in the feed and return line at the power plant and the substation respectively. As recalibration of the existing meters is mandatory every 4 years, the customer was also provided with backup meters for each size. KROHNE also supplied flow straighteners to condition the flow and eliminate flow distortion effects on the measurement.

The flowmeter is certified according to OIML R75 (accuracy class 1) and MID MI-004. It can thus be used as part of a heat metering system. The OPTISONIC 3400 District Heating is the only inline flowmeter for district heating that provides high accuracy measurement of heated water using three ultrasonic paths throughout the whole flow range.

Due to its three-path design, the OPTISONIC 3400 District Heating is less prone to distorted flow profiles. It is also not susceptible to (magnetite) scaling as occurs in heat circuits.

4. Customer benefits

The CHP operator benefits from a long-term stable flow measurement as an essential part of the billing procedure and the pipeline integrity monitoring. The MI-004 class 1 certified OPTISONIC 3400 offers further economic advantages for the operator with its higher accuracy for billing of the thermal energy compared to the other solutions available on the market.

The flowmeter only needs recalibration in accordance with the four-year interval as defined by the Czech metrology institute. If necessary, the transducers of the flowmeter can be replaced or checked on-site and without process shutdown while the pipe remains pressurized. The measuring principle is practically insusceptible to scaling and thus drift-free.

The comprehensive project management practice was another advantage for the customer – starting with engineering and calibration ending up with delivery and installation. All services necessary have been provided from one source, including certification and recalibration services as well as accuracy assessment. Calibration and recalibration are carried out at KROHNE's certified calibration centre in the Netherlands.

5. Product used

OPTISONIC 3400 F District Heating

- Ultrasonic flowmeter for district heating applications (up to +180°C / +356°F)
- 3-path meter for thermal energy measurement and heated water
- CT: OIML R75, MID MI-004 (Class 1, 2, 3)
- Calibration up to 30,000 m³/h / 1,059,440 ft³/h
- Flange: DN25...2000 / 1...80", max. PN40 / ASME Cl 300

Contact

Would you like further information about these or other applications?

Do you require technical advice for your application?

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Supply line with flow straightener (1) and flowmeter (2)



Flow straightener



Flow measurement of heated water with the OPTISONIC 3400

