



APPLICATION REPORT Power Generation

Heat metering at a transfer station of a district heating pipeline

- Process instrumentation for the sustainable use of thermal energy from a waste-to-energy plant
- Monitoring of flow, pressure and temperature in an energy transfer station
- Complete solution from a single source for accurate billing of heat in accordance with MI-004, Class 1

1. Background

Vestforbrænding is Denmark's largest waste management company. It provides waste disposal and treatment services to 19 municipalities in Greater Copenhagen and North Zealand. The utility also uses the energy from waste incineration to generate electricity and feeds eco-friendly thermal energy into the district heating network.

2. Measurement requirements

Having taken over a district heating pipeline, the utility needed to manage the heat transfer to the district heating network of energy supplier Norfors. The heat quantities provided must therefore be determined and billed accordingly. This required the use of process instrumentation approved for heat metering in accordance with the standards of the Measuring Instruments Directive (MID) MI-004 (2014/32/EU, Annex VI).

As the heat transfer station is in a nature conservation area, the installation was to be placed almost exclusively underground. Together with the responsible environmental protection authority, the district heating network operators agreed on the construction of an underground measuring station by means of a special permit. The manhole was designed for two pipes (feed and return) in nominal size DN250 and specified for a maximum pressure of 40 barg / 580 psig and a process temperature of +110°C / +230°F.

3. KROHNE solution

The utility qualified Fagerberg as a partner for the instrumentation and control engineering. KROHNE's sales and service partner responsible for Denmark has put together a complete solution for the underground metering station according to the customer's requirements – from process instrumentation to the flow computer. As the customer wanted the highest possible accuracy for heat metering, Fagerberg recommended using the OPTISONIC 3400 District Heating ultrasonic flowmeter in both the feed and return lines. The KROHNE device is certified according to MI-004, Class 1, and is thus one of the few measuring devices of its kind on the market to meet the highest accuracy requirement for thermal energy measurement.

KROHNE

The 3-path ultrasonic flowmeter has a full-bore design without any obstructions, operates without pressure loss and is insensitive to magnetite scaling. It measures with long-term stability over a wide dynamic range and is also ideally suited for measuring conditioned, low-conductivity water, often used to feed district heating networks.

The OPTISONIC 3400 District Heating is designed for heat energy measurement and functions as a heat meter in combination with temperature sensors and an energy calculator. To this end, four paired temperature sensors were installed in each heat transfer pipe. The weld-in resistance temperature assemblies (RTD) have a tapered barstock thermowell very well suited for demanding district heating applications with higher pressures and flow rates. An energy calculator then calculates the supplied and consumed thermal energy based on all readings.



District heating measurement with OPTISONIC 3400 District Heating flowmeter, temperature sensors and OPTIBAR PM 3050 pressure transmitter

In addition, the customer uses the OPTIBAR PM 3050 pressure transmitter in the feed and return lines. Pressure serves as a control parameter since the pumps in the heating network are controlled depending on the heat demand to keep energy use as low as possible. This allows load flexibility in correlation with the flow rate, i.e. in case of reduced heat consumption. The compact pressure transmitter comes with a fully welded stainless-steel construction featuring high overload resistance as required in this application.

4. Customer benefits

Thanks to the tailored combination of all the necessary components – incl. averaged temperature measurement from four measuring points as well as flow measurement acc. to class 1 – Vestforbrænding has a MI-004 approved district heating transfer station. Billing of thermal energy supplied to Norfors via the district heating pipeline can now be done in accordance with the legal framework. All components have been conformity assessed and were supplied calibrated. The flow measurement in the feed and return lines also enables the customer to balance the volume flow rate and thus to operate integrity or leakage monitoring. The pressure measurements serve to control the performance of the pumps according to demand and reduce energy consumption to a minimum.

KROHNE offers process instrumentation for energy measurements in heat transport pipelines, transfer stations, substations and pumping stations for district heating through a worldwide network of sub-sidiaries and sales partners such as Fagerberg. This includes the supply of certified flowmeters and other instrumentation as well as energy calculation. In addition, the corresponding services such as calibrations according to module D or F as well as the legally required maintenance are also an essential part of this complete package for energy measurements, which KROHNE offers from a single source.

5. Products used

OPTISONIC 3400 District Heating

- Ultrasonic flowmeter for district heating applications
- 3-path meter for thermal energy measurement and heated water
- Approvals: MID MI-004 (Class 1, 2, 3), OIML R75

OPTIBAR PM 3050

- Pressure transmitter for general pressure and level applications



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.

