



APPLICATION NOTE Power Generation

Auto-purge metering solution for a coal-fired power plant

- Long-term stable flow measurement of dust-laden gases, virtually maintenance-free
- Pre-assembled, tailored automatic self-purging system with DP transmitter, unique purge valve, intelligent control unit and averaging pitot tube
- Constantly good combustion quality and low NO_x emissions through precise balancing and air flow measurement

1. Background

An electric utility company operates an ultra-supercritical (USC) lignite-fired combined heat and power plant in Slovenia. The modern 600 MWe power station has an efficiency of 46%. The plant was updated with a new unit in the recent past to further cut the plant's carbon footprint.

2. Measurement requirements

As many other modern power plants that burn solid fuels, this power unit uses an air preheater (APH) to heat up the combustion air and increase efficiency. This often causes a carryover of fly ash into the combustion air. Low NO_x burners and a staged combustion are therefore utilised to keep NO_x emissions on a very low level to comply with environmental regulations.

As a rule, the air flow rate in the large-size ducts is measured with Venturi tubes as part of the duct design or by averaging pitot tubes installed in the ducts. The air flow rates in the different combustion zones must be kept within narrow limits depending on the boiler load. Differential pressure measurements in those applications commonly work with pressure tapping and impulse lines which, however, are subject to clogging by the fly ash contained in the combustion air. In conventional installations these measurements need constant cleaning and servicing on a regular basis to keep the measurements operating properly.

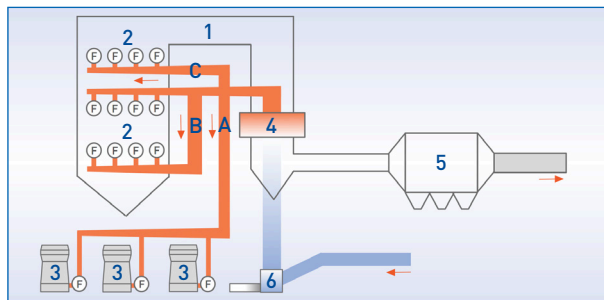
In order to improve the carbon footprint while at the same time reducing maintenance of their differential pressure instrumentation, the customer requested a field-proven and less maintenance-prone technical solution to measure the flow rate of the dust-laden air flows to the furnace. The typical duct concentration can vary from 100...1000 mg/m³ at temperatures from +160...190°C / +320...374°F. Flow velocities range from 1...10 m/s. Duct sizes can have diameters up to 6 m / 236".

KROHNE

3. KROHNE solution

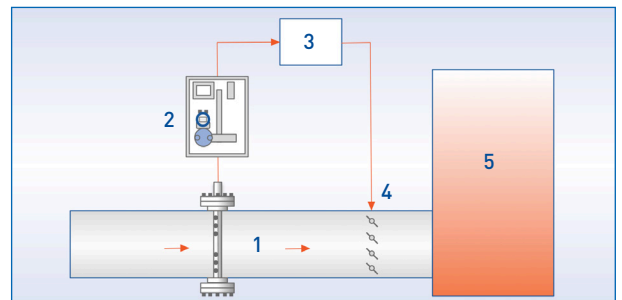
The power plant operator decided in favour of an auto-purge metering system. This industry-specific solution is tailored to the needs of flow measurements of dust-laden air and gases. It consists of a primary flow element (OPTIBAR PT 2000) as well as a fully assembled and tested auto-purge cabinet with a motor-operated valve, a customised KROHNE control unit and the OPTIBAR DP 7060 differential pressure transmitter.

The averaging pitot tube is fitted to the duct system. The system purges the high pressure and the low-pressure ports consecutively one after another. This is done with a pulse of compressed air in defined cycles. Purging is carried out very effectively, saving a lot of air this way. During purging, the reading is held, and the transmitter is checked for drift so there is no special programming required for the control system. An optional auto-zeroing function for the DP transmitter can also be provided.



Air system scheme

- | | |
|------------------------------|-----------------------|
| 1 Furnace | A Primary air (PA) |
| 2 Burners | B Secondary air (SA) |
| 3 Pulverizer | C Over fire air (OFA) |
| 4 Air preheater (APH) | Ⓢ Measurement point |
| 5 Electrostatic precipitator | ■ Air supply |
| 6 FD Fan | ■ Preheated air |
| | ■ Flue gas |



Schematic drawing of a measurement point

- | |
|---|
| 1 OPTIBAR PT 2000 pitot tube |
| 2 Auto purge cabinet with control unit, valve and OPTIBAR DP 7060 differential pressure transmitter |
| 3 Plant control system |
| 4 Multi louver damper |
| 5 Furnace |

4. Customer benefits

Using KROHNE's auto-purge metering solution, the customer stands to gain from significantly higher process efficiency and reduced emissions. This solution allows long-term stable flow measurement through efficient purging, flow control and balancing of the pre-heated air. In this way, an optimal air-fuel ratio can be obtained. NO_x regulations are reliably met without regular maintenance of the flowmeters.

The utility company benefits from a tried and tested industry solution particularly designed for power plants and combustion processes containing dust. Unlike conventional technical solutions, this compact and pre-assembled KROHNE solution saves installation and commissioning time. It also consumes only little air during operation. Given that it is virtually maintenance-free, operating costs can be minimised significantly. Being a field-proven system, this auto-purge metering solution requires only very little project engineering for installations.

5. Products used

OPTIBAR DP 7060 differential pressure (DP) transmitter

- For volume flow measurement of liquids, gases, and steam

OPTIBAR PT 2000 averaging pitot tube

- Low pressure loss design; from basic to engineered versions

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.

