

Differential Pressure Flow Meters

Verabar® flow sensors are the measurement of choice in many fluidized bed coal combustion power plant applications. Fluidized beds suspend solid fuels on upward jets of air during the combustion process. The result is a turbulent mixing of gas and solids. The turbulent action, much like a bubbling fluid, provides more effective chemical reactions, heat transfer and lowers emissions.

Verabar applications include Air (primary, secondary, combustion, undergrate, seal, FGD's and OFA), Water (condenser, boiler feedwater and cooling) and Steam (LP, IP, HP, SBF).

Application

Alabama Power operates a coal fired, fluidized bed power plant in Burks, Alabama. They requested assistance in solving a problem in the measurement of Soot Blower Flow (SBF) where superheated steam is used to remove the combustion residue for disposal. The Flowing Conditions are: 4" pipe - 50,000 (max.), 5,000 (min.) lbs/hr, 609 psig @ 700°F.

Problem

Initially, two vortex meters were installed, proving to be unreliable:

- 1) First the vortex meters became inoperable during start-up due to water hammer from residual condensate.
- 2) After repair, they were inaccurate below 50% of flow and could not measure the minimum flow rate.
- 3) Additionally, the vortex meter could not output a temperature and pressure compensated flow rate.

Solution

Veris designed two special 600# flanged spool sections with integral V510 flanged Verabar flow sensors and separate flanged RTD's in a Thermowell (Photo 1). The spool piece had to fit the existing dimensions of the Vortex meters. The DP at max flow was 175.288" H₂O (50,000 lbs/hr). At minimum flow (5000 lbs/hr), the DP was 1.75" H₂O. This represents a 100:1 turndown in DP and a 10:1 turndown in flow.

Results

Alabama Power reported complete satisfaction with the performance of the Verabar spool sections (Photo 2).

- 1) Problems associated with water hammer from residual condensate during start-up were eliminated.
- 2) The Verabar produced accurate readings over the entire 10:1 flow range.
- 3) Multivariable transmitters were incorporated to output a dynamically compensated flow rate.

Fluid:	Steam
Industry:	Power Utility–Soot Blower Flow
Application:	Removal of combustion residue
Specifications:	10:1 turndown, handles water hammer

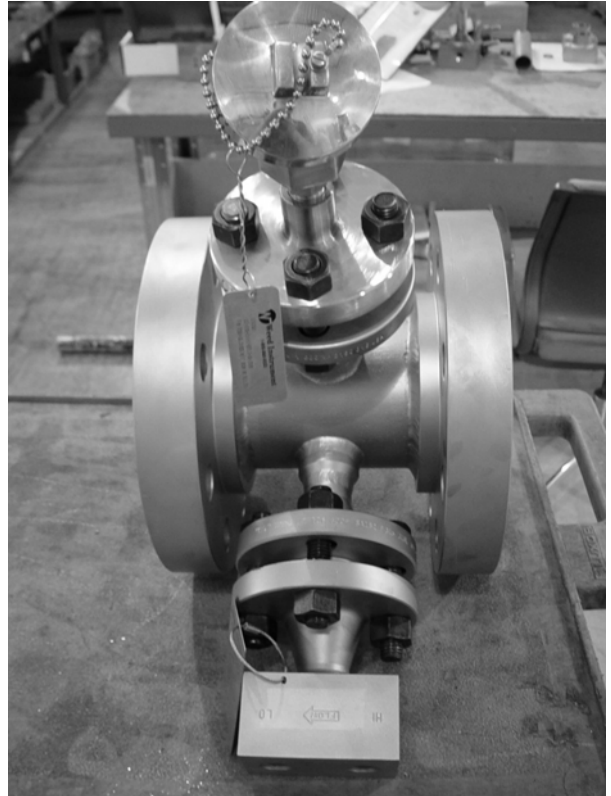


Photo 1

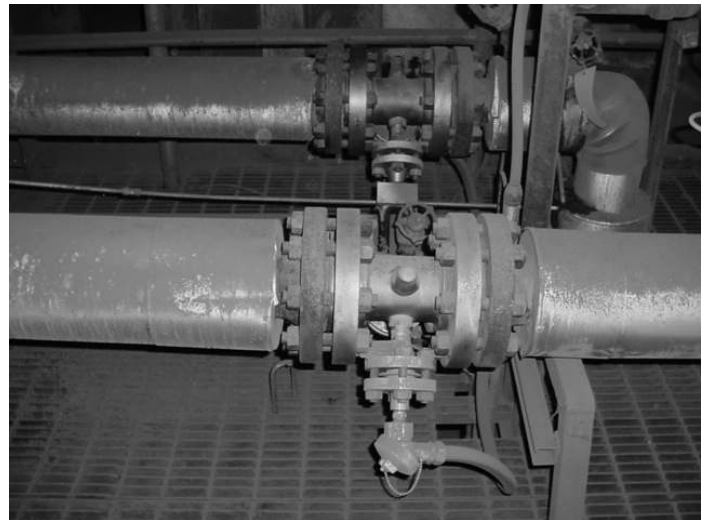


Photo 2