

APPLICATION NOTE

Boiler Drum Level Measurement

INTRODUCTION

The primary function of a utility boiler is to convert water into steam which is used to turn a steam turbine thus, generating electricity. A steam/water interface exists within the boiler drum. An objective for safe and efficient boiler operation is to maintain a constant level in the boiler drum. This can be accomplished by maintaining a balance between the amounts of steam leaving and water entering the boiler drum. Unfortunately, boiler drum level control is complicated by changes in electrical load requirements or variations in the fuel and air supply.

BOILER DRUM LEVEL

Boiler drum level is one of the most difficult power plant pressure transmitter applications due to high static and low level differential pressures. Typical static pressures can be 2800 psig in utility boiler drums. A change in static pressure can cause significant output shifts in level transmitters. Static pressure changes occur when a boiler is starting up or shutting down at which time accurate level measurement is most critical. The table below summarizes transmitter zero errors (% span) versus static pressure for DPharp (resonant silicon) and metallic capacitance type pressure transmitters.

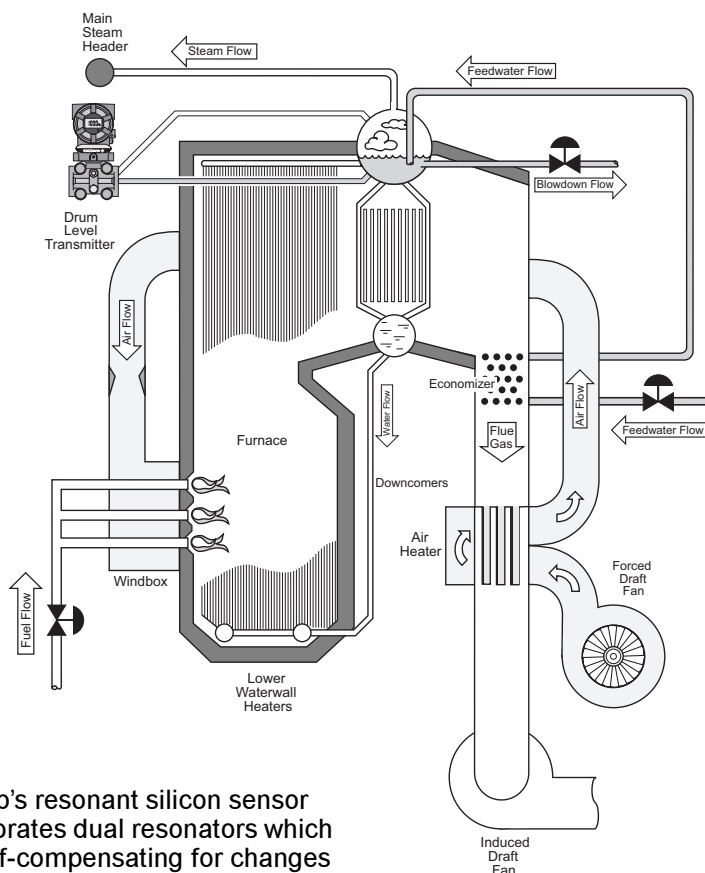
DPharp has approximately 1/3 of the static pressure effect on zero experienced by metallic capacitance pressure transmitters.

Span of 0 to 100 inH₂O

Static Pressure	3000 psi	4000 psi
Resonant Silicon (EJA130A)	0.34%	0.50%
Metallic Capacitance	1.00%	1.50%

DPharp's resonant silicon sensor incorporates dual resonators which are self-compensating for changes in static pressure. Differential frequency between the resonators is used for measurement of differential pressure or water level in the boiler drum. Static pressures applied to the dual resonator sensor within DPharp does not lead to a differential frequency change as both resonators are affected equally. Therefore, DPharp experiences minimal output shift due to changes in static pressure leading to superior performance in boiler drum level measurement applications.

BOILER DRUM LEVEL MEASUREMENT



DPharp pressure transmitters include a unique hysteresis free capsule design that provides overpressure protection. DPharp's overpressure protection can withstand application of differential pressures equal to the transmitter's maximum working pressure for most capsule ranges. For example, the specification for overpressure effects on calibration for EJA130A is $\pm 0.03\%$ of URL per 4500 psi. Metallic capacitance type transmitters typically are specified not to fail under overpressure conditions. The effects of overpressure on calibrated accuracy is typically not stated for metallic capacitance transmitters.

SOLUTION

DPharp performance in boiler drum level measurement applications is superior to metallic capacitance type pressure transmitters. Improved performance can be attributed to the unique resonant silicon sensor design with dual resonators.

A unique hysteresis free capsule design protects the resonant silicon sensor from calibration shifts due to overpressure events. DPharp has a lower cost of ownership in boiler drum level applications due to superior static pressure performance and an ability to maintain transmitter calibration after overpressure events that can occur during boiler blow down. Fewer transmitter calibrations are required as a result of these DPharp features.

DPharp EJA130A

- ❑ $\pm 0.03\%$ overpressure calibration protection
- ❑ $\pm 0.1\%$ per 24 month longterm stability
- ❑ $\pm 0.1\%$ accuracy
- ❑ Autolevel software feature (See PD-G-01)
- ❑ Low static pressure effects ($< 0.5\%$ up to 4000 psig typical)
- ❑ 100:1 turndown

