

## **Application Note Combustion Air Applications**

The quality of intake air used for combustion, whether for a turbine, boiler or internal combustion engine has a significant impact on the efficiency, emissions and longevity of the turbine, burner or motor.

In internal combustion engines, actively managing the combustion parameters is required to meet proper power, efficiency and emissions requirements. For transportation applications intake air conditions are dictated by the ambient environment. Engines must run efficiently in hot, cold, wet and dry conditions which significantly varies the mass of the intake air. In developing the combustion control algorithms accurate monitoring of intake air temperature and humidity is required. Precise measurement of the relative humidity over the wide range of temperatures used in engine tests both in the vehicle and on the test stands is a strength of the Hygrocontrol RH sensor. Premium automobile manufacturers like Mercedes and BMW have relied on the Hygrocontrol model 72 and 82 RH Meter for years based on the excellent temperature and drift characteristics of the proprietary RH sensor.

Optimization of turbine performance through the measurement and control of humidity in the intake air is another application where the superior stability of the Hygrocontrol RH sensor excels. The mass density of the air being compressed in a turbine intake has a significant impact on turbine output and efficiency. Since increased air density gives better performance, in hot ambient conditions water is sometimes injected into the intake air for cooling purposes. As an additional benefit, humidity in the intake air decreases the NO<sub>x</sub> emissions in the turbine exhaust. However, too much water in the intake air in the form of an aerosol or condensation leads to damage and corrosion of the internal turbine components.

In cooler climates, the humidity and temperature measurement is equally important. Dew points of the combustion air can be reached as the air is compressed in the turbine intake. Again, condensation, aerosol water droplets or even ice can form in the intake air stream causing catastrophic damage to the turbine.

Boilers and industrial furnaces face similar challenges as the humidity and temperature of the intake air effects combustion efficiency and exhaust emissions. Again, the stability of the Hygrocontrol RH sensor provides a superior measurement solution for combustion control in these applications.