



Engine Testing

Background

Engine testing is an important environmental requirement in the design and production of any engine which uses the internal combustion process. Included in this category are petrol and diesel engine motor vehicles, trucks, diesel locomotive engines, aircraft engines and gas turbines. Testing is regulated by the Environmental Protection Agency (EPA) and the Californian Air Resources Board (CARB) in the USA and in Europe is covered by various EC legislative standards.

Typical emissions which are monitored and regulated by various government agencies include NO, NO₂, N₂O₄, SO₂, SO₃, CO, CO₂, Pb and residual hydrocarbons. The quality and relative concentrations of these emissions are affected by various factors, including ambient temperature, pressure and humidity and the type of engine, fuel and conditions of use. It follows therefore that in order to minimise variability of test results, extraneous factors need to be controlled or eliminated wherever possible.

Studies carried out in the USA by the Environmental Protection Agency (C D Paulsell, Moisture and Humidity, 1985: pp 735-744, Instrument Society of America) illustrated that the most successful method of determining the ambient humidity for the correction of the emissions concentrations was to use a cooled mirror dewpoint hygrometer. Up until that time it was common for ambient humidity to be measured with a psychrometer. Paulsell's research showed that such instruments are extremely prone to errors in measurement due to a wide variety of factors and, even if used under carefully controlled conditions, have no significant advantages over the use of a cooled mirror hygrometer.

Measurement Technique

The Michell Dewmet or S4000 Precision Cooled Mirror Dewpointmeter is the ideal product for this application. They offer accurate and continuous measurement (within ± 0.2 °C dew point) of the ambient dew point in an engine test cell and perhaps more importantly, are capable of extended service without drift and with full confidence. Every instrument is delivered fully calibrated, traceable to National Standards - we maintain direct traceability to NPL (London, UK) and NIST (Washington DC, USA) through our UKAS accredited Humidity Calibration Laboratory. This satisfies the most stringent of quality system requirements and gives ultimate confidence in the



Engine testing being conducted at MIRA, UK

measurement being made. Dewmet has a measurement range down to -40 °C dew point at normal room ambient temperature - more than enough to cope with any ambient humidity conditions. The S4000 range can offer measurements down to -75, -85 or -100 °C dew point depending upon the model chosen.

The above notes relate specifically to emissions in motor vehicle testing. Similar applications apply in truck, locomotive and aero testing for similar reasons. In the particular case of aero engine testing the analysis is more targeted to obtaining optimum performance from the aero engine rather than to minimising emissions. In all of these applications, Dewmet has been successfully used by numerous world famous organisations.

Reference Users

Alstom Gas Turbines, Cosworth Engineering, Ford Motor Company, GEC, Jaguar Cars, MIRA, Pratt & Whitney, Rolls Royce, Scania, Volvo