INFLUENCE OF TEMPERATURE AND HUMIDITY TO FILTER EFFICIENCY AND DUST HOLDING CAPACITY

Martin Schmidt[1]
[1]Palas GmbH

Temperature and Humidity may affect the efficiency and loading capacity of air filters. Taking this into account ISO Standards focus more on real conditions than in the past. As an example, the ISO 16890 contain a discharge cabinet for filters to simulate the possible degradation of filter efficiency due to ambient influences as e.g. moisture, Temperature or influences from separated particle. But still most of the standards still require a 50% rel. Humidity and Temperatures between 20°C and 25°C with regard to comparable results.

These filters are used in cars (Cabin air filters, Motor inlet filters), general ventilation systems of buildings or gas turbines or processes where the climatic conditions vary from 10% up to 100% Humidity and Temperatures between -20°C up to 50°C. Influences to the test result caused by different test conditions are thus not evaluated.

This is the reason why Palas® has developed the flat sheet media test bench MFP 3000 HF. With the new MFP 3000 HF, it is possible to set the relative humidity from 10 to 80 % and the temperature from -10 to 50 °C. The inflow velocity has been extended as compared with standard models to a range of 4 cm/s – 2 m/s.

Test duct and sample taking:
The MFP 3000 HF is equipped with a new designed cooling and heating system which covers the whole test channel section including sample taking for particle detection to avoid condensation inside the test section and provide isothermal conditions.

From the economical point of view, it is beneficial to operate such a test bench with a media test at low volume air flows to reduce energy cost for heating / cooling as well as humidification.

Aerosol measurement from 5 nm up to 40 µm:
Especially at high Humidity, changes of the Aerosol may occur by condensation or evaporation. With the Promo® 3000 H Aerosol spectrometer it is possible to control Temperature even inside the Aerosol Sensors and thus ensure isothermal conditions for a reliable particle detection in the range of 200nm up to 40µm.

Additionally, the MPPS may be detected with the Palas® U-SMPS in a range of 5nm up to 1 µm.

Aerosol Generation:
The MFP 3000 HF is equipped with all necessary Aerosol generators to cover loading and fractional efficiency requirements as mentioned in e.g.

- ISO 5011, dust loading ISO A2 Fine at 1000 mg/m³,

- ISO TS 11155-1, KCl low concentration for fractional efficiency and dust loading of ISO A2Fine at 75 m/m³

- ISO 16890 KCl and DEHS in low concentrations for fractional efficiency and ISO A2 Fine at 140 mg/m³.
- Other powders from practice at variable concentrations

This presentation outlines the technical set-up and climatization characteristics of the new test bench. We will show the possible changes of fractional efficiency and dust loading characteristics of the test sample due to the influence of rel. Humidity and Temperature.