PROFICIENCY TESTING FOR DETERMINATION OF PARTICULATE MATTER ON DUST TESTING TRAIN IN OSTRAVA (CZECH REPUBLIC)

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Proficiency Testing

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The proficiency testing for determination of particulate matter mass flow has been performed every year since 2009 on a dust testing train for particulate matter determination which is operated at VSB – Technical University Ostrava in the Energy Research Center testing room.

What is the dust testing train able to do?

The dust testing train allows preparation of the reference ("veritable") value of the following factors in the vertical pipeline:

- Particulate matter mass flow (25-2500 g/h)
- Particulate matter mean concentration (5 up to 500 mg/m3 - at 101325 Pa, 0°C)
- Air mass mean velocity (5-20 m/s)

Proficiency testing performed so far

Five years of proficiency testing were organized and participants were from the Czech Republic, Slovak Republic, Germany and Serbia.

	Particulate matter mass flow			Particulate matter mean concentration			Air mass mean velocity		
Year	Number of participants	Successful participants %	Mean value g/h	Number of participants	Successful participants %	Mean value mg/m^3	Number of participants	Successful participants %	Mean value m/s
2009	47	91,5	310	47	83,0	96	49	95,9	13,0
2010	37	86,5	93	37	86,5	30	37	100,0	12,9
2011	27	70,4	88	27	77,8	29	27	88,9	12,2
2012	26	80,8	104	26	76,9	40	26	92,3	10,7
2013	28	85,7	60	28	64,3	20	28	89,3	12,6

How does the dust testing train work?

Preparation of a concentrated aerodispersive mixture is ensured by a vibration batcher that spills a known amount of dust into a funnel from which the air and dust mixture is transported to an ejector. The ejector sucks-in the batched dust with air and this mixture with ejector jet air occurs in a diffuser. Next, this mixture is transported by 20 mm pipeline through a conical mixing piece (perforated sheet) to an inlet into the testing train sampling section which is formed by Ø 313 mm vertical pipeline of c. 7 m length. There are two locations enabling to realize a representative air mass sample take-off for determination of the mean concentration of particulate matter and their mass flow on the vertical sampling section. Further, the air mass is lead into a filtration device where a substantial part of batched dust is captured. The filtration device is subsequently connected with an exhausting fan which represents a source of suction for the dust testing train. The particulate matter mass flow reference value is determined on the basis of the batched dust weighed amount and batching time. The particulate matter mean concentration reference value is determined from the particulate matter mass flow and air mass volume flow in the dust testing train. Air mass volume flow is determined by the Venturi tube which is positioned in front of the filtration device. Flow rate is controlled with the help of a frequency converter that alters the exhausting fan rotational speed.

Other utilization of the dust testing train?

Except for the proficiency testing for particulate matter determination, the dust testing train can be used e.g. for the following:

- Verification of dust-meters functionality (calibration, sensibility to a kind, shape, size and colour of PM)
- Validation of devices for on-line determination of dust concentration -
- Determination of filtration properties of materials for industrial filtration
- Study of fractional separability of filtration materials

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