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New synthetic nano-aerosol for accelerated realistic ageing of air filters

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FILTECH 2019

Koelnmesse · October 22–24, 2019

FILTECH

October 22 – 24, 2019
Cologne – Germany

The Filtration Event
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Abstract Book

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Filtration and Separation Technology

FILTECH 2019 · October 22–24

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Session Overview

Monday 21.10.2019 09:00-18:00h

Short Course I · Solid/Liquid Separation

Short Course II · Fine Dust Separation

Tuesday, 22.10.2019

08:30	Registration				
10:15	Opening Session				
10:45 12:00	PL Plenary Lecture – Dr. Harald Anlauf, Academic Director – Karlsruhe Institute of Technology (KIT) / Germany Centrifugation – Key technology for solid/liquid/liquid separation				
Lunch – Fair					
	Room 1A – 1st floor	Room 1B – 1st floor	Room 2 – 2nd floor	Room 4A – 4th floor	Room 4B – 4th floor
13:00 14:15	K1 Keynote Lecture 1 Prof. Dr. H. Nirschl	L1 Particle and Slurry Characterization	M1 Membrane Design and Characterization	G1 Air Filtration	F1 Enhancement of Filter Media by Surface Treatment
Coffee Break – Fair					
14:45 16:00	K2 Keynote Lecture 2 Prof. Dr. A. Mukhopadhyay	L2 Particle, Slurry and Cake Characterization	M2 Micro and Ultra Filtration	G2 Cabin Air Filters	F2 Progress in Wire Mesh Development
Coffee Break – Fair					
16:45 18:00	L3 Cake Filtration - Influences on the Cake Structure	L4 Wet Particle Fractionation	F3 Advanced Filter Media Developments and Manufacturing Methods	G3 Gas and Particle Separation	G4 Mist and Droplet Separation
18:00	Get Together Reception				

Wednesday, 23.10.2019

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Coffee Break – Fair					
10:45 12:00	K3 Keynote Lecture 3 Dr.-Ing. S. Haep	L6 Cake Filtration - Characterization, Modelling, Simulation	M4 Ceramic Membranes and Fouling	G6 Surface Filtration II	F6 Performance Improvements of Nonwovens
Lunch – Fair					
13:00 14:15	K4 Keynote Lecture 4 Dr.-Ing. G. Bickert	L7 Cake Filtration - Particle Washing	M5 Process and Waste Water Treatment	G7 Filter Test Systems I	F7 Advanced Composite Fiber Materials
Coffee Break – Fair					
	Room 1A – 1st floor	Room 1B – 1st floor	Room 4A – 4th floor	Room 4B – 4th floor	
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16:00 16:45	Poster Presentation	Poster Presentation	Poster Presentation	Poster Presentation	Poster Presentation
	Room 1A – 1st floor	Room 1B – 1st floor	Room 2 – 2nd floor	Room 4B – 4th floor	Room 2 – 2nd floor
16:45 18:00	L10 Centrifugal Sedimentation Decanter Centrifuges	L11 Centrifugal Cake Filtration	F8 Micro and Nanofiltration Media	G10 Filter Test Systems II	G11 Modelling and Simulation

Thursday, 24.10.2019

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Coffee Break – Fair					
10:45 12:00	L14 Dewaterability of Sludges	L15 Depth Filtration and Adsorption - Model- ling and Simulation	F10 Numerical Analysis of Filter Media Pore Size and Structure	G14 Measurement Techniques II	G15 Filter Medium Design
Lunch – Fair					
13:00 14:15	L16 Dewaterability of Sludges	L17 Backwashing Filtration	L18 Froth Flotation and Liquid/Gas Separation	G16 Particles for Filter Testing	F11 Numerical Methods for Filter Media Charac- terization & Improvement
Coffee Break – Fair					
	Room 1A – 1st floor	Room 1B – 1st floor	Room 4A – 4th floor	Room 4B – 4th floor	
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Programme is subject to amendments. Up-to-date Programme is available at www.Filtech.de

FILTECH 2019 PAGE INDICATOR AND SESSION CHAIRMEN

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NEW SYNTHETIC NANO-AEROSOL FOR ACCELERATED REALISTIC AGEING OF AIR FILTERS

Jesús Marval, Luis Medina, Emanuele Norata, Paolo Tronville*
Politecnico di Torino – Corso Duca degli Abruzzi 24, 10129 Turin – Italy

*Corresponding and presenting author

ABSTRACT

To assess reliably the energy impact of air filters, it is essential to ascertain changes of their airflow resistance during their whole service life and not just when they are clean.

Current laboratory standards simulate the ageing of air filters by dispersing and loading synthetic dusts with particle size distribution (PSD) completely different from the particulate matter (PM) found in urban atmospheres. Since the size (diameter) of aerosol particles is especially important in determining the kinetics of the clogging process of an air filter, this technique does not replicate the real behavior of the filters in operation. The current methods used for artificial filter ageing are considered acceptable for rating and comparing the performance of air filters, but do not provide an accurate prediction of their airflow resistance increase in a real environment. Therefore, the duration and energy-use assessment of HVAC filters cannot be reliably estimated by means of current laboratory test dusts.

We describe various methods for generating nanoparticles having approximately the same particle size distribution of a typical urban aerosol, but at higher mass concentrations. The purpose is to allow accelerated ageing in a similar way to what happens in actual service conditions.

The paper describes the thermal aerosol generator chosen to produce the desired particle size distribution of the synthetic aerosol in an existing test rig according to ISO 16890:2016 specifications. This generator produces a high number of nanoparticles by burning a salt stick (e.g. made with KCl) with an oxy-propane flame. The salt vapor condenses in the air stream to form a cloud of ultrafine particles.

We present some preliminary data characterizing this thermal generator and we discuss some critical aspects to standardize the new ageing procedure with a synthetic aerosol closely representing a typical urban atmosphere.

KEYWORDS

Aerosol Generation, Ageing, Dust Loading, Nano Aerosols,
Particle Size Distribution, Test Dust.

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