Looking for the minimum efficiency of fibrous air filters during their service life

11th World Filtration Congress & Exhibition

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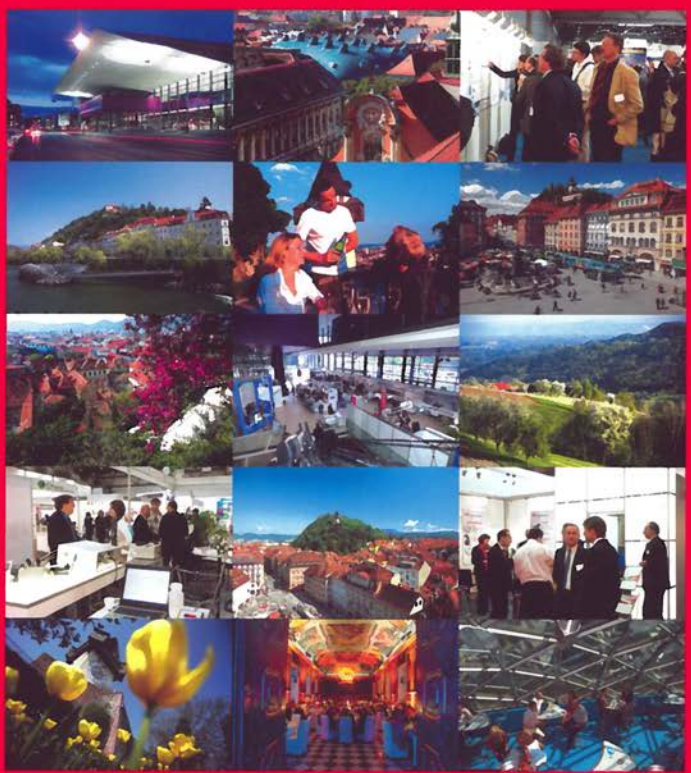
April 16 - 20, 2012 – Graz – Austria



Abstract Book

WFC 11
11th WORLD FILTRATION CONGRESS
APRIL 16 – 20, 2012 · GRAZ – AUSTRIA

WFC11

11th World Filtration Congress

Abstract Book

CONTENT VOLUME I

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THURSDAY, APRIL 19, 2012

FRIDAY, APRIL 20, 2012

LOOKING FOR THE MINIMUM EFFICIENCY OF FIBROUS AIR FILTERS DURING THEIR SERVICE LIFE

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ABSTRACT

Electret fibrous air filter media achieve high efficiencies while maintaining low air flow resistance by incorporating electrostatic charges on their fibers. However, captured ultrafine particles reduce this electrostatic enhancement. It is important to evaluate the behavior of such media when their electrostatic enhancement has been completely suppressed, leaving only "mechanical" effects such as sieving, impaction, interception and diffusion. Existing standards EN779:2002 and ASHRAE 52.2-2007 specify preconditioning procedures to eliminate or reduce electrostatic effects. ASHRAE 52.2 exposes the full air filter to KCl nanoparticle aerosols. ISO/TS 21220:2009 and EN 779 precondition filter media by a 2 minute soak in isopropyl alcohol (IPA), after which the filter media are dried before further efficiency measurement. These approaches present problems:

- To control the size distribution of KCl nanoparticles requires additional expensive equipment and, even after completing this procedure, the electrostatic charge can be still partly active.
- The structure of some media may be affected by immersion in liquid IPA.
- Soaking full scale air filters is not practical and requires large amounts of IPA, which is then dispersed into the environment.

The most recent efforts in getting the discharged efficiency of a filter have been made by ISO/TC142 "Cleaning equipment for air and other gases" Working Group 9, which is devoted at developing standards for gas turbine air intake applications.
A new procedure proposed by Hayashi (Japan) eliminates electrostatic effects by exposing filters to IPA vapor for 8 hours or longer. This procedure has been successfully duplicated by Cai (China), at the Politecnico di Torino and in other laboratories.
WG9 of ISO/TC142 organized inter-laboratory tests comparing IPA vapor treatment to liquid IPA immersion on samples of five media types.
The data obtained indicate that IPA vapor treatment can replace the immersion approach successfully. The main result of these tests was the adoption of IPA vapor treatment on a flat sheet of medium in ISO/FDIS 29461-1 "Air intake filter systems for rotary machinery -- Test methods -- Part 1: Static filter elements". The discharge of full scale filter elements is still under study.
We summarize all these studies, and describe the new test protocols that could be adopted by future national and international test methods. The results presented here could also be useful to evaluate the need for further research in this area.

KEYWORDS

Air Filters, Air Filter Media, Conditioning Agents, Intake Filters, Nonwovens, Filter Media Testing