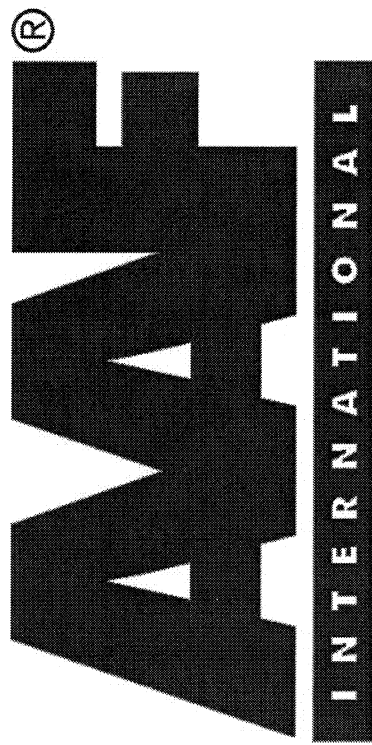




27th Nuclear
Air Cleaning Conference

Nashville, TN

24 SEP 2002

DEDICATION
OF
COMMERCIAL PREFILTERS

Ben Franklin
AAF International
Louisville, KY

Dedication of Commercial Prefilters For Nuclear Safety Related Applications

ABSTRACT

Many filter systems in nuclear power plants and fuel processing and waste handling facilities function under emergency and accident as well as severe ambient conditions. These filter systems are designed, built and tested under specifications, which require rigid quality assurance as well as design controls. They also include commercial prefilters of low efficiency, which are made to industry specifications and minimal quality assurance programs. A procedure is presented which successfully assures the capability of the commercial prefilter to perform under the applicable environments. A lot of filters is segregated, and a small statistical sample is drawn from it. The sample is inspected visually and tested to meet ASHRAE and other assigned characteristics. The lot of filters is then considered acceptable for use as a safety related prefilter.

Outline

- DEDICATION
 - Prefilters
 - Safety Related Application
 - Need to Dedicate
 - Characteristics
 - Dedication
- ASHRAE
 - 52.1
 - 52.2

Prefilters

- Types
 - Panel (Throwaway - Furnace)
 - Pleated
 - Bag (Pockets)
 - Box / Cartridges
- Uses
 - Roughing
 - Protect HEPAs

QA

- ISO 9000
- 10CFR50 App B
- ASME NQA-1
- Safety Related
 - Non S/R
 - S/R Systems
- Why Dedicate
 - Withstand Operating Conditions
 - Insure Filters Don't Disintegrate

Characteristics to Evaluate

- Dimensions
- Resistance at Rated Flow
 - Initial
 - Final
- ASHRAE 52.1 Efficiency
 - Dust Spot Efficiency
 - Arrestance

The Dedication

- Plan
 - Client Agreement
- Sampling
 - Lot
 - Sample Size
 - Standard
 - Reduced

ASHRAE

- 52.1 (Original 1958)
 - Resistance
 - Dust Spot Efficiency
 - Ability to reduce staining of dust
 - Arrestance
 - % Dust captured / dust fed
 - Uses Calibrated Dust
 - Tolerances (See AR1-850-92)

EXAMPLES

- Resistance: 0.5 in w.g. Published ... 0.55 Allowed
- Dust Spot Efficiency:
 - 30% Published ... 22.8% Min Allowed
 - 99.97% HEPA ... 96.97 % Min Allowed
 - (Nuclear won't allow reduction)

The Dedication

- Characteristics
 - Dimensions
 - Resistance
 - Efficiency
- Example
 - - 52.1

ASHRAE

- 52.2 (1999)
 - Removal efficiency by particle size
 - Yesterday's needs: Protect Machinery
 - Today's needs: Fine Particle Inhalation
 - 52.1 Failed to address efficiency of fines

ASHRAE

- Method
 - Select known particle size(s)
 - Report filtration efficiency as MERV (Min. Eff. Reporting Value)
 - Uses KCL - controlled particle size and precise particle counting
 - Measures minimum eff. (not avg.)
 - More accurate filter comparison

ASHRAE

- 52.2 Test Method
 - KCL Aerosol - Initial Efficiency
 - 12 Ranges of Particulate Sizes (0.35 - 8.37)
 - 5 Loadings of SAE Dust
 - Efficiency Readings
 - (Each Range, Each Loading)

ASHRAE

- Average lowest efficiency reading over 3 particle size ranges
 - E1 0.3 - 1.0 Microns
 - E2 1.0 - 3.0 Microns
 - E3 3.0 - 10.0 Microns
- Determine MERV No. (1-16) from table - use efficiency from each range
 - (Note: MERV 17-20 for HEPA's)

52.2 vs. 52.1

<u>Type</u>	<u>Merv Range</u>	<u>Dust Spot EF</u>
Panel/Throwaway	1-4	<20%
Pleat	7-8	30%
Box	10-11	50-65%
Bag/Box	14	90-95%
HEPA (99.97 DOP)	17	N/A
HEPA (99.999)	19	N/A

