Revised Approach FI, Metal HEPA Filters

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ASME FI Standard 7-06

Overview

- HEPA standards from the 1950's
- Metal filters cannot meet low pressure drop
  - AG-1, Section FC
- Draft FI may have been dated at conception
- Metal filtration materials have vastly improved
  - 99.999% efficiency with robust design
- Advantages and needs for metal filter
- A need exists for Metal Filter Standards
- Path forward for FI

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FC Section Impacts on Draft FI

- HEPA standards are from 1950's
  - Pressure drop 1" w.c. @ 1000 cfm air flow, new filter
  - 99.97% efficiency when challenged with 0.3 μm DOP
- Existing draft FI may have been dated at conception
  - Written around direct HEPA replacement mentality
  - dP 1" w.c. @ 1000 cfm air flow

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FC Section Impacts on Draft FI - continued

- Metal filters would replace existing 2'x'2x1' HEPA's
  - Use existing conventional HEPA filter housing
  - No system design modification required
  - No changes in system requirements (dP, flowrates, etc.)

- Industry unable to provide a metal filter
  - 1" w.c. dP per AG-1, FC
  - Direct replacement "foot print"
  - Cost effectiveness vs. risk reduction (1000 cfm or larger)
  - Filter media surface area

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Concept to Replace an Conventional HEPA

Original concept of metal filters replacing a conventional HEPA

Many small metal filters were used In a 2'x2x1' configuration to obtain a large surface area.

64 filters ~150 ft^2 surface area

50 ft^2 less than a glass fiber filters

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2’ x 2’x1’ Metal HEPA Filter Assembly

- Concept never implemented in facility process
- Tested at ORNL in 1990’s

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Changes in Filtration Media Technology

- Metal filtration materials have vastly improved
  - Greater than 99.97% efficiency (can be >99.999999999)
  - Robust design
  - High differential pressure and pressure surges)
  - Not damaged by water
  - High temperature resistant
- Metal filters are being used in small processes within nuclear facilities
- Metal filter cannot meet the low pressure drop requirement
- Existing standards (FC) will need to differ for metal filters (FI)
  - Higher dP
  - Efficiency testing material (DOP or PAO not ideal)
- Equipment Improvements
- Blower design to support the higher dP

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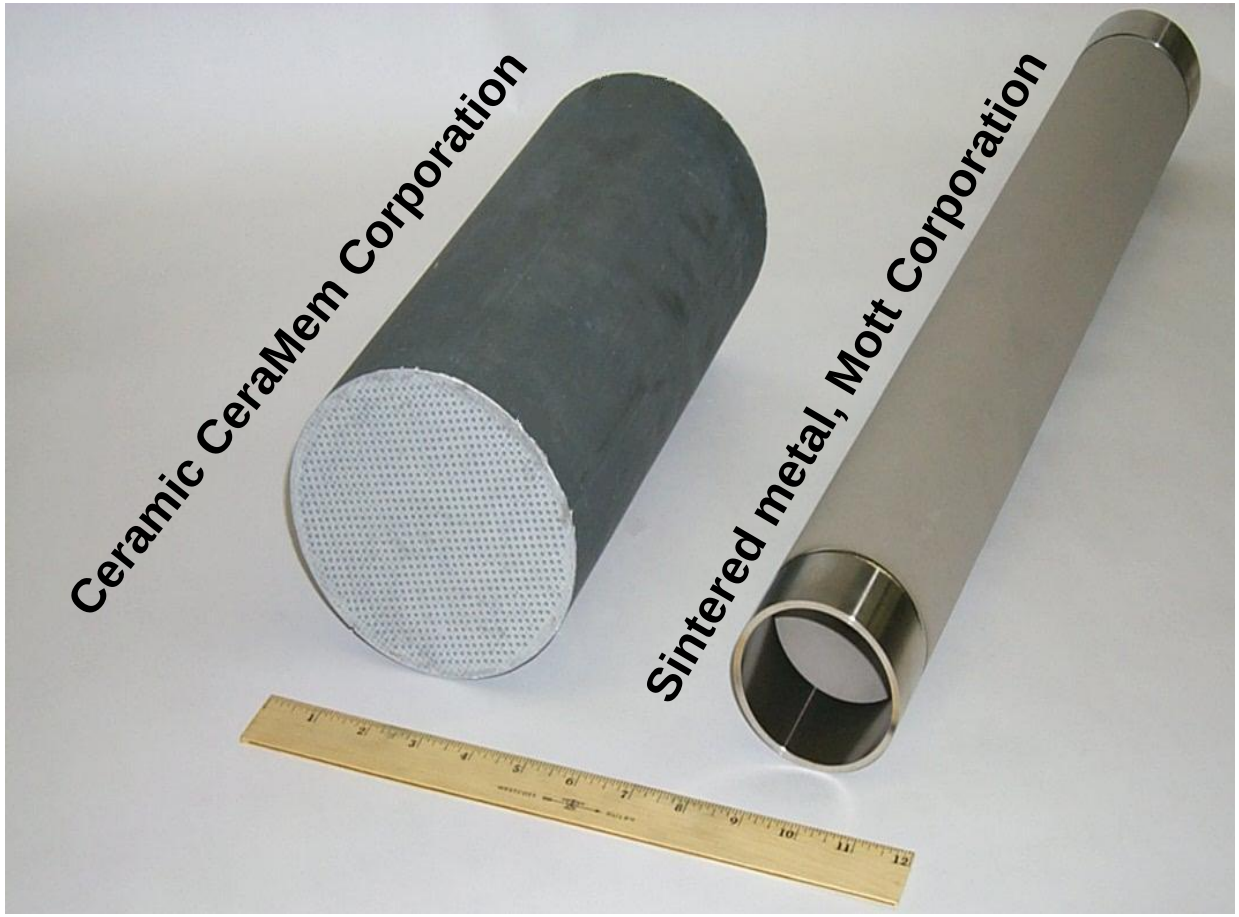
High Grade Alternative HEPA Filters

Industry is manufacturing high grade HEPA filters that are being used in many commercial and government applications but not direct replacement of conventional HEPA systems.



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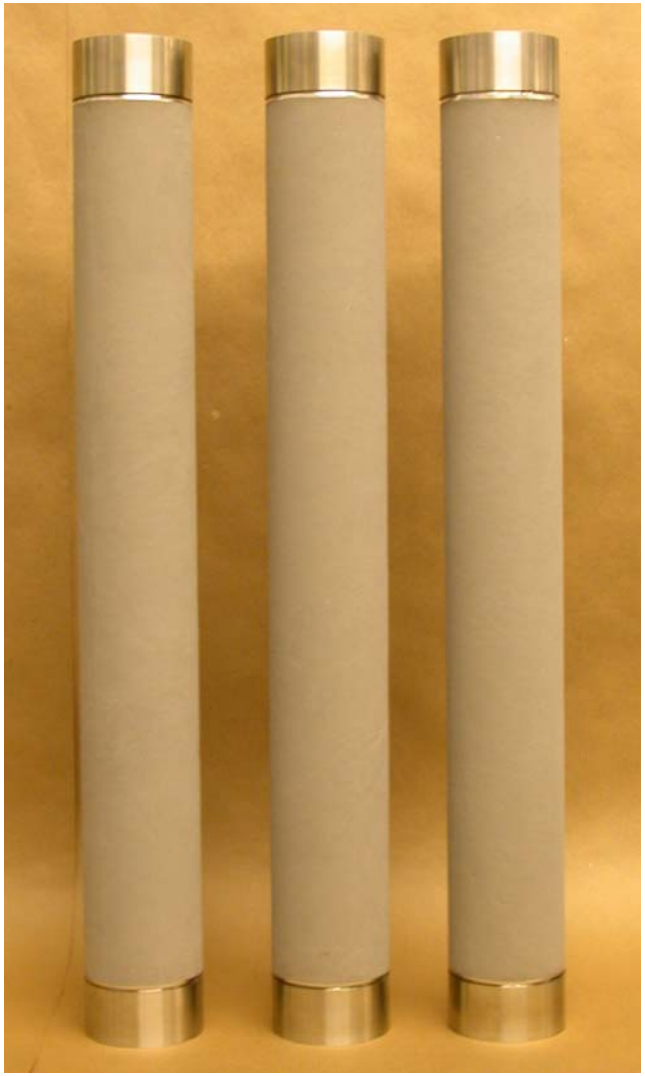
Sintered Metal Full-scale Filter Element

- Full Size Filter Characteristics
- Material: 200 Nickel
- Diameter: 3.0 in.
- Length: 24 in.
- Surface Area: 1.8 ft^2
- 90” wc dP @ 30 cfm
- Excellent particle retention
  - 99.999% Tested at Oak Ridge FTF
- Cleans well insitu
- Robust filter media



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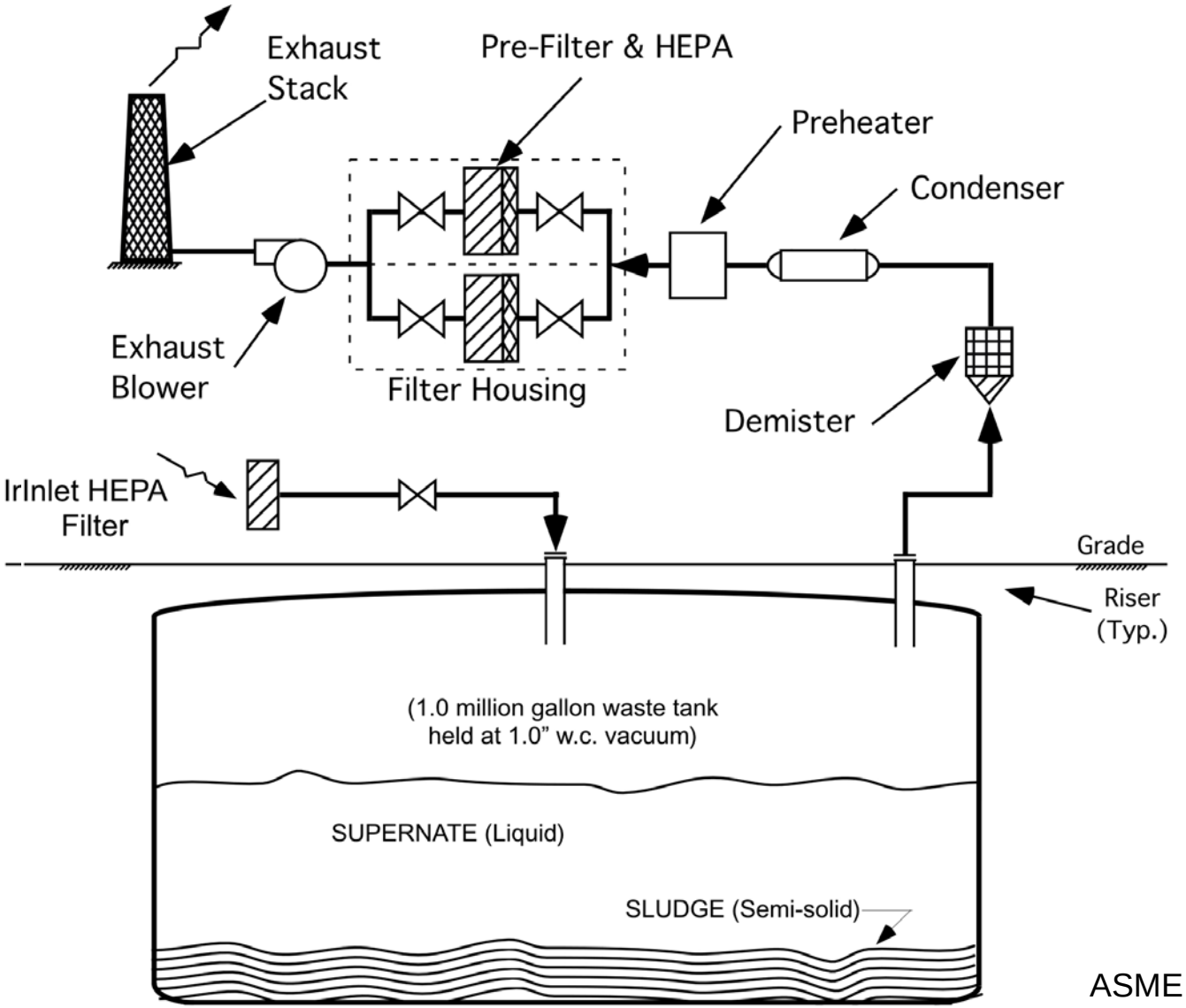
Metal Filter Application, HLW Tank H&V System



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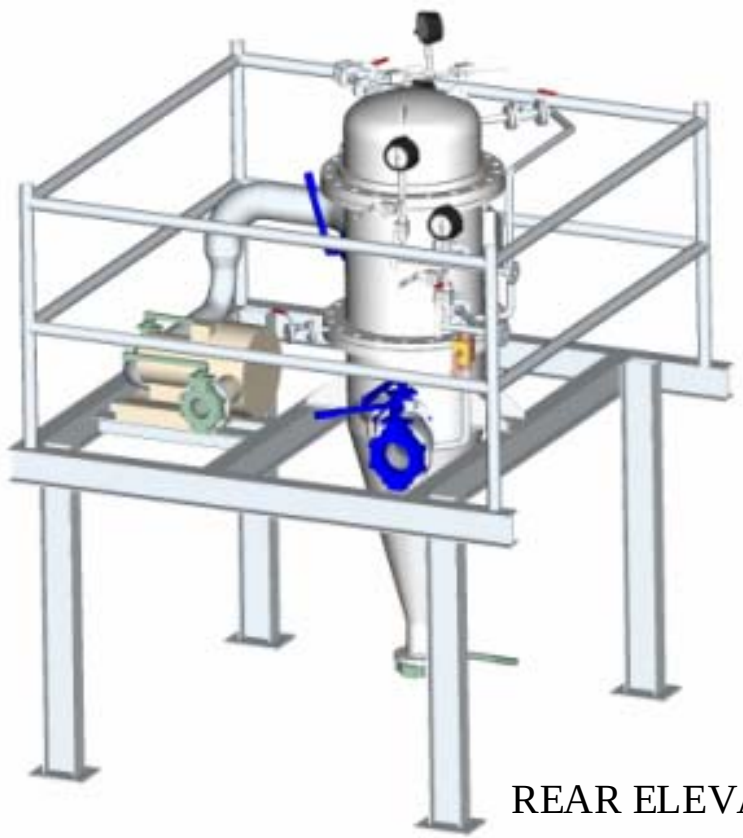
Single Metal HEPA System, 800 cfm



REAR ELEVATION ISOMETRIC

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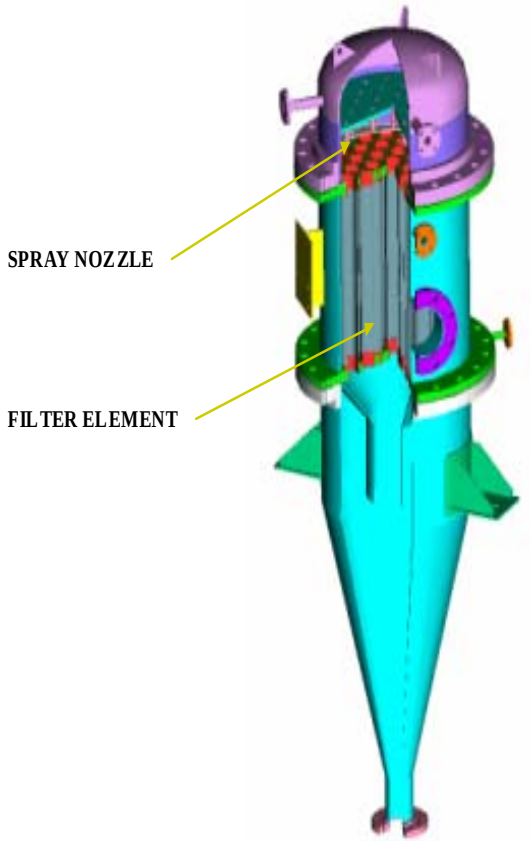
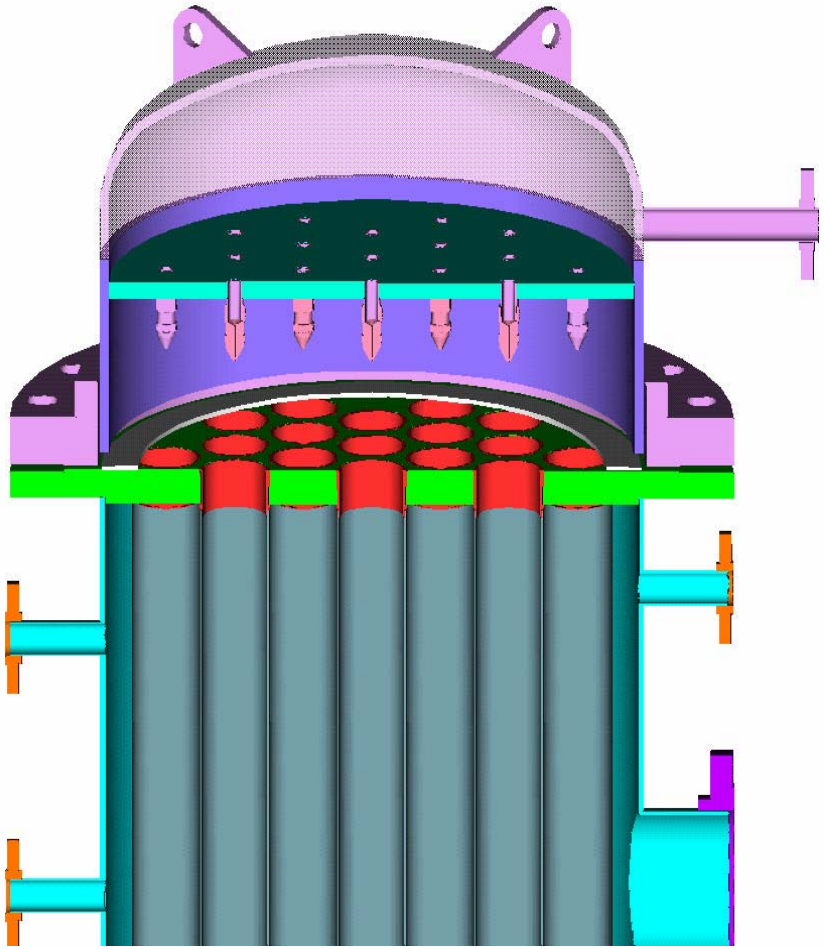
Filter Vessel, Sintered Metal Filter Elements



SECTION SHOWING FILTER INTERNALS



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Point-of-Use Metal Filters

- Developed for Semiconductor Industry over past 15 years
- Used for all process gases
  - Includes highly toxic
  - Helium leak tested
- Efficiency: > 99.999999999%
- Material: 316L stainless steel, Nickel, Hastelloy C-22
- Flow rates: Range for 1 to >10,000 SLPM (<0.1 to >300 SCFM)
- Pressure drop (max rated flow): 5 - 10 psid (130 - 250” wc)

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Advantages and Needs for Metal Filter

- Ideal for small hostile type systems
- Minimizes risk of catastrophic failure
- Not damaged by water exposure
- Fire and temperature resistant
- Great potential for in-situ cleaning

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Conclusion

- A need exists for Metal Filter Standards
  - Small systems, less than 1,000 cfm
  - Hostile environment
- Metal filters are in used in nuclear facilities
- Contact metal manufacturers to support standard development (Vested interest)
  - Mott Corporation, Pall Corporation, Fairey Microfiltrex Inc., Purolator Corporation, Etc.
- Team members/companies to prepare a plan for rewriting FI
- Withdraw the existing ballot of FI

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