

# ePTFE Membrane Filter Media for Dry FGD Systems

McIlvaine Hot Topics Hour

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W. L. Gore & Associates, Inc.



# Agenda

- Overview of W. L. Gore & Associates
- Introduction to ePTFE Membrane Filtration
- Filter Media for DSI & DFGD Systems
- ePTFE Membrane Filtration for DSI/DFGD
- Summary & Conclusions

# Overview of W. L. Gore & Associates



# Company Overview

- Founded in 1958
- Inventors of ePTFE membrane (patented in 1963)
- Associate-owned
- 10,000 associates
- 50 plants and sales locations globally
- Manufacturing in U.S., Germany, Scotland, Japan, and China
- Sales of approx \$3 billion
- Ranked in the U.S. and Europe by Fortune Magazine as one of the top 100 company's to work for

# Gore's Four Divisions

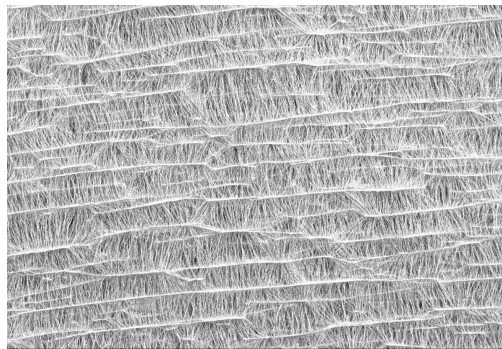
- Electronic products
- Industrial products
- Medical products
- Fabrics



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# e-PTFE membrane filtration

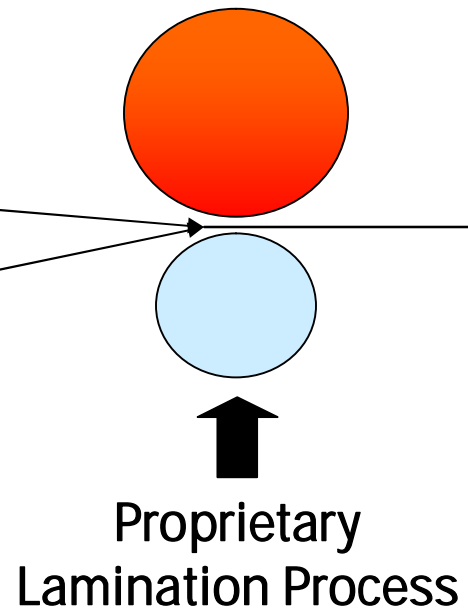
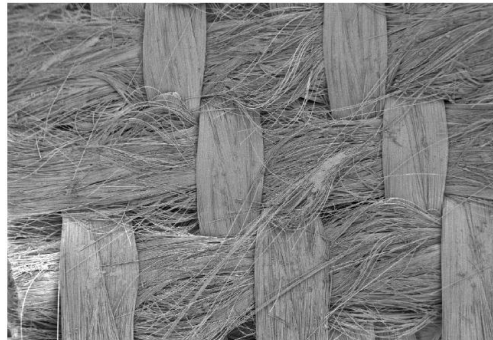
# What is Membrane Filter Media?



ePTFE Membrane



Fabric (Fiberglass or felt)



ePTFE Membrane Laminate



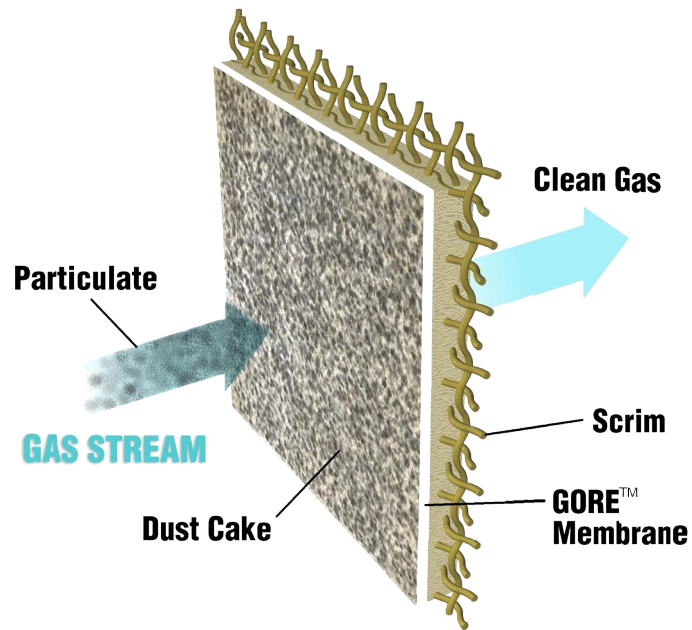
# GORE® Filter Laminate



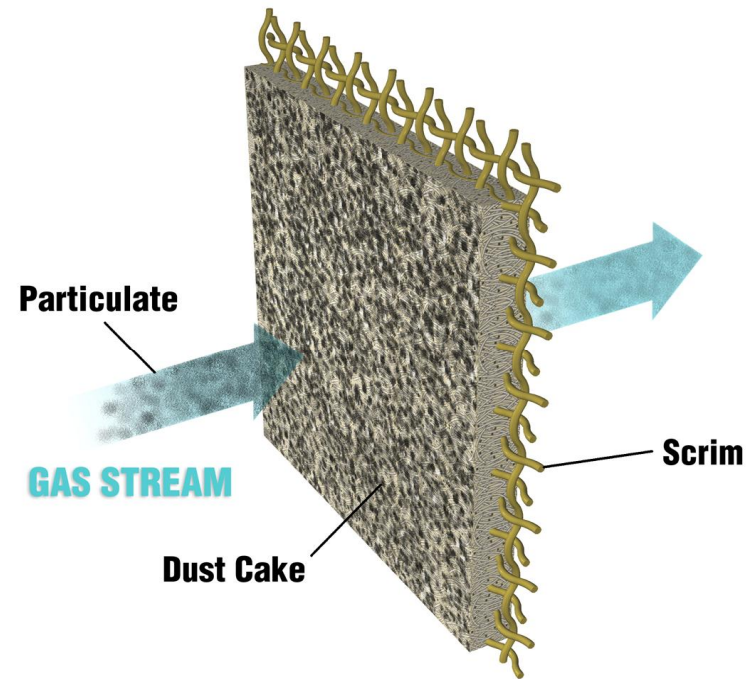


# Filtering Mode (Surface vs. Depth)

Membrane Filtering Mode

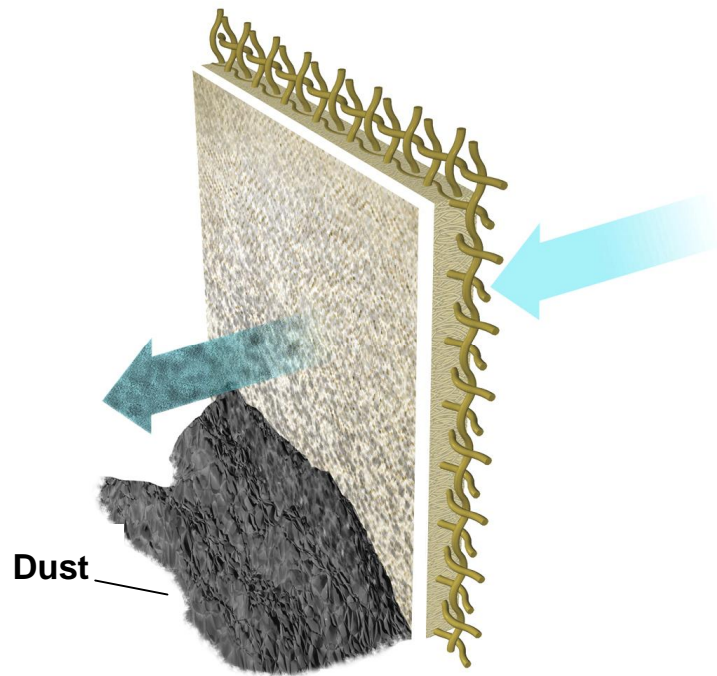


Conventional Filtering Mode

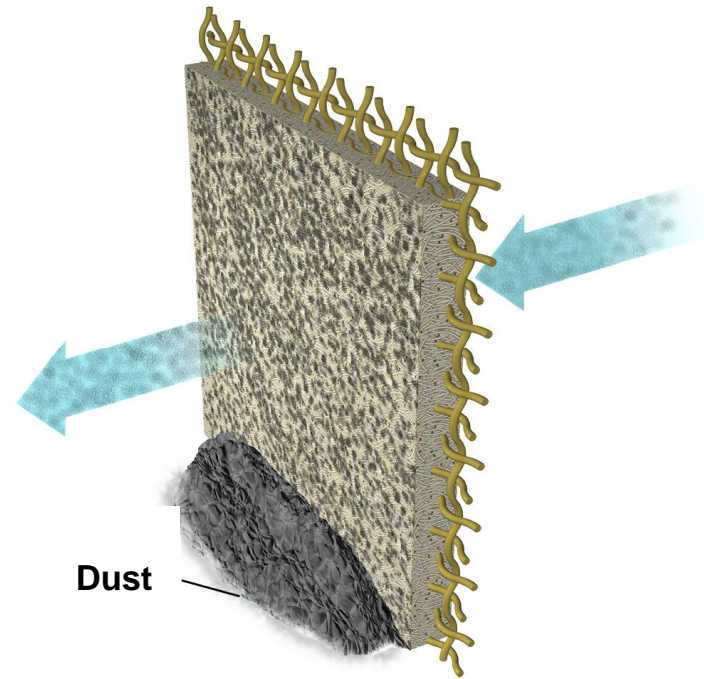


# Cleaning Mode (Surface vs. Depth)

Membrane Cleaning Mode



Conventional Cleaning Mode



# Filter Media for DSI & DFGD Systems



# Filter Media for DSI or DFGD

- PPS (or PPS/PI blend) felt for PJFF
- Woven fiberglass for RGFF
- Acrylic felt for PJFF if continuous operating temperature < 260 °F (126 °C)
- Polyester felt for PJFF (or woven PE for RGFF) may be an option for low temperature systems but it is subject to hydrolysis
- ePTFE Membrane on PPS felt or woven fiberglass (common in MSW plants; gaining acceptance with Electric Utilities)

# DSI or DFGD Impact on Filter Media

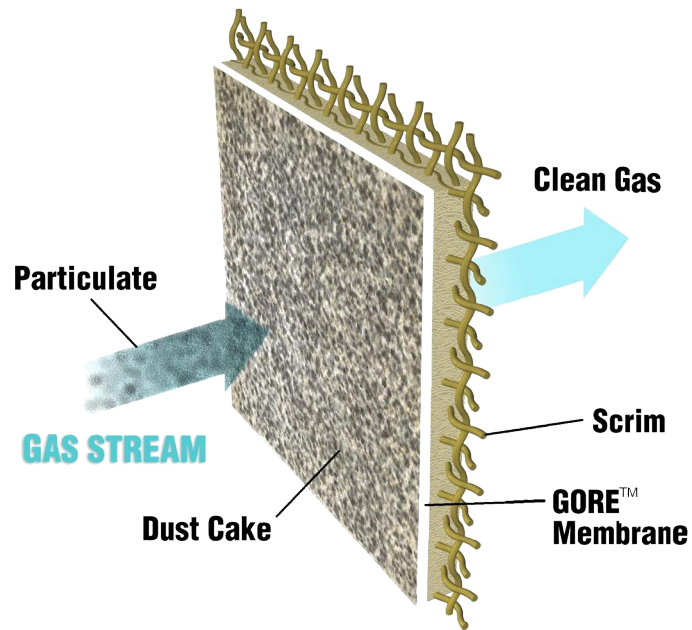
- In a case of a DSI or spray dryer retrofit before an existing fabric filter the operating conditions will change
- Higher dust loading
  - May effect cleaning frequency
  - May effect ash handling system operation
- Ash characteristics change
  - Particle size distribution will change
  - Ash may become more cohesive (stickier) with higher moisture and lower temperature (especially true with lime based reagents in DFGD)
- All the above may impact the performance of the existing filter media

# ePTFE Membrane Filtration for DSI/DFGD

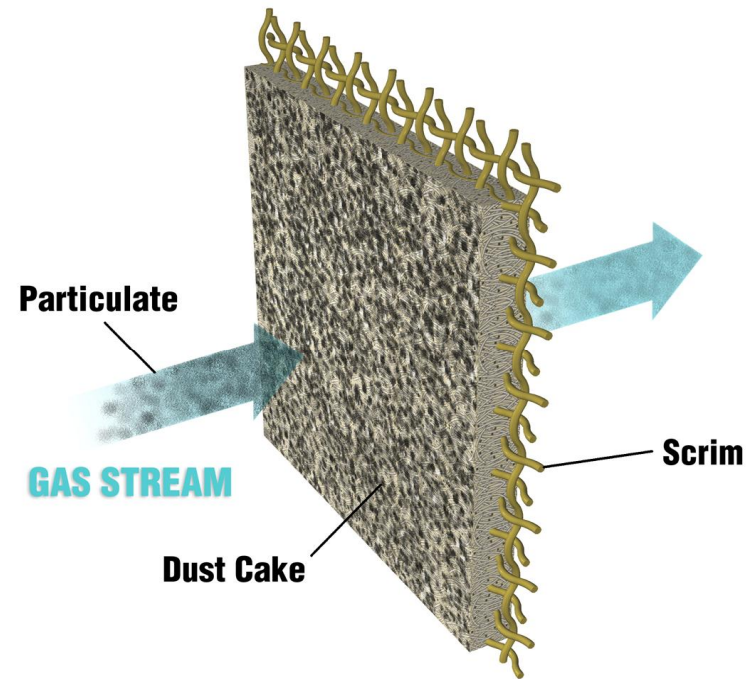


# Filtering Mode (Surface vs. Depth)

Membrane Filtering Mode

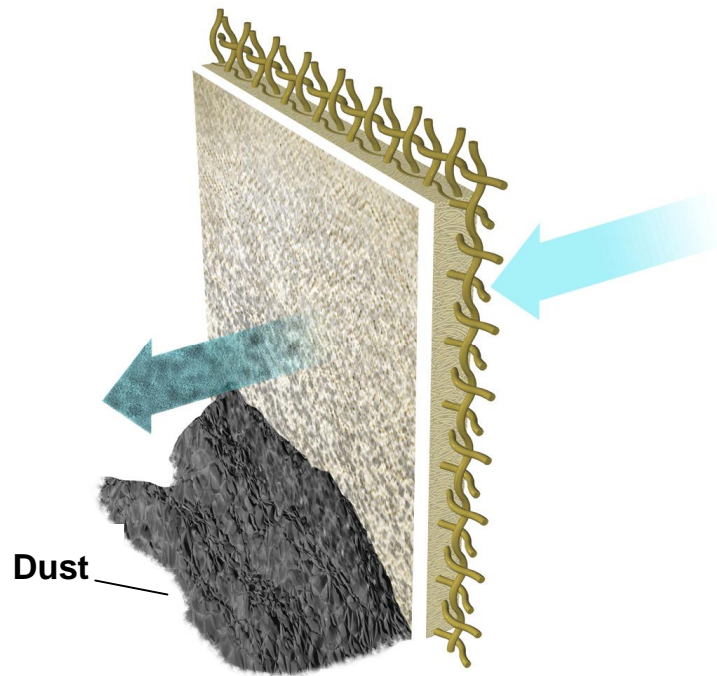


Conventional Filtering Mode

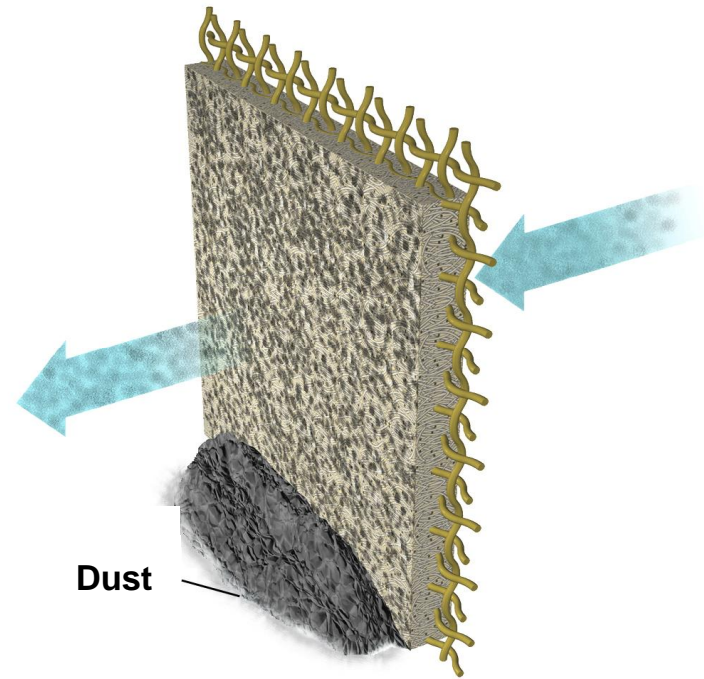


# Cleaning Mode (Surface vs. Depth)

Membrane Cleaning Mode

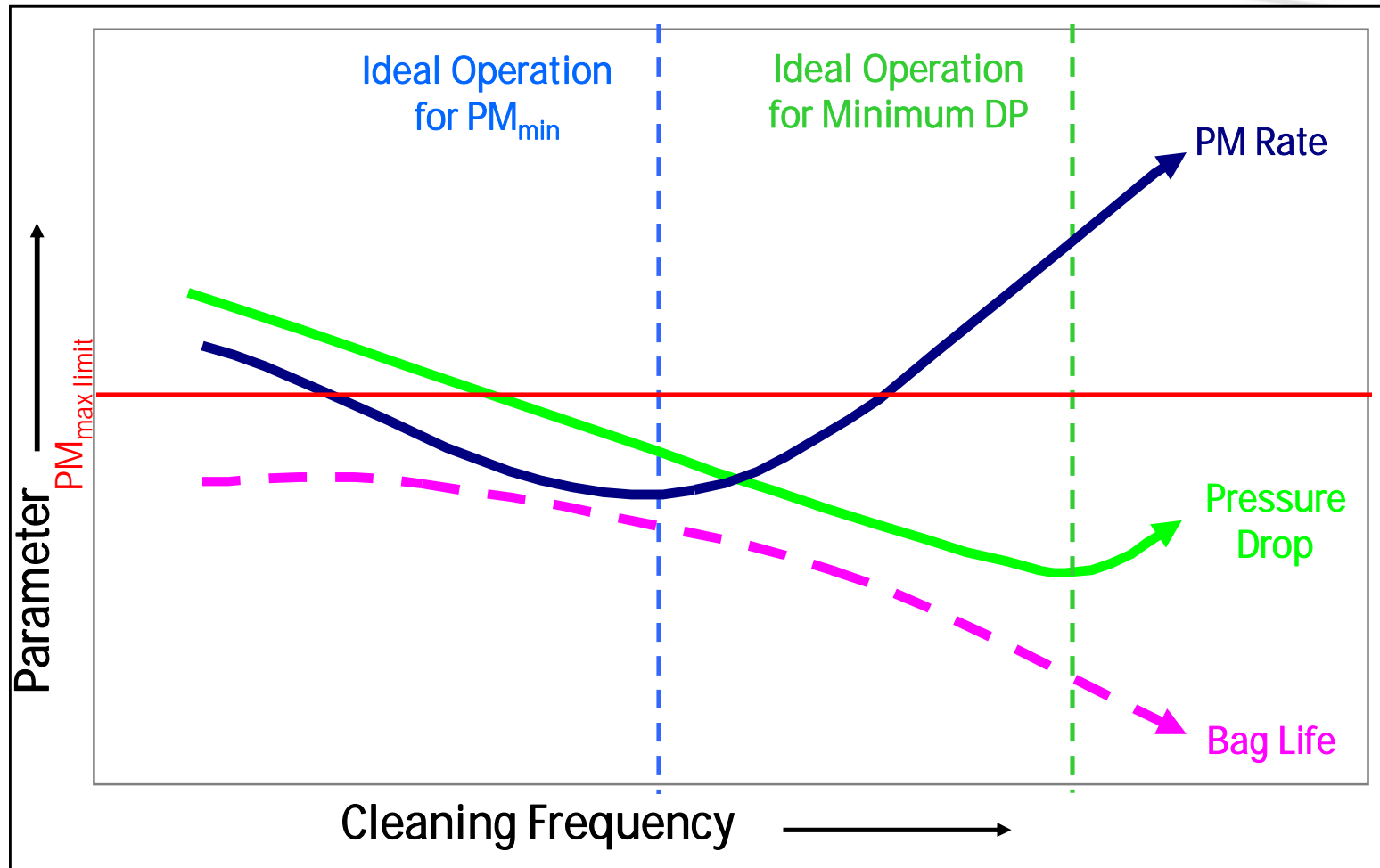


Conventional Cleaning Mode





# Effect of DSI/DFGD on Filter Media



# Membrane Advantages in DSI/DFGD

- Expanded PTFE membrane is chemically inert
- ePTFE membrane captures of **fine aerosol** PM on the surface
  - Co-benefit of capturing HAP metals
  - Protects the backing material from acidic PM (solid or liquid)
  - **(Note: Membrane will not collect acid gas/vapor)**
- Smooth, micro-porous surface provides superior release of sticky ash
- ePTFE membrane is less sensitive to changes in ash (size or chemistry)
- ePTFE allows more flexibility with cleaning system to adjust for changes in dust loading and ash characteristics
- ePTFE membrane can recover from process upsets, tube leaks, and start-up/shutdown problems

# What Happens When Switching to ePTFE Membrane (From Conventional Filter Media)?

- Less residual dust cake
  - Lower DP after cleaning
  - Less frequent cleaning cycles to reach DP set point
- Solid PM will be reduced due to the high efficiency of ePTFE membrane

# What About the Total PM Emissions?

- Solid PM will be reduced due to the efficiency of ePTFE membrane
- In a well documented case with DFGD
  - The DP across the system was considerably less with ePTFE membrane bags
  - Total PM decreased by nearly 50% compared to the conventional felt media
  - The solid PM decreased by 90% with membrane, but the condensable PM increased by nearly 50%

# Why Did the Condensable PM Increase?

- The condensable PM was removed in the residual dust cake on the filter media (not the membrane)
  - You can reduce the condensable PM emissions by allowing the dust cake to build up
- Low residual dust cake with ePTFE membrane resulted in lower DP after cleaning
  - You can choose lower DP (with higher condensable PM)
  - You can choose the same DP (as conventional media) with similar condensable PM and longer bag life (by less frequent cleaning)
  - You may achieve the lower reagent consumption
- You can optimize the cleaning system for lower DP or lower condensable PM or lower reagent consumption (or a combination of the above)

# Summary & Conclusions

# Summary & Conclusions

- There are several filter media choices for DSI and DFGD depending on the gas design conditions
- In cases of a DSI or DFGD retrofit upstream of an existing baghouse, the current filter media may not perform as well as in the original baghouse system
- High performance filter media like ePTFE membrane may improve the system performance over the current filter media
  - Reduced DP, longer bag life, and/or lower emissions
  - Higher capture of solid PM may provide some margin for Total PM (even if condensable PM increases)
  - The cleaning system may need to be optimized for the desired result
- No normal filter media will capture gases or vapors

# Questions?



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