



**Department of  
Environmental  
Conservation**

# **Introduction: Tackling the PFAS Air Emissions Problem: State Perspectives**

**National Association of Clean Air Agencies  
Webinar  
November 12, 2020**

# EPA PFOA Stewardship Program

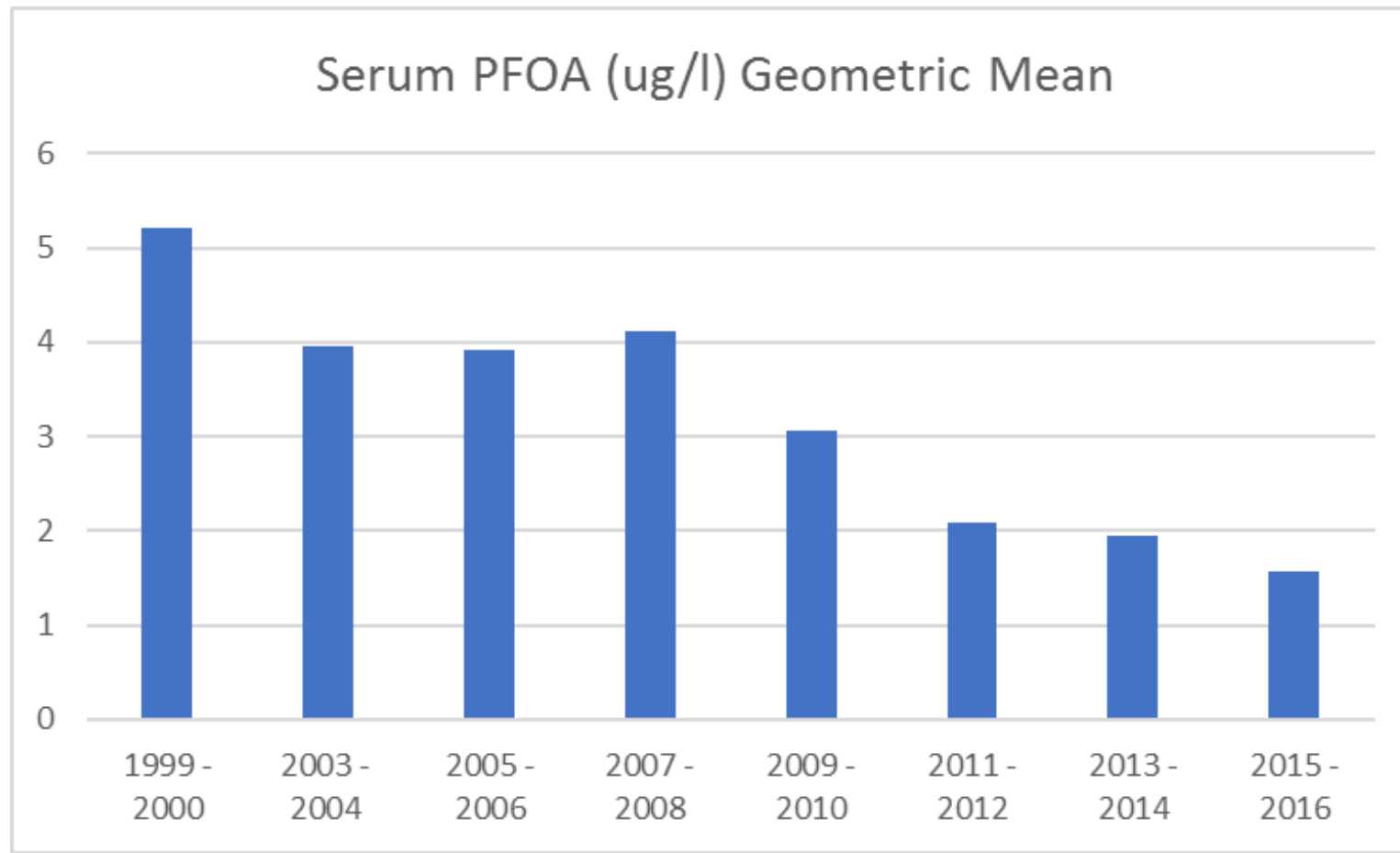
- Eight Participating Companies (Arkema, Asahi, Ciba, Clariant, Daikin, Dupont, 3M/Dyneon and Solvay Solexis)
- Agreed to submit baseline data on facility emissions and product content of PFOA, PFOA precursors and related higher homologue chemicals by October 31, 2006. Creation of Year 2000 baseline
- Agreed to 95% reduction in emissions and product content by 2010
- Work toward total elimination of these chemicals from emissions and products by 2015
- This may not be always zero (“vanishing zero”)

# National Health & Nutrition Examination Survey (NHANES)

- Biomonitoring survey conducted to examine human exposure to environmental chemicals by analyzing blood, serum and urine samples in the U.S. population
- PFOA and PFOS added to the list of chemicals to be biomonitored in 1999, along with 10 other PFAS
- Environmental chemical defined as a chemical present in air, food, soil, dust or other environmental media (consumer products)



# NHANES PFOA Results 1999 -2016

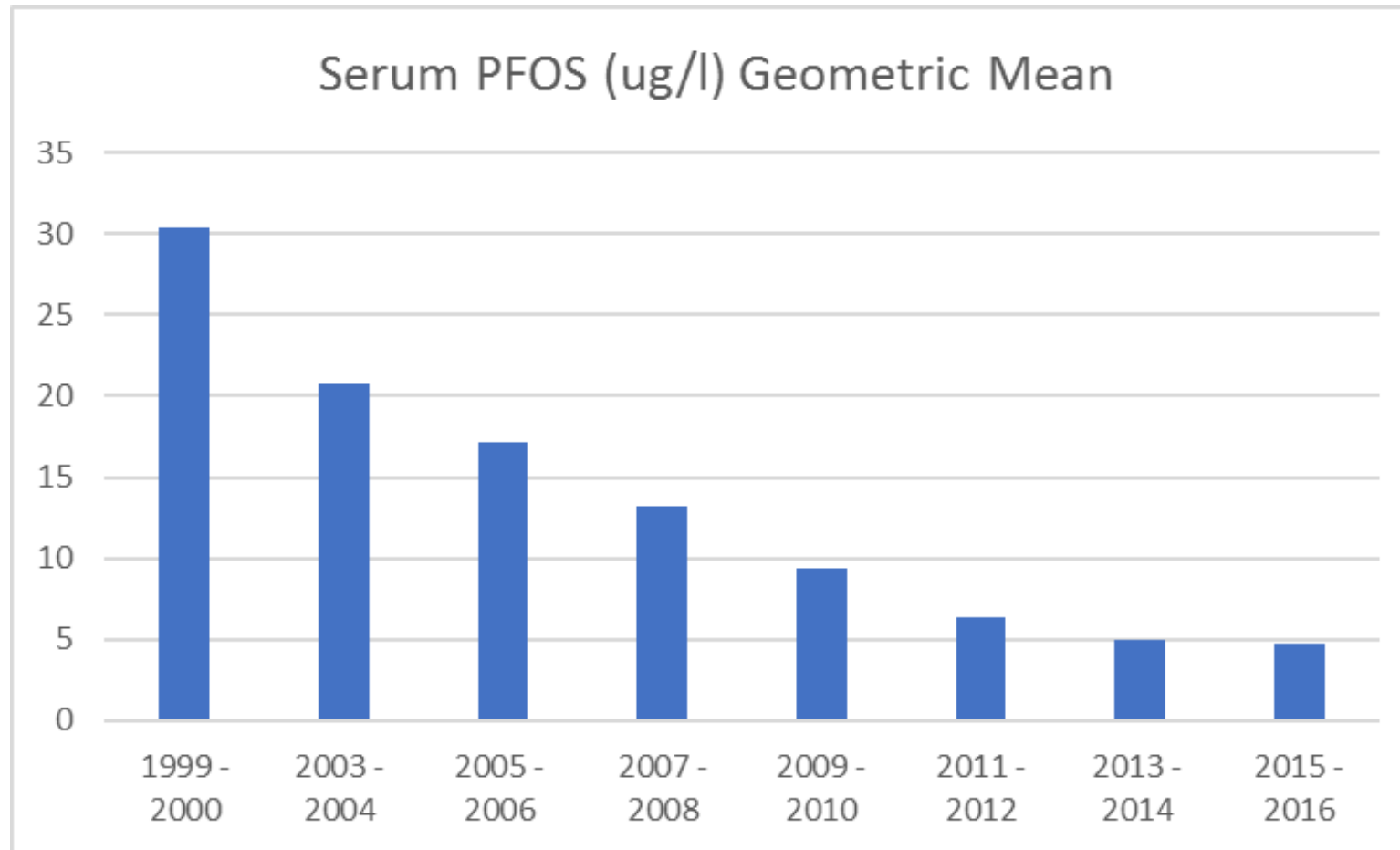


Total U.S. Population



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# NHANES PFOS Results 1999 - 2016



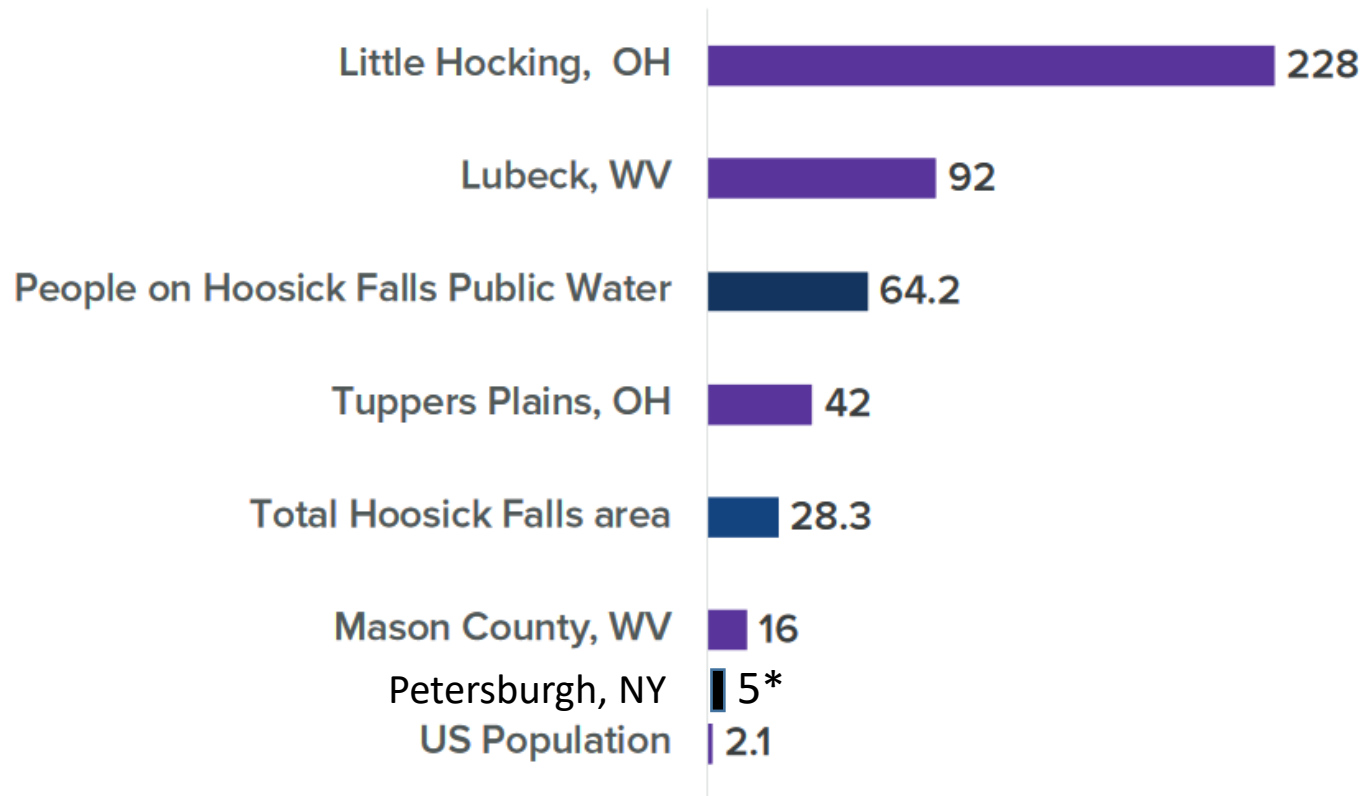
Total U.S Population



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# PFOA Blood Levels of Hoosick Residents Compared to Residents from Other Communities

**PFOA level in Blood:**  
**Hoosick 50th Percentile Compared to US Population and Other Community Studies of Public Water Supplies**  
(Micrograms per Liter)



NYSDOH, 2016

\* added

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# **Early Air Pollution Control/PFAS Emission Testing Legacy and Emerging PFAS (Targeted Analysis)**

**Thomas Gentile, New York Department of Environmental Conservation  
National Association of Clean Air Agencies  
Webinar  
November 12, 2020**

# Background

- Taconic manufactures polytetrafluoroethylene (PTFE) coated fiberglass/fabric products, tapes, belts and laminate materials for industrial applications and the food processing industry.
- One process involves the use of woven fiberglass fabric dipped into a PTFE aqueous dispersion, where the coated fabric passes through ovens to be dried and baked. Oven temperature vary to properly bond the PTFE to the fabric.
- The process results in the liberation of PFAS polymerization aides that are used in the PTFE dispersions and highly toxic PTFE decomposition products. The primary fluoropolymer aide was perfluorooctanoic acid (PFOA), it has been replaced with other aides (DuPont trade name GEN-X).



# Background

- The emissions from these PTFE coating lines are controlled by Fume Eliminator (FE) air pollution control devices.
- NYSDEC required Taconic to conduct simultaneous inlet/outlet emission testing of one FE (#5) for 24 PFAS's using a modified method 5 sampling train and analyzed by method 537.
- The FE tested collected emissions from 15 PTFE vertical oven coating lines. Maximum production rate. (PTE).
- Testing was completed on December 7, 2016.
- Test results were presented at public meetings in Petersburg, NY. (February 21, 2017/October 3, 2017)

# Fume Eliminator

- A two-stage air pollution control device used to collect the submicron particulate matter released during the sintering of the PTFE.
- The fiberbed diffusion filters are designed to collect both solid and liquid particulate.
- Exhaust is cooled to 120°F with a Cyclonic Scrubber which condenses the pollutants into water droplets.
- The water droplets fall into the sump of the air pollution control device.
- Water is recirculated and automatically added to compensate for evaporative losses.
- The remaining exhaust moves through a pre-filter to further remove foulants to protect the main fiber bed and then into a bed of densely packed fiber bed filters to achieve the final removal of the aerosols.



# PFAS Emissions Analysis (Method 537)

## Target Compounds

## Carbon Group

Perfluorobutanesulfonic acid (PFBS)	C4
Perfluorobutanoic acid (PFBA)	C4
Perfluoropentanoic acid (PFPeA)	C5
Perfluorohexanesulfonic acid (PFHxS)	C6
Pefluorohexanoic (PFHxA)	C6
6:2 Fluorotelomer sulfonate	C6
Perfluoroheptanoic acid (PFHpA)	C7
Perfluoroheptane sulfonate	C7
Perfluorooctanesulfoninc acid (PFOS)	C8
Perfluorooctanoic acid (PFOA)	C8
Perfluorooctanesulfonamide (PFOSA)	C8
8:2 Fluorotelemer Sulfonate	C8
Perfluorononanoic acid (PFNA)	C9
Perfluorodecanoic acid (PFDA)	C10
Perfluorodecane Sulfonate	C10
Perflouroundecanoic acid (PFUnA)	C11
2-(N-methyl-Perfluorooctanesulfonamidoacetic acid (MePFOSA-AcOH)	C11
Perfluorododecanoic acid (PFDoA)	C12
2-(N-ethyl-Perfluorooctanesulfonamidoacetic acid) (Et-PFOSA-AcOH)	C12
Perfluorotridecanoic acid (PFTrDA)	C13
Perfluorotetradecanoic acid (PFTA)	C14
N-ethylperfluoro-1-octanesulfonamide	C10
N-methylperfluoro-1-octanesulfamide	C9
Hexafluoropropylene oxide dimer acid (Gen-X)	



# PFAS DETECTED (Inlet or Outlet)

<u>Target Compounds</u>	<u>Carbon Group</u>	<u>Inlet Rank</u>
Perfluorobutanoic acid (PFBA)	C4	2
Perfluoropentanoic acid (PFPeA)	C5	4
Pefluorohexanoic (PFHxA)	C6	5
Perfluoroheptanoic acid (PFHpA)	C7	7
Perfluorooctanoic acid (PFOA)	C8	3
Perfluorononanoic acid (PFNA)	C9	6
Perflououndecanoic acid (PFUnA)	C11	8
Hexafluoropropylene oxide dimer acid		1

# Emission Testing Results

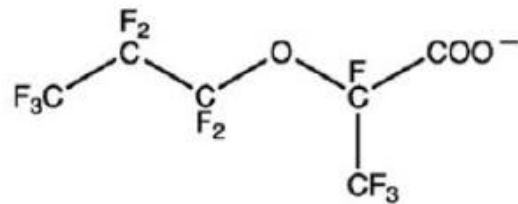
The results found five PFAS in the outlet stack emissions at extremely small amounts.

- Perfluorobutanoic Acid – PFBA (C<sub>4</sub>) @ 2.6 grams/year
- Perfluoropentanoic Acid – PFPeA (C<sub>5</sub>) @ 1.25 grams/year
- Perfluorooctanoic Acid – PFOA (C<sub>8</sub>) @ 3.75 grams/year
- Perfluorononanoic Acid – PFNA (C<sub>9</sub>) @ 3.12 grams/year
- Perfluoroundecanoic Acid – PFUnA (C<sub>11</sub>) @ 1.25 grams/year
- Hexafluoropropylene Oxide Dimer Acid – HFPO-DA @ <1.25 grams/year

# Air Pollution Control Efficiency

- 88 % removal for total measured PFAS.
- 78 % removal for PFOA.
- GEN- X (PFOA replacement) as measured by HFPO-DA was reduced to non-detectable amounts at outlet (> 99 % control).
- The Fume Eliminators are effectively reducing the PFAS, particulate and hydrogen fluoride emissions.

- **HFPO-DA GenX (CAS No. 62037-80-3)**



# Follow Up Investigation

- What was evaluated: **Use of water containing PFOA.**
- During the initial emissions test, supply water to Fume Eliminator 5 ranged from 0.017 to 0.032 ppb in three samples.
- Fume Eliminator 5 Sump water samples ranged from 56 -120 ppb.
- Following the results of December 2016 Sampling/Testing, Taconic was required to analyze Fume Eliminator 11 Sump for presence of PFOA/PFAS.
- PFOA containing dispersions had never been used in associated ovens and all water sources have been filtered to non detect during entire operation. Therefore PFOA should not have been detected in Sump water.
- PFOA was detected at 0.37 ppb in the FE 11 sump.



# Follow Up Investigation

- What was evaluated: **Chemicals currently being used by Taconic in PTFE manufacturing.**
- DEC required Taconic to analyze the current PTFE dispersions in use for PFOA/PFAS content.
- Each dispersions was sampled twice for Quality Assurance
- Some PTFE Dispersions contained a trace amounts of PFOA (ND - 110 ppb).
- Other PFAS found at trace levels in all dispersions
- Taconic had been under the assumption dispersions they purchased were PFOA free per the EPA Stewardship Agreement with PFAS manufacturers to phase out PFOA use.

# Sump/Supply Water Testing Results

## Sump Water Results (2016)

Perfluoroheptanoic Acid – PFHpA (C <sub>7</sub> )	6.3 – 12 ppb
Perfluorononanoic Acid – PFNA (C <sub>9</sub> )	5.0 – 11 ppb
Perfluorooctanoic Acid – PFOA (C <sub>8</sub> )	56 – 120 ppb

## Supply Water Results (2016)

Perfluorooctanoic Acid – PFOA (C <sub>8</sub> )	17 – 32 ppt
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## Historical Sump Water Results (2005)

Perfluorooctanoic Acid – PFOA (C <sub>8</sub> )	172000 ppm
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## Where Are We Going?

- Collaborated with USEPA Office of Research & Development National Risk Management Research Laboratory on an emissions characterization of the polytetrafluorethylene sintering process.
- Collaborative emissions testing of PFAS production and process uses are currently underway with various state environmental agencies.
- Continued evaluation of air pollution control technology.
- Goal: Development of an approved EPA emission testing method for PFAS.
- Goal: Development of PFAS air pollution source control requirements.
- Hope: Development of Total Organic Fluoride emission method.
- EPA published their PFAS Action Plan on February 14, 2019.
- <https://www.epa.gov/pfas>