American Membrane Technology Association

Broad Definitions of PFAS may Classify PVDF Membranes as PFAS Compounds

PVDF IS WIDELY USED FOR MEMBRANE WATER AND WASTEWATER TREATMENT

Polyvinylidene fluoride (PVDF) is a widely used material in the manufacturing of ultrafiltration (UF), microfiltration (MF), and membrane bioreactor (MBR) treatment systems. Although, several other materials have been used by membrane manufacturers including polyethylene, polypropylene, polyamide, polyethersulfone, and cellulose acetate, PVDF has become the most widely used and most successful material in membrane filtration processes for several reasons:

- PVDF is resistant to a broad range of chemicals either present in the wastewater feed streams or those used as membrane cleaners to maintain filtration performance without significantly reducing membrane life.
- PVDF is generally tolerant of higher temperatures, offering the opportunity to use hot cleaning solutions that are necessary to reverse fouling in difficult applications.
- The chemical and thermal stability makes PVDF more suitable than alternatives for many different treatment schemes including harsh environments.
- PVDF is made with a very high degree of purity because its monomer is gaseous under normal conditions of temperature and pressure. This enables PVDF products to satisfy stringent leachable limits and other national health regulations, ensuring that they are safe for use in water treatment.
- PVDF is durable, withstanding high pressures while maintaining structural integrity.
- PVDF has proven to be a safe and successful membrane material that is very stable, inert, and highly resistant to breakdown in an ambient environment based on data gathered for routine regulatory performance assessment.
- Aside from the manufacture of membranes, PVDF is often used in components of water treatment facilities such as coatings of piping for corrosion or abrasion resistance, for sensors, instruments and various valves and pumps.

Due to this extraordinary array of valuable attributes, PVDF now represents approximately 60-77% of all polymeric membrane filtration systems used in water and wastewater applications.[i,ii]

In the US, access to clean and plentiful surface or ground water sources is becoming more challenging in some communities, and the demand for proven, PVDF-based MF and UF is expected to continue to grow as these communities turn to more difficult water sources to produce drinking water or consider direct or indirect wastewater reuse to satisfy their water needs. For municipal utilities who must balance risk and cost, PVDF has provided access to products that have over 20 years of successful applications in drinking water and wastewater treatment at an economically acceptable upfront cost.

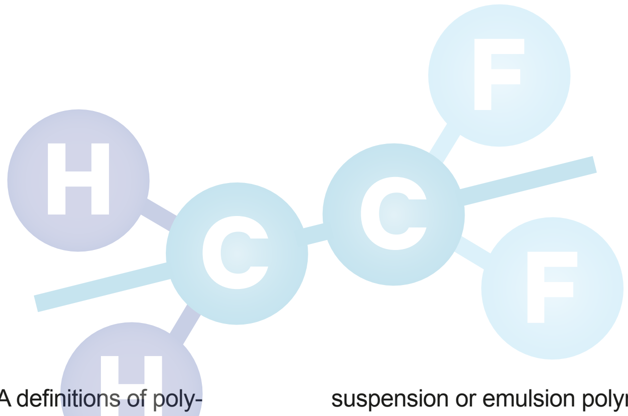
Despite this success, the water treatment industry will face major ramifications as PVDF gets entangled with the on-going PFAS regulatory efforts:

- Why would PVDF be at risk given that it is a non-toxic product, approved by public regulators for use in water treatment for so long under stringent conditions?
- What would the regulatory path be to allow for a manageable transition for utilities currently using PVDF membranes to continue to achieve targets for more traditional regulated water quality parameters (that the PVDF membranes were installed for)?

Given the role played by PVDF-based membranes in sustaining life and economic activity in communities facing increasing difficulties, in accessing clean surface and ground water, to deliver safe drinking water to their constituents around the world, the current situation of uncertainty creates challenges for communities currently operating PVDF membranes, those planning new PVDF membrane-based treatment facilities, and the licensed professionals who design and construct facilities, as well as the many companies manufacturing PVDF membranes.

AMTA SUPPORTS PFAS REGULATIONS THAT ARE FOR PROTECTING THE ENVIRONMENT AND PUBLIC HEALTH

AMTA supports the goal of limiting the release of harmful per- and polyfluoroalkyl substances (PFAS) into the environment and has always supported appropriate regulations to protect the environment and public health. In fact, many of the AMTA member companies and individuals have been actively working on research and full-scale reverse osmosis (RO) membrane facilities to remove PFAS from our public water systems and the environment. Currently, RO membranes are one of the few treatment processes designated as best available technologies (BATs) by the United States Environmental Protection Agency (EPA) for removing PFAS/PFOA.



The current EPA definitions of poly-fluorinated compounds exclude PVDF.[iii] However some overly broad definitions of PFAS adopted in some emerging regulatory efforts propose to include PVDF.

In Europe for example, in some recently proposed regulations, PFAS are being defined broadly as any substance that contains at least one fully fluorinated methyl (CF3) or methylene (CF2) carbon atom (without any H/Cl/Br/I attached to it). This simple definition captures a wide variety of chemical structures, including PVDF.

AMTA believes that PVDF is normally considered to be part of a class of high molecular weight fluoropolymers that are distinct from non-polymeric PFAS, and have distinctly different physicochemical, toxicological, and environmental profiles. PVDF used for membrane production has a high molecular weight homopolymer (>100,000 g/mol) produced from either suspension or emulsion polymerization of gaseous vinylidene fluoride in water. PVDF can be produced in the absence of a PFAS processing aid, and suppliers of PVDF used for water treatment membrane have provided certification letters verifying no use of PFAS processing aids.

AMTA SUPPORTS THE EPA'S DEFINITION OF PFAS

The EPA recently updated its definition of PFAS in a way which excludes PVDF. For the purpose of Contaminant Candidate List (CCL) 5, the structural definition of per- and polyfluoroalkyl substances (PFAS) includes chemicals that contain at least one of these three structures (except for PFOA and PFOS which are already in the regulatory process):

- R-(CF2)-CF(R′)R″, where both the CF2 and CF moieties are saturated carbons, and none of the R groups can be hydrogen
- R-CF2OCF2-R′, where both the CF2 moieties are saturated carbons, and none of the R groups can be hydrogen
- CF3C(CF3)RR′, where all the carbons are saturated, and none of the R groups can be hydrogen

AMTA
American Membrane Technology Association

FOR MORE INFORMATION:
American Membrane Technology Association (AMTA)
1811 Englewood Road, #280
Englewood, FL 34223
Phone: (772) 469-6797
Email: custsrv@amtaorg.com
www.amtaorg.com

@AmericanMembraneTechnologyAssociation

@amtaorg

AMTA'S POSITION

AMTA is requesting regulatory and governing agencies to:

- **Consider the significant current role and benefit PVDF plays** in advanced water and wastewater treatment and in the protection of public health, as a barrier to pathogens, prior to any potential limit of use caused by an unproven risk.
- Some recently completed facilities designed to mitigate water supply or treatment challenges had a reasonable expectation that replacement PVDF membranes and components would be available over the facility life, which is typically 20 to 30 years. **Should PVDF become subject to regulation, a manageable transition period will definitely be required to avert unrelated water and wastewater quality and quantity issues from arising.**
- **Exempt PVDF used in the water and wastewater treatment** (membranes and other key components) from restrictions otherwise resulting from the various definitions of PFAS being adopted in emerging regulations.
- **Consider the adoption of a definition of PFAS (such as EPA's definition)** unless explicit data to the contrary arises.

[i] Judd, S., 2017. The material question – choosing MBR membrane materials (https://www.thembrsite.com/blog/choosing-mbr-membrane-materials/, update April 23, 2022)
[ii] Pearce, G., 2019. Microfiltration and Ultrafiltration Market Report, s.l.: Membrane Consultancy
[iii] https://www.epa.gov/system/files/documents/2022

This material has been prepared as an educational tool by the American Membrane Technology Association (AMTA). It is designed for dissemination to the public to further the understanding of the contribution that membrane water treatment technologies can make toward improving the quality of water supplies in the US and throughout the world.