FROST & SULLIVAN

2024 PRODUCT LEADER

IN THE GLOBAL NF MEMBRANE-BASED MUNICIPAL W&WWT INDUSTRY

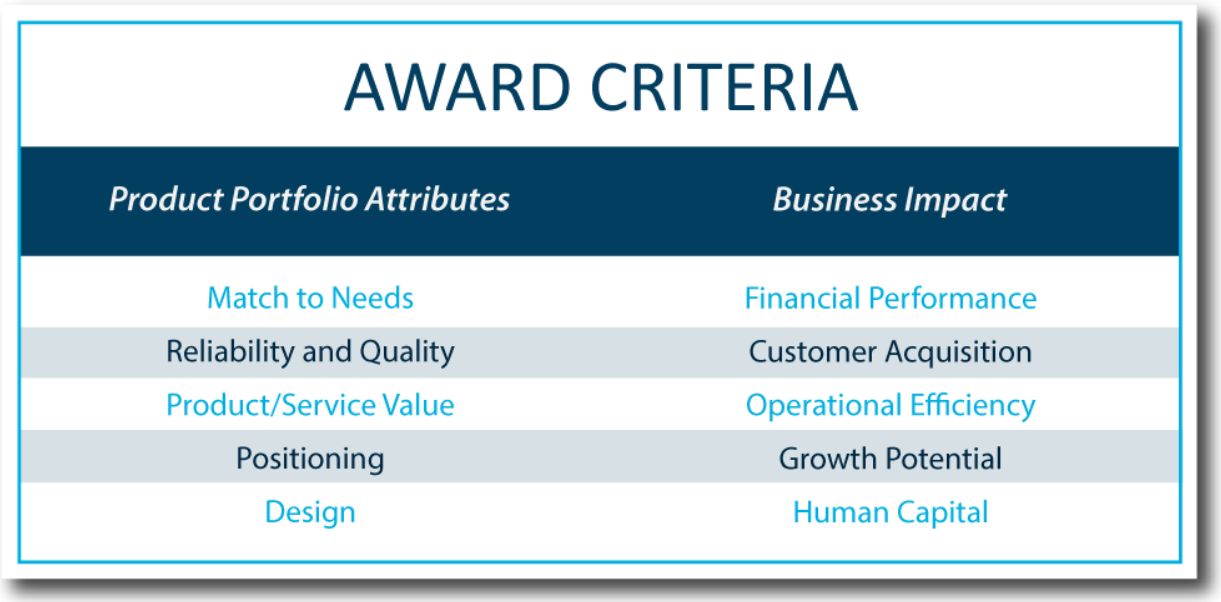
nx filtration

FROST & SULLIVAN

2024 BEST PRACTICES AWARD

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each Award category before determining the final Award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. NX Filtration excels in many of the criteria in the NF membrane-based municipal W&WWT space.



Empowering Sustainable Water Solutions with Membrane Treatment Systems

Membrane treatment systems are advanced filtration technologies that address various challenges associated with water stress (e.g., droughts, lack of adequate rainfall, and pollution) while promoting sustainable water management practices. The critical benefit of membrane treatment systems lies in their capacity to produce high-quality water sustainably. Moreover, their scalability and adaptability make them versatile in treating diverse water sources for multiple purposes across different settings - including industrial, municipal, and residential areas. Significant characteristics of these technologies include their relatively low footprint and availability to cater to micropollutant removal, treated water reuse, and seawater or brackish water desalination. Notably, these solutions enable end users to enhance overall resilience to interruptions induced by climate change or weather while implementing a circular economy.

As enterprises and end-users increasingly explore sustainable water management solutions, the worldwide community is investing in the circular economy of water, thereby boosting the adoption of membrane treatment systems. Frost & Sullivan estimates that the global membrane treatment systems market will grow to $27.04 billion by 2028 with a compound annual growth rate (CAGR) of 6.5%.[1] Within this context, the municipal membrane treatment systems market will grow by a CAGR of 6.9%% between 2022 and 2028.[2]

[1] *Global Membrane Water and Wastewater Treatment Systems Market* (Frost & Sullivan, July 2023)
[2] Ibid.

Moreover, municipal and industrial customers actively embrace water transition to mitigate water stress or scarcity risks and impacts. Water transition entails shifting the current form or pattern of water use, management, and infrastructure toward a more sustainable model. Frost & Sullivan finds the primary driver of its growth lies in its versatile treatment technology, adaptable for both water and wastewater treatments[3]. Additionally, its modular and scalable nature allows manufacturers to install it swiftly compared to traditional treatment solutions. Numerous countries, including France, Spain, the United Kingdom (UK), Denmark, Belgium, Germany, Italy, India, China, the United States (US), Taiwan, the Philippines, Namibia, South Africa, and various nations in the Middle East and North Africa, have all established water reuse policies mandating municipal wastewater treatment at facilities capable of direct or indirect potable reuse.[4] The acceptance and adoption of treated wastewater reuse are on the rise globally.

NX Filtration's HFNF Technology: Game-changing Capabilities

Founded in 2016 and headquartered in Enschede, Netherlands, NX Filtration is a membrane solution provider and developer of hollow fiber nanofiltration (HFNF) technology that can leverage water transition trends. The company has spent nearly a decade building and refining its product portfolio, enabling use cases in all facets of the NF membrane-based water & wastewater treatment (W&WWT) ecosystem (e.g., industrial and municipal wastewater). Thus, the HFNF solution applies to various industries and empowers stakeholders throughout the value chain - including municipal water treatment, industrial manufacturing, agriculture, food and beverage, pharmaceuticals, commercial real estate, government, environmental, and research institutions.

> *"Frost & Sullivan highlights that key growth drivers for NX Filtration include repeat projects, client acquisition through strategic partnerships with equipment manufacturers, customer acceptance of the HFNF membrane technology, and the success of pilots that translated into demo and full-scale plants."*
>
> ***- Paul Hudson***
> ***Senior Industry Analyst***

NX Filtration's solutions can support water reuse and remove emerging contaminants through a distinctive low-fouling hollow fiber configuration capable of removing organics, color, micropollutants, and water hardness. The company's HFNF membranes effectively target suspended solids, turbidity, bacteria, viruses, protein, colloidal silica, nano plastics, micropollutants, color, humic acids, and per- and poly-fluoroalkyl substances (PFAS), as well as selective salts and partial softening.

One significant difference is the company's single-step membrane filtration process, which incorporates a micro strainer or sand filtration before membrane filtration. Unlike other methods, additional pretreatment is not necessary. This crucial aspect enables municipalities to purify their water supplies sustainably while also being cost-effective, as it reduces energy consumption by eliminating the need for extensive pretreatment. For instance, NX Filtration allowed a wastewater treatment plant in the Netherlands to effectively remove micropollutants from the wastewater effluent before discharging it

[3] Ibid.
[4] Ibid.

into an environmentally sensitive local water stream. HFNF achieved a 97% rejection rate for total organic carbon and over 80% rejection for a mixture of micropollutants, predominantly pharmaceuticals.[5]

As part of its quality assurance process, NX Filtration certifies all its products to comply with industry-related standards and certifications. For example, the company has approvals from the National Sanitation Foundation, KTW Technology, and the independent Dutch Water Research Institute. This last institution evaluated the retention of different PFAS compounds using HFNF membranes. The research involved dosing PFAS into actual surface water and municipal effluent streams to assess their removal efficiency. The study concluded that when testing HFNF with PFAS20, a group of substances under European Union monitoring for regulation, NX Filtration's membrane exhibited an average retention rate of 94.7%.[6]

Furthermore, the company employs a patented layer-by-layer process to manufacture its products, depositing multiple nano-scale layers onto a membrane support. Its approach enables very precise and controlled rejection and flux properties of the membrane. NX Filtration's patent portfolio comprises nine patent families, with 50 granted patents, including 14 awarded in 2023.[7]

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>
> ***- Valentina Barcia***
> ***Best Practices Research Analyst***

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Strategic Collaboration with OEMs: Growth Strategy Central Pillar

As the market adopts new regulations and investment strategies driven by factors like droughts and water pollution, NX Filtration emerges as a standout with its compelling solution. The company recognizes countries' priorities for implementing new strategies. For instance, in March 2023, France introduced 53 measures to share, reuse, and conserve water with the goal of achieving 10% wastewater reuse by 2030, compared to less than 1% currently. The French government has established a target of developing 1,000 new reuse projects by 2027.[8] Also, Spain announced a €2.2 billion package in May 2023 to address the impact of drought, while Germany announced new limit values for PFAS in drinking water in June 2023.[9] In addition, the European Union's implementation of new regulations mandates the safe reuse of treated

[5] https://nxfiltration.com/solutions/removal-of-micropollutants-from-municipal-wastewater-after-biological-treatment/. Accessed March 2023.
[6] https://nxfiltration.com/solutions/pfas-retentions-of-direct-nanofiltration-validated-by-kwr/. Accessed March 2024.
[7] https://nxfiltration.com/app/uploads/2023-Annual-Report.pdf. Accessed March 2024.
[8] https://www.anses.fr/en/content/reuse-non-potable-water#:~:text=In%20its%20water%20plan%2C%20the,developing%201000%20projects%20by%202027.&text=The%20reuse%20of%20non%2Dpotable,it%20into%20the%20natural%20environment. Accessed March 2024.
[9] https://nxfiltration.com/app/uploads/2023-Annual-Report.pdf. Accessed March 2024.

wastewater in agricultural irrigation, marking a widespread adoption across the region.[10] The Water Reuse Regulation establishes standardized minimum water quality standards to promote the safe reuse of treated urban wastewater, thereby enhancing the potential for increased water reuse in Europe.

Similarly, in the US, the government proposed the first-ever national drinking water standard for PFAS in March 2023. Specifically, Colorado and California have enacted regulations allowing for direct potable reuse, which may serve as a model for adoption by other states across the US.[11]

Regarding the APAC region, in March 2023, Indonesia expressed its interest in having 100% universal water coverage and announced investing in water treatment and supply infrastructure.[12] In China, various cities increased their use of recycled water since 2020. This trend occurred amid intensified nationwide efforts to establish more water-saving cities. In line with these efforts, China aims to increase the utilization rate of recycled water in water-scarce cities at the prefecture level and above by over 25% by 2025.[13] Meanwhile, in India, the government aims to increase the reuse of treated wastewater to 50% by 2030, representing a substantial scaling up of reuse efforts over the next decade.[14]

Frost & Sullivan applauds the way that NX Filtration has established a product-led, customer-focused strategy and consistently brings to market best-in-class products that meet customer and market demands. Over the years, the company has helped numerous municipalities ensure access to enhanced water sources in various countries, including Indonesia, Vietnam, and Sweden.

To acquire new customers, the company actively collaborates with original equipment manufacturer (OEM) partners (e.g., Veolia, Aqualia, Suez, and Nijhuis Saur) to deploy its direct nanofiltration technology, aligning with these market trends. This strategy allowed NX Filtration to grow on full-scale projects with large orders from various OEMs that have entered into cooperation agreements, with substantial orders from companies like Greentech in China and Hydroflux in Australia. Likewise, in Europe, the company secured follow-on orders from clients such as Ekopak, a Belgian Water-as-a-Service company, and Envirogen, a UK-based industrial water treatment provider.[15]

Moreover, in March 2024, NX Filtration announced a strategic partnership with TZW-DVGW (Technologiezentrum Wasser, German Water Centre). The partnership aims to assess the effectiveness and economic feasibility of NX Filtration's hollow fiber nanofiltration for PFAS removal through comprehensive pilot tests at five waterworks throughout Germany. This announcement testifies to the company's effort to assist clients in meeting new German regulations concerning PFAS-group limits, particularly with specific deadlines set for PFAS20 by January 2026 and PFAS4 by January 2028.[16]

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[10] https://environment.ec.europa.eu/news/water-reuse-new-eu-rules-improve-access-safe-irrigation-2023-06-26_en#:~:text=The%20Water%20Reuse%20Regulation%20sets,the%20uptake%20of%20this%20practice. Accessed March 2024.
[11] https://www.epa.gov/waterreuse/recent-and-upcoming-water-reuse-activities#:~:text=With%20this%20project%2C%20San%20Bernardino,treated%20water%20for%20groundwater%20replenishment. Accessed March 2024.
[12] https://worldwaterforum.org/blog/news-3/the-government-of-indonesia-talked-water-as-main-priority-for-development-in-swa-side-event-38. Accessed March 2024.
[13] https://worldwaterforum.org/blog/news-3/the-government-of-indonesia-talked-water-as-main-priority-for-development-in-swa-side-event-38. Accessed March 2024.
[14] https://www.ceew.in/sites/default/files/scaling-wastewater-reuse-treatment-and-management-india.pdf. Accessed March 2024.
[15] https://nxfiltration.com/app/uploads/2023-Annual-Report.pdf. Accessed March 2024.
[16] https://nxfiltration.com/knowledge-base/publications/nx-filtration-and-tzw-dvgw-partner-for-pfas-removal-from-drinking-water/. Accessed March 2024.

While evolving from a product standpoint, NX Filtration never loses sight of its customers' perspective. Given today's landscape, Frost & Sullivan believes the company is in a prime position to increase its market share in the NF membrane-based municipal W&WWT market.

The Road Ahead

Throughout the years, NX Filtration has capitalized on the increasing market's trend of addressing global water challenges. Its commercial strategy is to invest in pilot systems initially deployed as mobile units at customers' sites to evaluate water treatment performance. Over time, these pilot systems evolve into demonstration (demo) systems that are larger in scale to establish optimal process parameters and conditions for the eventual implementation of full-scale plants. Pilot projects are a crucial foundation for NX Filtration's expansion, setting a solid groundwork for recurring revenues from repeat projects and module replacements in the long term. Notably, the company has initiated 490 pilot projects since 2020.[17]

NX Filtration demonstrates high-growth potential. The company holds a strong market position with an industry-leading product that delivers exceptional value, particularly in high-demand sectors. In 2023, NX Filtration initiated 209 pilot projects, a 25% growth compared to 2022.[18] Furthermore, in 2023, it recorded €8.1 million in annual revenue. Its clean municipal water business line reached €2,613 thousand, increasing from €2,569 thousand in 2022. In 2023, membrane sales by NX Filtration facilitated the production of 254 billion liters of clean water, equivalent to the drinking water supply for 46 million people for one year. Additionally, the company provided access to clean water across 35 countries.[19]

NX Filtration's new membrane production facility will become operational in H1, with the capability to scale up production to manufacture 120,000 membrane modules annually. Frost & Sullivan highlights that key growth drivers for NX Filtration include repeat projects, client acquisition through strategic partnerships with equipment manufacturers, customer acceptance of the HFNF membrane technology, and the success of pilots that translated into demo and full-scale plants.

Conclusion

To be a product leader, a company needs to understand the market's needs and deliver a solid solution designed and embedded with high-quality and reliable performance. Frost & Sullivan finds that NX Filtration embodies this concept and exemplifies it with best practice implementation. Its hollow fiber nanofiltration (HFNF) technology offers a chemical-free, energy-efficient, and cost-effective solution for purifying water supplies, enabling municipalities to achieve cleaner water. The adaptability of HFNF to serve various industries is a critical factor for success. Its unique single-step membrane filtration process, which eliminates the need for additional pretreatment, positions the company to favorably capitalize on new growth opportunities in a high-demand market. Moreover, with a solid commercialization strategy of deploying pilots and collaborating with original equipment manufacturer partners, NX Filtration further cements its worldwide expansion. With its strong overall performance, NX Filtration earns the 2024 Frost & Sullivan Global Product Leadership Award.

[17] https://nxfiltration.com/investors/investor-news/nx-filtration-reports-2023-results/. Accessed March 2024.
[18] Ibid.
[19] Ibid.

What You Need to Know about the Product Leadership Recognition

Frost & Sullivan's Product Leadership Award recognizes the company that offers a product or solution with attributes that deliver the best quality, reliability, and performance in the industry.

Best Practices Award Analysis

For the Product Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Product Portfolio Attributes

Match to Needs: Customer needs directly influence and inspire the product portfolio's design and positioning

Reliability and Quality: Products consistently meet or exceed customer expectations for performance and length of service

Product/Service Value: Products or services offer the best value for the price compared to similar market offerings

Positioning: Products serve a unique, unmet need that competitors cannot easily replicate

Design: Products feature innovative designs, enhancing both visual appeal and ease of use

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

About Frost & Sullivan

Frost & Sullivan is the Growth Pipeline Company™. We power our clients to a future shaped by growth. Our Growth Pipeline as a Service™ provides the CEO and the CEO's growth team with a continuous and rigorous platform of growth opportunities, ensuring long-term success. To achieve positive outcomes, our team leverages over 60 years of experience, coaching organizations of all types and sizes across 6 continents with our proven best practices. To power your Growth Pipeline future, visit Frost & Sullivan at http://www.frost.com.

The Growth Pipeline Engine™

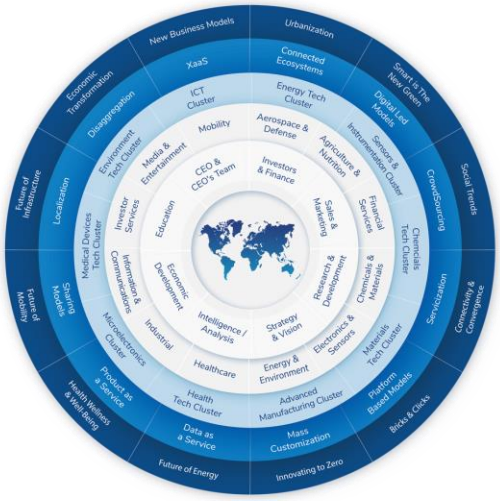
Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™.
Learn more.

Key Impacts:

- **Growth Pipeline:** *Continuous Flow of Growth Opportunities*
- **Growth Strategies:** *Proven Best Practices*
- **Innovation Culture:** *Optimized Customer Experience*
- **ROI & Margin:** *Implementation Excellence*
- **Transformational Growth:** *Industry Leadership*

The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.



Analytical Perspectives:

- Mega Trend (MT)
- Business Model (BM)
- Technology (TE)
- Industries (IN)
- Customer (CU)
- Geographies (GE)