



**EXCLUSIVE INTERVIEW**

# ENG. ESSAM M. ZAHRA

## ADVANCING WATER SECURITY AND SUPPLY CHAIN RESILIENCE

Insights, strategies, and innovations for a sustainable water future.

### FILTRALITE®

**From Bottleneck to Breakthrough:**  
Rethinking Filter Media in Modern Water Infrastructure



**End-to-End Pumping Solutions:**  
From Engineering Studies to Commissioning



**Binder's Role in Optimizing Energy Consumption in Wastewater Treatment Systems**



**Operational Sustainability Behind the Scenes:**  
Why Next Turbo Redefines Maintenance & Reliability Standards?





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# Innovative Solutions to Achieve Sustainability in Water and Energy

## From The Editor

The global water sector is navigating a period of profound and undeniable transformation. Once managed primarily as a traditional background utility, water security has rapidly ascended to the forefront of national resilience, economic stability, and sustainable development. Driven by the escalating realities of climate whiplash, where communities must pivot seamlessly between prolonged, intense droughts and severe, overwhelming flood events, the demand for adaptive, future-ready infrastructure has never been more urgent.

This issue explores the innovative engineering solutions and strategic frameworks redefining how we protect, treat, and manage this critical resource. In our exclusive interview, Eng. Essam M. Zahra details how the National Water Works Company (NWWC) is aligning with Saudi Arabia's Vision 2030. Backed by the five-decade water-sector legacy of Al-Mousa Group, NWWC demonstrates how local execution strength, bold strategic inventory, and end-to-end lifecycle performance can fortify vital supply chains against global disruptions.

Beyond macro strategies, true systemic resilience is often achieved by rethinking overlooked components. We examine how advanced filter media technologies like Filtralite are transitioning from simple consumables to core engineering tools that maximize existing plant efficiency. Achieving true systemic resilience also requires bridging the operational gaps between system

design and long-term maintenance. We examine how Al Mousa Trading Co. addresses this by pioneering integrated pumping and fire protection solutions, managing everything from initial hydraulic calculations to ongoing maintenance under a single, unified strategy.

Furthermore, we dive into wastewater facility sustainability. With Italian industry leader Next Turbo Technologies (NTT) shattering "black box" constraints through field-serviceable, non-proprietary blowers engineered to last over 25 years, operators are achieving complete management autonomy. When coupled with Binder's intelligent VACOMASS® airflow systems, facilities can realize over 40% energy savings.

Finally, we look at the digital revolution. By combining physical domain expertise with artificial intelligence and machine learning, water professionals are now predicting infrastructure failures, optimizing precision irrigation, and transforming harsh operational data into decisive, actionable insights. Together, these advancements show that the future of water security belongs to those who successfully couple engineering reliability with strategic digital readiness.



**Mohamed Khalifa**

Founder and CEO

**COMPANY:**

AQUA ENERGY EXPO LLC

**ADDRESS:**

(ST. PETERSBURG, FLORIDA USA 33702)  
(L23000439864), EIN (61-2116509)



**Email Address:**

Info@aquaenergyexpo.com



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**Mohamed Khalifa**  
 Founder and CEO

Team leader  
**Heba Sayed**

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- Omnia Gamal
- Nesma Saeed
- Walaa Mohamed

### Content Writers

#### Water Section

- Hadeer Omar
- Aya Mohsen

#### Energy Section

- Omnia Gamal

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- Heba Taha

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- Hadeer Omar
- Haidy Walid
- Khlood Khaled
- Heba Taha

### Social Media Team

- Heba Taha

### Knowledge Hub Team

- Esraa Hany

## Marketing Team

- Heba Sayed : Heba@aquaenergyexpo.com
- Esraa Hany : Esraa@aquaenergyexpo.com
- Khlood Khaled : Khlood@aquaenergyexpo.com
- Haidy Walid : Haidy@aquaenergyexpo.com
- Hagar Wali : Hager@aquaenergyexpo.com

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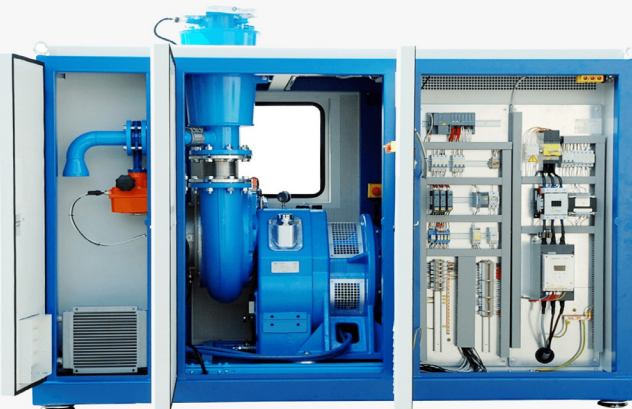


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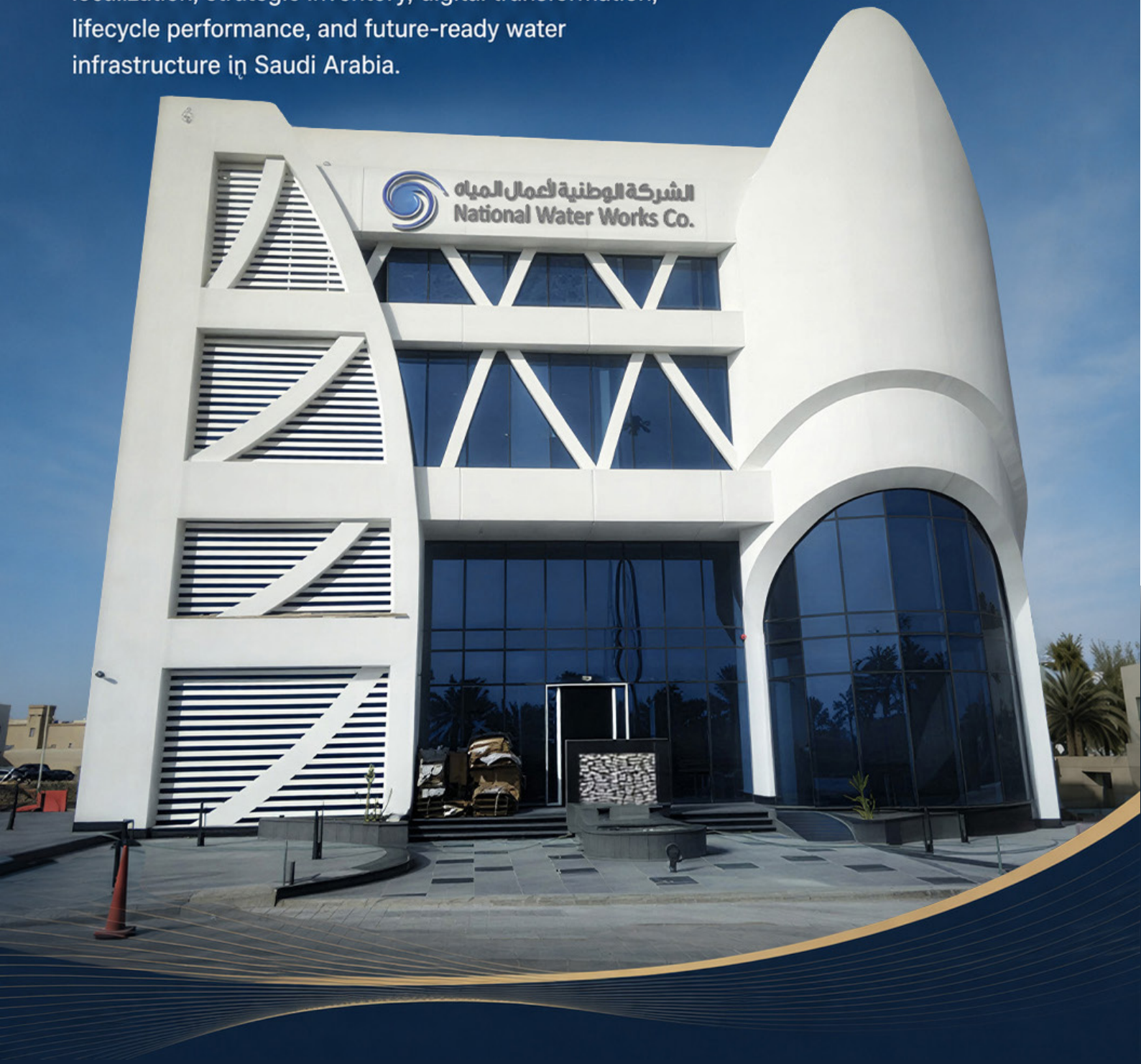
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EXCLUSIVE INTERVIEW



# Eng. Essam M. Zahra on Advancing Water Security and Supply Chain Resilience

A media-ready executive conversation on NWWC's role in localization, strategic inventory, digital transformation, lifecycle performance, and future-ready water infrastructure in Saudi Arabia.



Water is not only a utility. It is the foundation of national resilience, industrial growth, and sustainable development.

## NWWC's role in Saudi Arabia's water transformation

National Water Works Company (NWWC) is part of a long-standing water-sector legacy through Al-Mousa Group. Today, the company's role extends beyond supply and installation into integrated engineering solutions, lifecycle support, localization, and strategic contribution to Saudi Arabia's water security agenda.

### Executive profile

- Agri-Mechanical Engineer with a Mini MPA in Business Communication.
- More than 30 years of experience in water pumping systems, water handling equipment, and major project management across the Gulf region.
- CEO and Board Member of National Water Works Company (NWWC), Saudi Arabia.

### NWWC strategic position

- Active across supply and installation, commercial water services, O&M, EPC projects, and maintenance and after-sales services.
- Supports water and wastewater infrastructure, desalination, treatment, pumping stations, wells, pipelines, and transmission networks.
- Combines in-house technical expertise with partnerships with leading global manufacturers.
- Aligned with the Kingdom's Vision 2030 water-sector transformation and local-content priorities.

NWWC's next chapter is not only about supplying water solutions. It is about helping secure the Kingdom's water future.



## Eng. Essam M. Zahra

CEO of National Water Works Company (NWWC)

**25+ years**

Group legacy in Saudi water sector

**SAR 2B+**

Accumulative

**300+**

Workforce across the Group

**7.5M m<sup>3</sup>/day**

Pumping contribution across NWWC equipment

**\$80B**

Planned desalination investment

**14,000 km**

Water transmission network

**70%**

Treated wastewater reuse target by 2030

## 1. To begin, how would you describe your journey in the water industry?

My journey has always been connected to practical engineering, water movement, and the delivery of reliable systems under real operating conditions. I am an Agri-Mechanical Engineer with a Mini MPA in Business Communication, and I have spent more than 40 years working across water pumping systems, water handling equipment, and major project management throughout the Gulf region.

Today, as CEO and Board Member of National Water Works Company, I see my role as a continuation of that journey, but with a broader mandate. The industry is no longer only about products, supply, or project execution. It is about resilience, national readiness, operational continuity, and the ability to support the Kingdom’s long-term water security objectives.

As the original water-sector company within Al Mousa Group, NWWC carries a legacy that extends over more than five decades in Saudi Arabia’s water industry. Through its platform, several specialized companies were established and developed, including TDS, FBC, NEWC, and NMI — shaping an integrated ecosystem that continues to support the Kingdom’s growing water infrastructure sector. This long-standing heritage is more than a history of success; it is a responsibility that drives NWWC to preserve the highest standards of technical reliability while continuously modernizing its solutions, services, and market approach to meet the evolving demands of the future.



## 2. Why Has Water Security Become One of Saudi Arabia’s Most Strategic Priorities Today?

As Saudi Arabia continues its rapid urban, industrial, and economic growth, water security has become a critical pillar of sustainable development. With limited natural freshwater resources and rising demand, the Kingdom is heavily investing in desalination, water reuse, strategic storage, and smart infrastructure in line with Saudi Vision 2030 and the National Water Strategy to build a more resilient and sustainable water sector.

In this evolving landscape, NWWC continues to support the Kingdom through reliable and sustainable water solutions backed by decades of technical expertise. The company believes that groundwater aquifers and deep wells remain among the most dependable water sources during critical conditions, which has positioned NWWC as a leading provider of borehole pumping solutions that enhance water security and ensure operational continuity across Saudi Arabia.





### 3. How Does NWWC Translate Saudi Arabia’s Water Vision into Integrated Solutions?

Aligned with Saudi Vision 2030 and the National Water Strategy, NWWC has evolved from a traditional pumping equipment supplier into a provider of integrated water solutions that support the Kingdom’s infrastructure and sustainability goals.

Through five core business channels Commercial, Supply & Installation Projects, EPC Projects, Operations & Maintenance, and Maintenance & After-Sales Services the company supports clients across the full project lifecycle, from technical consultation and installation to commissioning, maintenance, spare parts, and long-term operational support.

Backed by decades of expertise, NWWC delivers advanced pumping systems and turnkey solutions across water treatment, desalination, transmission networks, pumping stations, water wells, and wastewater facilities ensuring reliable performance and sustainable water infrastructure across Saudi Arabia.

### 4. How is NWWC strengthening supply chain resilience and operational continuity?

Supply chain resilience has become a major strategic priority. Global disruptions, geopolitical risks, and delivery constraints have shown that water infrastructure companies must think beyond traditional procurement. At NWWC, we are strengthening supplier diversification, improving logistics visibility, and expanding local capabilities to reduce exposure to disruption.

One of the most important pillars is our bold approach to inventory. We consider strategic stock a business continuity tool, not simply a cost item. By carrying selected critical and fast-moving items, NWWC protects delivery schedules, accelerates emergency response, and gives customers a higher level of confidence when timing is critical.

This inventory courage is part of our supply chain philosophy. It supports project execution, maintenance response, after-sales service, and spare parts availability. In a sector as critical as water, readiness is not optional; it is part of the value proposition.

## 5. What role do localization and in-Kingdom capability play in NWWC's next phase?

Localization has become a core pillar of NWWC's long-term strategy, aligned with Saudi Vision 2030 and the Kingdom's direction toward stronger local content and industrial development. The company is expanding its in-Kingdom manufacturing, assembly, technical services, and operational support capabilities to enhance service reliability, delivery speed, and supply chain resilience.

A key driver of this transformation is NMI, which has evolved into a strategic industrial platform supporting pumps, mechanical systems, assembly, testing, and technical services. One of its major milestones was the development of LEO KSA, strengthening the Group's presence in the commercial and project pumps market while improving local responsiveness and after-sales support.

At the same time, NWWC continues to collaborate with global technology leaders such as Franklin Electric to combine international technology with Saudi execution strength, supporting knowledge transfer, future localization opportunities, and sustainable industrial growth within the Kingdom.

## 6. How is digital transformation changing the way NWWC operates?

Digital transformation is directly linked to operational efficiency. One of NWWC's strategic objectives is to accelerate automation, integrate advanced technologies, and improve process visibility. For us, this means building faster, smarter, and more transparent operations.

We are working toward more agile and digitally enabled logistics and supply chain models. Better visibility across procurement, project cycles, delivery, maintenance, and after-sales support allows us to improve response speed and decision quality.

Digital transformation is also important for the wider market.

Saudi Arabia is moving toward smart water infrastructure, AI-enabled water management, IoT-supported systems, smart metering, and stronger resource efficiency. NWWC must be part of this shift, not only as a supplier, but as an execution and service partner.



## 7. Which market segments represent the strongest growth opportunities?

The Saudi water sector is expanding across several fronts. Desalination remains a backbone of potable water supply, while wastewater treatment and reuse are becoming increasingly important for sustainability, agriculture, industry, and circular water economy objectives.

Industrial and commercial water services are also becoming more attractive as economic diversification creates higher demand from manufacturing, mining, petrochemicals, food and beverage, commercial buildings, and new urban developments. These sectors require treatment, pumping, filtration, reuse, firefighting, & reliable lifecycle service.

Agriculture is another important area because it is one of the largest water-consuming sectors. The movement toward precision irrigation, treated wastewater reuse, and efficient water management creates a broader opportunity for technical solutions that reduce water intensity while supporting food security.

## 8. How does NWWC support mega projects and national development programs?

NWWC is proud to contribute to major national developments such as NEOM, the Red Sea, Qiddiya, and AMAALA. These projects require more than equipment supply. They require reliable engineering, supply chain discipline, lifecycle support, and the ability to meet demanding project requirements.

Mega projects are reshaping expectations in the water sector. They require future-ready infrastructure, sustainability alignment, technical flexibility, and trusted partners who understand the local operating environment. This is where NWWC's integrated model creates value.

Our objective is to support these projects with resilient water and wastewater solutions that match the ambition of Saudi Arabia's transformation and contribute to long-term infrastructure performance.



## 9. What does lifecycle performance mean for NWWC?

Lifecycle performance means that our responsibility does not stop at delivery. Water assets must continue to perform safely, efficiently, and reliably after installation. This is why operations support, preventive and corrective maintenance, testing and commissioning, workshop services, spare parts, and after-sales support are essential parts of our value proposition.

NWWC's maintenance and after-sales services are designed to improve reliability, extend equipment life, reduce downtime, and maintain compliance with project and manufacturer requirements. This is particularly important for critical water infrastructure, where failure can have operational, financial, and public-service consequences.

In practical terms, we want customers to see NWWC as a long-term performance partner, not only as a project vendor.

## 10. What is the message you want the market to associate with NWWC?

The message is simple: NWWC is ready for the next phase of the Saudi water sector. We bring technical depth, local presence, global partnerships, strategic inventory, lifecycle support, and a clear understanding of the Kingdom's water security priorities. Our vision is to be the number one strategic partner in the water industries. That requires more than growth. It requires trust, reliability, innovation, customer focus, governance, and consistent execution.

At NWWC, we are not only delivering water solutions. We are contributing to a broader national vision: stronger water security, industrial growth, sustainable infrastructure, and long-term resilience for Saudi Arabia.

“The future of the water sector will belong to companies that combine engineering reliability with strategic readiness, local capability, and long-term service commitment.”

**NWWC**الشركة الوطنية لأعمال المياه  
National Water Works Co.**NWWC**Driving the Future of  
**WATER &  
INFRASTRUCTURE**  
SOLUTIONS IN SAUDI ARABIA

Over 50 years of expertise in the water and infrastructure sector.



Integrated solutions covering supply, installation, operation, and maintenance.



Strong support for desalination, treatment, water, and wastewater projects.



Strategic inventory and resilient supply chains ensuring project continuity.



Expanding localization and in-Kingdom capabilities aligned with Vision 2030.



Adopting digital transformation and smart solutions to enhance efficiency.



Contributing to major national projects including NEOM, Red Sea, and Qiddiya.



Focused on sustainability, lifecycle performance, and long-term water security.



## From Bottleneck to Breakthrough: Rethinking Filter Media in Modern Water Infrastructure

In the face of growing challenges in the water sector from rising energy costs to fluctuating raw water quality, performance optimization is no longer optional, but essential.

While most investments focus on major equipment, there is one element that often determines the real performance of a plant: **Filter media**.

Not as a supporting component... but as a critical factor controlling the efficiency and stability of the entire system.

### The Real Bottleneck Inside the Filter

In many water treatment plants, the same operational symptoms appear over time:

- Rapid increase in head loss
- Frequent backwashing cycles
- Reduced effective production capacity
- Fluctuating treated water quality
- Difficulty handling sudden changes in raw water quality

These challenges are not always related to system design... but rather to the physical limitations of conventional filter media.

### Filtralite®: Redefining the Role of Filter Media

What Filtralite offers is not just an alternative material—it is a complete re-engineering of the filtration process itself.

Thanks to its lightweight expanded clay structure with high internal porosity, Filtralite® enables different performance levels within water treatment systems through three main product families:

#### ◆ Filtralite® PURE

Designed for advanced drinking water filtration, with high efficiency in removing organic matter and improving final water quality.

#### ◆ Filtralite® CLEAN

Optimized for conventional filtration upgrades, improving turbidity removal and extending filter run times between backwashing cycles.

#### ◆ Filtralite® AIR

Specialized for biological filtration and aeration processes, supporting biological activity and enhancing treatment efficiency.

## How Filtralite® Re-engineers Filtration Performance

### • True Deep Bed Filtration

Particles are captured throughout the full filter depth, not just at the surface.

### • Balanced Flow Distribution

Reduces channeling and ensures stable hydraulic performance.

### • Higher Dirt Holding Capacity

Extends operational cycles and reduces backwashing frequency.

### • Lower Head Loss

Directly improves energy efficiency and operational cost.

## Case Study: Fredrikstad Drinking Water Treatment Plant – Norway

In the Fredrikstad Drinking Water Treatment Plant in Norway, the filtration system faced operational challenges caused by fluctuating raw water quality and the need for stable long-term performance.

### ◆ Challenges Before Improvement

- Fluctuating raw water quality from Lake Isnesfjorden (connected to River Glomma)
- Turbidity levels reaching up to 10 NTU
- Color levels reaching up to 100 mg Pt/L during extreme periods
- Reduced efficiency with conventional sand/antracite media
- High demand for stable operation and reduced backwashing frequency

### ◆ Role of Filtralite® in the Solution

A trial was conducted by replacing part of the conventional filter media with Filtralite, initially installed above the existing sand layer in one filter and operated in parallel with the other filters.

#### This approach enabled:

- Improved deep filtration performance instead of surface-limited filtration
- Better resilience against raw water quality variations
- Enhanced flow distribution within the filter bed
- Increased system stability under variable conditions

### ◆ Operational Results

- Longer filter run times compared to sand/antracite filters
- Stable and consistent water quality performance
- Effluent turbidity reduced to 0.06 NTU
- Average filter effluent turbidity around 1.1 NTU
- Stable operation at a filtration velocity of 10 m/h
- Improved overall operational efficiency and system reliability



## From Operational Improvement to Strategic Decision

What these results demonstrate is a fundamental shift in thinking:

Filter media is no longer a consumable component... but a core engineering tool for system-wide performance optimization.

## Why This Shift Matters Today

In today's operating environment, defined by:

- Rising energy costs
- Water quality variability
- Stricter regulatory requirements
- Pressure to maximize existing infrastructure

Improving filtration performance becomes one of the fastest and most impactful solutions.

## Conclusion

The shift from “bottleneck” to “breakthrough” does not always require large infrastructure investments...

Sometimes it starts with rethinking a single core element that has been underestimated for years.

Filtralite® demonstrates that:

Filter media can be the difference between a plant that simply operates... and a plant that operates with stability, efficiency, and long-term reliability.

## FROM BOTTLENECK TO BREAKTHROUGH:

Rethinking Filter Media in  
Modern Water Infrastructure

### Filtralite®

Advanced Filtration  
Performance for  
Sustainable Water  
Treatment



DEEP BED FILTRATION



LOWER HEAD LOSS



REDUCED BACKWASHING FREQUENCY



HIGHER OPERATIONAL STABILITY



ENHANCED WATER QUALITY



#### CASE STUDY HIGHLIGHT:

 **FREDRIKSTAD DRINKING WATER  
TREATMENT PLANT – NORWAY**

“ Filter media is no longer a supporting component...  
but a strategic engineering tool for  
performance optimization. ”



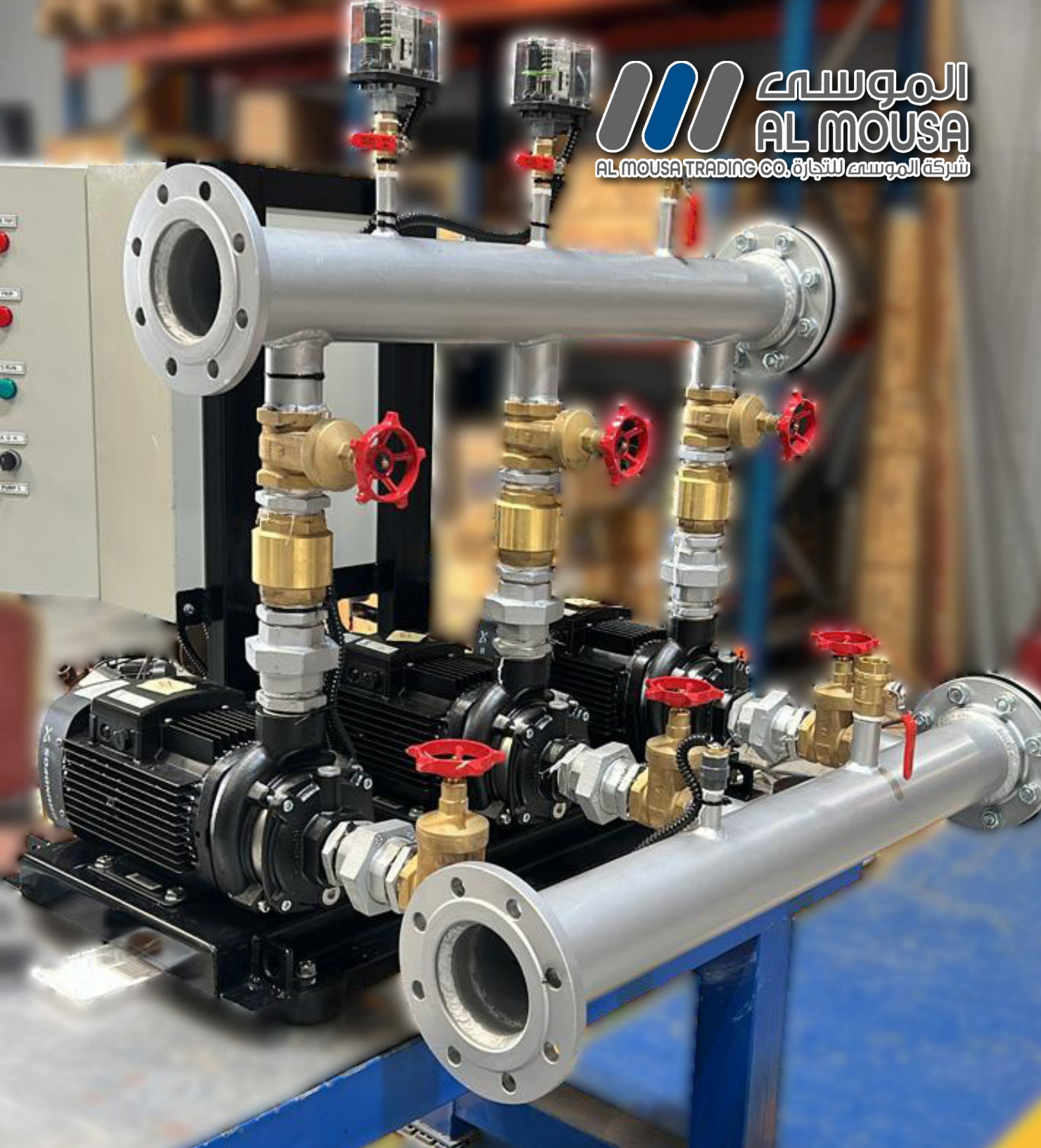
EFFICIENT  
FILTRATION



SUSTAINABLE  
PERFORMANCE



LONG-TERM  
RELIABILITY



**End-to-End Pumping  
Solutions: From Engineering  
Studies to Commissioning**



In today’s fast-evolving construction and infrastructure landscape, the performance of pumping systems plays a critical role in ensuring operational efficiency, safety, and sustainability. However, many projects face challenges not because of equipment quality, but due to gaps between design, supply, installation, and maintenance. This is where end-to-end solutions become essential.

Al Mousa Trading Co. adopts a comprehensive approach to delivering reliable water and fire protection systems covering every stage from initial engineering studies to long-term maintenance and support.

## The Need for Integrated Pumping Solutions

Traditionally, projects involve multiple contractors handling different stages, such as:

- Design consultants
- Equipment suppliers
- Installation teams
- Maintenance providers

**This fragmented approach often leads to:**

- System inefficiencies
- Increased operational risks
- Higher lifecycle costs
- Coordination issues

An integrated solution ensures consistency, accountability, and optimized performance across all stages.

## Comprehensive Service Approach

### 1. Engineering Studies & System Design

Every successful system begins with accurate analysis and design.

**Engineering services include:**

- Hydraulic calculations
- System sizing and selection
- Performance optimization
- Compliance with international standards

Through a detailed understanding of project requirements, each system is designed to ensure efficiency and reliability from day one.

### 2. Supply of High-Quality Equipment

Selecting the right equipment is critical for long-term performance.

### Al Mousa Trading Co. supplies:

- Water supply pumps & wastewater pumps
- Fire protection pumps
- Pressure boosting systems
- Control panels and accessories
- Water treatment & filtration solutions
- Thermal & heating systems
- High-performance piping solutions
- Swimming pools, SPA & water features solutions

The company partners with leading global manufacturers to ensure quality, durability, and compliance.

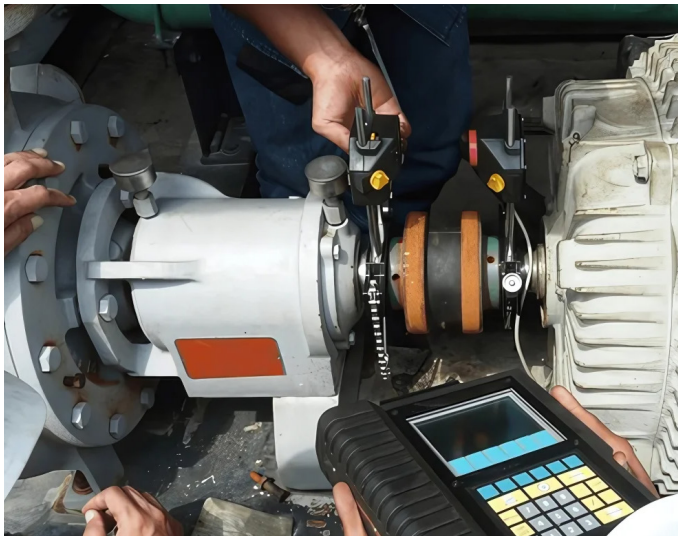
### 3. Testing & Commissioning

A system's effectiveness depends on proper commissioning.

#### This stage includes:

- Verification of proper installation
- Performance testing under real operating conditions
- System calibration and adjustments
- Compliance with project specifications

Thorough testing and commissioning ensure systems operate as intended before handover.



### 4. Maintenance & After-Sales Support

Long-term performance relies on proper maintenance.

#### Services include:

- Preventive maintenance programs
- Corrective maintenance services
- Trouble shooting and repairs
- System performance monitoring

#### These services help to:

- Reduce downtime
- Extend equipment lifespan
- Lower operational costs

## Why End-to-End Solutions Matter

### ✓ Improved System Reliability

Integrated services eliminate gaps between design & execution, ensuring consistent performance.

### ✓ Cost Efficiency

Optimized design and proper maintenance reduce energy consumption & prevent costly failures.

### ✓ Enhanced Performance

Systems are designed, installed, and maintained under a unified strategy, leading to better overall efficiency.

## Applications Across Industries

These solutions support a wide range of sectors, including:

- Residential and commercial developments
- Industrial facilities
- Private and government facilities
- Irrigation and landscaping projects
- Infrastructure and utilities

Each project is approached with a focus on customization, performance, and compliance.

## The Future of Pumping Systems

As technology advances, the integration of smart systems, automation, and data analytics is reshaping the industry. End-to-end service providers are best positioned to adopt and implement these innovations effectively.

Al Mousa Trading Co. continues to evolve its solutions to meet future demands, ensuring clients benefit from modern, efficient, and intelligent systems.

## Conclusion

Reliable pumping systems require more than just high-quality equipment; they demand a holistic approach that covers every stage of the project lifecycle. By combining engineering expertise, quality supply, precise testing & commissioning, and dedicated maintenance, Al Mousa Trading Co. delivers complete solutions that ensure performance, reliability, and long-term value.

## Contact Information

 **Website:** <https://almousatrade.com/>

 **Email:** [info@almousatrade.com](mailto:info@almousatrade.com)

 **Phone Number:** + 966 549 300 388

# END-TO-END PUMPING SOLUTIONS

*From Engineering Studies  
to Commissioning*

*Integrated Water, Fire Protection  
& Infrastructure Solutions*



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& HYDRAULIC DESIGN



HIGH-PERFORMANCE  
PUMPING SYSTEMS



TESTING &  
COMMISSIONING  
SERVICES



PREVENTIVE  
MAINTENANCE &  
TECHNICAL SUPPORT



SMART, RELIABLE &  
ENERGY-EFFICIENT  
SOLUTIONS

## COMPREHENSIVE SOLUTIONS FOR

- ✓ Water Supply Systems
- ✓ Fire Protection Applications
- ✓ Wastewater & Infrastructure Projects
- ✓ HVAC & Thermal Systems
- ✓ Water Treatment & Filtration
- ✓ Swimming Pools & Water Features



## WHY INTEGRATED SOLUTIONS MATTER

- ▲ Improved System Reliability
- ▲ Lower Lifecycle Costs
- ▲ Optimized Operational Performance
- ▲ Reduced Downtime & Maintenance Risks

“ Reliable pumping systems are not built through equipment alone, but through seamless integration across every project stage. ”

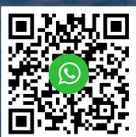
ONE PARTNER. EVERY STAGE. **TOTAL RELIABILITY.**

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## Binder's Role in Optimizing Energy Consumption in Wastewater Treatment Systems

**E**nergy efficiency has become one of the most critical challenges facing modern wastewater treatment plants (WWTPs). Increasing electricity costs, stricter environmental regulations, and global sustainability targets are forcing utilities to rethink traditional plant operation strategies. In most biological wastewater treatment facilities, energy consumption represents the largest portion of operational expenditure. Studies indicate that energy costs account for 45–70% of total operating expenses, with aeration systems alone responsible for nearly 40–60% of total plant energy use.

Within this context, Binder Group plays an important role by delivering intelligent airflow management and advanced aeration control technologies designed to reduce energy consumption while maintaining treatment performance.

### Aeration: The Primary Energy Consumer

Biological treatment processes depend heavily on aeration to supply oxygen for microorganisms responsible for organic matter removal and nitrification.

However, conventional aeration systems often operate using fixed dissolved oxygen (DO) setpoints. These systems fail to respond to real biological demand variations, leading to:

- Over-aeration during low load conditions
- Excessive blower operation
- Increased pressure losses
- Reduced oxygen transfer efficiency

Operational analyses show that inefficient aeration control can increase energy consumption by 25–40% above optimized levels.

According to Binder technical expertise, nearly two-thirds of a wastewater treatment plant’s energy consumption is directly linked to aeration blowers, making airflow management the most effective pathway for energy optimization.

## Smarter Aeration with VACOMASS®

Binder introduces an advanced approach through its VACOMASS® aeration control philosophy. Instead of maintaining constant airflow, the system dynamically adjusts air distribution based on real-time biological parameters such as ammonia concentration and process load.



Dr. Maher AlHammoud, MENA Sales Manager at Binder Group, explains:

“Aeration is the largest energy consumer in wastewater treatment plants. Intelligent airflow control allows operators to reduce operating costs while improving process stability and sustainability.”

Demand-driven aeration ensures that oxygen is supplied only when required, preventing unnecessary energy consumption without compromising effluent quality.

Typical operational improvements achieved through intelligent aeration include:

- 10–30% energy savings through optimized air-flow distribution
- 8–15% additional savings using ammonia-based DO control
- Further reductions through pressure stabilization and diffuser monitoring

Combined energy savings can exceed 40–50% depending on plant configuration and operating conditions.



## Enhancing Oxygen Transfer Efficiency

Oxygen Transfer Efficiency (OTE) is a key factor influencing aeration performance.

Traditional diffused aeration systems frequently operate at OTE values between 5–15%, meaning a significant portion of supplied energy does not contribute effectively to biological treatment.

Binder’s system-level optimization improves:

- Airflow balancing across aeration zones
- Valve pressure losses
- Header pressure stability
- Diffuser performance monitoring

Binder engineering specialists emphasize:

“True efficiency is achieved by optimizing the entire air supply chain—from blower operation to diffuser performance—not by improving isolated components.”

Field experience demonstrates relative OTE improvements of 15–25%, directly reducing air demand and energy consumption.

## Marselisborg Wastewater Plant: From Energy Consumer to Energy Producer

### Marselisborg Wastewater Treatment Plant

A globally recognized example of successful energy optimization is the Marselisborg Wastewater Treatment Plant operated by Aarhus Vand.

#### » Project Background

The plant implemented a comprehensive energy optimization program that included:

- Advanced aeration control strategies
- High-efficiency blower systems
- Real-time process monitoring
- Intelligent airflow management

#### » Verified Operational Results

Measured performance improvements included:

- 25% reduction in total plant energy consumption
- Savings of approximately 1 GWh annually
- 35% reduction in CO<sub>2</sub> emissions
- Achievement of 150% energy self-sufficiency, transforming the facility into a net energy producer.



The Marselisborg case demonstrates how intelligent aeration control plays a central role in transforming wastewater treatment plants into energy-efficient and sustainable infrastructure.

### Lifecycle Performance and Long-Term Reliability

Energy optimization is not limited to immediate savings. Over time, untreated inefficiencies such as diffuser fouling, pressure imbalance, and mechanical wear can increase plant energy consumption by 10–20%.

Binder's integrated control philosophy maintains stable operating conditions by:

- Reducing mechanical stress on blowers
- Maintaining optimal pressure distribution
- Supporting predictive maintenance strategies
- Stabilizing biological treatment performance

Since energy represents more than 60% of lifecycle operating costs, sustained efficiency improvements generate substantial long-term economic benefits.

### Toward Energy-Positive Wastewater Treatment Plants

The wastewater industry is moving toward the concept of energy-positive treatment plants—facilities capable of producing more energy than they consume.

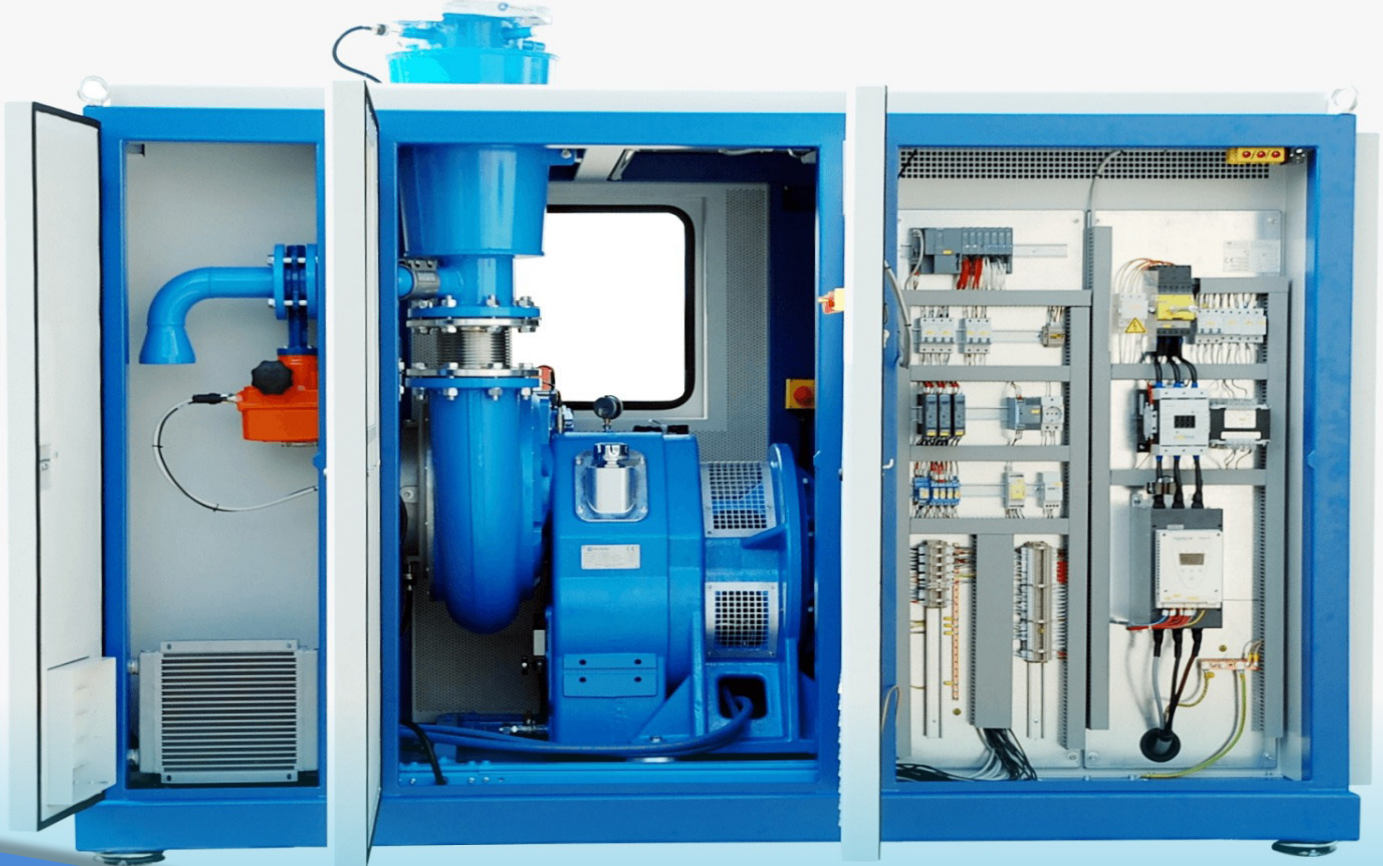
Intelligent aeration management is a key enabler of this transformation.

Through advanced airflow measurement, dynamic valve control, and ammonia-based process optimization, Binder contributes to:

- 20–35% baseline aeration energy reduction
- Improved nitrogen removal efficiency
- Reduced chemical consumption
- Lower overall carbon footprint

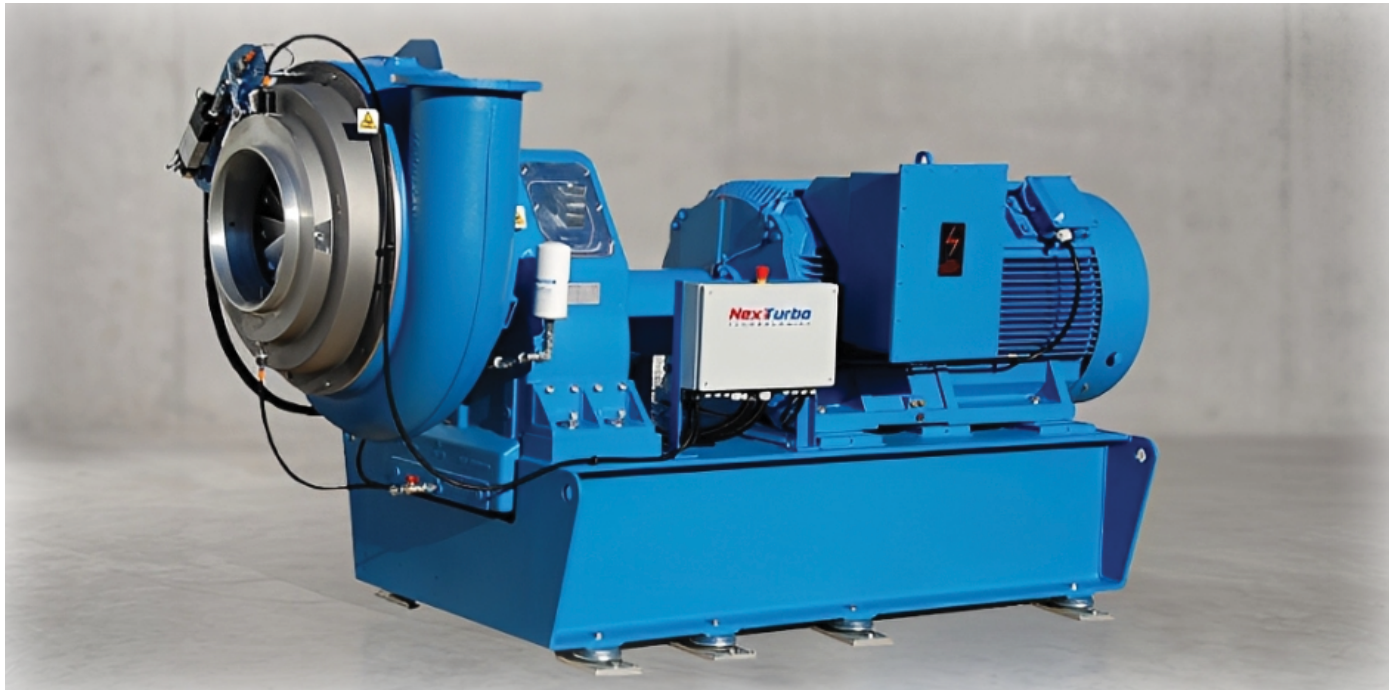
Dr. AlHammoud concludes:

“Transforming aeration from a fixed mechanical process into a demand-driven biological control system is essential for the future of sustainable wastewater treatment.”



## Operational Sustainability Behind the Scenes: Why Next Turbo Redefines Maintenance and Reliability Standards?

**Maintenance is not a cost — it's an investment: why Next Turbo's design changes the equation?**



In the design and operation of wastewater treatment plants (WTP), the primary focus is often placed on energy efficiency—especially when selecting key equipment such as air blowers, which play a central role in aeration systems, the quality of air blowers is not merely measured by their initial efficiency, but by their ability to operate reliably for decades with minimal downtime. Next turbo technologies (NTT), the Italian industry leader, has established a new market benchmark under the philosophy of "engineering for sustainability," however, with the growing scale and complexity of modern facilities, it has become increasingly clear that maintenance is not a secondary consideration, but a decisive factor that can determine long-term system success.

In this article, next turbo technologies highlight an important perspective: a long equipment lifetime has little value without effective maintenance and secure spare parts availability.

### • The "field-serviceable" philosophy:

Most modern blowers, such as air foil or magnetic bearing types, rely on a "black box" design. In these systems, if an internal component fails, it is often impossible to repair on-site, forcing the operator to ship the entire unit back to factory.

In contrast, NTT blowers utilize an integrally geared design that allows full access to all internal components. This means any maintenance or repair task can be performed on-site by trained technicians, reducing downtime from months to mere days.

This enables what is known as: remaining life assessment "the ability to estimate the remaining lifetime of components and take proactive, data-driven decisions".

Maintenance strategies have evolved significantly—from reactive repairs to proactive asset management.



- **Design lifetime: 25+ years of confidence:**

There is a fundamental difference between "equipment life" and "technology life." systems heavily dependent on complex electronics and high-speed VFDs often suffer from obsolescence within less than 10 years, making it difficult to source replacement control boards.

Next turbo blowers, however, designs its core mechanical components—such as gears and bearings—for a design lifetime of 25+ years. This mechanical durability ensures that an investment in NTT blowers is a secure, long-term asset for future generations.

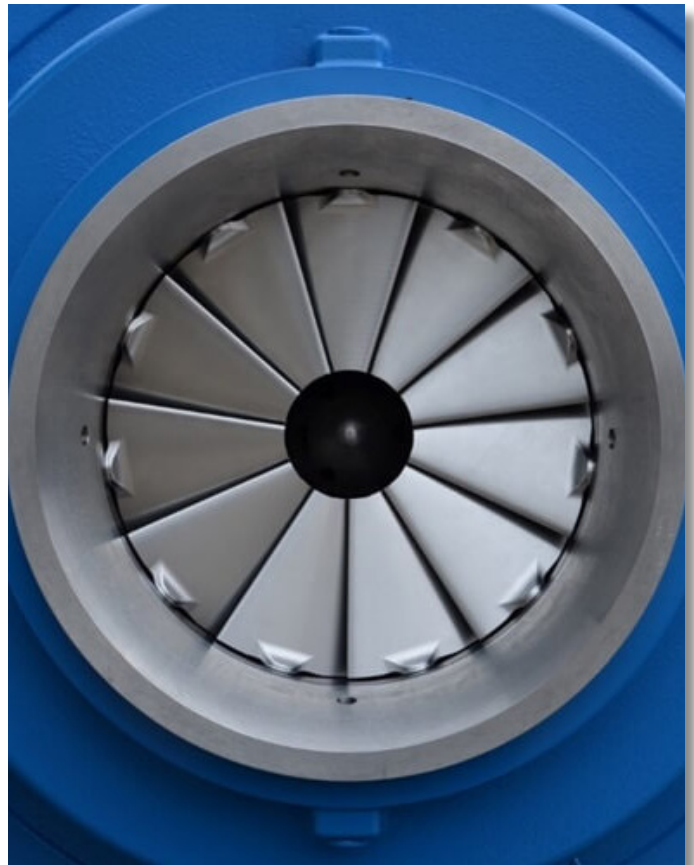
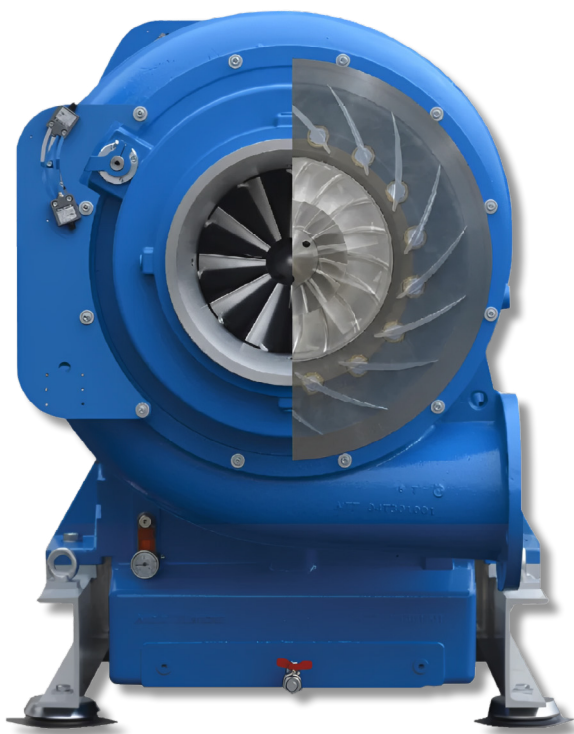
- **Bearing robustness in crisis situations:**

bearings are the most critical point in high-speed turbomachinery. NTT blowers utilize:

**Hybrid ceramic bearings:** in smaller series, offering extreme hardness and ease of replacement.

**Hydrodynamic bearings:** in larger units, where a specialized oil film acts as a vibration damper.

The ultimate value of these bearings is proven during a power failure, NTT's mechanical bearings are self-protected by a continuous lubrication system, making them truly heavy-duty.



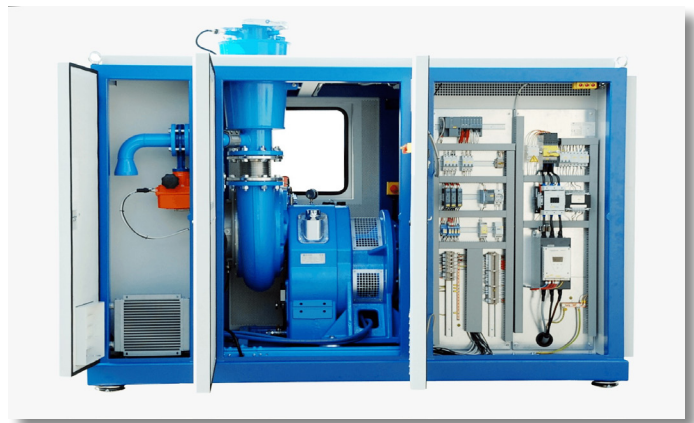
- **Breaking the service monopoly (non-proprietary components):**

Many plants suffer from "vendor lock-in." NTT breaks this service monopoly by following an open market/non-proprietary component policy. They utilize:

**Standard motors, gears, bearings:** that can be serviced or replaced locally.

**Standard plc (programmable logic controller):** open-architecture control systems that allow local engineers to troubleshoot and program basic faults.

This policy ensures spare parts availability in the local market and significantly lowers operating expenses (OPEX).



• **Environmental and financial sustainability (total cost of ownership):**

When analyzing the TCO (total cost of ownership), energy savings are only one part of the equation. The larger portion comes from avoiding frequent replacement and specialized service costs. By adhering to the "repair instead of replace" principle, NTT ensures that the machine remains in service with peak efficiency and minimal recurring costs, making it the smartest economic and engineering choice.



**Conclusion**

"The evaluation of air blower technologies must transcend the limits of initial efficiency to encompass 'performance longevity' and equipment serviceability under the most demanding conditions. Next turbo technologies (NTT) emerge as a strategic choice, offering an engineering design that shatters 'black box' constraints and grants plants complete autonomy in management and maintenance.

Relying on non-proprietary components and a design lifetime exceeding 25 years is not merely a technical advantage, but a financial safety valve against the risks of technology obsolescence and spare parts monopolies.

Choosing next turbo is an investment in 'operational peace of mind,' ensuring a rugged, field-serviceable system designed to remain at peak performance for decades, this makes NTT the fundamental pillar for a sustainable, stable, and cost-effective future in wastewater treatment technology."



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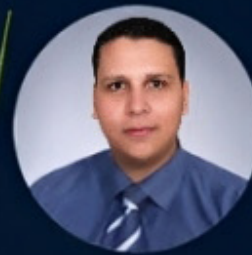
WEEKLY WEBINARS



**WATER TREATMENT AS A CRITICAL ENABLER FOR SCALABLE GREEN HYDROGEN PRODUCTION**

 **DATE**  
Saturday, May 2nd


 **TIME**  
08:00 - 10:00 PM  
(Saudi Arabia Time)



**Dr. Mohamed Nazih**



**INTRODUCTION TO WASTEWATER TREATMENT**

 **DATE**  
Friday, May 8th


 **TIME**  
08:00 - 10:00 PM  
(Saudi Arabia Time)



**Dr. Hossam Mostafa Hussien**



**USING PRESSURE EXCHANGERS (PX) IN LOW PRESSURE RO, BRACKISH WATER AND WASTEWATER REUSE APPLICATIONS**

 **DATE**  
Friday, May 15th


 **TIME**  
08:00 - 10:00 PM  
(Saudi Arabia Time)



**Wessam El Mahgoub**  
Sales Manager MEA at Energy Recovery ERI.



**ENGINEERING OVERVIEW OF ODOR CONTROL SYSTEMS AND DESIGN REQUIREMENTS IN COLLABORATION WITH BIOAIR, FEATURING THE LATEST TECHNOLOGIES**

 **DATE**  
Saturday, May 23

 **TIME**  
08:00 - 10:00 PM  
(Egypt & KSA Time)



**Haider Ezal-Deen**  
Regional Sales Manager





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# **WATER NEWS BRIEF**

**May | 2026**

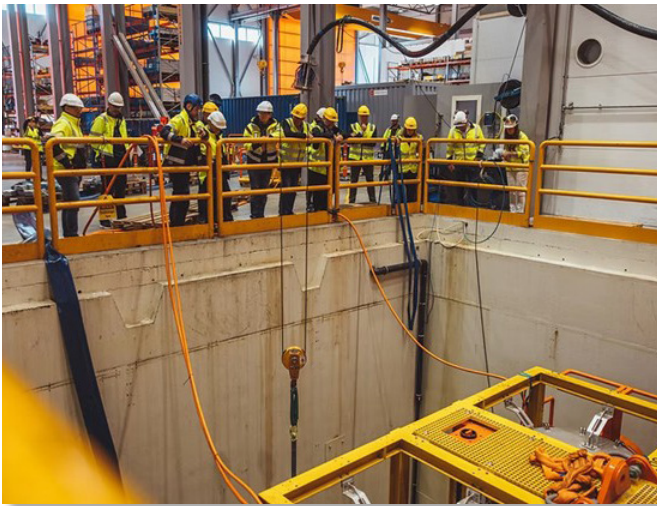
[www.aquaenergyexpo.com](http://www.aquaenergyexpo.com)

## Veolia's Stakeholders Assembly Takes a Stand for Environmental Security

Veolia announced the launch of its new “Stakeholders’ Assembly” to promote environmental security, with a strong focus on water security and wastewater reuse. The initiative brought together 34 international representatives from governments, industry, academia, and environmental organizations in Paris to sign a joint commitment supporting sustainable solutions to global water scarcity challenges. Discussions focused on regulatory development, financing mechanisms, and improving public acceptance of water reuse projects. CEO Estelle Brachlianoff emphasized that achieving environmental security requires collective action, innovation, and knowledge sharing to develop practical and sustainable solutions that support communities, industries, and long-term economic resilience worldwide.



## Flocean Named Semifinalist in XPRIZE Water Scarcity Competition



Flocean has been named a semifinalist in the global XPRIZE Water Scarcity Competition, recognizing its innovative approach to sustainable freshwater production. Flocean’s subsea desalination technology places desalination systems deep underwater, using natural ocean pressure instead of energy-intensive pumping, which greatly reduces energy use and operational costs compared to conventional methods. The selection highlights growing international confidence in the company’s scalable and environmentally friendly solution for addressing global water scarcity. Flocean aims to support coastal regions and water-stressed communities with low-energy desalination systems designed for long-term sustainability and efficient freshwater supply.

## Ecolab Unleashes Water Intelligence to Drive Growth in the AI Era

Ecolab announced its new “Water Intelligence” strategy to help businesses improve water management in the AI era. Central to the initiative is Water Navigator IQ, an AI-powered platform that combines real-time data, predictive analytics, and site-level insights to optimize water efficiency across operations. Ecolab noted that growing AI adoption, particularly in data centers and semiconductor manufacturing, is driving higher water demand while global freshwater shortages are expected to worsen of 56% by 2030. The solution helps companies monitor performance, detect risks early, and align water use with operational and sustainability goals to support long-term growth.



## Thames Water Signs Landmark Leak Detection Contract with Origin Tech to Save Over 100 Million Litres of Water per Day

Thames Water has signed a landmark contract with technology company Origin Tech to deploy advanced AI-powered leak detection across its water network. The system uses satellite data and artificial intelligence to identify underground leaks quickly and accurately, improving detection compared to traditional methods. Following successful trials, the technology is expected to help the company save over 100 million litres of water per day. The 13-month agreement will be fully integrated into Thames Water's operations, making it the first UK utility to adopt this system at scale. The project aims to reduce water loss, improve network efficiency, and support long-term water sustainability amid growing demand and climate pressure.



## Acciona.org Extends Electricity and Water Services to 200,000 People (+24%) in Remote Communities



Acciona announced that its foundation, Acciona.org, has expanded access to clean electricity, safe drinking water, and sanitation services to remote communities across multiple countries. The initiative has now reached nearly 200,000 people in nine countries, improving living conditions in rural, indigenous, and refugee areas. The project is based on community-led management, where residents help operate and maintain the systems to ensure long-term sustainability. It also supports social development by reducing energy costs, improving health and education, and enabling small economic activities in isolated regions. The program reflects ACCIONA's broader commitment to sustainable development and closing infrastructure gaps through renewable energy and water solutions.

## SUEZ and Salinity Solutions Launch the First Industrial Pilot of Hybrid Batch Reverse Osmosis for Municipal Wastewater Reuse in Béziers

SUEZ announced a pilot project with Salinity Solutions to test hybrid batch reverse osmosis (HBRO) technology for municipal wastewater reuse at the Béziers treatment plant in France. Using HyBatch™ technology, the system internally recycles brine during treatment, achieving water recovery rates of 90–95%, compared to about 85% in conventional systems. The technology also reduces energy use, chemical consumption, and brine discharge. The pilot project aims to demonstrate a more sustainable and cost-effective wastewater reuse solution to ease pressure on freshwater resources and address global water scarcity challenges.



# Global Water Events

## Global Water Summit

**Date:** From 18 to 20 May 2026

**Location:** Madrid, Spain

Climate extremes, rising energy demands, and pressures on capital mean the systems we rely on must adapt quickly. New technologies and AI will tackle such challenges, even as they place new demands on water. How do we strike a balance? This year's Global Water Summit is about turning that question into action.

**Website:** [watermeetsmoney.com](http://watermeetsmoney.com)



## WATERTECH CHINA

**Date:** From 9 to 11 June 2026

**Location:** Shanghai National Exhibition & Convention Center

WATERTECH CHINA 2026 is a premier water industry event, recognized as a significant “industry benchmark.” Building on the achievements of its previous edition, the event will take place from June 9 to June 11, 2026, at the renowned National Exhibition and Convention Center (NECC) in Shanghai.

**Website:** [watertechsh.com](http://watertechsh.com)



## 8th Annual International Conference and Exhibition Desalination Latin America

**Date:** 17 & 18 June 2026

**Location:** Santiago, Chile

The international investment conference and exhibition “Desalination Latin America” is the only business platform for developing effective strategies, sharing experiences, presenting new investment projects & innovations, and consolidating efforts of governments and businesses to implement desalination projects & to increase water supplies all over Latin America.

**Website:** [desalinationlatinamerica.com](http://desalinationlatinamerica.com)



## Indo Water 2026 Expo & Forum

**Date:** From 11 to 13 August 2026

**Location:** JIExpo Kemayoran, Jakarta, Indonesia

Join at Indo Water 2026 Expo & Forum, the Indonesia's No. 1 International Water and Wastewater Technology Event. Through exhibitions, conferences, seminars, and workshops, connect industry leaders, innovators, and professionals to showcase the latest technologies & solutions in water resource management, sewerage, industrial wastewater, purification, and irrigation.

**Website:** [indowater.com](http://indowater.com)



## Aquatech Mexico

**Date:** From 1 to 3 September 2026

**Location:** Centro Banamex ,Av. del Conscripto 311, Mexico City

On 1<sup>st</sup> to 3<sup>rd</sup> September 2026, Aquatech Mexico will take place. You're invited to join other professionals, experts and investors interested in doing business in the water technology industries in the Americas. Join 3 action-packed days that provide the ideal platform to make profitable business relationships, exchange ideas and learn all about opportunities in this specific region for the water technology.

**Website:** [aquatechtrade.com/mexico](http://aquatechtrade.com/mexico)



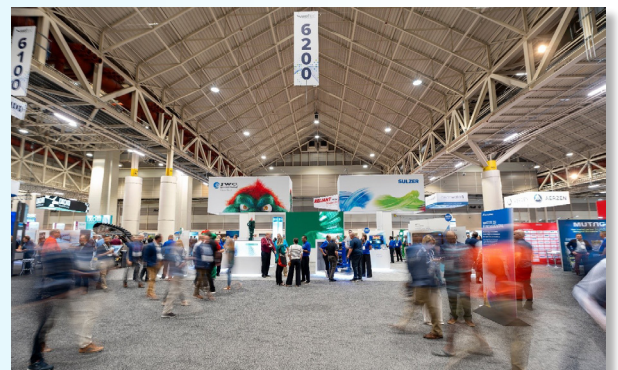
## WEFTEC 2026

**Date:** From 28 to 30 September 2026

**Location:** Ernest N. Morial Convention Center | New Orleans, La. USA

Solving water challenges takes more than great ideas, it takes connection, collaboration, and action. At WEFTEC 2026, you'll find all three through cutting edge solutions, hands on learning experiences, and a global network of water professionals.

**Website:** [weftec.org](http://weftec.org)



## FiltXPO 2026

**Date:** 28 & 29 October 2026

**Location:** Minneapolis Convention Center,  
Minneapolis, Minnesota

Grow your business by connecting with decision-makers across diverse industries who are actively sourcing advanced filtration and separation solutions. Engage with 1,200+ filtration professionals from around the world. Expand your North American market reach. Generate leads across high impact sectors, including: Water and Wastewater Treatment, Power Generation, Oil & Gas.

**Website:** [filtxpo.com](http://filtxpo.com)



## Aquatech China

**Date:** From 28 to 30 October 2026

**Location:** 2345 Long Yang Road Pudong New Area  
201204, China

China is making monumental investments in this sector, recognizing the critical need to address water shortages in its cities. With a mandate for cities to reclaim 25% of used water, the commitment is clear. This drive is further evidenced by the planned construction of 100 new sewage treatment plants.

**Website:** [aquatechtrade.com/shanghai](http://aquatechtrade.com/shanghai)



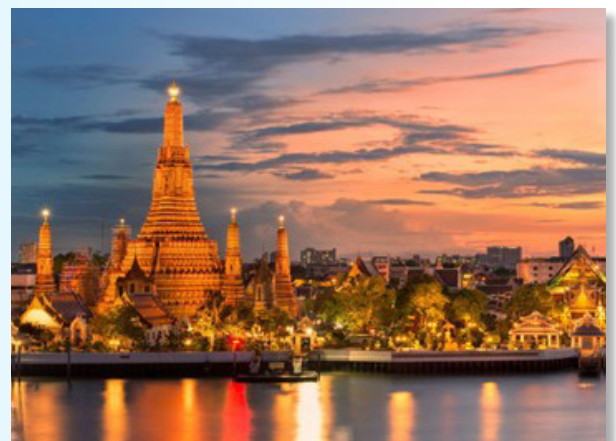
## Aquatech Asia

**Date:** From 25 to 27 November 2026

**Location:** Queen Sirikit National Convention  
Center, Bangkok

The most recent addition to the well-known Aquatech portfolio is Aquatech Asia, which will be present at flagship trade shows in China, Mexico, and Amsterdam. Southeast Asian water experts, innovators, and decision-makers will come together at Aquatech Asia.

**Website:** [aquatechtrade.com/asia](http://aquatechtrade.com/asia)





# The Digital Revolution in Water Management: Leveraging AI for a Sustainable Future

**W**ater is arguably our most critical global resource, essential for human health, economic development, and environmental sustainability. However, as cities, industries, and agricultural sectors compete for increasingly scarce water supplies, water professionals face unprecedented challenges in managing these demands effectively. To address these complexities, the water sector is undergoing a profound digital transformation. Driven by international frameworks and the pursuit of best practices, the industry is increasingly turning to Artificial Intelligence (AI) to foster innovation and deliver a more resilient water future.

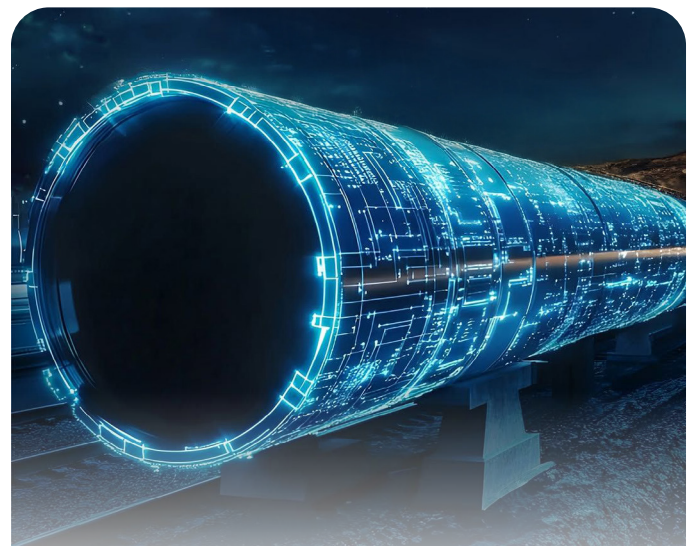
## The Digital Shift in the Water Sector

Historically, the water management industry has been viewed as slow to adopt new technological paradigms. Many professionals in instrumentation, control, and modeling once faced frustration when innovative ideas failed to transition into real-world practice. Today, however, that narrative has shifted significantly. We are currently witnessing a massive hype cycle and genuine implementation of digitalization. From utility boards and CEOs to municipal leaders, there is a clear mandate to digitize

operations, with many utilities now appointing Chief Digital Officers to accelerate this transition.

## The Data Pipeline: From Sensors to Actionable Insight

One of the fundamental pillars of AI in wastewater treatment is the data pipeline—a systematic approach to moving from raw data to understanding and, ultimately, decisive action. Wastewater treatment environments are notoriously harsh and “nasty,” which poses a unique challenge for sensor maintenance.



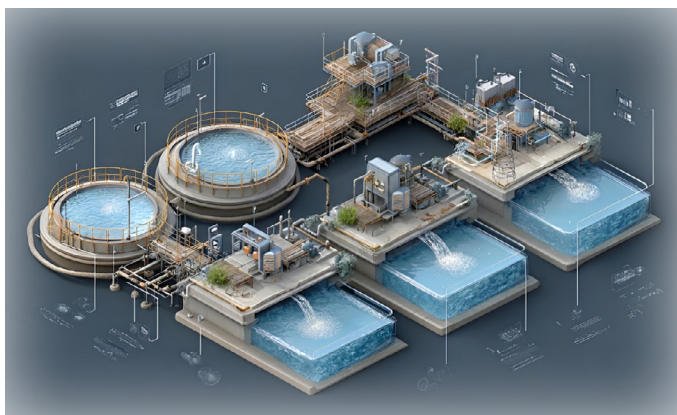
**Hardware Realities:** Even high-quality sensors can quickly become obscured by debris and biological growth, requiring innovative solutions like automated compressed-air sparging to keep sensor tips clean.

**Modeling and Prediction:** By leveraging historical data on flows, weather, and nutrient concentrations, experts can utilize neural networks to predict system performance for up to 12 hours in advance.

**Handling Seasonality:** AI models, such as those trained on rain and temperature data, can effectively capture complex patterns like snowmelt events, which significantly dilute concentrations in urban sewer systems.

## AI in Asset Management: Predicting Infrastructure Failure

Beyond treatment processes, AI is revolutionizing how we maintain aging infrastructure. In cities like Montreal, municipalities have utilized machine learning to optimize the replacement of water pipes, tackling the pervasive issue of frequent pipe breaks. By analyzing historical failure data and asset characteristics, AI models can prioritize maintenance schedules far more efficiently than traditional methods. Furthermore, the rise of Large Language Models (LLMs) is allowing utility managers to interact with complex asset databases using natural language, enabling rapid decision-making in the field, such as mapping high-risk pipes within seconds of a query.



## Knowledge-Driven Machine Learning: Bridging Theory & Data

While pure data-driven models have their place, the integration of physical and chemical domain knowledge, often called “knowledge-driven machine learning”, is proving to be a game-changer for specialized processes like membrane filtration.

**Overcoming Data Scarcity:** Many environmental datasets, such as those documenting micro-pollutant rejection, are relatively small (around 2,400 points). AI can supplement this by incorporating known physical mechanisms, such as size exclusion and donor-acceptor interactions, ensuring models remain grounded in scientific reality.

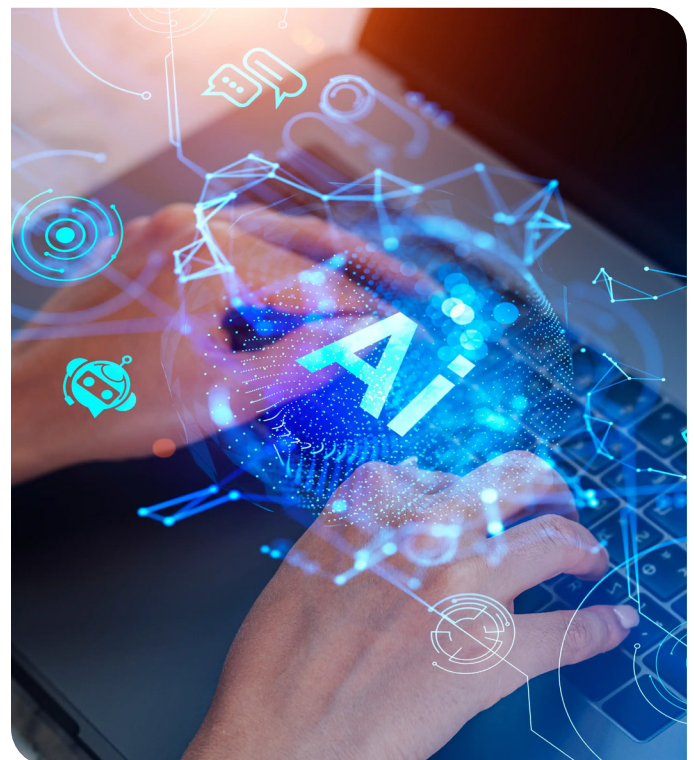
**Hybrid Modeling:** By combining the predictive power of XGBoost or LLMs with established engineering principles, researchers are creating models that do not just provide a number but explain the underlying mechanisms of water treatment.

## The Human Element: Skills and Future Collaboration

A recurring theme throughout this transformation is that AI is not a replacement for human expertise, but a sophisticated tool to augment it. For students and professionals looking to enter this field, the path involves a blend of traditional engineering knowledge and modern data skills.

**Collaboration:** Successful projects rely on diverse teams that bring together environmental engineers, data scientists, and biologists.

**Learning Curve:** The barriers to entry are lower than ever, with abundant online resources for learning Python and other coding tools. The key is to start small, experiment with pilot projects, and maintain a critical, stepwise approach.





## Case Studies

The following case studies highlight effective applications of artificial intelligence (AI) in tackling urgent global water management issues, showcasing notable gains in resilience, sustainability, and efficiency.

- **Barcelona's Smart Water Management System (Spain):** In the past, urbanization caused a 25% rise in water consumption, and inefficiencies cost the city 30% of its water supply. To meet the growing water demand, Barcelona installed an AI-powered smart water management system in 2018. To maximize water distribution, the system makes use of predictive analytics and real-time monitoring. Within two years, customer engagement improved thanks to data-driven insights, water losses decreased by 15%, and water supply efficiency rose by 20%.

- **Los Angeles's AI-Powered Leak Detection System (US):** Due to outdated water infrastructure, Los Angeles used to experience a 25% water loss. To address water leaks, Los Angeles installed an AI-powered leak-detection system in 2019. To find leaks early, the system makes use of sensors and machine learning techniques. Predictive maintenance led to a 25% reduction in water losses, a 30% reduction in infrastructure damage, and an improvement in maintenance schedule within two years.

- **Drought Management System (Jordan):** Ten million people in Jordan used to suffer from severe droughts. In order to lessen the effects of the drought, Jordan installed an AI-driven drought management system in 2020. To forecast drought threats, the system examines data on soil moisture, reservoir levels, and weather trends. Crop yields rose by 15%, and water use during droughts decreased by 20% in just 1.5 years.

- **Shanghai's Water-Efficient Data Center (China):** In the past, data centers in Shanghai, China, consumed a large amount of water for cooling and 10% of the city's electricity. In 2020, Shanghai addressed the energy-water nexus by implementing an AI-powered water-efficient data center. The technology minimizes energy use while optimizing water use for cooling. Water and energy use decreased by 20% and 15%, respectively, in a year.

- **Egypt's Nile Delta Precision Irrigation System:** In the past, inefficiencies caused the Nile Delta to lose 30% of its agricultural water. In order to maximize agricultural water management and lower energy usage, Nile Delta installed a precision irrigation system driven by artificial intelligence in 2020. Crop yields rose by 20%, water consumption decreased by 25%, while pumping and distribution energy use decreased in just 1.5 years.

- **Dubai's Smart Water Quality Monitoring System (UAE):** 3.3 million people lived in Dubai, UAE, which used to have 25% water contamination from industrial and agricultural runoff. In order to combat pollution and urban water management, Dubai installed an AI-powered smart water quality monitoring system in 2020. To identify contaminants, the system makes use of sensors and machine learning techniques. Public health protection increased and water pollution decreased by 22% in just 1.5 years.

## Conclusion

As we look to the sustainable future, the integration of AI into the water sector offers immense potential to enhance efficiency, prevent infrastructure failure, and protect our most valuable resource. The expert consensus is clear: proceed with a mindset of "under-promising and over-delivering." By combining rigorous scientific knowledge with the flexibility of data-driven modeling, we can ensure that these digital tools are used not just as a "hammer for every nail," but as a precise instrument for building a sustainable water future. In a world where infrastructure demands are constantly increasing, the ability to maintain uninterrupted flow is a competitive advantage. AI is not just helping to prevent blockages it is redefining how systems operate at their core.



# From Drought to Floods: How Can Investing in Water Save Communities?

**T**he pace of change in the water sector has become impossible to ignore. Communities, industries, and governments are all grappling with immediate and intensified water challenges and are seeking solutions that can be deployed faster, smarter, and more sustainably than ever before. Once a background concern, water security has become an urgent global priority. Private investment plays a critical role, as the scale and complexity of today's challenges require not only capital but also strategic and operational expertise to help innovative companies grow.



## Water Investment is Increasingly Unavoidable

The urgency around water investment stems from three converging challenges: water security, flood risk, and public concern. Water security is no longer a concern only for arid regions, as it now affects cities worldwide where demand increasingly exceeds locally available freshwater. The bigger shift is in supply reliability, as hotter global temperatures lengthen and intensify droughts. Flood risk is rising as storm events become more intense and overwhelm traditional infrastructure strategies. Public concern is also driving urgency, as contamination from combined sewer overflows or micropollutants in drinking water is no longer tolerated, creating political and social pressure for action on water quality. This growing urgency is creating opportunities in four themes: flexibility, agility, credibility, and availability. These themes are reshaping the sector and guiding how cities, utilities, and industries respond to rapidly changing conditions.

## Rising Temperatures and Changing Rainfall Patterns

### • Increasing Frequency and Severity of Drought

Drought conditions are becoming more frequent, extensive, and longer lasting in both arid and non-arid regions. The trend is driven by rising global temperatures, which increase atmospheric evaporative demand and change global rainfall patterns. This creates an “in your face problem” for governments, businesses, and farmers, strengthening the case for investment in water security. Wildfires multiply this urgency because they expose the vulnerability of water supplies while proving their necessity.

### • The Double Impact of Rising Temperatures

Higher temperatures have a double impact on drought. First, the atmosphere becomes “thirstier,” increasing evaporative demand that dries soil and plants. Drier land also reduces evaporation, reinforcing drought conditions. Second, changes to atmospheric circulation impact storm tracks, monsoons, and wet season timing, turning seasonal dry spells into multi-year droughts.

### • Infrastructure Gaps and Escalating Water Crises

The problems arising from drought are worsened by underinvestment in water infrastructure. Many systems lack storage, distribution flexibility, and treatment capacity to cope with prolonged drought. When supplies collapse, structural weaknesses turn climate shock into a service crisis, amplifying public concern and forcing costly emergency measures.

### • Case Study

The Los Angeles wildfire of January 2025 highlighted how drought-driven fires create urgent water challenges. Firefighting requires huge volumes of water diverted at short notice, straining limited supplies. After the fire, rainfall washes ash, sediments, and contaminants into reservoirs and rivers, overwhelming treatment plants and threatening drinking water. Repeated fires also damage catchments and reduce their recharge capacity, making droughts more severe. Similar patterns in California, Australia, and Europe show how fire compounds both scarcity and safety challenges, forcing utilities to rethink resilience and invest in flexible treatment solutions.



## Increased Flood Risk: Wet Weather Events Becoming Impossible to Manage

Flooding is becoming more frequent, intense, and complex, overwhelming traditional defenses and driving urgent spending on emergency response, monitoring systems, and resilient infrastructure. Climate change is a key driver, as warmer air holds more moisture, fuels stronger storms, and alters rainfall patterns, sometimes stalling systems or shifting them to new regions. Urban expansion worsens flooding by replacing permeable land with hard surfaces, increasing runoff, while saturated soils and compound events such as river floods combined with storm surges intensify impacts. Critical infrastructure in low-lying areas is especially vulnerable. Water agencies now face “whiplash” conditions, rapidly shifting between drought and flood, making preparedness and fast response more essential than ever.



## A Crisis of Trust in Water Quality

Public concern over water is increasingly driven by a growing crisis of trust in water quality, not just by floods and droughts. High-profile incidents like the Flint water crisis, along with declining confidence in public institutions, have intensified demands for transparency. Key concerns include microplastics, PFAS, sewage overflows, microbial contamination, nutrient pollution, and industrial waste. These issues threaten human health, ecosystems, and economies, while frequent pollution events have raised public anger. As a result, there is rising pressure on governments and utilities to improve monitoring, provide accurate information, and ensure accountability.

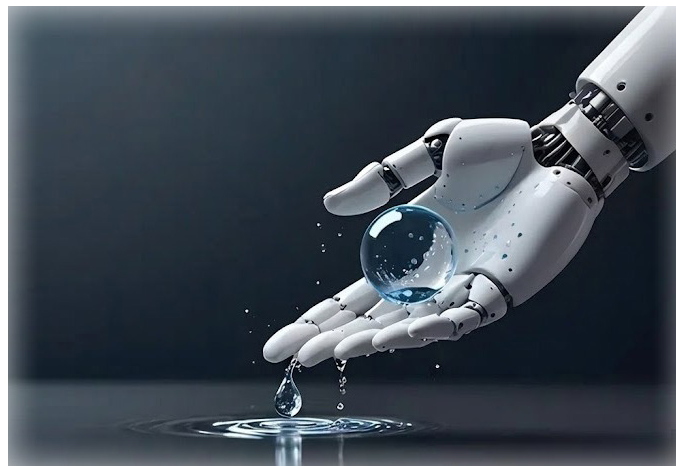
## Flexibility: Rapidly Deployable Mobile Systems

Traditional water infrastructure, designed for long-term planning and cost recovery, is no longer suitable due to unpredictable droughts and floods. Building systems for every scenario is too costly, shifting focus toward flexible, rapidly deployable solutions. This flexibility market serves municipalities, industries, emergencies, and remote projects. Utilities increasingly adapt existing infrastructure, while industries rely on mobile and modular systems for temporary needs or operational changes. Emergencies such as disasters and conflicts drive demand for quick water and sanitation solutions. Regulatory uncertainty, especially around contaminants like PFAS, also discourages fixed investments. Mobile water treatment systems are growing rapidly, alongside broader efforts to repurpose infrastructure efficiently without full redesign.

A case study highlighted is Opus Water, a platform uniting manufacturers of mission-critical engineered products for utilities and industrial processes. These technologies support resilient infrastructure, allow plants to extend operating life or be repurposed, and safely handle large volumes of water in harsh environments.

## AI-Driven Smart Water Management

In a changing climate, fixed water infrastructure is becoming less reliable, while AI enables more agile and adaptive management. Real-time data and predictive tools help optimize existing systems, reduce damage, and extend asset life without costly expansion. Strategies include early warning systems, dynamic flow control, and integrated data platforms that coordinate responses to droughts and floods.



Advanced monitoring and analytics allow faster decision-making, targeted maintenance, and proactive actions such as deploying mobile treatment units or activating defences before risks escalate.

**A case study** is Metron, which provides smart metering and analytics, capturing real-time information on leaks and network conditions. This allows operators to act before small issues escalate. By integrating meter data with utility operations, Metron supports optimized infrastructure use, rapid incident response, reduced non-revenue water, and targeted maintenance.

## Transparency & Real-Time Assurance of Water Quality

Water credibility now depends on proving safety through transparent, real-time data rather than assurances. Public outrage over pollution, including sewage spills and PFAS, has made openness essential. Utilities and regulators are adopting monitoring, analytics, and reporting tools to rebuild trust. Successful examples include open data portals, real-time alerts, community sensors, and public dashboards, demonstrating how transparency can restore confidence and improve water management.

**A case study** is Luminultra, addressing the issue that traditional microbial lab tests take days or weeks. In an environment where public confidence can shift instantly, delays are unacceptable. Luminultra provides microbial monitoring solutions delivering results in minutes. Its offerings are embedded in regulatory frameworks worldwide across drinking water, wastewater, and industrial markets. Faster detection enables quicker reporting, protects infrastructure, reduces costs, and supports compliance with tightening standards.



## Availability: Increasing Supply Through Desalination and Water Reuse

Water availability concerns are expanding beyond arid regions due to urbanisation and unpredictable rainfall, pushing cities to explore alternatives like desalination and water reuse. These unconventional sources rely more on advanced technology than traditional infrastructure, offering potential cost reductions. Investment opportunities span developers, systems integrators, and enabling technologies such as membranes, which are vital for efficient treatment. Improving energy efficiency in membrane processes is a key focus. In desalination, innovations target pre-treatment and the reduction of environmental impacts, while reuse focuses on process efficiency, resource recovery, water quality assurance, and decentralized systems. These advancements aim to lower costs and enhance long-term water security.



### Conclusion

Overall, the water sector continues to grow more slowly than other investment areas, reflecting that infrastructure is largely owned and operated by the public sector, and public finances face pressure from deficits and resistance to increased charges. However, this is being challenged by more frequent droughts and floods, as well as rising public anger over water issues. Spending that delivers flexibility, agility, credibility, and availability is being prioritized.

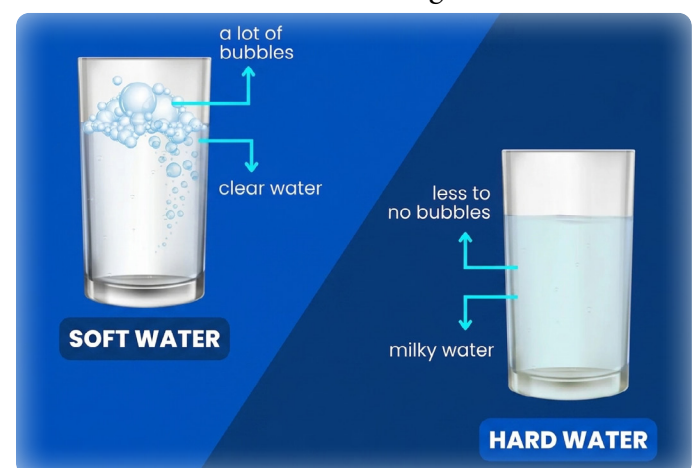
# Corrosion and Water Quality: The Role of Water Softeners in Managing Hard Water

**H**ard water is a challenge in both residential and commercial water systems, causing scale buildup, inefficiencies, and damage to appliances and plumbing. Water softeners, specifically cation exchange systems, are widely used to reduce calcium and magnesium minerals that create these issues. However, there persists a common misconception that softened water contributes to corrosion in plumbing systems. We explain how softeners work, what corrosion truly is, common causes of corrosion, and research findings related to softened water and corrosion. Understanding these concepts helps water and energy professionals make informed decisions about water treatment strategies.

## The Nature and Effects of Hard Water

Elevated levels of calcium and magnesium define hard water. These minerals react with soap, reducing its effectiveness in cleaning and creating insoluble residues known as soap curd, which can appear as films on bathtubs, sinks, and laundry.

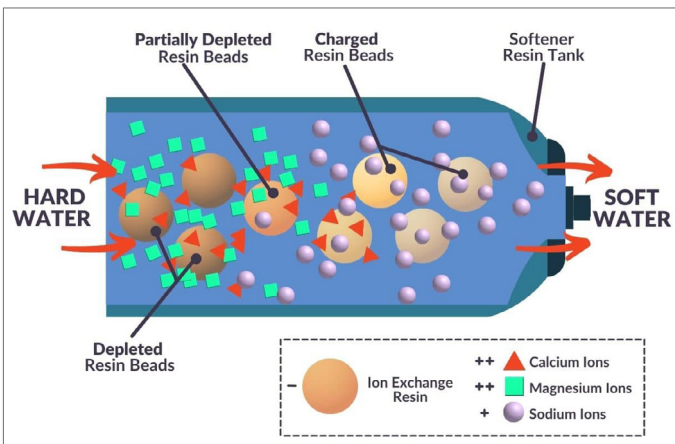
Hard water minerals also accumulate as scale inside plumbing, fixtures, and appliances such as water heaters. Even small amounts of scale can reduce energy efficiency and damage water-heating equipment. The degree of hardness is commonly expressed in grains per gallon (gpg), a measurement that represents the concentration of hardness minerals. Hard water's negative effects on daily life and building systems underscore why water softening is a common treatment in areas with high mineral content.



## How Cation-Exchange Softeners Work

### The Science of Ion Exchange

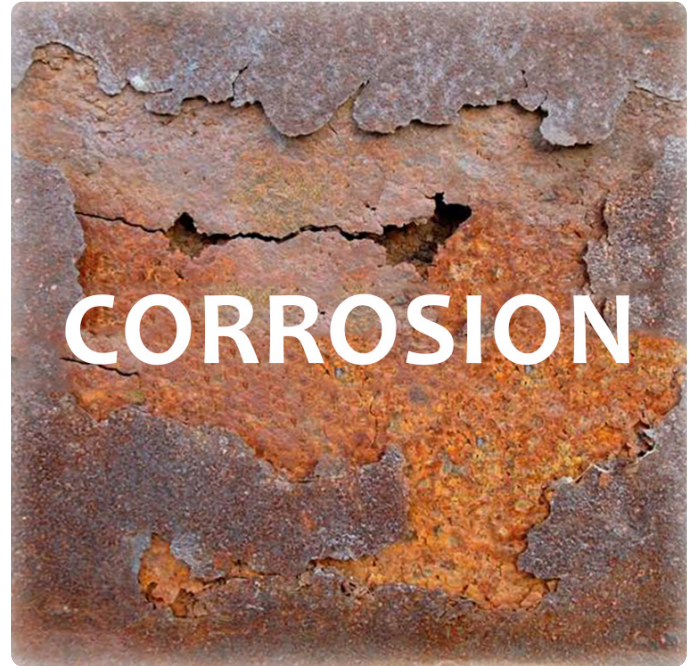
Cation exchange water softeners remove calcium and magnesium ions through an exchange process that replaces these hardness minerals with other ions. As hard water passes through the softener's resin, calcium and magnesium attach to the resin and are replaced with more benign ions. This process reduces the concentration of hardness minerals, preventing their detrimental reactions with soap and reducing scale buildup in pipes and appliances. In addition to hardness ions, softeners may also capture other cations such as radium, selenium, and barium. It's important to note that while this exchange changes the mineral composition of the water, it does not create the chemical conditions associated with corrosive water. Properly configured softeners improve water quality without inherently increasing corrosion risk.



### What Corrosion is and How it Occurs

Corrosion is a natural, electrochemical process by which metal deteriorates when it interacts with water. The most familiar example is rust, the corrosion product of iron and its alloys, like steel. However, corrosion also affects copper, brass, and aluminum. Corrosion can manifest in various ways, including reddish-brown rust staining, leaks, pitting (small holes in metal), and blue-green discoloration from copper corrosion. In some cases, corrosion may release harmful contaminants like lead and copper from pipes into water. Several environmental and water chemistry factors influence corrosion, including pH, dissolved solids, temperature, and the presence of dissimilar metals in contact with each other.

Understanding corrosion is fundamental to evaluating whether any water treatment, including softeners, affects plumbing integrity. It can release harmful contaminants like lead and copper from pipes into water. Several environmental and water chemistry factors influence corrosion, including pH, dissolved solids, temperature, and the presence of dissimilar metals in contact with each other. Understanding corrosion is fundamental to evaluating whether any water treatment, including softeners, affects plumbing integrity.



### Factors That Influence Corrosion

A range of chemical and physical factors can accelerate corrosion in plumbing systems. Water with low pH (acidic conditions) supplies excess hydrogen ions that attack metal surfaces. Conversely, very high pH can cause pitting in metals like aluminum. High total dissolved solids (TDS) enhance water conductivity, increasing galvanic corrosion between dissimilar metals. Water low in minerals (low TDS) is "hungry" and can leach metals from plumbing. High water velocity or turbulence promotes erosion corrosion, particularly at fittings and directional changes in pipes. Elevated temperatures speed up reaction rates, and strong oxidizing disinfectants like chlorine or chloramines can exacerbate corrosion. Biofilms and bacterial activity can trigger localized corrosion as microbes alter pH and concentrate corrosive agents. Other factors include high chloride to sulfate ratios and dissolved carbon dioxide, which lowers water pH.

## Naturally Soft vs. Softened Water

Some regions naturally supply soft water due to low levels of dissolved minerals. Naturally soft water typically has low total dissolved solids and is often acidic. These chemical properties can make naturally soft water corrosive, capable of attacking metal pipes and fixtures. This is a different condition than softened water, which has had hardness minerals removed and replaced through ion exchange. Because the softening process replaces calcium and magnesium with other ions, it does not produce the same chemical profile that makes natural soft water corrosive. Softeners do not create corrosive conditions. In cases where water is already corrosive, a softener will not solve that problem, nor will it make previously non-corrosive water corrosive.



## Dispelling Misconceptions in the Field

Even though research clearly demonstrates that softened water does not increase corrosion, the myth persists among some professionals. Confusion often arises from conflating naturally soft, corrosive water, which is low in dissolved minerals and acidic, with water that has been softened by an ion exchange system. Since softeners reduce hardness but do not create pH or conductivity conditions associated with corrosion, it's incorrect to blame softeners for plumbing corrosion. Water quality experts should evaluate the full suite of chemical parameters in a water system, including pH, TDS, temperature, and dissolved gases, before determining corrosion risks. Understanding the science helps professionals avoid misdiagnosis and focus on the true causes of material degradation.

## Integrating Softeners with Effective Water Management

For water and energy professionals, effective water quality management requires distinguishing between hardness and corrosivity. Softeners are valuable tools for reducing scale and improving system efficiency, but they should not be relied on to mitigate corrosion. Comprehensive water analysis remains essential for identifying corrosive conditions, and solutions such as pH adjustment or corrosion inhibitors may be needed.

When evaluating a system, professionals should consider how factors like disinfectants, flow characteristics, and material combinations interact with water chemistry. Applying research-based knowledge ensures that treatment solutions are scientifically grounded and effective. By dispelling myths and understanding the specific effects of softening technology, professionals can optimize both water quality and infrastructure longevity without over-attributing corrosion to water softeners.



## Conclusion

Water softeners play a key role in reducing hard water problems and protecting plumbing and appliances from scale buildup. However, the long-standing misconception that they increase corrosion is unfounded. Corrosion is a complex electrochemical process dependent on pH, dissolved solids, temperature, and other factors, not simply on the absence of hardness minerals. Scientific research consistently confirms that properly designed cation-exchange softeners do not make water corrosive when other conditions remain equal. Water and energy professionals should base their decisions on evidence, addressing actual causes of corrosion rather than attributing it to softening alone. This clarity improves system performance and supports better water quality practices overall.



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## Achieving Efficiency in Reverse Osmosis Systems: Integrated Design to Ensure Water Sustainability

**R**everse osmosis (RO) has become one of the most effective and widely adopted technologies for producing high-quality water for municipal supply, industrial processes, and energy-related operations. Its ability to remove dissolved salts, organic contaminants, and microscopic impurities makes it essential in modern water treatment strategies. However, designing an RO system is not simply a matter of selecting membranes and installing pumps. Successful system performance depends on engineering decisions related to feedwater quality, system recovery, operating pressure, pretreatment efficiency, and long-term reliability. Each design parameter directly affects energy consumption, membrane lifespan, operational stability, and overall cost. Proper engineering ensures sustainable performance and optimized water production.

### Understanding RO System Design Fundamentals

Reverse osmosis is a pressure-driven membrane process in which water is forced through a semi-permeable membrane, leaving dissolved salts and contaminants behind. From an engineering perspective, RO system design is governed by the relationship between feedwater chemistry, membrane characteristics, pressure requirements, and hydraulic behavior. A well-designed RO system must achieve the target permeate flow and quality while controlling fouling, scaling, and energy consumption. Engineers must also consider that RO membranes are sensitive to suspended solids, biological activity, and mineral precipitation. Therefore, system design begins with a detailed analysis of the feedwater source and expected operating conditions.

## Feedwater Characterization and Water Quality Assessment

Accurate feedwater analysis is the foundation of any RO design project. Engineers must evaluate parameters such as total dissolved solids (TDS), hardness, alkalinity, silica, turbidity, iron, manganese, and microbiological activity. These values determine not only the membrane selection but also the required pretreatment and the achievable recovery rate. For example, high hardness and alkalinity increase the risk of calcium carbonate scaling, while elevated silica levels can limit recovery due to precipitation potential. In industrial and energy applications, feedwater may contain oils, organic compounds, or process-related contaminants that accelerate membrane fouling. Seasonal changes in water composition must also be considered, especially in surface water sources. Without a detailed water quality assessment, RO systems may suffer from rapid performance decline, frequent chemical cleaning, and shortened membrane service life.

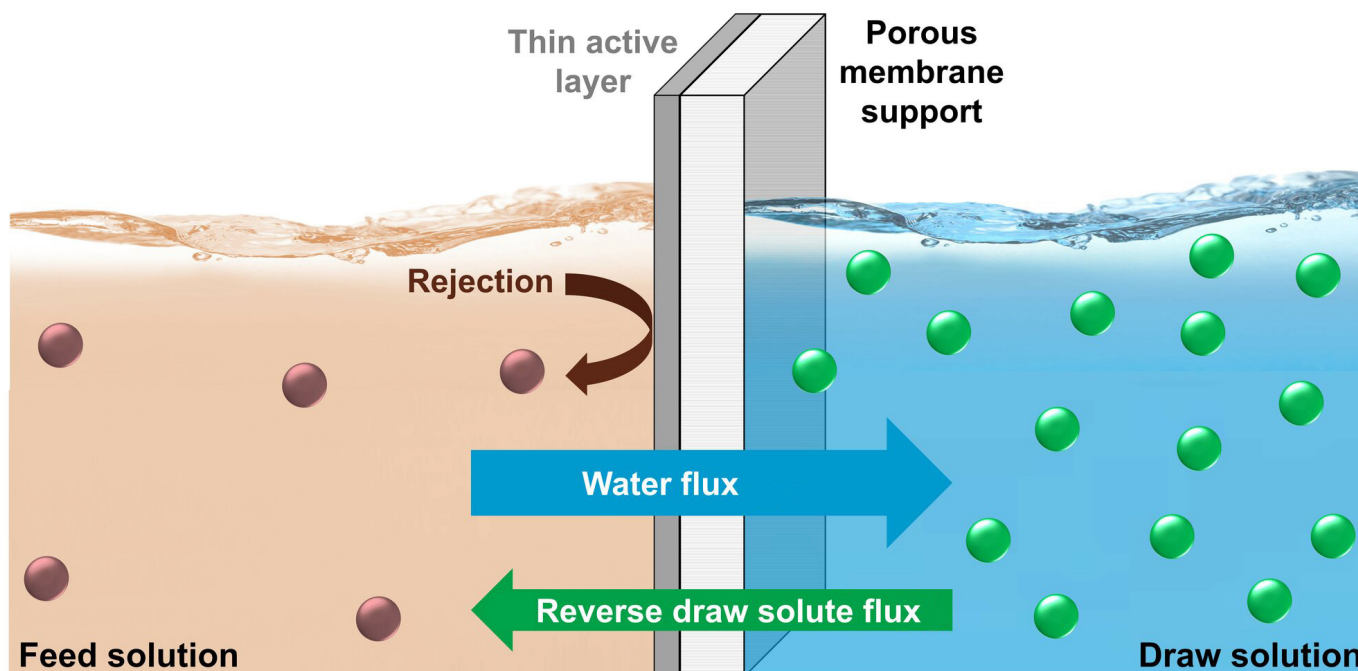
## Membrane Selection and Flux Design Criteria

Selecting the appropriate membrane type is a critical design decision that impacts system efficiency and reliability. RO membranes vary in salt rejection performance, permeability, and resistance to fouling. Engineers typically select membranes based on target permeate quality and feedwater salinity, while also considering operating pressure limits and cleaning tolerance.

Equally important is determining the design flux, which represents the permeate flow rate per membrane area. High flux designs may reduce the number of membrane elements required, lowering capital costs, but they also increase fouling risk and accelerate membrane aging. Low flux designs provide more conservative operation and improved membrane longevity, but they require more membrane area and a higher initial investment. A balanced flux design ensures stable operation, manageable cleaning frequency, and sustainable energy performance throughout the membrane lifecycle.

## Recovery Rate Optimization and Scaling Control

Recovery rate refers to the percentage of feedwater converted into permeate. Higher recovery rates improve water efficiency by reducing reject volume, which is especially valuable in regions with limited water resources. However, increasing recovery concentrates salts in the brine stream, raising the risk of scaling and precipitation on membrane surfaces. As recovery increases, sparingly soluble salts such as calcium sulfate, calcium carbonate, barium sulfate, and silica become more likely to deposit, reducing membrane performance and increasing pressure drop. Engineers must optimize recovery based on water chemistry, scaling indices, and antiscalant effectiveness. In many cases, multi-stage designs allow recovery to be distributed more evenly, reducing stress on individual membrane elements. Proper recovery planning ensures that water production



goals are met without sacrificing long-term membrane integrity and operational stability.

## Array Configuration and Staging Strategy

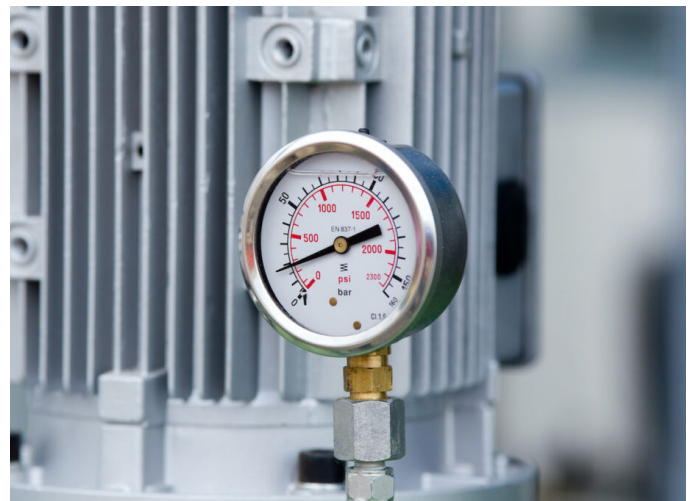
RO systems are typically designed using single-stage or multi-stage membrane arrays, depending on the desired recovery and feedwater quality. In a single-stage configuration, all pressure vessels operate in parallel, offering simplified hydraulics and ease of operation. This approach is often suitable for challenging feedwaters where fouling risk is high. Multi-stage configurations, however, are commonly used to achieve higher recovery rates. By arranging vessels in sequential stages, the system can gradually increase concentration while maintaining acceptable flux levels across each stage. This staging approach improves hydraulic balance and reduces the likelihood of overloading the lead elements. Engineers must also consider element recovery limits, pressure distribution, and concentrate flow requirements when designing array layouts. A properly engineered array ensures stable performance, optimized membrane utilization, and improved overall system efficiency.

## Pretreatment Engineering for Fouling Prevention

Pretreatment is one of the most decisive factors influencing RO performance and energy efficiency. Even high-quality membranes cannot deliver long-term stability if the feedwater contains suspended solids, biological contaminants, or scale-forming minerals. Common pretreatment methods include multimedia filtration, ultrafiltration, cartridge filtration, activated carbon, chemical dosing, and pH adjustment. The goal is to protect the membranes by reducing turbidity, removing colloidal particles, and controlling scaling potential. Inadequate pretreatment often leads to rapid fouling, increased cleaning frequency, reduced permeate flow, and rising operating pressure. For industrial applications, pretreatment may also involve oil removal and organic reduction to prevent irreversible membrane damage. Engineers must design pretreatment systems based on feedwater characteristics and target operational reliability, as pretreatment directly influences membrane lifespan and long-term operating costs.

## Pressure Requirements and Energy Efficiency Considerations

Energy consumption is a major cost factor in RO operation, making pressure optimization a key design priority. RO systems require applied pressure greater than osmotic pressure to drive water through the membrane. As feedwater salinity increases, osmotic pressure rises, requiring higher pump energy. For brackish water systems, operating pressures are moderate, while seawater systems demand significantly higher pressures and energy input. Engineers must select pumps, pressure vessels, and piping materials that withstand expected pressures while minimizing hydraulic losses. Energy efficiency can be improved through optimized system hydraulics, proper pump sizing, and the use of variable frequency drives (VFDs) to match flow demand. In large-scale applications, energy recovery devices may also be integrated to capture pressure from the concentrate stream. Effective pressure management improves both productivity and energy performance.



## Instrumentation, Monitoring, and Operational Stability

Reliable monitoring systems are essential for maintaining RO performance and protecting membranes from irreversible damage. Key instrumentation typically includes feed, permeate, and concentrate flow meters, pressure sensors, conductivity analyzers, temperature indicators, and differential pressure monitoring across stages. These measurements allow operators to detect early signs of fouling, scaling, or membrane damage. For example, rising differential pressure may indicate particulate buildup, while increased permeate conductivity may signal membrane leakage or degradation.

Modern RO systems often integrate automated control panels capable of adjusting pump speed, chemical dosing, and flushing cycles based on real-time feedback. Effective monitoring not only improves operational stability but also reduces downtime by enabling preventive maintenance. In the water and energy sectors, consistent monitoring is essential for ensuring regulatory compliance and uninterrupted production.

## Maintenance Strategy and Lifecycle Cost Planning

A well-designed RO system must include a practical maintenance strategy to ensure long-term performance. Membrane cleaning, replacement planning, and routine inspection schedules should be considered during the engineering stage, not after installation. Cleaning frequency depends heavily on pretreatment effectiveness and operating flux. Engineers must also account for the cost of chemicals, energy usage, labor, and membrane replacement when evaluating total lifecycle cost. In many projects, operating expenses exceed initial equipment costs over the system's lifespan. Therefore, designing for lower fouling rates and energy efficiency provides significant economic advantages. Maintenance-friendly layouts, adequate access space for membrane removal, and standardized spare parts selection also improve long-term system management. Lifecycle-focused design ensures that RO systems remain economically sustainable and operationally reliable.



## Conclusion

Reverse osmosis remains a cornerstone technology for water production in municipal, industrial, and energy applications, but its success depends heavily on sound engineering design. Key considerations such as feed-water characterization, membrane selection, flux control, recovery optimization, staging configuration, pretreatment design, and pressure management directly influence system reliability and energy efficiency. In addition, proper monitoring and lifecycle maintenance planning ensure long-term operational stability and predictable costs. By approaching RO design as a complete engineering system rather than a collection of components, water professionals can achieve high-quality permeate production while reducing energy demand and minimizing operational risk. Effective design ultimately supports sustainable water management and optimized resource utilization.



## Desalination in the Energy Age: Electrical Innovations as Sustainable Solutions

**A**s freshwater availability declines worldwide, desalination has evolved from a regional alternative into a global necessity. Coastal cities, industrial hubs, and arid nations increasingly depend on desalinated seawater to ensure a stable supply for domestic and economic growth. Yet the long-standing challenge remains: desalination is energy-intensive. In response, the industry is shifting its focus beyond membranes and pumps toward the electrical systems that drive plant performance. High-efficiency motors, automation, advanced drives, and digital monitoring platforms are now essential to making desalination more economical and sustainable. In many ways, electricity has become the true backbone of modern water security.

### Desalination Expanding Role in Water Security

Water scarcity is no longer limited to traditionally dry regions. Climate variability, population growth, and industrial expansion are placing increasing pressure on rivers, reservoirs, and groundwater. Desalination offers a dependable solution because seawater is widely available and does not rely on seasonal rainfall patterns. Governments are therefore investing heavily in large-scale desalination plants to stabilize municipal supply & support critical industries. However, these projects require long-term financial

planning, and electricity costs often dominate operational budgets. This is why energy efficiency is now a central benchmark in desalination development. Plants that can reduce energy consumption while maintaining production capacity are best positioned to deliver long-term economic and environmental value.

### Energy Consumption: The Core Challenge

Reverse osmosis remains the leading desalination technology due to its efficiency compared to thermal methods. Nevertheless, RO plants require substantial energy to generate the high pressures needed to push seawater through membranes. This electricity demand is not a minor operational detail; it can determine whether a plant remains financially competitive over the long term. Additionally, energy consumption directly affects carbon emissions, particularly in regions where electricity is still produced mainly from fossil fuels. As sustainability regulations tighten and environmental expectations increase, desalination operators face growing pressure to reduce their energy footprint. Improving the electrical performance of a plant through optimized power distribution and advanced control is becoming as critical as improving membrane efficiency itself.

## Electrical Infrastructure: The Silent Driver of Reliability

Behind every desalination facility lies an electrical network that must function continuously under demanding conditions. Transformers, switchgear, and power distribution systems form the foundation that keeps pumps, filtration units, and control systems operating without interruption. Reliability is crucial because a short power disturbance can disrupt production, damage equipment, or increase membrane fouling due to unstable operation. Coastal environments add further complexity, as electrical components must withstand high humidity, salt corrosion, and temperature fluctuations. This is why modern desalination plants increasingly depend on specialized electrical design that prioritizes durability, safety, and redundancy. A well-engineered electrical backbone reduces downtime and ensures consistent water output, even during periods of heavy demand.



## High-Efficiency Motors: Where Energy Savings Begin

Electric motors are among the largest energy consumers in desalination plants, particularly those powering high-pressure pumps. The adoption of high-efficiency motor technology can significantly reduce energy waste and improve overall plant performance. Modern medium-voltage motors are designed to operate with minimal losses while delivering reliable torque under heavy loads. Their contribution extends beyond reduced electricity bills: efficient motors also generate less heat and experience less wear, lowering maintenance frequency and extending service life. In a sector where plants are expected to run continuously for decades, motor efficiency is not simply a technical upgrade; it is a strategic investment. Improving motor performance can translate into measurable long-term cost savings.

## Variable Frequency Drives: Precision Control for Modern Plants

Variable frequency drives (VFDs) have become essential tools for increasing energy efficiency in desalination. Instead of operating pumps at a fixed speed regardless of demand, VFDs allow operators to adjust pump speed dynamically, matching output with real-time production requirements. This reduces unnecessary energy consumption and improves process stability. In addition, VFDs minimize mechanical stress on pumps, valves, and pipelines by enabling smooth startups and controlled pressure changes. This not only improves equipment lifespan but also reduces the risk of sudden failures. In desalination facilities where high-pressure systems dominate operations, precise electrical control is key to maintaining consistent membrane performance. VFD technology, therefore, supports both energy efficiency and operational reliability.



## Automation and Smart Control Systems

Modern desalination plants rely heavily on automation to ensure stable performance and optimized energy use. Advanced control systems regulate pressure, flow rates, chemical dosing, and cleaning cycles with high accuracy. This reduces human error and allows plants to operate closer to optimal efficiency targets. Automation also plays a key role in improving safety by monitoring critical electrical loads and detecting abnormalities before they become major failures. Many systems now integrate real-time operational data into centralized platforms, enabling faster decision-making. As plant capacity increases and operational complexity grows, automation becomes more than a convenience; it becomes a necessity. A highly automated desalination plant can maintain consistent production while reducing energy waste and operational risk.

## Modular Electrical Rooms: Faster Deployment and Higher Quality

The construction of large desalination plants often faces tight deadlines and logistical challenges. Modular electrical rooms provide a solution by delivering prefabricated units that contain switchgear, motor control centers, automation systems, and power distribution components. These modules are assembled and tested in controlled factory environments, ensuring higher quality and reducing on-site installation risks. Once delivered, they can be rapidly integrated into the plant, accelerating project timelines. Modular designs also improve safety and simplify future expansion, which is increasingly important as water demand continues to grow. By reducing on-site labor and minimizing commissioning delays, modular electrical infrastructure is becoming a preferred approach in modern desalination projects, particularly in remote coastal locations.

## Digital Monitoring and Predictive Maintenance

Digitalization is transforming desalination by enabling operators to monitor electrical performance continuously. Sensors and monitoring systems track parameters such as vibration, temperature, load variations, and energy consumption. These tools provide early warning signals that allow predictive maintenance, preventing costly breakdowns and reducing downtime. Digital platforms also support performance benchmarking by identifying energy inefficiencies across equipment groups and operational phases. Instead of relying solely on periodic inspections, operators can make data-driven decisions in real time. In large facilities where equipment failure can interrupt water supply for entire communities, predictive maintenance is a major advantage. Ultimately, digital monitoring strengthens reliability while supporting sustainability goals through improved energy management.



## Renewable Energy Integration: A New Direction for Desalination

As the water sector faces pressure to decarbonize, desalination is increasingly being linked to renewable energy sources such as solar and wind. However, renewables introduce variability that traditional electrical systems were not designed to manage. Advanced electrical infrastructure, such as intelligent power electronics, inverters, and energy management systems, allows desalination plants to operate more flexibly under changing energy supply conditions. Automation and digital monitoring also help adjust production rates based on available power. This approach reduces reliance on fossil fuels and improves environmental performance. In regions with strong solar potential, renewable-powered desalination represents a promising long-term solution. The success of this model depends largely on robust and adaptable electrical engineering.



## Conclusion

Desalination has become a cornerstone of global water security, but its future depends on making it more energy-efficient and environmentally responsible. While membranes and pumps remain essential, the true transformation lies in the electrical backbone of desalination plants. High-efficiency motors, variable frequency drives, automation systems, modular electrical rooms, and digital monitoring platforms are redefining how desalination facilities operate. These technologies reduce energy consumption, improve reliability, and support renewable energy integration. As water scarcity intensifies worldwide, electrical innovation will continue to play a decisive role in ensuring desalination is not only a solution for today but also a sustainable foundation for tomorrow.

# Buyers Guide for Water and Renewable Energy Companies

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## LONGi Secures PV Tech AAA Rating for 25th Consecutive Time

LONGi has maintained its AAA rating in the Q1 2026 PV ModuleTech Bankability Report for the 25th consecutive time, reflecting its strong operational metrics and commitment to solar technology innovation. The company achieved a breakthrough with its HIBC solar cell, certified with a conversion efficiency of 28.13%. Additionally, LONGi launched fire-resistant modules and a new PV-storage integration strategy to enhance safety and efficiency. Recognized in BloombergNEF's Tier 1 list for eight quarters, LONGi is reshaping the PV-storage industry through continuous innovation, contributing to the global energy transition and carbon neutrality goals.



## Iberdrola Expands its Generation Capacity in Italy to 450 MW with a New Wind Project



Iberdrola has agreed to acquire a 40 MW wind power plant in Basilicata, Italy, from Belenergia and RGREEN INVEST. Commissioned in 2018, the asset benefits from a long-term incentive scheme ensuring stable cash flows. This acquisition enhances Iberdrola's renewable portfolio in Italy, complementing existing projects like the 20 MW Montelungo PV plant and the 243 MW Fenix solar project, totaling approximately 450 MW of installed capacity. The transaction aligns with Iberdrola's strategic focus on generation technologies that ensure energy security and competitiveness, supporting its growth commitment in the Italian market under stable regulatory frameworks.

## Grundfos Teams Up with Prestigious Universities to Develop Sustainable Cooling Systems for the Future

Grundfos announced partnerships with leading universities to develop sustainable and intelligent solutions that improve energy efficiency and water management across industries and smart buildings. The collaborations focus on driving innovation, developing talent, and creating educational and training programs related to sustainability and digital technologies. The initiative also supports the United Nations Sustainable Development Goals, particularly those linked to clean water and climate action. The company emphasized that cooperation between industry and academia will help accelerate low-carbon technologies, reduce environmental impact, and prepare future engineers and specialists to address global water and energy challenges effectively.



## Syria: TotalEnergies Signs a Cooperation Agreement on Offshore Exploration

TotalEnergies announced the signing of a cooperation agreement with the Syrian Petroleum Company, alongside QatarEnergy and ConocoPhillips, to explore Offshore Block 3 in the Eastern Mediterranean off Syria’s coast. The agreement includes conducting technical studies and establishing a framework for future commercial and technical discussions related to offshore exploration activities. The move marks a renewed engagement in Syria after operations were suspended in 2011 due to sanctions and conflict. It also reflects growing international interest in Syria’s offshore energy potential and the possible revival of investment opportunities in the region’s oil and gas sector.



## Shell Announces Agreement to Acquire Canadian Energy Company, ARC Resources Ltd (“ARC”)



Shell announced a definitive agreement to acquire Canadian energy company ARC Resources in a deal valued at approximately \$16.4 billion, including debt. The transaction is structured as 75% Shell shares and 25% cash, offering ARC shareholders CAD 8.20 in cash plus 0.40247 Shell shares per ARC share, representing a significant premium over its recent trading price.

The acquisition strengthens Shell’s position in Canada’s Montney shale basin, adding large-scale natural gas and liquids production and increasing output by around 370,000 barrels of oil equivalent per day. It also supports Shell’s strategy to expand low-cost, long-life gas assets and secure future LNG supply growth.

## ACCIONA Energía Secures Contracts to Decarbonize Energy-Intensive Industry in Italy

ACCIONA Energía announced new agreements in Italy to supply around 800 GWh of renewable electricity to energy-intensive industries, including steel manufacturers, supporting industrial decarbonization efforts. The contracts are part of Italy’s Energy Release 2.0 mechanism, which connects industrial electricity demand with the development of new renewable energy projects. Under the agreements, companies will purchase green electricity at fixed prices for three years, while ACCIONA Energía will develop additional renewable capacity backed by long-term tariffs. The initiative aims to cut emissions in hard-to-abate sectors, provide price stability for manufacturers, and accelerate renewable energy expansion.



# Global Energy Events

## Renewables Procurement & Revenue Summit

**Date:** 20 & 21 May 2026

**Location:** Hilton London Tower Bridge

The Renewable Procurement & Revenue Summit 2026 brings together the UK and Ireland's renewable energy ecosystem to address these realities head on. Over two days, featuring dedicated Buyer and Seller streams, the Summit blends plenary discussions, expert panels, case studies, executive interviews, and peer to peer roundtables to deliver actionable insights on market trends, risk mitigation, and innovative contracting solutions.

**Website:** [renewablerevenue.co.uk](https://renewablerevenue.co.uk)



## The Battery Show Europe

**Date:** From 9 to 11 June 2026

**Location:** Messe Stuttgart, Germany

Join Peers at the Leading Meeting Place for the Advanced Battery and H/EV Technology Community. Meet battery manufacturers, suppliers, engineers, thought leaders, and decision makers for a conference and battery tech expo focused on the latest developments in the advanced battery and automotive industries.

**Website:** [thebatteryshow.eu](https://thebatteryshow.eu)



## PV ModuleTech USA

**Date:** 16 & 17 June 2026

**Location:** Napa, USA

The event will gather the key stakeholders from solar developers, solar asset owners and investors, PV manufacturing, policy making and all interested downstream channels and third-party entities

**Website:** [pvtechconferences.com/pv-moduletech-usa](https://pvtechconferences.com/pv-moduletech-usa)



## Intersolar Europe

**Date:** From 23 to 25 June 2026

**Location:** At Messe München

As the world’s leading exhibition for the solar industry, Intersolar Europe demonstrates the enormous vitality of the solar market. For more than 30 years, it has been providing a networking opportunity for the key players from manufacturers, suppliers and distributors to installers, service providers, project developers, planners and start-ups all under the motto “Connecting Solar Business”.

**Website:** [intersolar.de](https://intersolar.de)



## International Energy Storage & Battery Conference & Exhibition

**Date:** From 9 to 11 October 2026

**Location:** Shanghai World Expo Exhibition and Convention Center

Council (Preparatory), New Energy Industry Association for Asia and the Pacific, European Association of Energy Storage Trade, China Electric Power Construction Association, Shanghai Federation of Industrial Economics, Shanghai New Energy Industry Association, and the SNEC PV, Storage & Hydrogen Energy Alliance, the SNEC ES+ 13th (2026) International Energy Storage & Battery Conference & Exhibition (abbreviated as “2026 SNEC ES+ Exhibition”) will be grandly held.

**Website:** [energystorageexpo.org](https://energystorageexpo.org)



## Battery Asset Management Summit Europe 2026

**Date:** 2 & 3 December 2026

**Location:** Hotel nhow Roma, Italy

Europe saw unprecedented growth in energy storage last year, with a record-breaking 12GW installed, and Battery Energy Storage Systems (BESS) continued to dominate this expansion. What continued to set this summit apart was the strength of its community. Through technical workshops and structured networking, stakeholders came together not only to learn but also to work through the real operational challenges shaping Europe’s storage landscape.

**Website:** [batteryeurope.solarenergyevents.com](https://batteryeurope.solarenergyevents.com)





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