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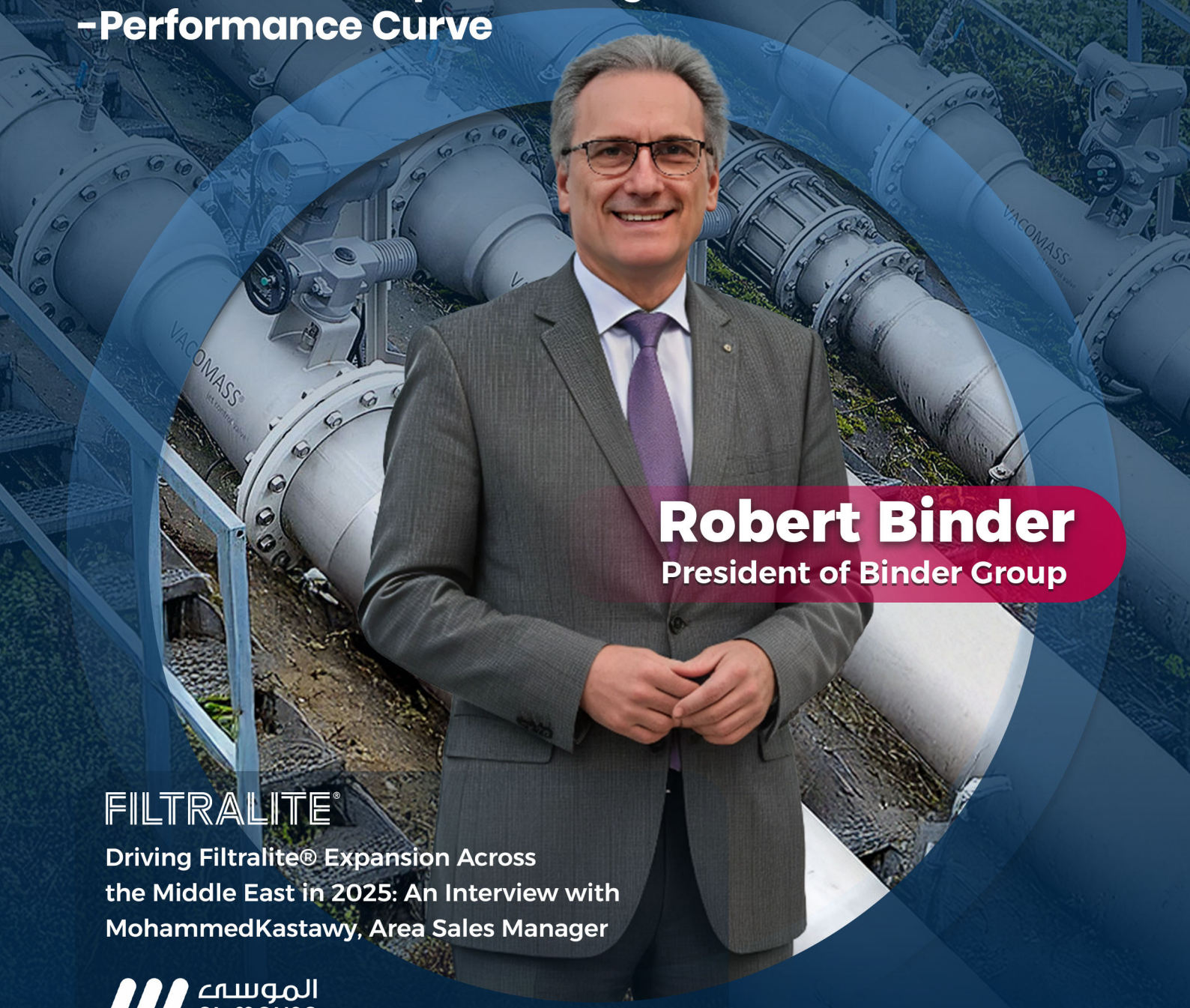
BINDERGROUP
MEASUREMENT & CONTROL

The 65% Energy Problem in STP Aeration: How Binder Group Is Shifting the Cost-and -Performance Curve



Robert Binder
President of Binder Group

FILTRALITE®

Driving Filtralite® Expansion Across the Middle East in 2025: An Interview with MohammedKastawy, Area Sales Manager

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AL MOUSA
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Al-Mousa Trading Co. Reinforces Its Leadership in Water Solutions with Dual Recognition at the GRUNDFOS Annual Convention 2025

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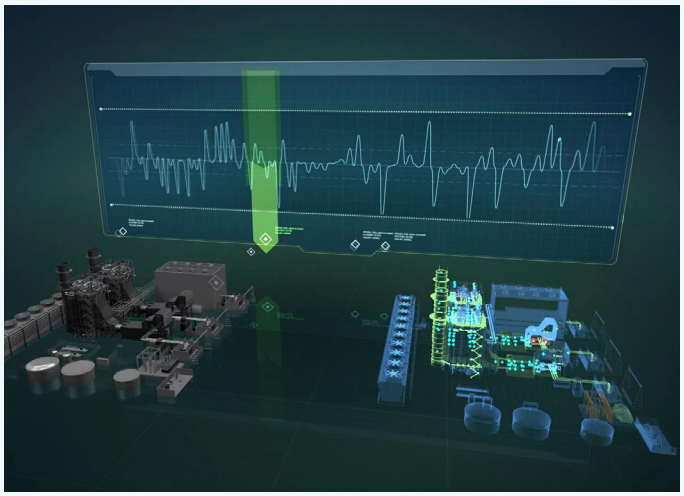

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Innovative Solutions to Achieve Sustainability in Water and Energy

From The Editor

In an era defined by resource scarcity and climate volatility, the convergence of water management, energy efficiency, and digital innovation has never been more critical. This issue explores the marvels of engineering and strategic shifts defining this new landscape, highlighting how the industry is moving from reactive operations to proactive, data-driven resilience.

We begin by addressing the "energy elephant" in the room: aeration. With aeration accounting for up to 65% of a wastewater plant's energy consumption, the need for precision is paramount. We spotlight Binder Group, whose intelligent control systems, specifically VACOMASS®, are redefining efficiency by moving away from fixed setpoints to demand-driven operations based on real-time ammonia loads.

Regionally, we focus on the Middle East's accelerating infrastructure boom. Al-Mousa Trading Co. stands as a testament to local leadership, reinforcing its strategic partnership with GRUNDFOS to deliver high-performance water solutions aligned with Saudi Arabia's Vision 2030. Similarly, Filtralite® is expanding its footprint, offering advanced filtration media that are proving vital for the region's desalination and water reuse projects, as evidenced by its success at the Beni Saf plant in Algeria.

However, efficiency requires a robust technological backbone. The rise of Digital Twins (DTs) marks a transformative moment for the sector.

No longer limited to aerospace, DTs are now creating virtual replicas of water infrastructure to predict performance and optimize resources in real-time. This digital shift extends to pump stations, where IIoT and analytics are extending asset life and slashing energy costs.

Sustainability remains the thread binding these stories together. We delve into the "circular economy" within the beauty and personal care industry, where companies are decoupling growth from water consumption through recycling and reuse. We also explore the critical role of specialized pumps in converting methane, a potent greenhouse gas, into clean energy, and celebrate the enduring power of hydropower, exemplified by China's massive Fengning Pumped Storage Power Station, the world's largest "water battery".

From the microscopic pores of filter media to gigawatt-scale energy storage, this issue celebrates the technologies turning today's challenges into tomorrow's sustainable solutions.

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BINDERGROUP
MEASUREMENT & CONTROL

The 65% Energy Problem in STP Aeration: How Binder Group Is Shifting the Cost-and-Performance Curve

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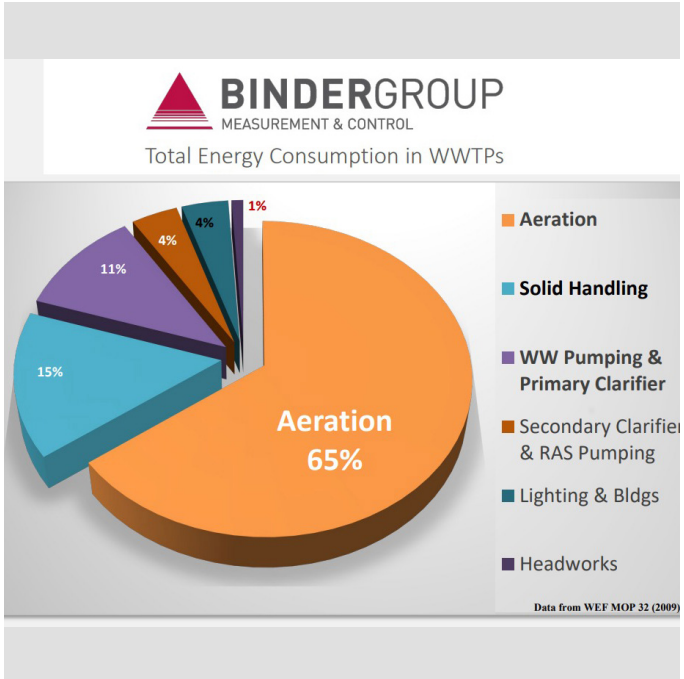
Aeration is the heart of biological wastewater treatment—and at the same time, its most energy-intensive process. Operational data from wastewater treatment plants (WWTPs) worldwide confirm that aeration alone accounts for approximately 65% of total plant energy consumption. While aeration is essential for sustaining biological activity, conventional control strategies often rely on fixed dissolved oxygen (DO) setpoints, leading to over-aeration, wasted energy, and rising operational costs.

This challenge has accelerated the shift toward intelligent, demand-driven control strategies. Among the global technology leaders addressing this issue is Binder Group, a German specialist in gas flow measurement, analysis, and control systems.



Binder Group: Engineering Control for a Better Environment

Headquartered in Ulm, Germany, Binder Group brings more than six decades of experience in gas flow technologies.

Its solutions are deployed in over 50 countries across water, wastewater, environmental, and energy sectors. The company's philosophy, **"Better Control. Better Environment."**, is reflected in its integrated approach to efficiency, reliability, and sustainability.

> Aeration is where wastewater plants consume the majority of their energy. If you want to reduce operating costs and carbon footprint, this is the process where intelligent control delivers the highest impact,

says Dr. Maher AlHammoud, MENA Sales Manager at Binder Group.

From Fixed DO to Intelligent Aeration Control

Traditional aeration systems operate on the assumption of stable biological loading, maintaining constant DO setpoints regardless of real-time process conditions. In practice, influent load, ammonia concentration, and biological activity are continuously fluctuating, making fixed control strategies inherently inefficient.

Binder Group addresses this gap through VACOMASS®, an intelligent and fully integrated aeration control and management system designed for wastewater and sewage treatment plants.

VACOMASS® – Intelligent Aeration Control

VACOMASS® isn't a single device but a complete aeration control ecosystem.

The system integrates:

- Dedicated aeration air flow meters
- Specialized aeration control valves
- The intelligent VACOMASS® flexcontrol unit
- Process sensors including DO, NH_4-N (ammonia), and NO_3-N (nitrate)

This architecture enables precise air distribution and real-time adjustment based on actual biological demand. As a result, aeration energy consumption can be reduced dramatically while maintaining stable treatment performance.

Well-designed systems aim to achieve aeration energy consumption below 15 kWh per population equivalent (PE) per year, and total plant energy consumption below 25 kWh/PE/year, benchmarks that are increasingly achievable through intelligent aeration control strategies.

Ammonia-Based DO Control: Responding to Real Process Load

One of the key differentiators of VACOMASS® is its ammonia-based DO control strategy.

Instead of maintaining a fixed oxygen concentration, the system dynamically adjusts aeration based on measured ammonia levels in the biological process.

> By linking dissolved oxygen directly to ammonia concentration, VACOMASS® ensures that air is supplied only when and where it is truly needed. This eliminates over-aeration while protecting process stability,

explains Dr. Maher AlHammoud.

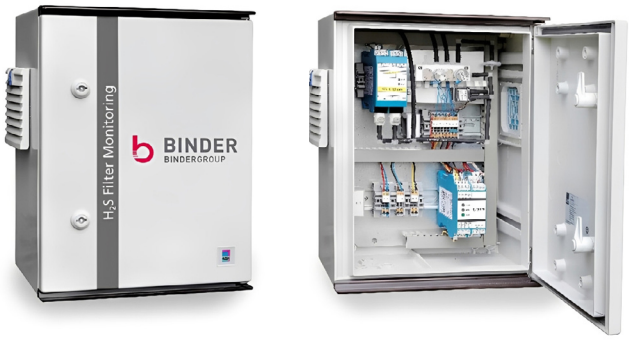
This approach improves nitrification and denitrification efficiency, stabilizes effluent quality, and significantly reduces blower energy demand.

COMBIMASS® – Extending Control Beyond Aeration

While VACOMASS® focuses on aeration control, Binder also offers COMBIMASS®, a comprehensive gas flow measurement and gas analysis solution.

They provide quantitative and qualitative monitoring of gases such as NH_3, CH_4, CO_2, O_2, and H_2S, supporting safe operation, process optimization, and environmental compliance.

Together, VACOMASS® and COMBIMASS® reflect Binder Group's holistic approach to gas management across the entire wastewater treatment value chain.



Expanding Control Capabilities with the Smart Aqualogic® Platform

Recently, Binder Group expanded its control portfolio by acquiring Aqualogic®, an advanced fuzzy-logic-based process control platform for wastewater biological treatment.

Aqualogic® complements VACOMASS® and COMBIMASS® by providing intelligent, load-dependent process regulation, enabling additional energy savings, enhanced operational stability, and integrated chemical dosing control—setting the stage for future AI-driven adaptive plant management.

Measured Energy Savings and Performance Gains

Field data from multiple installations demonstrate the tangible benefits of intelligent aeration control:

- 10–30% energy savings through precise aeration control
- 8–15% additional savings from ammonia-based DO control
- 5–15% savings through diffuser monitoring and maintenance functions

Combined, total aeration energy savings can exceed 40–50%. In parallel, plants report total nitrogen reductions of up to 25% in the effluent, alongside lower chemical consumption and reduced operational expenditure (OPEX).

Global Reference Projects

VACOMASS® systems are successfully operating in major WWTPs worldwide. At Shanghai Bailonggang WWTP in China, one of the largest treatment plants in Asia, flexible DO setpoints—typically ranging from 0.6 to 2.0 mg/L—have delivered stable operation and significant energy savings. In Munich, Germany, the modernization of aeration control reduced pressure losses and resulted in annual energy savings exceeding €100,000.

Today, VACOMASS® systems serve more than 23 million m^3/day of treatment capacity in China alone, highlighting the scalability and reliability of Binder Group's solutions.

Furthermore, Binder systems as a whole are used in 1200 WWTPs in 50 countries worldwide, spanning capacities from the smallest plants to those handling 7 million cubic meters.

Conclusion
Intelligent Control as a Path to Sustainability

As wastewater utilities face increasing energy costs and stricter environmental regulations, intelligent aeration control has become a strategic necessity rather than a technical upgrade.

Through VACOMASS® & COMBIMASS®, Binder Group demonstrates how advanced control strategies, real-time process data, and integrated system design can significantly reduce energy consumption while enhancing treatment performance. By transforming aeration from a fixed-setpoint operation into a demand-driven process, Binder Group is redefining efficiency, & supporting a more sustainable future for wastewater treatment worldwide.

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FILTRALITE®

Driving Filtralite® Expansion Across the Middle East in 2025

An Interview with Mohammed Kastawy, Area Sales Manager

With the Middle East accelerating investments in water security and desalination, advanced filtration technologies have become more critical than ever. In this interview, **Eng. Mohammed Kastawy**, Filtralite's MENA Region Sales Manager, shares insights into Filtralite®'s regional expansion,participation in Aqua Energy Expo and key case studies that demonstrate real operational impact across the region.

Can you tell us about Filtralite® and its role in water treatment?

Filtralite® is a high-performance filter media made from expanded clay, engineered specifically for water and wastewater treatment applications. Unlike traditional sand media, Filtralite® offers a high porosity structure, low weight, and excellent hydraulic performance. This unique structure allows for higher filtration efficiency, longer filter cycles, reduced pressure drop, and lower backwash requirements. As a result, plants can improve water quality while significantly reducing operational costs, energy consumption, and water losses. Filtralite® has proven its effectiveness in drinking water, wastewater, and desalination pre-treatment systems worldwide.

How is Filtralite® expanding across the Middle East?

The Middle East represents a strategic growth market for Filtralite®, driven by large-scale desalination projects, water reuse initiatives & sustainability goals. Our expansion strategy focuses on long-term partnerships, technical support, and solutions tailored to local operating conditions.

Strong Partnership with Al-Mousa Trading Company

A key part of our Middle East strategy is the strong collaboration with Al-Mousa Trading Company, one of Saudi Arabia's leading engineering solution providers. This partnership allows us to deliver customized filtration solutions to utilities, EPC contractors, and operators across the GCC, ensuring Filtralite® is installed, maintained, and optimized for local conditions.

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Why is participation in Aqua Energy Expo important for Filtralite®?

Aqua Energy Expo is a key platform for engaging with decision-makers, consultants, and operators in the water and energy sectors. Our participation allows us to showcase Filtralite® as a proven technology, supported by real-world case studies rather than theoretical performance.

The exhibition also provides an opportunity to discuss regional challenges directly with stakeholders, exchange technical expertise, and explore new collaborations. Being present at the expo reinforces our commitment to the Middle East market and highlights our readiness to support major infrastructure projects.

How Has Filtralite® Improved Filtration Performance in the Middle East?

A Case Study from Beni Saf Desalination Plant

One of Filtralite®'s most significant case studies in the Middle East and North Africa is the Beni Saf Desalination Plant in Algeria, one of the largest desalination facilities in the Mediterranean, with a production capacity of 200,000 m³/day of drinking water.

The Challenge

Frequent heavy rainfall along the Algerian coast led to high suspended solids (SS) levels in the intake water, causing frequent backwashing, production bottlenecks, and increased operating costs.

The Solution

To overcome these challenges with minimal capital investment, the plant replaced traditional sand media with Filtralite® filter media in the first filtration stage across 48 filters, implemented in two phases between 2020 and 2021.

What were the results of using Filtralite®?

• The results exceeded expectations. During intense rain events, filter cycles with Filtralite® lasted 200% longer than sand, while filter maturation time was reduced by nearly 66%.

• Production losses dropped dramatically—from 673,000 m³ to 380,000 m³, representing a 45% reduction. With the full conversion completed, expected reductions in downtime-related losses exceed 85%.

• Additionally, the filtered water quality improved by 0.3 to 0.5 SDI points, leading to fewer cartridge filter replacements and lower chemical cleaning requirements.

• As stated by Mr. Mohamed Chaffi, Director of the Beni Saf Desalination Plant:

> "The results are positive... We have far exceeded the initial process limits. I would do it again with pleasure and have already recommended it to other plants."

How do these case studies support Filtralite®'s future in the region?

These case studies demonstrate that Filtralite® is not just a product, but a cost-effective operational upgrade. By reducing water losses, energy consumption, and maintenance costs, Filtralite® directly supports sustainability goals and long-term operational resilience.

Looking ahead to 2025, we see Filtralite® playing a key role in desalination, potable water, and reuse projects across the Middle East, helping utilities produce more water, at lower cost, with greater reliability.

Conclusion

Filtralite® continues to prove its value through real-world performance. With a growing regional presence, strong exhibition participation, and successful case studies like Beni Saf, the future of Filtralite® in the Middle East is built on efficiency, sustainability & trust.

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Filtralite®: The Future of Filter Media in Water Treatment in the Middle East – Efficiency, Sustainability, and Innovation!

- **Enhancing Water Treatment:** Boosting efficiency and delivering reliable, high-performance results.
- **Advanced Technologies:** Innovative filtration solutions that optimize performance and reduce costs.
- **Strategic Partnerships:** Collaborating with Al-Mousa Trading Company to provide tailored solutions.
- **Active Participation:** Engaging decision-makers at Aqua Energy Expo.
- **Proven Results:** The Beni Saf Desalination Plant showcases improved productivity and reduced costs.
- **Sustainable Future:** Supporting sustainability goals across water and desalination projects in the region.

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Al-Mousa Trading Co. Reinforces Its Leadership in Water Solutions with Dual Recognition at the GRUNDFOS Annual Convention 2025

In the dynamic and competitive water solutions sector, Al-Mousa Trading Co. has established itself as a symbol of excellence, reliability, and innovation in Saudi Arabia.

With decades of experience, the company has consistently delivered high-performance water systems that cater to residential, commercial, industrial, and municipal projects. By combining deep local knowledge with global technologies, Al-Mousa Trading Co. ensures every solution not only meets the highest engineering standards but also aligns with the Kingdom's ambitious infrastructure goals.

At the heart of its success lies a strategic partnership with GRUNDFOS, a world-leading provider of advanced pumping technologies. This collaboration allows Al-Mousa Trading to bring state-of-the-art solutions to the Saudi market, enabling clients to achieve optimal water efficiency, energy savings, and operational reliability. Over the years, this partnership has become a cornerstone of Al-Mousa's commitment to excellence, positioning the company as the go-to expert for sustainable and innovative water solutions across the Kingdom.

Al-Mousa Trading Co. serves as the official partner for GRUNDFOS, promoting an extensive portfolio of cutting-edge pumping solutions designed to meet the unique needs of various sectors in Saudi Arabia.

- **Buildings & Commercial Developments**

Hydro MPC & Hydro Multi-E Booster Systems: Ensure stable water pressure in high-rise buildings and large complexes.

CR & CRE Vertical Multistage Pumps: Provide reliable water supply for commercial and residential buildings.

MAGNA & TPE Circulation Pumps: Optimize HVAC systems for energy efficiency and

building automation.

- **Water Supply & Infrastructure**

NK & NB end-suction Pumps: Designed for municipal water networks and large-scale distribution.

TP inline Pumps: Enhance water circulation and pressure control.

Smart Control and Boosting Solutions: Improve network efficiency and operational reliability.

- **Industrial Applications**

CR/CRE Multistage Pumps: Energy-efficient pumps for industrial processes.

TPE & TP Pumps: Designed for cooling, heating, and process circulation applications.

Intelligent Pumping & Digital Monitoring Solutions: Maximize operational efficiency and lifecycle performance.

- **Wastewater & Drainage**

SEG Grinder Pumps: Handle complex wastewater applications with ease.

SL & SE Submersible Pumps: Reliable solutions for drainage and flood control.

High-reliability Systems: Built for continuous operation in challenging conditions.

- **Firefighting & Life Safety**

Firefighting Pumps Compliant with International Standards: Ensure operational readiness for emergency response.

Robust System Configurations: Guarantee uninterrupted performance in critical scenarios.

By marketing and deploying these products, Al-Mousa Trading Co. ensures clients benefit from high-quality, reliable, and energy-efficient water solutions across all sectors.

Strategic Marketing Excellence

Al-Mousa Trading Co.'s market leadership is driven by a sophisticated, client-focused marketing strategy. Rather than focusing solely on products, the company emphasizes solution-driven campaigns that highlight the practical

- **Key Marketing Approaches:**

Consultative Engagement: Understanding client challenges to tailor solutions for efficiency, reliability, and cost-effectiveness.

Sector-Specific Campaigns: Targeting developers, municipalities, industrial operators, and facility managers with solutions that meet specific operational requirements.

Relationship Management: Building long-term partnerships that foster trust, repeat business, and thought leadership.

This methodical approach has solidified Al-Mousa's reputation as a trusted provider, ensuring the adoption of advanced pumping solutions across the Kingdom.

Comprehensive Services Offered

Beyond marketing, Al-Mousa Trading Co. provides end-to-end project services, ensuring every solution delivers maximum value.

- **Services Include:**

Consultation & System Design: Customizing solutions to project-specific needs.

Installation & Commissioning Support: Ensuring seamless integration of GRUNDFOS products.

Maintenance & After-Sales Services: roviding ongoing reliability and operational efficiency.

Technical Support & Training: Equipping client teams with knowledge to optimize performance and extend equipment lifecycle.

This holistic approach positions Al-Mousa Trading Co. as more than a supplier it is a partner in operational excellence.

Dual Recognition at the GRUNDFOS Annual Convention 2025

The company's strategic approach and oper ational excellence were celebrated at the GRUNDFOS An nual Convention 2025, where Al-Mousa Trading Co. received two prestigious awards:

- **Highest Sales in Saudi Arabia**
- **Highest Booster Pumps Sales in Saudi Arabia**

These awards reflect outstanding commercial performance, but more importantly, they acknowledge the company's
effective partnership model, expert teams, and consistent delivery of high-performing solutions.

Alignment with Saudi Vision 2030

Al-Mousa Trading Co.'s solutions are fully aligned with Saudi Arabia's Vision 2030, supporting key national objectives:

- Energy Efficiency: Optimizing water and pumping systems to reduce operational costs.
- Sustainable Development: Deploying eco-friendly, long-lasting solutions.
- Infrastructure Modernization: Supporting the Kingdom's smart city projects and industrial expansion.

By integrating sustainable technologies, Al-Mousa Trading contributes to a resilient and future-ready water infrastructure, demonstrating leadership in national development initiatives.

Shaping the Future of Water Solutions

The achievements of 2025 are a stepping stone for future growth. Al-Mousa Trading Co. plans to:

- Expand technical capabilities with the latest GRUNDFOS technologies and digital solutions.
- Strengthen strategic partnerships to introduce innovative solutions to the Kingdom.
- Develop sector-specific solutions for emerging projects in smart cities, industrial zones, and critical infrastructure.
- Invest in talent development to maintain a highly skilled workforce for world-class service.

With its proven track record, market insight, and commitment to excellence, Al-Mousa Trading Co. is poised to shape the future of water solutions in Saudi Arabia, providing reliable, efficient, and innovative systems for decades to come.

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Al-Mousa Trading: A Leader in Water Solutions in Saudi Arabia Achieving Excellence with GRUNDFOS Awards

- Al-Mousa Trading Co. is a leader in water solutions in the Kingdom, offering advanced pumping systems that meet the needs of various sectors in collaboration with GRUNDFOS.
- The company received the following awards at the GRUNDFOS Annual Convention 2025.

- **Highest Sales in Saudi Arabia**
- **Highest Booster Pumps Sales in Saudi Arabia**

- Al-Mousa is committed to supporting Vision 2030 through sustainable technologies and energy efficiency.
- Invest in the future with Al-Mousa, where they reshape water solutions to meet your needs with reliability and efficiency.

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Revolutionizing Energy Efficiency: ANDRITZ's Advanced Pumping Solutions for a Sustainable Pulp and Paper Industry

In the face of escalating energy costs and the urgent need to reduce environmental impact, industries, particularly the pulp and paper sector, are increasingly focusing on energy efficiency. Pump systems play a pivotal role in this endeavor, as they are integral to production processes. However, inefficiencies in pump design, system integration, and operational practices can lead to unnecessary energy consumption and increased costs.

ANDRITZ addresses these challenges with advanced pumping solutions tailored for the pulp & paper industry. Their innovative technologies, such as medium-consistency pumps, headbox pumps, and self-priming centrifugal pumps, not only enhance efficiency but also minimize energy usage, contributing to sustainable industrial practices and improved competitiveness.

The Importance of Integrating Pump Systems in Reducing Energy Consumption

Reducing the environmental footprint to protect the climate is currently one of the biggest challenges facing industries. This is especially true for the pulp & paper industry. Significant increases in energy costs make efficiency even more critical. Centrifugal pumps play a key role in the overall energy considerations for pulp and paper production. Apart from pump design and hydraulics, system integration has a decisive impact. Plant layout, piping, valves, and process parameters directly affect energy consumption & efficiency. Oversized pumps, excessive safety margins, improper configurations (piping, throttling, bypass control, or operating modes),

or wear can lead to unnecessary energy consumption and higher costs that reduce competitiveness.

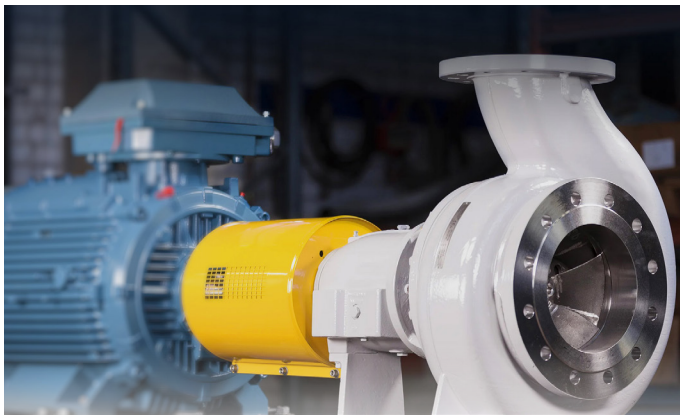
ANDRITZ's Advanced Pumping Solutions for Increased Energy Efficiency

• Medium-consistency Pumps

ANDRITZ medium-consistency pumps convey chemical and mechanical pulp as well as secondary fibers with consistencies of up to 16% b.d. and efficiencies of up to 74%. In most applications, they can be operated without an internal or external vacuum pump. The greatest advantage of the ANDRITZ medium-consistency pump, MC series, is its innovative fiber separation system (SMARTSEP). With ANDRITZ SMARTSEP, an additional separation impeller returns fibers reliably to the pump and guides air out of the pump at the same time. This makes it possible to guarantee that there are no fiber losses, particularly in run-up operations and at low consistencies. Additionally, it ensures an easy control of the degassing valve.

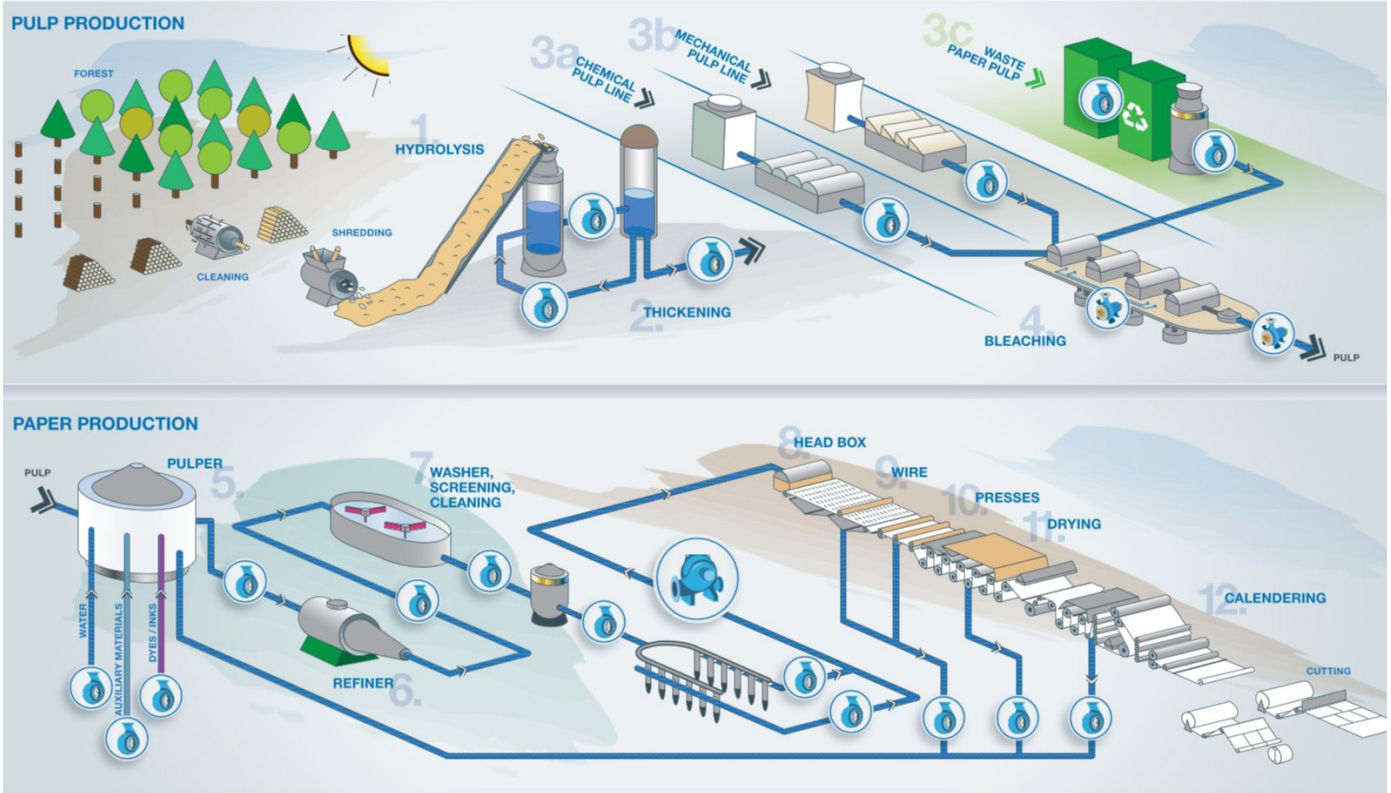
• Headbox or Cleaner Pumps

ANDRITZ double-flow axial split case pumps have been optimized for use in the pulp and paper industry as headbox or cleaner pumps. They feature efficiencies of over 90% and low pulsation due to the offset rotor blades developed especially for the applications in this industry. ANDRITZ fan pumps from the ASP series convey stock suspensions with consistencies of up to 2%. They are characterized by low pulsation and very high efficiencies.



• Process Pumps

ANDRITZ centrifugal pumps are used as process pumps in many different areas of pulp and paper mills. They pump suspensions at consistencies of up to 8% b.d., offer high efficiencies of up to 90%, and convince customers with their service friendly and modular design. These pumps are also available with an additional degasser if the medium to be pumped has a high gas content. For complete information on our centrifugal pumps for the pulp & paper industry.



• Self-priming Centrifugal Pumps

ANDRITZ self-priming centrifugal pumps convey media with a high gas content. They are also extremely suitable for transporting viscous and solids-containing media due to their open impellers.

• Sump Pumps

ANDRITZ sump pumps convey pulp suspensions, slurries containing solids and large particles, and abrasive media.

Comparison Between Conventional Pumps and Modern ANDRITZ Pumping Solutions

When assessing the performance and long-term value of pumping systems in pulp and paper mills, the difference between traditional pumps and modern ANDRITZ solutions becomes clearly significant. Conventional pumps, which were designed for older operating conditions, are often limited in their ability to handle today's high-efficiency, high-capacity production requirements.

As a result, they consume more energy due to outdated hydraulics, higher friction losses, and suboptimal operating points. In contrast, ANDRITZ pumps are engineered with advanced hydraulic designs and optimized flow paths, allowing them to operate much closer to their Best Efficiency Point (BEP), reducing energy consumption by a notable margin. Many mills report annual energy savings ranging from 10% to 20% after transitioning to ANDRITZ pumping systems.

The Superiority of ANDRITZ Pumps

Another major difference lies in service life. Traditional pumps tend to experience accelerated wear due to less refined impeller designs, insufficient degassing mechanisms, and greater sensitivity to abrasive media. This shortens their operational lifespan and increases maintenance demands. ANDRITZ pumps, however, are constructed using robust materials and incorporate technologies such as SMARTSEP fiber separation and efficient degassing systems, which significantly extend component life and reduce mechanical stress.

Failure frequency is also considerably lower in ANDRITZ pumps. Older pumps often suffer from frequent breakdowns caused by vibration, air entrainment, and inconsistent flow. These interruptions not only raise maintenance costs but also lead to costly production downtime. Modern ANDRITZ systems address these issues through stable hydraulic performance, reduced pulsation, and intelligent monitoring options, helping mills achieve more reliable and continuous operation.

The Role of Digitalization and Intelligent Control in Improving Pump Efficiency

Digitalization and intelligent control have become essential elements in the development of pumping systems within pulp and paper mills, given their vital role in increasing efficiency, reducing energy consumption, and ensuring operational stability.

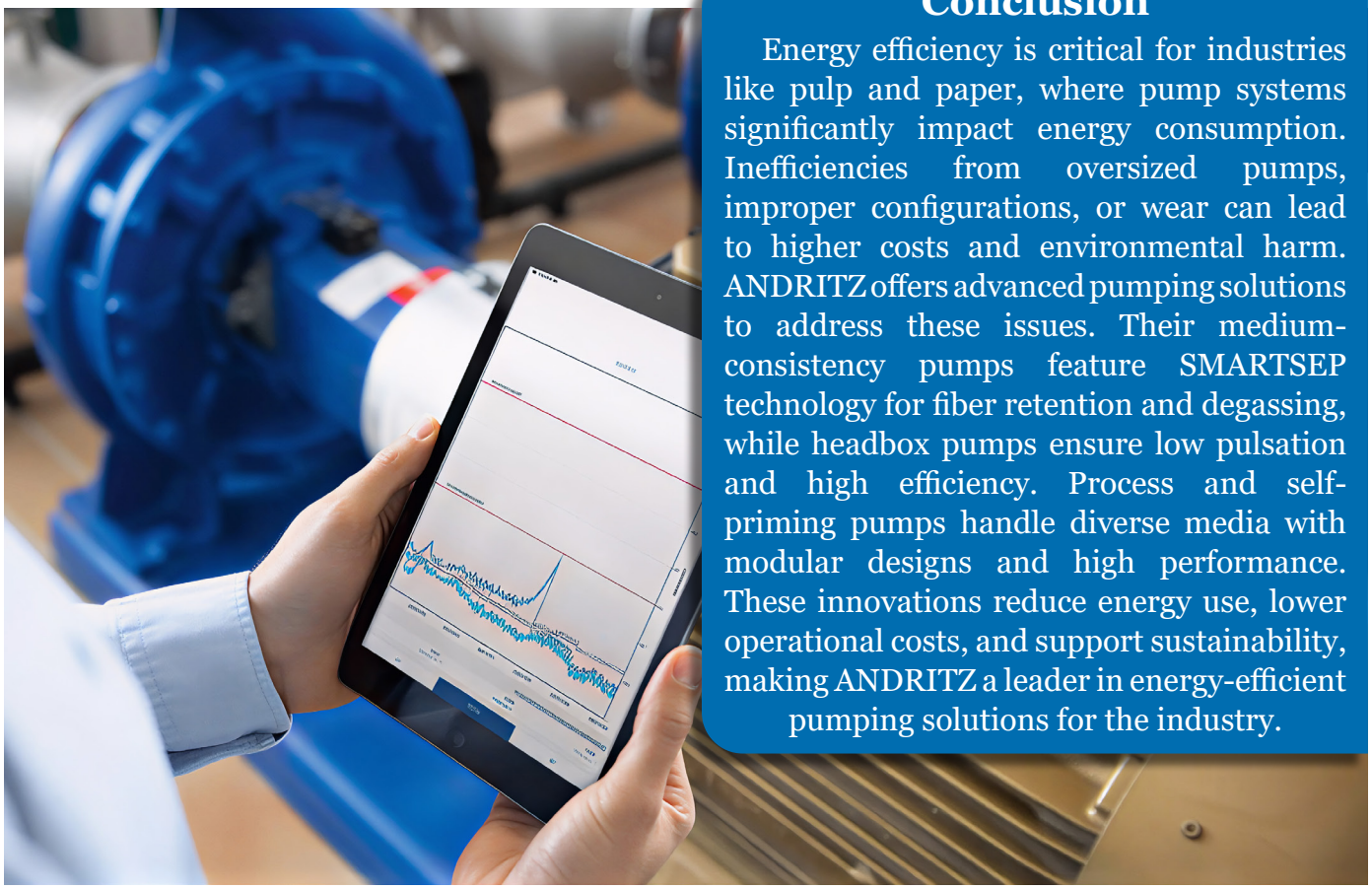
Modern mills rely on a range of advanced technologies that enable precise monitoring of pump status and rapid intervention when needed, contributing to maintaining productivity and reducing operating costs.

Sensors play a crucial role in providing real-time data on pump performance, such as pressure, temperature, flow rates, and vibration levels. This data provides operators with a clear picture of the actual pump condition, enabling them to make informed decisions rather than relying on estimates. Furthermore, SCADA systems and Internet of Things (IoT) technologies are used to connect pumps to an integrated digital infrastructure, allowing for comprehensive and interconnected management of all operational phases through a single central platform.

Predictive Maintenance as a Core Advantage of Digital Pumping Systems

One of the most significant benefits of digitalization is enabling predictive maintenance, which relies on data analysis to anticipate potential malfunctions before they occur. This type of maintenance helps reduce unplanned downtime, which is a very costly problem in continuous industries like papermaking. When intelligent systems detect abnormal changes in pump behavior, proactive measures can be taken, such as adjusting operating conditions or scheduling immediate maintenance, preventing sudden production stoppages.

Intelligent control also improves energy efficiency, as pump speeds can be automatically adjusted based on actual demand, reducing waste caused by operating at excessively high speeds. As a result, these technologies contribute to lower energy consumption and enhanced sustainability of industrial processes, making digitalization a key driver in the development of modern pumping systems and the long term improvement of plant performance.



Conclusion

Energy efficiency is critical for industries like pulp and paper, where pump systems significantly impact energy consumption. Inefficiencies from oversized pumps, improper configurations, or wear can lead to higher costs and environmental harm. ANDRITZ offers advanced pumping solutions to address these issues. Their medium-consistency pumps feature SMARTSEP technology for fiber retention and degassing, while headbox pumps ensure low pulsation and high efficiency. Process and self-priming pumps handle diverse media with modular designs and high performance. These innovations reduce energy use, lower operational costs, and support sustainability, making ANDRITZ a leader in energy-efficient pumping solutions for the industry.

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WEBINARS

Meet our Experts at Aqua Energy Expo Weekly Webinars

Eng. Ahmed Khairy

Engineering and Water: Careers in Desalination and Water Sustainability

Thursday, January 8th

8:00 to 10:00 PM (Saudi Arabia Time)

Eng. Hatem Hussien

From Idea to Implementation: Skills for Building a Culture of Innovation in Your Company through Establishing an R&D Department

Friday & Sunday , January 9th & 11th

8:00-10:00Pm (Saudi Arabia Time)

Dr. Eman Fouad

Transboundary Water Management: A Digital Vision for Sustainability and Water Governance

Friday, January 16th

8:00-10:00 Pm (Saudi Arabia Time)

Dr. Rania Adnan Ghneim

Genomic Characterization of Cryptosporidium spp. in Sludge Produced from Wastewater Treatment Plants in the Gaza Strip: Environmental Health Impact

Saturday, January 17th

8:00 to 10:00 PM (Saudi Arabia Time)

Mr. Maher Al-Hammoud

Engineering and Water: Careers in Desalination and Water Sustainability

Friday, January 30th

7 – 9 PM (Egypt) | 8–10 PM (KSA)

Mrs. Manuela Charatjan

Dr. Ghada Al Mandily

Water Pollution Indicators

Sunday, January 25th

8:00-10:00 Pm (Saudi Arabia Time)

Mr. Florian Adam

Redefining Aeration Efficiency in WWTPs: The Next Generation of Air Blowers

Friday, January 30th

7-9 Egypt | 8-10 KSA

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WATER NEWS BRIEF

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Florida's Largest Membrane Bioreactor Plant Celebrates Expansion with DuPont™ MemPulse™ Modules

The Bee Ridge Water Reclamation Facility in Sarasota, Florida, has expanded its capacity by 50%, now treating 18 million gallons per day using MemPulse™ Membrane Bioreactor (MBR) technology. This makes it Florida's largest MBR installation, meeting Advanced Wastewater Treatment (AWT) standards.

The project, completed by Sarasota County, Carollo Engineers, and Garney Construction, reduces nitrogen and phosphorus discharge, safeguarding local waterways. The high-quality effluent supports non-potable reuse for irrigation, conserving potable water. DuPont's MemPulse™ MBR technology, known for efficiency and reliability, underscores the facility's role in sustainable water management and regulatory compliance.

Kurita and ispace Agree to a Strategic Partnership on Lunar Water Resource Development

Kurita Water Industries and ispace have signed a strategic partnership to advance lunar water resource development, focusing on sustainable infrastructure for future lunar missions. The collaboration includes business models, payload development for water treatment technologies, and joint lunar demonstrations using ispace's landers.

Kurita, leveraging its expertise in water purification, aligns with ispace's "Moon Valley 2040" vision to create a lunar-Earth ecosystem. This partnership builds on Kurita's 2-billion-yen investment in ispace and its participation in JAXA's lunar water purification projects, aiming to support space exploration while addressing Earth's sustainability challenges.

Ecolab Closes Acquisition of Ovivo's Electronics Ultrapure Water Business

Ecolab Inc. has finalized its acquisition of Ovivo's electronics business, a global leader in ultrapure water technologies for semiconductor manufacturing. This move expands Ecolab's role in the AI value chain, from semiconductors to data centers, and more than doubles its high-tech growth engine.

By integrating Ovivo's technologies with Ecolab's global water, digital, and service capabilities, the company aims to deliver circular water management solutions for the water-intensive semiconductor industry, reducing water use and enhancing sustainability. The business will retain its headquarters near Basel, Switzerland, operating under the brand Ovivo, Ultrapure Water+ by Ecolab.

SUEZ Reaffirms Long-term Commitment to China with New Collaborative Initiatives in Jiangsu and Shandong Provinces

SUEZ has announced new collaborations with local partners in Jiangsu and Shandong provinces, focusing on water and waste management to support China's ecological transition.

In Jiangsu, SUEZ will partner with Lianyun Economic Development Zone to build a RMB 440 million industrial water treatment plant, enhancing water conservation and supporting sustainable industrial growth.

In Shandong, SUEZ and Shandong Public Water Group have expanded their partnership from water services to infrastructure development and waste management, achieving notable results like zero liquid discharge and significant environmental benefits.

Projects to Start in Staveley to Improve Water Quality in the River Kent

United Utilities has begun the next phase of its project to improve water quality in Staveley, focusing on reducing storm overflow operations and enhancing wastewater treatment. New storage tanks and equipment will increase capacity and treatment standards at the village's treatment works, building on 2025 upgrades like a 50% capacity increase and 400 m of re-lined pipes.

Plans include laying new pipes under the River Kent and removing surface water from the sewer network. This effort is part of United Utilities' £13 billion investment over five years to protect and enhance waterways across the Northwest.

SWPC Announces Financial Close for Ras Mohaisen Independent Water Desalination Plant Project Valued at Over SAR 2.5 Billion

The Saudi Water Partnership Company (SWPC) has achieved financial close for the Ras Mohaisen Independent Water Desalination Plant Project in Al-Qunfudhah, Makkah Region, with an investment of SAR 2.57 billion, fully funded by the private sector. The plant, developed under the Build, Own, and Operate (BOO) model by a consortium including ACWA Power, HACO, and AlKifah Holding, will produce 300,000 cubic meters of water daily by 2030. It features renewable energy integration, local content development, and infrastructure enhancements, aligning with Saudi Arabia's Vision 2030 goals for water sustainability and economic growth.

الشركة السعودية لشراكات المياه
Saudi Water Partnership Company

Global Water Events

WateReuse Symposium 2026

Date: From 8 to 11 March 2026
Location: Los Angeles, California

The Annual WateReuse Symposium is the premier conference on water recycling, attracting water professionals and water reuse practitioners globally for knowledge-sharing, networking, and collaboration.

The Symposium is the most comprehensive water recycling learning opportunity available, covering policy, technology, operations, and communications for applications that range from irrigation and potable reuse to onsite and industrial systems.

Website: watereuse.org

The Pump Industry Awards 2026

Date: 19th March 2026
Location: The Hilton at St. George's Park, Burton upon Trent

The Pump Industry Awards is now recognised as one of the leading award ceremonies within the industrial arena.

Founded by the BPMA in 2000, the awards programme celebrates the achievements of pump companies and individuals who strive to go the extra mile.

Website: pumpindustryawards.com

Smart Water Systems

Date: 13 & 14 April 2026
Location: London, United Kingdom

The Annual Smart Water Systems conference is designed as a high-level forum to facilitate strategic dialogue and collaboration among water utility companies, solution providers, government authorities, & investment professionals.

The primary goal is to examine cutting-edge technologies, explore the latest industry trends, and share best practices to advance the UK and European smart water market.

Website: smgconferences.com

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

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

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 and innovations, and consolidating efforts of governments and businesses to implement desalination projects and to increase water supplies all over Latin America.

Website: 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 and solutions in water resource management, sewerage, industrial wastewater, purification, and irrigation.

Website: indowater.com

Aquatech Mexico

Date: From 1 to 3 September 2026
Location: Centro Banamex ,Av. del Conscripto 311, Mexico City

On 1 – 3 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

AQUATECH 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

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 & Wastewater Treatment, Power Generation, Oil & Gas.

Website: 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

Aquatech Asia

Date: From 25 to 27 November 2026
Location: Queen Sirikit National Convention Center, Bangkok

Aquatech Asia is the newest addition to the renowned Aquatech portfolio, joining flagship trade shows in Amsterdam, Mexico, and China. Aquatech Asia will unite water professionals, innovators, and decision-makers from across Southeast Asia.

Website: aquatechtrade.com/asia

Water Circularity in the Beauty and Personal Care Industry: Transforming Challenges into Best Practices

The beauty and personal care (BPC) industry is facing increasing challenges related to water management as the demand for products continues to rise. With growing awareness of water scarcity and its environmental impact, companies in this sector are reevaluating their strategies for water usage, treatment, and recycling.

The shift towards water circularity is not only a response to environmental challenges but also an opportunity to enhance sustainability & operational efficiency. In this context, businesses are striving to optimize water use, contributing to reduced environmental impact and improved brand reputation.

The Importance of Water in the Beauty & Personal Care Industry

Water plays a critical role in the manufacturing processes of beauty and personal care products. From formulation to cleaning, utilities, and packaging, nearly every aspect relies on water.

As Hans-Ulrich Buchholz from L'Oréal points out, sustainable access to water is essential for effective operations and customer satisfaction. However, the global situation is alarming, with factories in countries such as Brazil, Mexico, China, India, Egypt, and South Africa facing challenges like seasonal shortages & stringent

discharge regulations. As water stress escalates from a localized issue to a global operational risk, companies must adapt to ensure continuity.

Understanding the Risks

Several layers of risk compel the industry to adopt water circularity:

• Geographical Risks

Droughts, over-extraction of aquifers, and failing municipal systems hinder access to reliable water supplies.

• Operational Risks

The complexity of multi-product manufacturing leads to varying wastewater volumes & qualities, complicating water management.

• Financial Risks

Increasing costs associated with water treatment and transport, along with potential fines for noncompliance, threaten profitability.

• Technological Risks

The need for advanced processes to reclaim and recycle water safely & efficiently is becoming increasingly pressing.

Given these factors, many manufacturers now recognize water reuse and recycling as vital to their business operations rather than optional sustainability initiatives.

Decoupling Growth from Water Consumption

As consumer demand for personalized and diverse products grows, production volumes and cleaning frequencies have increased, making water efficiency more challenging yet essential.

In response, companies are establishing corporate water targets focused on improving efficiency, reducing pollution and developing circular water systems. Water circularity represents a pathway for manufacturers to grow sustainably, allowing them to expand production without proportionally increasing their water usage.

Building the Business Case for Water Circularity

Several strategic motivations for adopting water circularity include:

• Operational Resilience:

Reusing & recycling water ensures a consistent, high quality supply, even in water-stressed areas.

• Regulatory Compliance:

Advanced treatment technologies can reduce discharge volumes, helping companies meet increasingly stringent regulations.

• **Cost Reduction:**
By lowering the costs associated with freshwater procurement and discharge fees, companies can achieve significant long-term savings.

• **Reputation and Responsibility:**
Demonstrating responsible water stewardship enhances trust among consumers, investors, and local communities.

Leaders in the industry, such as Unilever, L'Oréal, Beiersdorf, Colgate-Palmolive, and Wella Company, are at the forefront of this transition, illustrating that circularity can be both technically feasible and financially viable.

Water Applications in Manufacturing

Water is utilized in four primary applications within BPC factories, each presenting distinct challenges and opportunities for improvement:

• **Water for Production:** Production water must meet stringent purity standards, often requiring advanced filtration technologies like ultrafiltration (UF), reverse osmosis (RO), or membrane bioreactors (MBR) for safe reintegration.

• **Water for Cleaning and Sanitization:** This process accounts for up to 90% of water usage at manufacturing sites. Strategies such as reusing final rinse water for pre-wash cycles or repurposing demineralization reject water can significantly reduce consumption.

• **Water for Utilities:** Lower-grade reclaimed water can be utilized in systems like boilers, cooling towers, and condensers, making them ideal candidates for circularity initiatives.

• **Water for Other Purposes:** Reclaimed or grey water can be redirected for irrigation, surface cleaning, and toilet flushing, further minimizing freshwater dependence.

While each application requires careful monitoring of microbial and chemical levels, together they can create a closed-loop system that substantially decreases overall freshwater use.

Overcoming Barriers to Circularity

Despite the evident benefits, the journey toward water circularity is fraught with challenges. The report identifies five main categories of barriers:

• Economic Challenges

High initial investment costs and uncertain payback periods can deter companies from pursuing circular projects, especially in regions where water is still relatively inexpensive. Understanding the "true cost of water," which includes hidden expenses for pumping, heating, and treatment, is crucial for justifying investments.

• Technical and Social Concerns

Maintaining microbial control is a significant challenge, particularly as the industry shifts toward preservative-free products. The risks associated with reclaimed water storage necessitate real-time monitoring and automated quality control systems.

• Corporate and Cultural Barriers

Many factories face coordination challenges among various departments, such as R&D and quality assurance, which may not frequently interact. Building internal competence and trust requires time, training, and a commitment to leadership.

• Environmental Dilemmas

Managing brine & sludge produced from advanced treatment processes presents a persistent challenge. Disposal can be costly and environmentally damaging, while stricter regulations limit options like landfilling. Some experts suggest viewing sludge as a resource for recovery rather than waste.

Innovation and Technology: Catalysts for Change

Advancements in treatment technologies are reshaping the landscape of circular water management. Innovations such as high-recovery RO systems and closed-circuit reverse osmosis (CCRO) not only reduce energy consumption but also maximize water recovery. Digital sensors enable precise microbial monitoring, while resource recovery technologies convert waste streams into valuable by-products. As Cecilia Coates from Colgate-Palmolive states,

> "Technology must stay agile to keep pace with evolving product portfolios and wastewater variability."

Cross-company collaboration, sharing both successes and failures, is essential for scaling innovation effectively.

Learning from Industry Leaders

Many pioneering companies have successfully implemented ambitious water programs that exemplify the principles of circularity:

• The Waterloop Factory

One leading company has established the "Waterloop" initiative, ensuring that 100% of process water is reused or recycled on-site, with only domestic water and product ingredients sourced externally. By 2030, this company aims for all its manufacturing sites to achieve Waterloop status, potentially reducing freshwater use by 80%.

• Circular Water Production Centres

Another industry player has adopted a comprehensive approach to water management, integrating reuse and reclamation across all processes. By 2025, three pilot sites are set to become full Circular Water Centres.

• Net Zero Water Initiative

Inspired by the LEED Zero Water framework, another manufacturer balances potable water consumption with reuse and rainwater harvesting, with two sites already achieving "Net Zero Water" status.

• Water Savings Programme

A notable company has optimized its cleaning processes and repurposed deionized water reject, leading to significant reductions in freshwater consumption while maintaining rigorous hygiene standards.

Case Studies: Circularity in Practice

Numerous success stories demonstrate the practical application of circularity:

- **Italy:** Achieved up to 100% utility water from reclaimed sources using UF and RO technologies, saving thousands of cubic meters annually.

- **Russia:** Implemented a Zero Liquid Discharge plant, reclaiming 75% of wastewater for industrial processes.

- **Belgium:** Utilized solar sludge drying and enhanced treatment systems to recycle 80% of treated water on-site.

- **Brazil:** Employed electro-oxidation reactors to cut freshwater use by 33%, with a payback period of just 2.4 years.

- **India:** Reduced water withdrawals by 30% by treating wastewater to WHO potable standards.

- **China:** Government-mandated Zero Liquid Discharge led to zero discharge and an annual savings of $55,000.

- **Germany:** Reuse of deionized water reject resulted in a 15–18% reduction in city water use.

These examples illustrate that with the right combination of technical innovation, regulatory support, and visionary leadership, circularity can become the standard practice within the industry.

Charting the Future Path

To accelerate the adoption of water circularity, clear recommendations tailored to different levels of industry engagement include:

• For Site-Level Managers

Map all water flows ("water trees") to identify potential reuse opportunities before investing in complex systems.

• For Corporate Strategists

Integrate water risk into enterprise risk management and long-term investment planning to ensure sustainable growth.

• For the Broader Industry

Encourage collaboration, share lessons learned, and harmonize permitting standards that promote recycling rather than restrict it.

Ultimately, the industry must recognize water security as both an environmental and economic asset, directly influencing brand reputation, investor confidence, and operational resilience.

Conclusion

The beauty industry has long been synonymous with renewal and transformation. Now, it is applying this ethos to water management. What began as isolated sustainability initiatives is evolving into a collective movement toward circularity, driven by innovation, collaboration, and a sense of responsibility. The necessary tools and technologies are already available. The challenge lies in shifting cultural perceptions rather than overcoming technical obstacles. Through shared learning, transparent reporting, and bold experimentation, the sector can redefine what it means to be "clean" not only in product claims but in every drop of water that contributes to their creation.

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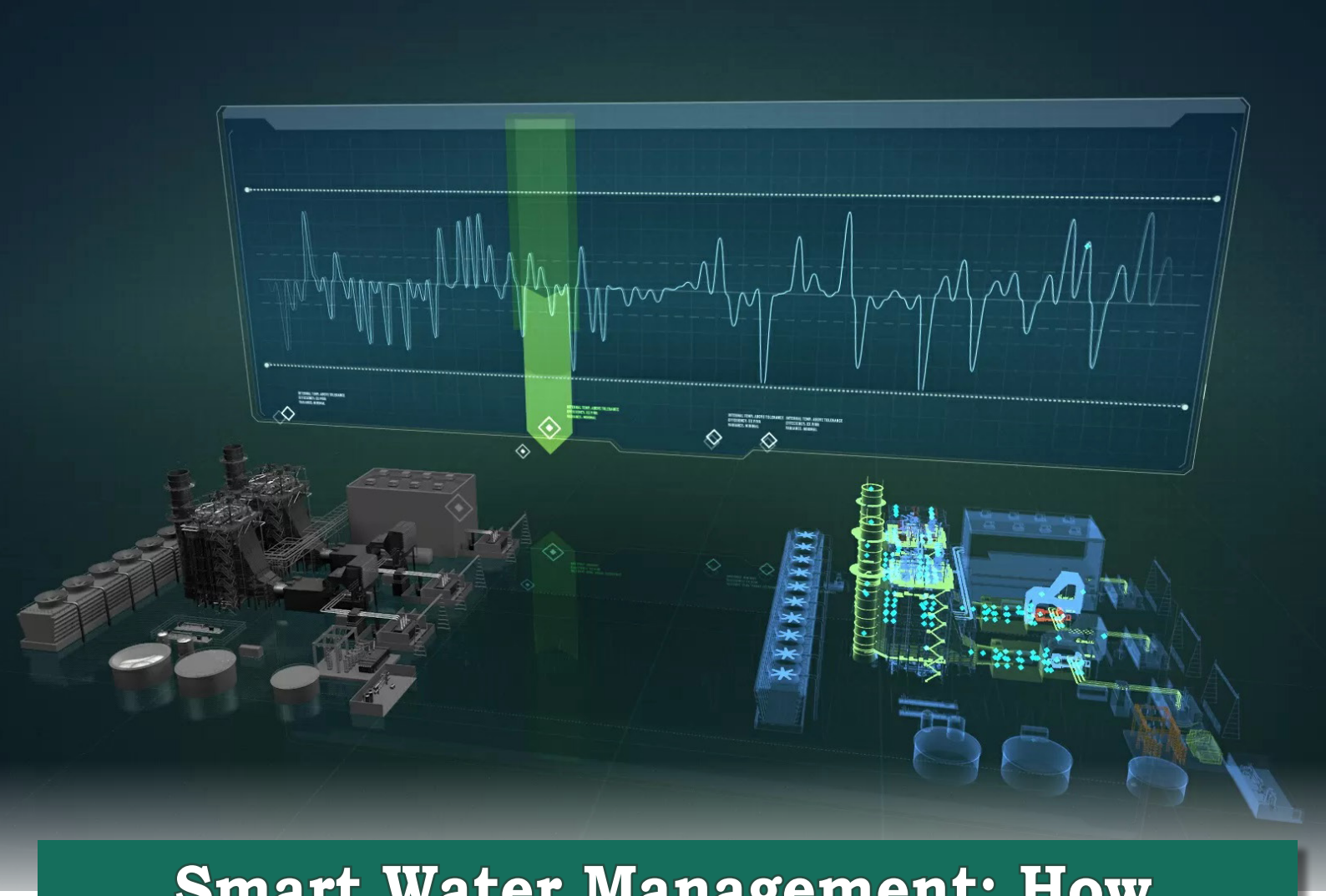


Smart Water Management: How Digital Twins Are Revolutionizing The Sector

Increasing population, urbanization, industrialization, and climate change are intensifying pressure on municipalities to adopt sustainable and efficient infrastructure. Wastewater treatment and water reclamation offer solutions to sanitation and water scarcity but face dual challenges: ensuring clean water for a growing population amid uncertain raw-water availability and addressing the energy- and carbon-intensity of water treatment, distribution & wastewater handling. Advanced tools combining real-time data, analytics, and forecasts are crucial for informed decision-making. Digital Twins (DTs), virtual representations of physical systems, are emerging as a solution for monitoring, prediction, and optimization. However, questions remain about their integration and scalability in water systems.

The Evolution and Adoption of Digital Twins

The aerospace industry has been using DTs, which are defined as the digital or virtual version of a running physical system, since the 1960s. These days, a number of industrial sectors, including manufacturing and production, smart energy systems, urban environments, residential management, and transportation, are adopting the idea of a DT more and more.

The water industry has been studying DTs more and more in recent years, mostly for process design, control, and optimization (e.g., collection, treatment, and distribution systems). Although researchers and municipalities are still relatively new to the idea of implementing and applying DTs in the water sector, a growing number of

papers evaluating various obstacles related to doing so have been published in recent years.

Future Directions of Digital Twins in Water Systems

There are also a few recent studies on applying DTs in real-world water systems around the globe, in which a small number of cases have come very close to implementing and operating a full-scale DT. This literature review aims to assess the key benefits, challenges, opportunities, and currently unanswered questions regarding the utilization of DTs to manage and optimize water systems. It explores how DTs are improving efficiency and sustainability in different water systems, identifies current limitations and gaps in their use, and discusses the future developments needed to enhance their integration and scalability.

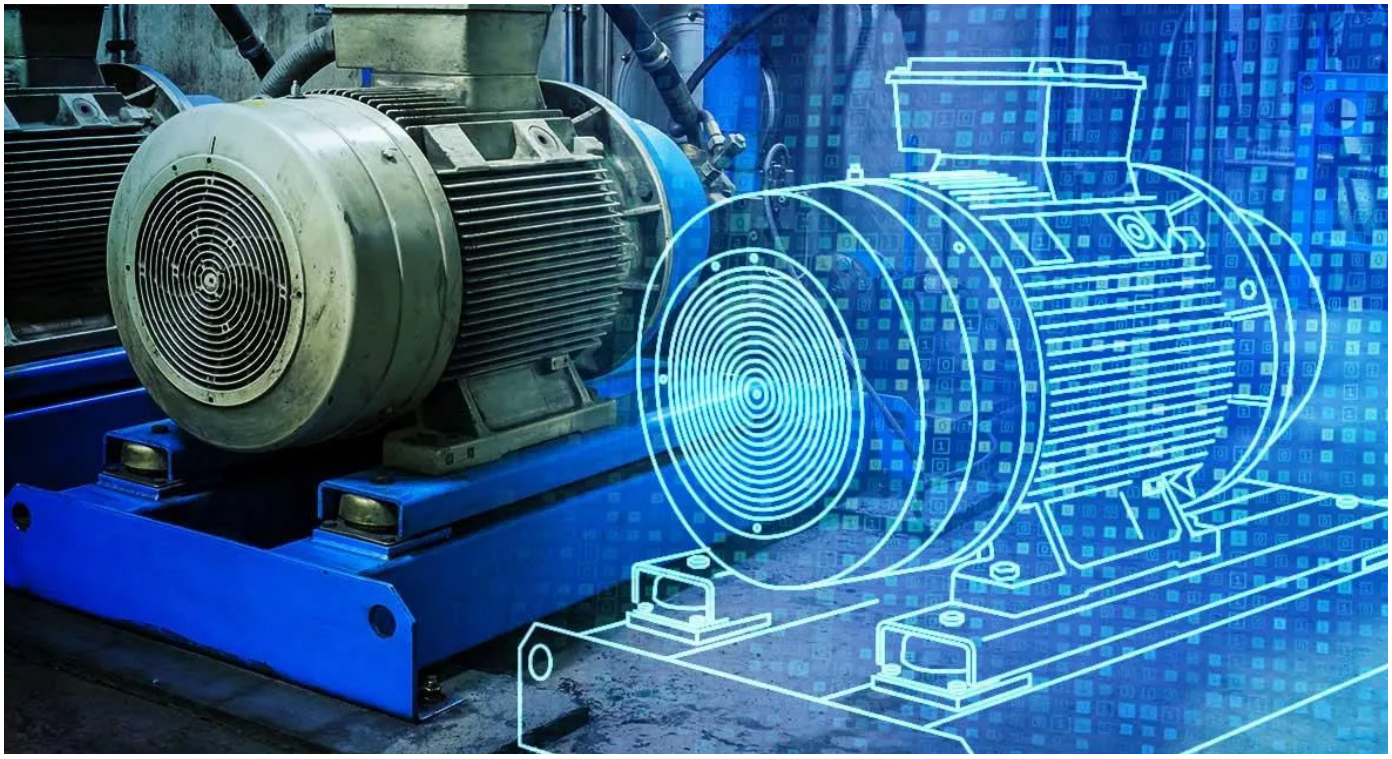
Simulator Models and Their Evolution into Digital Systems

A simulator model is often used for characterization and planning purposes, mainly to minimize costs and labor before implementing full-scale plans (e.g., expansion and process modifications). When integrated into advanced digital frameworks, these models can evolve into more sophisticated systems such as Digital Shadows (DSs) or Digital Twins (DTs).

The key difference between DS and DT lies in data flow directionality. In a DS, data from the physical asset automatically updates the digital model, but any feedback from digital to physical remains manual or absent. In contrast, a DT supports automatic, bidirectional data: real-time data from the physical object updates the virtual model, and the virtual model can autonomously trigger actions in the physical system. Importantly, "real-time" should not be treated as a fixed latency; the acceptable update interval depends on the twin's purpose (e.g., fault detection vs. closed-loop control) and on the governing process time scales (e.g., aeration dynamics vs. sludge age).

Operational Differences Between Digital Shadows and Digital Twins

In a DS, the outputs of the virtual model must be manually processed, which restricts its application in strategic planning. On the other hand, a DT is made up of a closed-loop, two-way data exchange, a virtual entity that replicates its current state and behavior, and an operational physical entity. In order to provide real-time feedback, predictive insights, and remote or automated control under various operating situations, the virtual entity constantly synchronizes with real-world data.



Therefore, automatic data intake and dynamic model updating characterize a DT, albeit the precise update cadence is application-specific rather than general.

Digital Twin Applications

DT development and industry requirements have been examined in a number of review studies. examined DT programming, applications, and advantages with a focus on manufacturing. examined the literature and real-world history of DT. Product design, production, prognostics, health management (the most common sector), and service are some of the main domains where DTs are employed. They found that operational control and dispatching optimization are two attractive areas for DTs.

• General Overview and Water-Sector Applications

provided a general overview of what DTs are and what the values, challenges, and enablers of implementing and operating a DT from a modeling perspective are. Although the study was not directly related to one specific industry, some of the findings can be applied to any corresponding field, including the water industry.

Compared with broad industrial reviews, water-sector applications emphasize plant-wide process control and energy optimization at WRRFs (e.g., Changi water reclamation plant) and district-scale hydraulics for flood risk and leakage in collection/distribution systems.

These emphases shape model choices (hybrid/mechanistic + ML) & data orchestration across SCADA and smart-meter infrastructures.

• Purpose-Specific Digital Twin Categories

Although a full-scale DT, when all the required components and elements are implemented in the design, provides all the benefits & advantages of having a virtual representation of an operational physical system, some DTs are designed to serve a specific purpose.

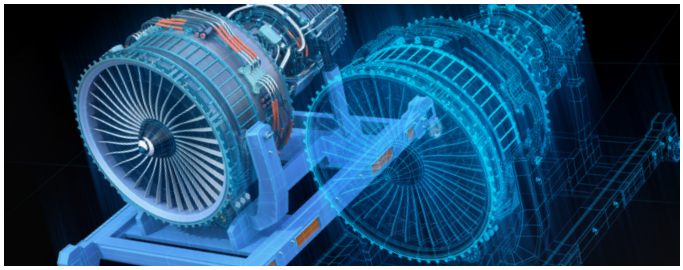
Accordingly, a DT can fall into one specific category, including Monitoring DT (MDT), Optimizing DT (ODT), Forecasting DT (FDT), Sensitivity DT (SDT), or a wrapper for process safety. While these categorizations offer a focused application of DT technology, it is important to recognize that they may not fully align with the holistic definition of DTs that integrates all key functions into a unified system.

• Toward a More Integrated Digital Twin Model

Although useful for particular operational objectives, the division into single-purpose DTs may lose the chance to take advantage of the entire spectrum of interconnected capabilities that a DT can offer when deployed as a comprehensive system. As a result, even while these particular kinds of DTs greatly help in the development and specialization of technology, it is crucial to recognize that a more comprehensive approach may provide a fuller and more accurate portrayal of what DTs are essentially intended to do. This viewpoint promotes greater research into how these various features might be combined to create a more complete DT model.

Digital Twins in the Water Industry

A review of 147 studies highlights the growing maturity of DT applications in the water sector. These studies are grouped into seven topical categories that are most applicable to the water industry: review and conceptual studies, wastewater treatment, wastewater collection systems, water distribution networks, drinking water treatment, water reclamation, and water desalination. Most studies focus on water distribution networks, wastewater treatment, and drinking water treatment plants. Coverage remains uneven across domains. These areas merit focused DT research and deployment, consistent with the identified gaps in membrane-based systems. While the scope of the topic is expanding, key gaps remain, particularly in membrane-based systems and applications in low- and middle-income regions.



Challenges, Limitations, and Current Approaches

The application of DTs in the water sector presents a viable solution to enhance sustainability, resource management, and operational effectiveness. However, a number of significant obstacles & restrictions prevent the widespread use of DTs in the water industry, despite their enormous potential. The intricacy of water systems, the requirement for real-time data integration, and the connection between physical and virtual components are frequently connected to these difficulties.

The water industry's current infrastructure is frequently ill-equipped to facilitate the smooth integration of DT technology. Moreover, as DTs evolve to encompass more comprehensive functionalities, questions about data quality, computational demands, sensor accuracy, and workforce adaptability continue to emerge. Addressing these challenges is essential to unlocking the full potential of DTs and ensuring their applicability across diverse water management systems.

Case Study: Siemens and Dual Digital Copy Technology in Industry

Dual Digital duplication technology has been implemented across numerous industries for real-time data analysis and informed decision-making, resulting in significant cost reductions and improved energy and resource efficiency. Beyond the economic benefits, including substantial long-term cost savings, this technology also contributes to reduced energy consumption and carbon emissions, thus promoting environmental sustainability.

Siemens has successfully leveraged this technology to achieve significant improvements in its industrial processes, demonstrating its effectiveness in the industrial sector. Thanks to dual-digital duplication, process management has become more efficient, productivity has increased significantly, and the company's competitiveness in the global market has been enhanced. This technology is not merely a process optimization tool; it is a fundamental pillar of digital transformation in industry, opening new horizons for innovation & sustainable growth.

Conclusion

As cities grow and resource demands increase, the water sector faces critical challenges in delivering reliable, sustainable, and efficient services. Digital Twins (DTs), virtual replicas of physical systems, offer transformative potential for water infrastructure management. Originally from the aerospace industry, DTs are now being adopted in the water sector for real-time monitoring, simulation, and predictive control of treatment plants, distribution networks and water reuse systems. They enhance operational efficiency, reduce environmental impacts and support resilient water management. This review examines current DT applications, successful case studies, technical challenges, and knowledge gaps, while exploring how DTs can optimize resources and bridge the water-energy nexus.

AquaEnergy Expo

Optimizing Pump Station Operations Through Digital Transformation

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Water and wastewater treatment plants are essential for safeguarding public health, protecting the environment, and ensuring economic sustainability. However, these facilities face numerous challenges, including aging infrastructure, a declining workforce, limited financial resources, and the constant need for regulatory compliance. Aging equipment often results in frequent maintenance, costly repairs, and increased energy consumption, which can strain already tight budgets. Simultaneously, operators are under pressure to enhance service delivery and improve resiliency in response to evolving demands.

The Role of Digital Transformation

Digital transformation offers a viable solution to these pressing challenges. By harnessing modern technologies such as artificial intelligence (AI), real-time monitoring, advanced analytics, and automation, treatment plants can optimize their pump station operations. This approach not only extends the lifespan of critical assets but also reduces operational costs, ultimately providing a favorable return on investment (ROI) across the facility.

Benefits of Digital Transformation

The integration of advanced technologies, including the Industrial Internet of Things (IIoT), cloud computing, and data analytics, is at the core of digital transformation in pump station operations. These tools enable real-time monitoring and intelligent decision-making, leading to significant improvements in energy efficiency, maintenance processes, and overall operational performance.

• Energy Cost Reduction

One of the most tangible benefits of digitization is the reduction in energy costs. Pumps often operate under conditions that deviate from their optimal efficiency points, resulting in unnecessary energy consumption. With digital monitoring and control systems, facilities can optimize pump performance by operating closer to target curves, utilizing more efficient equipment, and taking advantage of lower-cost energy periods.

Furthermore, analytics can identify instances of energy waste and recommend corrective actions, enhancing overall efficiency.

• Enhanced Maintenance Efficiency

Digital technologies also significantly improve maintenance efficiency. Condition-based monitoring allows operators to detect potential issues before they escalate into costly breakdowns. For example, pressure sensors and analytics can continuously monitor pump suction and alert operators when performance begins to deviate from expected parameters. This proactive approach reduces reliance on scheduled maintenance and manual inspections, thereby minimizing labor costs and enabling facilities to allocate resources to more critical tasks.

• Operational Optimization

Operational optimization is another critical advantage of digital transformation. By synchronizing pump performance with other systems such as hydraulic networks or auxiliary processes plants can enhance overall efficiency. Real-time data provides actionable insights, empowering operators to make informed decisions that maximize operational effectiveness

Digital Pump Station Management Platforms

Digital management platforms are specifically designed to support the modernization and digitization of pump station assets.

With integrated architectures that connect devices, edge control systems, and analytics applications, operators gain a comprehensive view of their operations, facilitating both management and process improvement.

• Key Components of Digital Management Platforms

At the foundation of these platforms are connected products, such as pumps, motors, drives, and sensors. These devices are equipped with intelligent capabilities and interconnected to collect and share data. For instance, energy meters can measure real-time consumption, while pressure and flow sensors provide insights into hydraulic conditions.

The edge control layer, which includes programmable logic controllers (PLCs) and IIoT-enabled devices, facilitates seamless data exchange. This layer acts as a bridge between connected assets and analytics applications, ensuring that operational data is processed and delivered to appropriate systems for further analysis. At the top level, cloud-based applications and analytics tools provide actionable insights into energy usage, maintenance needs, and operational performance. These tools can identify energy waste points, recommend maintenance schedules, and optimize system performance.

• Cybersecurity Considerations

With any digital management platform, cybersecurity must be a top priority. Pump stations should strive to achieve the highest cybersecurity standards, as outlined by the International Electrotechnical Commission (IEC) 62443.

This involves leveraging products designed with cybersecurity in mind, implementing segmentation in the IT/OT architecture, regularly backing up systems, and training employees to maintain a secure operational environment.

By adopting this integrated approach, pumping operations can achieve significant reductions in energy, maintenance & operational costs. Additionally, these digital platforms offer the flexibility to adapt to changing conditions, ensuring long-term sustainability and resilience.

Case Study: Digital Transformation in Northern Spain

A water treatment plant in Northern Spain serves as an illustrative example of the benefits of implementing a digital pump station management platform. The facility faced several challenges, including high energy costs, frequent maintenance issues, and inefficiencies in communication across the plant.

• Objectives and Implementation

To tackle these challenges, the plant manager established clear objectives: reduce energy expenses, enhance operational efficiency, and lower overall operating expenditures. The implementation process began with the deployment of a performance improvement architecture, which included existing energy meters, intelligent motor drives, and pressure/flow sensors. These devices were integrated with a central IIoT edge box that communicated with the cloud-based digital management platform.

• Results Achieved

Within just three months of implementing these changes, the plant achieved remarkable results:

• Energy Cost Savings:

Adjustments to pump speed control led to reduced energy consumption, saving approximately $8,189 annually in energy charges.

• Maintenance Improvements:

By transitioning to condition-based monitoring, the plant eliminated biweekly inspections, resulting in savings of about $3,509 per year.

• Operational Optimizations:

Automating the chlorination valve reduced operating costs by approximately $5,300 annually.

In total, the plant realized annual savings of around $21,641, with ROI achieved in under three months. Notably, these savings were accomplished without the need to replace aging pumps; instead, control loop tuning and refurbishment of impellers and wear rings were sufficient.

Key Takeaways for Digital Transformation

1. Evaluate Current Operations

Begin by assessing the efficiency, energy consumption, and maintenance requirements of the pump station. Identify areas for improvement and estimate potential ROI from proposed changes.

2. Implement Targeted Improvements

Introduce secure digital monitoring tools, adjust control strategies, and optimize equipment performance to address identified inefficiencies. This targeted approach can lead to significant operational enhancements.

3. Monitor Progress

Utilize real-time data to track performance against established objectives. Leverage analytics to identify new opportunities for improvement, ensuring that the plant remains on course to meet its goals.

4. Adjust Performance

Fine-tune operations based on insights gained from monitoring. This may involve recalibrating control loops, scheduling maintenance, or implementing new operational strategies to enhance efficiency.

5. Embrace Continuous Optimization

Continuous optimization is essential for maintaining peak performance as conditions change. A central digital management platform provides the flexibility necessary to adapt to evolving challenges while achieving long-term savings and efficiency gains.

Conclusion

Digital technologies are revolutionizing the way water and wastewater treatment plants manage their assets. By taking initial steps toward digitization, facilities can unlock new levels of performance and efficiency, ensuring they are well-equipped to face future challenges. The integration of advanced technologies not only addresses existing issues but also sets the stage for sustainable growth and resilience in an ever-changing landscape. As the industry continues to evolve, embracing digital transformation will be crucial for maintaining operational excellence and delivering reliable services to communities.

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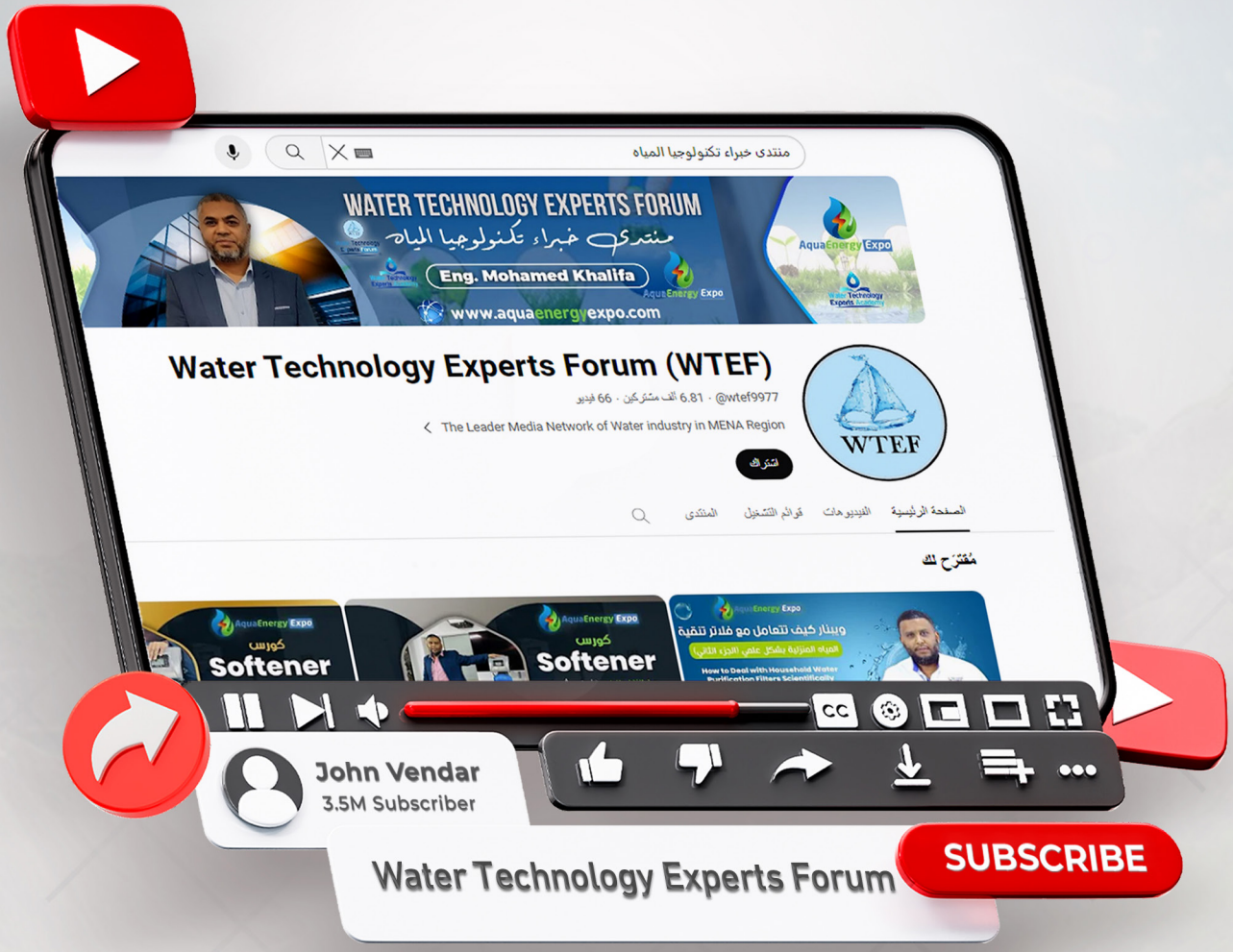

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AquaEnergy Expo

From Climate Threat to Clean Energy: The Critical Role of Pumps in Methane Abatement

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The production of biogas, which converts organic waste into renewable energy, is an essential part of the global shift to sustainable energy. Natural gas emissions from gas wells or associated gas from oil production have recently drawn more attention. The focus has now shifted to its true value as the cleanest form in the fossil fuel chain after it suffered from low gas prices due to takeaway capacity restrictions and being essentially viewed as a worthless waste product. Therefore, protecting our natural gas resources makes perfect sense.

It begins at the production site, where methane and CO_2 emissions are increased by wasteful flaring and venting, both intentional and unintentional. By lowering wellhead pressure, collecting the produced gas and liquids into a single multiphase flow stream, and removing flaring and venting, multiphase pumping can assist the producing wells.

Biogas Pumps for Effective Biogas-Based Energy Production

For biogas plants to produce electricity effectively, special pumps are required. These would need to mix and transport substrates with a high dry matter content in a reliable manner. In addition to energy crops, waste from food production and agriculture can be effectively transformed into clean energy in this way.

How Dry Biogas Substrates are Transferred by Biogas Pumps, Which Presents a Problem for Pumps?

The composition of the substrate presents the largest obstacle for biogas pumps in the production of biogas. Chicken manure and other relatively dry materials limit the flowability. Plant fibers from grass, maize, or grain residues have a tendency to clog, and the materials are attacked by corrosive slurry.

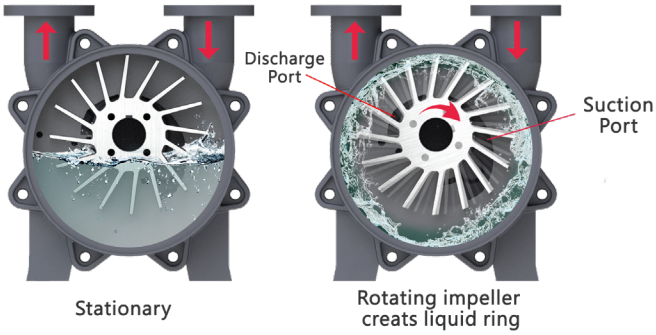
Furthermore, biowaste is frequently utilized to produce gas rather than renewable raw materials. In order to prevent an epidemic, these must be hygienic if they are meat scraps or slaughterhouse waste. This creates a further problem for the pumps used in the production of biogas and results in high medium temperatures of up to 80 °C.

The Function of Compressors and Liquid Ring Vacuum Pumps

From initial extraction to upgrading and compression, liquid ring vacuum pumps and compressors are made to support each stage of biogas production, guaranteeing effective, dependable, and reasonably priced solutions specifically for the biogas sector:

• The Biogas Production Process and Its Applications

Anaerobic digestion of organic materials, including manure, municipal waste, and agricultural waste, produces biogas. Methane (CH_4) and carbon dioxide (CO_2) make up the majority of the biogas produced by this process, which can be used to heat buildings, generate electricity, or be converted into biomethane for grid injection or as an alternative fuel. Purification, upgrading, and compression are some of the crucial procedures needed to optimize biogas' potential.



• Compressors and Liquid Ring Vacuum Pumps are Essential to the Production of Biogas

- Compression and Cleanup of Biogas

When biogas is extracted, it frequently contains contaminants like hydrogen sulfide (H_2S) and water vapor. In this setting, vacuum pumps perform exceptionally well, managing corrosive gases and high moisture content while maintaining steady, dependable operation. By eliminating impurities and water vapor, the pumps clean the biogas, preparing it for additional upgrading. The cleaned biogas is then compressed for storage or additional processing using liquid ring compressors.

Technical Specifics

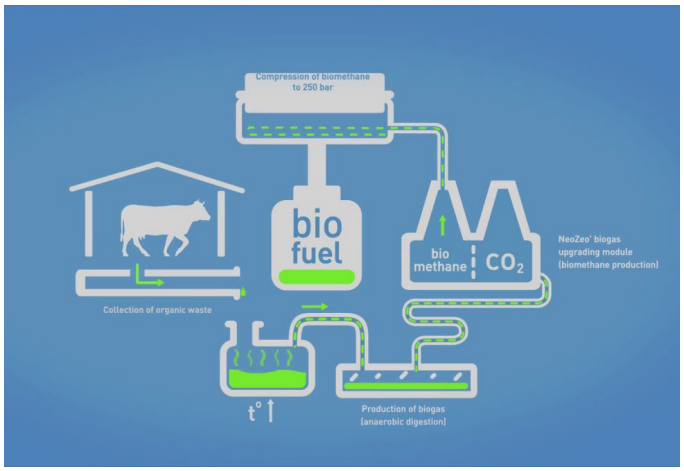
The seal and compression chambers of liquid ring vacuum pumps are formed by a liquid ring that is formed inside the pump casing. Because of this design, there is no chance of cavitation when handling saturated gases and vapors. In order to withstand corrosion from H_2S and other acidic gases, the pumps are usually constructed from materials like cast iron or stainless steel.

- Converting Biogas to Biomethane

Biogas is upgraded to near-natural gas quality, frequently through the use of membrane filtration or pressure swing adsorption (PSA). A vital component of the CO_2 removal process, liquid ring pumps effectively remove carbon dioxide and raise methane levels to satisfy purity standards for compressed natural gas (CNG) or grid injection.

Technical Specifics

Membrane filtration separates CO_2 from CH_4 by passing biogas through semi-permeable membranes. Pumps keep the vacuum levels at the ideal levels to maximize the separation process. Adsorbent materials that selectively adsorb CO_2 are passed through pressurized biogas in PSA. The biogas is kept at the proper pressure for efficient adsorption by compressors.



- Compression of Biomethane

After upgrading, biomethane needs to be compressed for storage, transportation, or integration into the natural gas grid. Compressors offer a reliable and energy-efficient solution for this step, ensuring the biomethane is compressed to the required pressures with minimal energy consumption.

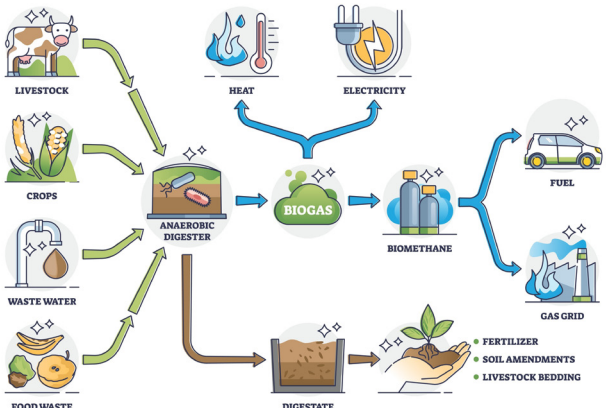
Technical Specifics

Liquid ring compressors use a similar principle to the vacuum pumps but are designed to compress gases to higher pressures. They can achieve compression ratios of up to 10:1 in a single stage, making them suitable for biomethane applications. The compressors are equipped with mechanical seals and bearings designed for high-pressure operation and long service life.

The Three-Stage Operation of Biogas Booster Pumps

The biogas booster pump is an affordable and secure option. Methane booster pumps, which are actually gas booster pumps, are another name for biogas boosters. Through compression, it can safely transform low-pressure biogas or methane into high-pressure biogas or methane, which can then be transported or used in gas cylinders and storage tanks.

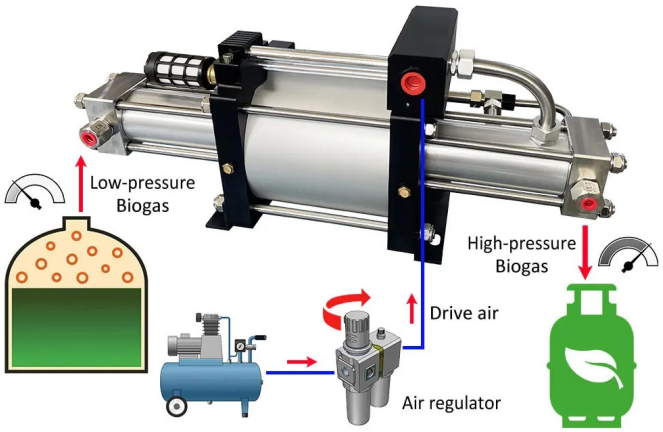
Three steps make up the biogas pump booster's operation: suction, compression, and high-pressure biogas output. Specifically, methane or low-pressure biogas can be drawn from the biogas digester by the biogas booster. After that, the pump will continuously compress the low-pressure biogas or methane to reach pressurization. The biogas booster will release the pressurized biogas or methane once the pressure reaches your desired level.



How to Compress and Transfer Biogas Safely with the Biogas Booster Pump

1. Because the biogas booster runs on compressed air rather than electricity, there is no chance that electric sparks will ignite the biogas. It is therefore impervious to explosions.
2. The biogas booster's high-pressure cylinder is the only place where the biogas or methane runs. Additionally, the drive cylinder and the high-pressure cylinder are separated, preventing compressed air contamination or biogas leakage.
3. By using oil-free compression, the biogas booster ensures the purity of the biogas and reduces the possibility of lubricating oil contamination.

Biogas Methane Booster Pump Working Circuit



4. The heat produced during the biogas compression is decreased by the cooling system built into the biogas booster.

Mechanical Transfer Systems in Biogas Production

A biogas transfer pump is a type of specialized pump used to move biogas from anaerobic digesters or other production sites to storage tanks or gas engines, boilers, or gas grids. Biogas is produced by anaerobic digestion of organic matter and is primarily made up of carbon dioxide (CO_2) and methane (CH_4), with trace amounts of other gases.

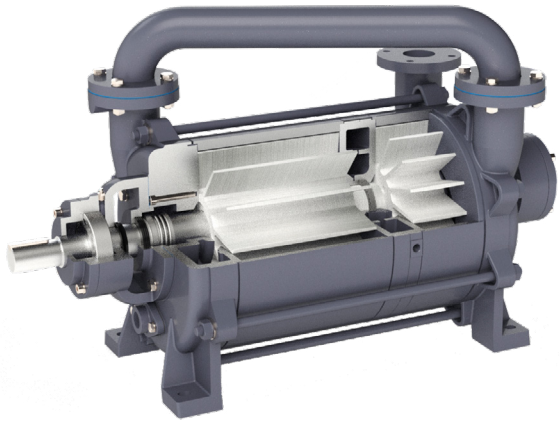
Biogas Transfer Pump Types

Pumps that use positive displacement transfer a predetermined volume of gas every cycle. Types consist of:

- Biogas is captured and transferred by rotary vane pumps using rotating vanes.
- Gas is forced through a vacuum created by diaphragm pumps.
- Lobe pumps move gas by means of rotating lobes.
- An impeller that rotates is used in centrifugal pumps.

Considerations for Choosing a Biogas Transfer Pump

- **The flow rate and pressure** required for your particular application should be taken into account when selecting a biogas transfer pump.
- **Material Compatibility:** Verify that the pump's components are resistant to corrosion and compatible with biogas.



• **Efficiency:** To cut operating expenses, select energy-efficient pumps.
• **Maintenance:** Consider the ease of maintenance and the availability of spare parts.
• **Safety Requirements:** Verify that the pump satisfies all relevant safety requirements and guidelines for processing biogas.

Major Features of Biogas Transfer Pumps

• **Gas Compatibility:** Made to manage trace gases, carbon dioxide, and methane, among other biogas compositions.
• **Corrosion Resistance:** The materials used are resistant to corrosion brought on by biogas components, especially the corrosive H2S (hydrogen sulfide).
• **Sealing:** Safe and effective sealing stops gas leaks.
• **Control of Pressure and Flow:** The capacity to regulate and sustain the required pressure and flow rate for efficient biogas transfer.
• **Safety precautions:** Contains measures to address the corrosive properties of biogas and the explosive nature of methane.

Conclusion

The shift from methane as a potent pollutant to a core sustainable energy source relies entirely on specialized pumping technology. Upstream, multiphase pumps eliminate wasteful flaring and venting by efficiently capturing gas at the wellhead. In biogas systems, robust slurry pumps handle corrosive organic waste, while precise liquid ring vacuum pumps and compressors clean and upgrade the gas for grid injection or vehicle fuel. These mechanical systems overcome severe physical and chemical challenges, ensuring purity and safe high-pressure delivery, often via non-electric biogas booster pumps. Ultimately, the successful conversion of methane into a high-value resource is a testament to mechanical engineering, proving that precision fluid dynamics is the decisive factor in achieving a cleaner, circular energy future.

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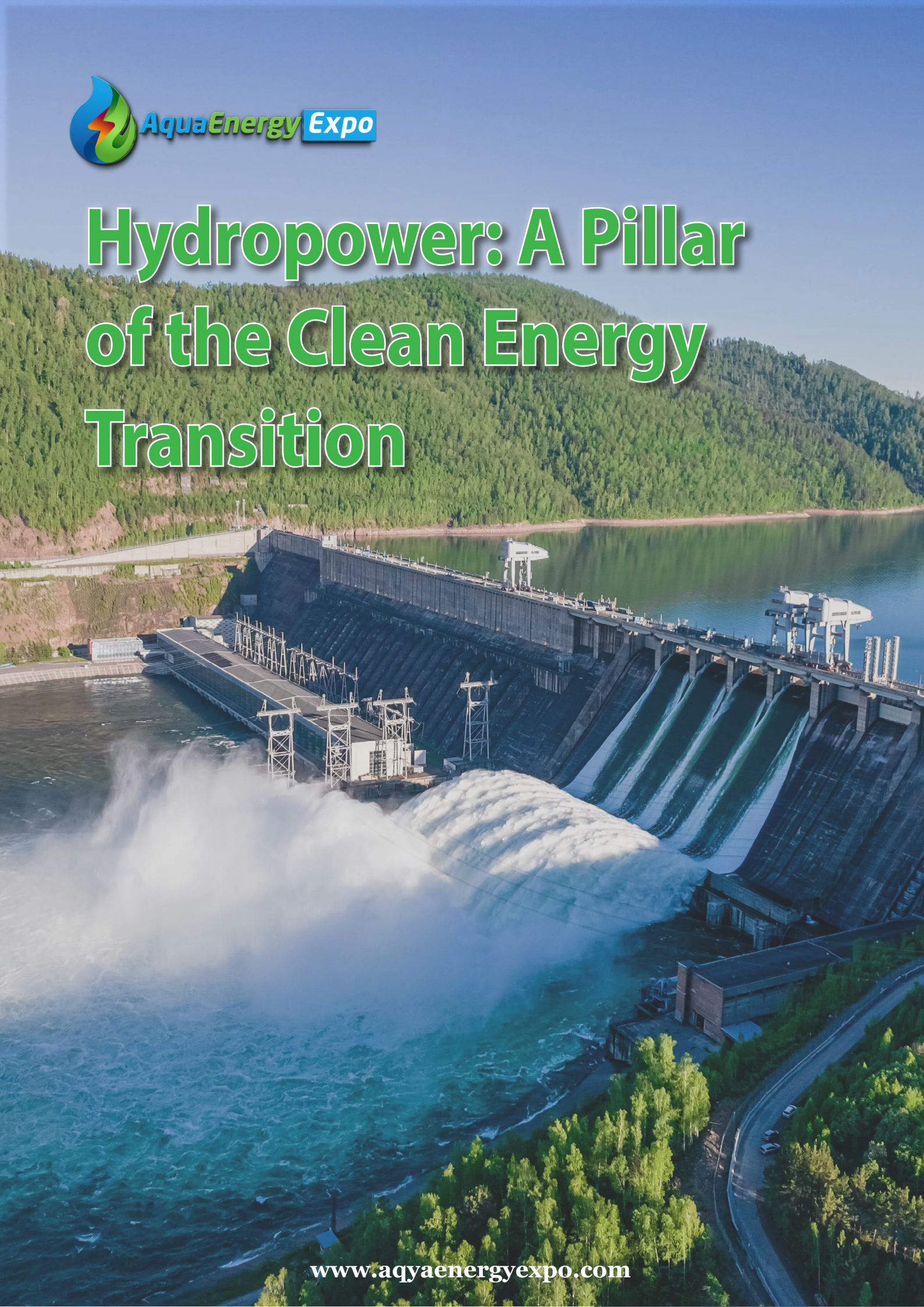
Hydropower: A Pillar of the Clean Energy Transition



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Hydropower is a low-carbon source of renewable energy and a reliable and cost-effective alternative to electricity generation from fossil fuels. Over 4,000 terawatt hours of electricity are produced annually by hydropower worldwide, providing clean energy to more than 1 billion people. According to independent studies, using hydropower instead of fossil fuels to generate energy has prevented the release of over 100 billion tons of carbon dioxide in just the last 50 years. The International Hydropower Association (IHA) projects that burning coal instead of hydropower would result in an annual increase in greenhouse gas emissions of over 4 billion metric tonnes and a minimum 10% increase in global emissions from industry and fossil fuels.

History of Hydropower

Humans have harnessed water for work for millennia, with ancient Greeks using water wheels for grinding wheat and Egyptians employing Archimedes' screws for irrigation. Modern hydropower began in the mid-1700s, evolving to meet growing societal energy needs. In 1880, a water turbine-powered dynamo supplied energy to a theater and storefront, followed by another in 1881, powering streetlights. Both used direct current (DC), which is limited in transmitting power over long distances.

The breakthrough came with alternating current (AC), enabling efficient long-distance transmission. This led to the establishment of the first commercial hydropower plant in the U.S., the Redlands Power Plant in California, in 1893. It utilized Mill Creek's flow to supply AC power to communities, solidifying AC as the dominant power transmission method. These milestones highlight hydropower's evolution from ancient applications to modern electricity generation.

Greenhouse Gases Produced by Renewable Sources

Because of the emissions from their production, building, and operation, all energy sources, including renewable ones, produce carbon emissions throughout their existence. Compared to technologies with shorter lifespans, hydropower assets have a very long

lifespan, which means that emissions related to construction can be amortized over a considerably longer duration and corresponding generation. Scientists and policymakers have long questioned hydropower's greenhouse gas footprint, particularly in relation to emissions from reservoir construction.

Under some circumstances, the breakdown of flooded organic material will cause a reservoir to release greenhouse gases. As a result, emissions from reservoirs often peak in the first ten to twenty years after reservoir impoundment before gradually declining.

Factors Influencing Reservoir Emissions

In other conditions, a reservoir may act as a carbon sink: absorbing more emissions than it emits. Emissions relating to the construction and operation of a reservoir vary depending on its type, size and location. Once filled, factors such as a reservoir's depth and shape, the amount of sun reaching its floor, and wind speed, affect the different biogeochemical pathways by which CO_2 and CH_4 are created and released to the atmosphere.

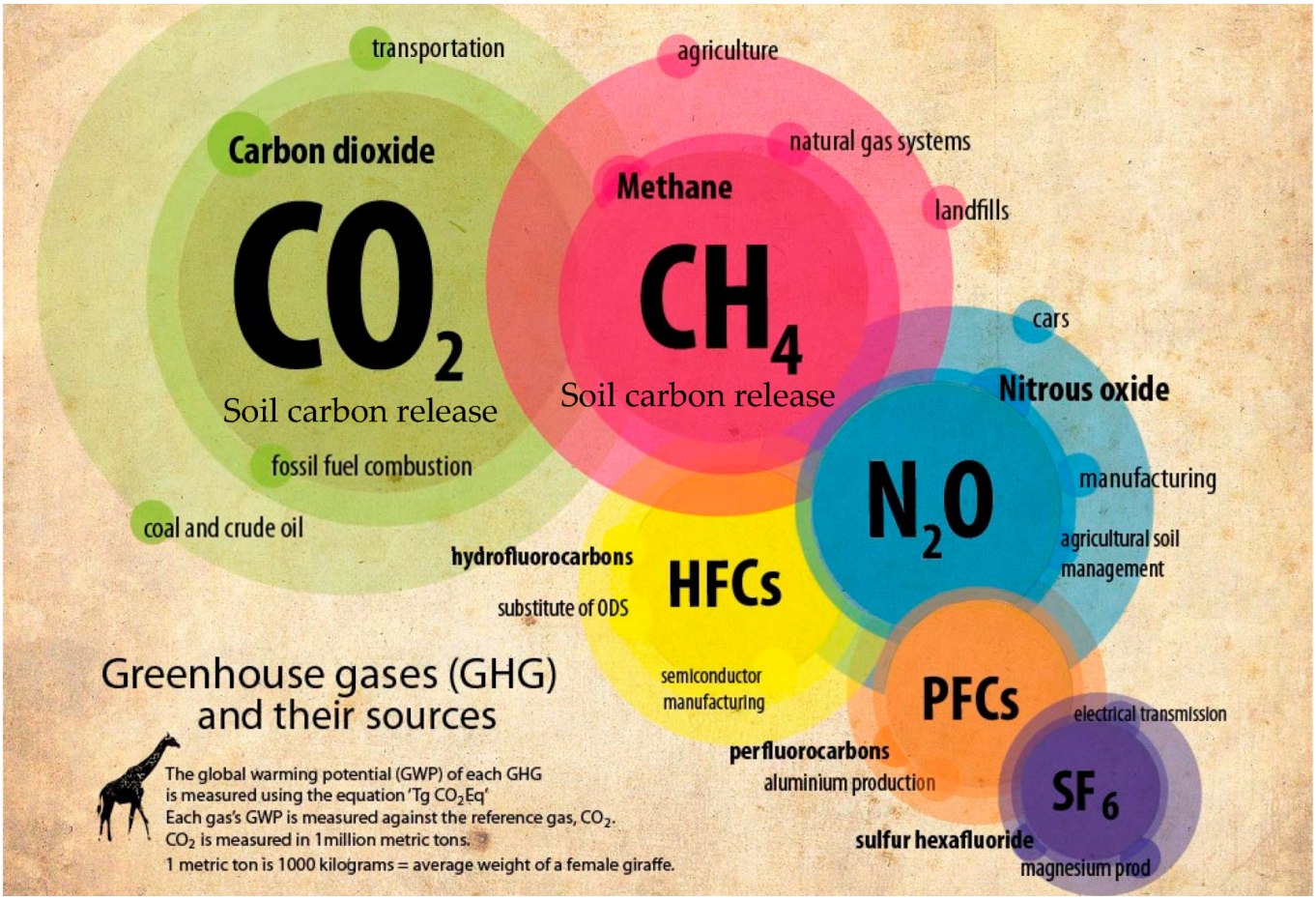
All The Benefits of Hydropower

Hydropower is an energy source that makes an important contribution to combat climate change because it avoids the use of fossil fuels and reduces emissions of carbon dioxide, climate-altering gases and particulate matter, thereby counteracting pollution and the greenhouse effect.

• It is Clean and Sustainable

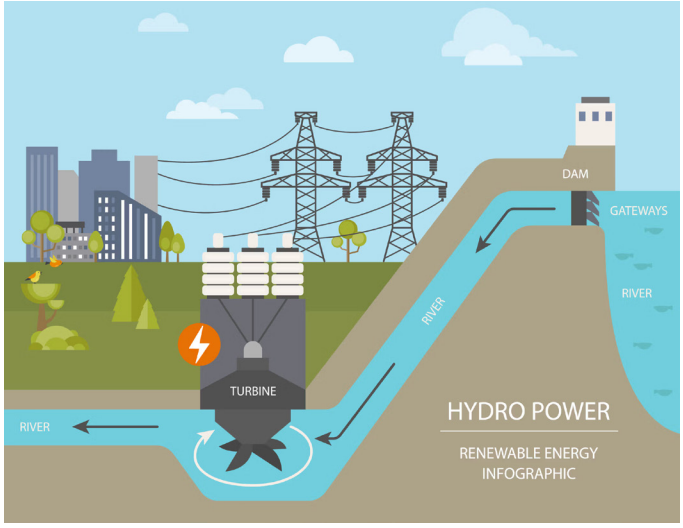
Because hydropower produces electricity without releasing greenhouse gases or other pollutants, it is a clean energy source. By lowering the use of fossil fuels, hydropower helps mitigate climate change and reduce air pollution.

Additionally, it offers limitless renewable energy. This is because the natural water cycle replenishes its sources, which include rivers and streams. Moreover, a hydroelectric plant does not deplete the ecosystem of water. This is because its water footprint is minimal, as everything that is taken away is eventually returned in full. Additionally, it is a resource that may be used in many nations to produce energy in a more sustainable and self-sufficient manner, which lessens the need to import raw materials.



• It is a Very Flexible Resource

Faced with water availability that can vary over time, power plants are extremely flexible. Generating systems require a very small amount of energy in order to come on line, so much so that in a matter of minutes, even a large plant can go from being idle to full power, and vice versa. This responsiveness depends on the type of turbine used and the management of water flows.



• It Stabilizes the Power Grid by Preventing Intermittency

A pumped storage hydropower plant acts as an energy store: excess electricity generated by wind or solar plants where weather conditions are favorable can be used to pump water into the upper reservoir. Later, when there is no sun or wind, the water can be used in order to generate electricity through turbines. In this way, the hydropower plant has a stabilizing effect on the power grid.

• Water Carries Huge Amounts of Energy

Hydropower has immense energy potential. In fact, there is a significant amount of gravitational potential energy present in the enormous amounts of water found at high altitudes; if you can harness even a small percentage of this energy, you will have an abundance of energy at your disposal. It is sufficient to state that all of the biggest power plants in the world are hydroelectric, and that millions of people's energy needs can be satisfied by a single facility.

Who Benefits from Hydropower?

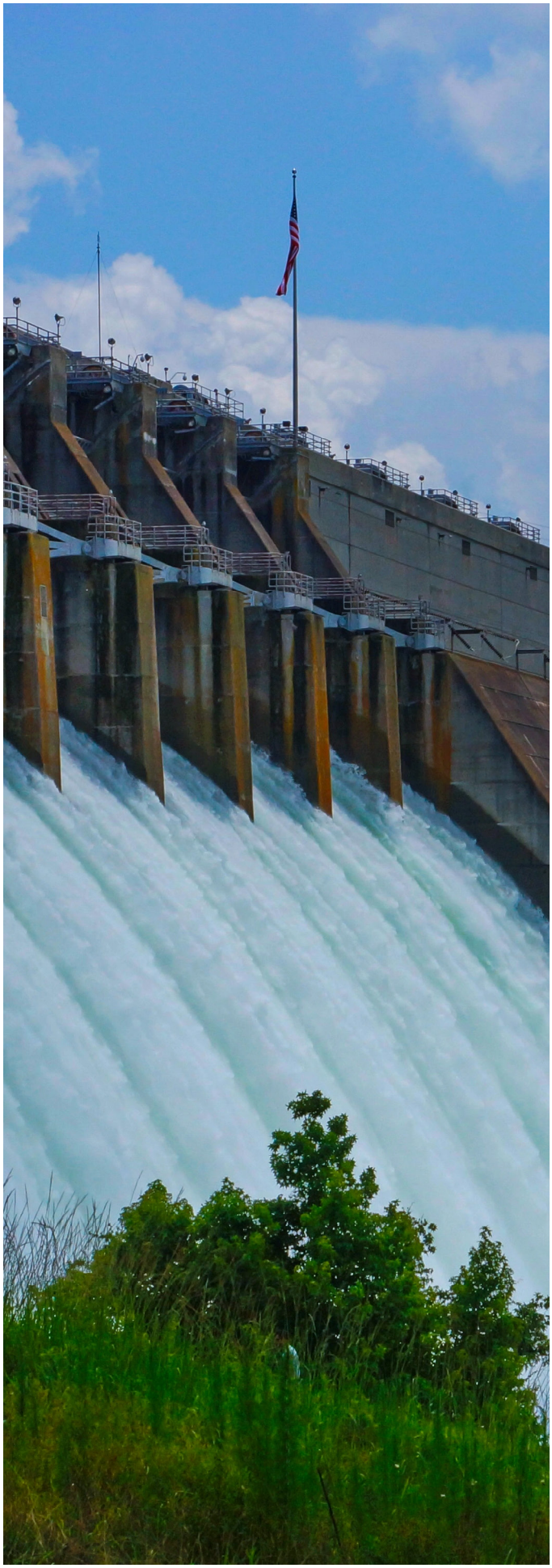
Beyond its environmental advantages, hydropower plays a practical and direct role in meeting the energy needs of a wide range of users worldwide. It is widely used by governments as a reliable source of electricity for national power grids, especially in countries with large rivers and established dam infrastructure. By relying on hydropower, these countries can reduce their dependence on fossil fuels, stabilize electricity prices, and improve long-term energy security.

Hydropower also benefits local communities and households, supplying electricity for homes, public services, and essential infrastructure. In many rural and remote areas, hydropower plants provide a stable source of power that supports daily life, improves living standards, and enables access to education, healthcare, and modern services.

Hydropower's Role in Industry and Grid Stability

Energy-intensive industries are among the largest beneficiaries of hydropower, as they require large volumes of stable and continuous electricity. Industries such as aluminum, steel, and paper manufacturing depend on hydropower to lower operating costs, maintain uninterrupted production, and reduce their environmental impact.

In addition, hydropower supports the wider transition to renewable energy by stabilizing electricity networks. Pumped storage hydropower systems store excess electricity generated from wind and solar sources and release it when demand is high or renewable generation is low. This flexibility makes hydropower a key enabler of a balanced, resilient, and sustainable energy system.



As a result, hydropower is not only a clean source of electricity but also a critical driver of economic development, social progress, and long-term sustainability.

Case study

Hydropower's low global carbon footprint

• The Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report noted that only wind and nuclear power have lower median lifecycle greenhouse gas emissions than hydropower. However, the panel cautioned that few studies had assessed the net emissions of freshwater reservoirs, accounting for pre-existing natural sources and unrelated human emissions.

• The IPCC states that hydropower has a median greenhouse gas (GHG) emission intensity of 24 gCO_2-eq/kWh - this is the grams of carbon dioxide equivalent per kilowatt-hour of electricity generated allocated over its life-cycle. By comparison, the median figure for gas is 490 gCO_2-eq/kWh.

• Analysis by the International Hydropower Association of almost 500 reservoirs worldwide using the G-res Tool (see below) confirms this low carbon footprint. The results published in Water Security and Climate Change: Hydropower Reservoir Greenhouse Gas Emissions (2021) found the median value of lifecycle GHG emissions for hydropower to be 23 gCO_2-eq/kWh, which is consistent with the IPCC findings.

Conclusion

Hydropower is a clean, renewable energy source that plays a significant role in combating climate change by replacing fossil fuels and reducing carbon dioxide emissions. According to studies, hydropower has prevented the release of over 100 billion tons of carbon in the past 50 years. While reservoir creation may initially emit greenhouse gases, they often transform into carbon sinks over time. Hydropower is highly flexible, capable of energy storage, and stabilizes power grids. Its median lifecycle emissions are 23-24 gCO_2/kWh, compared to 490 gCO_2/kWh for gas, making it one of the cleanest energy sources available.

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Solarpro and LONGi Collaborate on Europe's Largest Back-contact Solar Plant: 450MW PV Project Will Be Hungary's Biggest

Solarpro, in collaboration with LONGi, is constructing Hungary's largest 450 MW solar facility in Heves County, featuring 700,000 Hi-MO9 modules. This project follows their 176 MW development in Romania. The plant will generate 470 GWh annually, powering ~106,000 households and offsetting 415,000 tons of CO_2 yearly. It sets new benchmarks for renewables in Central Europe, positioning Hungary as a regional leader. LONGi Europe's Leon Zhang and Solarpro's Krasen Mateev emphasized their commitment to innovation, sustainability, and advancing clean energy. The project highlights the scalability and environmental-economic benefits of advanced PV technology.

Iberdrola Begins Assembly of Wind Turbines for Portugal's Largest Wind Farm, Capable of Supplying 128,000 Homes

Portugal's Tâmega Wind Farm (274 MW) will be the country's largest, featuring 38 Vestas EnVentus V172 turbines (7.2 MW each), the most powerful onshore models globally. The €350 million project will generate 601 GWh/year, powering 128,000 homes and cutting 230,000+ tonnes of CO_2 annually. It pioneers hybrid wind-hydro integration, shares a grid connection, and involves a Norwegian sovereign fund PPA. Located between Braga and Vila Real, it creates 700+ jobs and uses innovative transport for 85-meter blades. Iberdrola leads with €2.2B invested in Portugal's renewables, emphasizing eco-monitoring and community engagement.

Malaysia: TotalEnergies Signs New Renewable Power Agreement with Google to Supply Data Centers

TotalEnergies and Google have signed a 21-year Power Purchase Agreement (PPA) to supply 1 TWh of certified renewable power annually from the Citra Energies solar plant in Kedah, Malaysia. Scheduled for construction in early 2026, the 20 MW solar farm will support Google's data center operations.

The project, awarded under Malaysia's Corporate Green Power Programme, is a joint venture between TotalEnergies (49%) and MK Land (51%). This deal strengthens their collaboration, following a similar U.S. PPA in November 2025, and aligns with TotalEnergies' goal of 12% profitability in the power sector.

Casa dos Ventos and Vestas Announce New Partnership for the 828 MW Dom Inocêncio Wind Complex in Brazil

Casa dos Ventos and Vestas have announced an 828 MW wind project in Piauí, Brazil, using 184 V150-4.5 MW turbines. Scheduled for construction in 2026 and commissioning by 2028, the Dom Inocêncio complex will power 2 million households and mark a major step in Brazil's renewable energy expansion.

With a BRL 5 billion investment, it will create 8,500+ jobs, enhance local supply chains, and boost socioeconomic development. Vestas will supply turbines, oversee construction, and manage operations for 25 years under an AOM 5000 agreement, reinforcing their eight-year partnership.

Veolia and Science City Guangzhou Investment Group Sign Agreement to Establish an Innovative Decarbonization Project in China

Veolia and Science City Guangzhou Investment Group have signed a pioneering agreement to develop a decarbonization project in Guangzhou Development Zone, targeting industrial flue gas capture and utilization. The project aims to cut 200,000 tons of CO_2 annually and generate energy for local enterprises using Veolia's advanced waste heat recovery system, converting emissions into steam and electricity.

This initiative aligns with China's dual carbon goals and Veolia's global Greenup strategy, showcasing how sustainability can drive economic value. It strengthens Sino-French collaboration in green innovation and establishes a replicable model for low-carbon industrial development.

SunPower-REC Partnership Introduces Industry-Leading Solar Panel

SunPower has launched its Monolith solar panel, the first product under its Joint Development Agreement (JDA) with REC Group. The 470W REC Alpha Pure-TX panel, weighing just 50 pounds, is designed for residential and light commercial markets, offering record efficiency. SunPower plans to upgrade it to a bifacial panel, boosting output to 500+ watts.

This collaboration leverages SunPower's innovation legacy and REC's expertise in durable, high-quality panels. The project aims to deliver superior performance, lower energy costs, and exceptional ROI, addressing rising utility costs and escalating energy needs in the U.S.

Global Energy Events

WateReuse Symposium 2026

Date: 24 & 25 February 2026
Location: InterContinental London - The O_2

This is no longer a story about pilots, price curves, or proof points. Storage has become the backbone of energy security, industrial competitiveness, and the digital economy. It now sits at the centre of national strategies, capital allocation, and geopolitical power. A requisite, not a nice-to-have.

Website: storagesummit.solarenergyevents.com

Energy Storage USA 2026

Date: 24 & 25 March 2026
Location: Renaissance Dallas Addison Hotel

As the U.S. energy storage market scales rapidly in the wake of policy shifts and technological breakthroughs, the Energy Storage Summit USA 2026 returns to connect the entire value chain from storage developers and utilities to investors, grid operators, and innovators.

Website: storageusa.solarenergyevents.com

SolarLUS USA

Date: 24 & 25 March 2026
Location: Renaissance Dallas Addison Hotel

For five editions, Large Scale Solar USA has convened the people driving utility scale solar development across the US. From 2026, the Summit becomes SolarPLUS USA, a rebrand that mirrors where the market is heading. Developers, investors and utilities are now managing hybrid assets, multi-state pipelines, storage co-location and complex grid challenges.

Website: lssusa.solarenergyevents.com

SolarPlus by informa
USA

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

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

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

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

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

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

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