

WATER TREATMENT: INNOVATIVE TECHNOLOGY

Abdul Rahman Mohammed, CEO, Sahara Industry

Water is an essential resource for all life forms and industries, yet several regions around the globe are grappling with the pressing issue of water scarcity. With escalating populations and expanding urbanization, the thirst for water intensifies, exerting immense pressure on existing freshwater sources. To address this challenge, there is pressing necessity to explore and develop sustainable methodologies for treating unconventional water sources, including seawater, industrial, and municipal wastewater.

Because of the inherent connection between water and energy usage, known as the water-energy nexus, the expansion of water resources should not entail excessive energy consumption. As such, the high energy efficiency and often superior efficacy of membrane-based technologies have gained widespread implementation in various water treatment processes. Membranes allow passage of water, but largely reject salt and most other solutes, play a critical role in the majority of these processes. These types of membranes lie at the heart of traditional reverse osmosis (RO) processes.



Surface water sources, such as rivers, lakes, and reservoirs, play a crucial role in meeting the global demand for drinking water. However, the quality of these water bodies has been steadily declining due to various human activities, including agricultural runoff, industrial discharges, and the disposal of untreated wastewater. As a consequence, surface water has become increasingly contaminated with microorganisms, organic matter, particles, and dissolved solids.

The increasing contamination has not only raised the expenses linked with water treatment but has also compromised the quality of the treated water provided for drinking purposes.

This escalating contamination of surface water has led to significant challenges in water treatment processes. The presence of higher concentrations of contaminants has not only increased the costs associated with water treatment but has also compromised the quality of the treated water supplied for drinking purposes. According to the World Health Organization (WHO), poor drinking water quality is responsible for a shocking 5 million deaths worldwide each year, underscoring the severity of this issue.

These pressing challenges necessitated the emergence of novel water treatment techniques to effectively address the rising levels of contamination. Developing innovative and efficient methods to remove a wide range of contaminants from surface water sources is vital to ensuring the provision of safe, high-quality drinking water and safeguarding public health globally.

INNOVATIVE WATER TREATMENT TECHNOLOGY

There is latest innovation in water treatment technology and researchers have been diligently working on developing a solution that not only addresses current challenges but also sets new standards for efficiency and sustainability in water treatment.

ULTRASOUND TECHNOLOGY

Ultrasound technology has emerged as a promising and innovative approach for water treatment, offering a range of benefits and applications. This technology utilizes high-frequency ranges between 16 kHz and 500 MHz sound waves beyond the audible range of human hearing to achieve various treatment goals. Ultrasound waves are generated by transducers that convert electrical energy into mechanical vibrations. These vibrations create alternating high and low-pressure waves, leading to the formation of microscopic bubbles in the liquid medium. When these bubbles collapse, they release intense energy in the form of heat, pressure, and shockwaves, a phenomenon known as cavitation.

Ultrasound technology offers versatility in its applications, spanning from disinfection and pollutant degradation to emulsification and particle removal in various water treatment processes. Its non-invasive nature, environment friendly attributes, and ability to operate without the need for chemical additives make it an increasingly favourable choice in modern water treatment strategies.




APPLICATIONS OF ULTRASOUND TECHNOLOGY

Disinfection: The cavitation process generated by ultrasound waves can effectively inactivate and destroy harmful microorganisms, such as bacteria, viruses, and protozoa, by disrupting their cell walls and membranes. This makes ultrasound technology a promising alternative to traditional chemical

disinfection methods.

Oxidation of Contaminants: The high temperatures and pressures created during cavitation can promote the formation of reactive oxygen species such as hydroxyl radicals. These highly reactive radicals can oxidize and break down various organic and inorganic contaminants, including pesticides, pharmaceuticals, and industrial pollutants.



Investing in innovative water treatment technologies is essential for ensuring water security, protecting public health, and advancing global environmental stewardship.

Particle Removal: Ultrasound waves can enhance the coagulation and flocculation processes, improving the removal of suspended particles, colloids, and turbidity from water. This is achieved through the formation of acoustic streaming and micro-streaming, which promote particle aggregation and sedimentation.

Membrane Cleaning: Ultrasound can be used to clean and unclog membrane surfaces in water treatment processes, such as reverse osmosis and ultrafiltration. The cavitation bubbles and shockwaves dislodge and remove fouling materials, improving membrane performance and extending their lifespan.

BENEFITS OF ULTRASOUND TECHNOLOGY

- Chemical-free and environment friendly
- Effective disinfection without generating harmful by-products
- Capable of treating a wide range of contaminants
- Can be combined with other treatment processes for enhanced efficacy
- Potential for energy and cost savings compared to conventional methods

SCALING ULTRASOUND TECHNOLOGY FOR DRINKING WATER TREATMENT

Scaling up ultrasound technology for drinking water treatment requires a multidisciplinary approach, drawing upon expertise from various fields, including chemistry, electrical engineering, chemical engineering, and material sciences. One critical step towards achieving scalability is the implementation of an accurate energy characterization technique.

The accurate characterization of energy consumption is crucial, as the use of an inappropriate or inaccurate method could lead to discouraging energy figures. Such misleading data would act as a deterrent for industries considering the adoption of ultrasound technology for water treatment purposes. Overestimating energy requirements could potentially misrepresent the technology's economic viability and energy efficiency, hindering its widespread implementation.

To facilitate the successful scaling and commercialization of ultrasound technology in the

water treatment sector, it is essential to employ robust and reliable energy characterization methodologies. These methodologies should accurately quantify the energy demands of the ultrasound systems, taking into account factors such as the efficiency of transducers, power supply losses, and the influence of operating parameters on energy consumption.

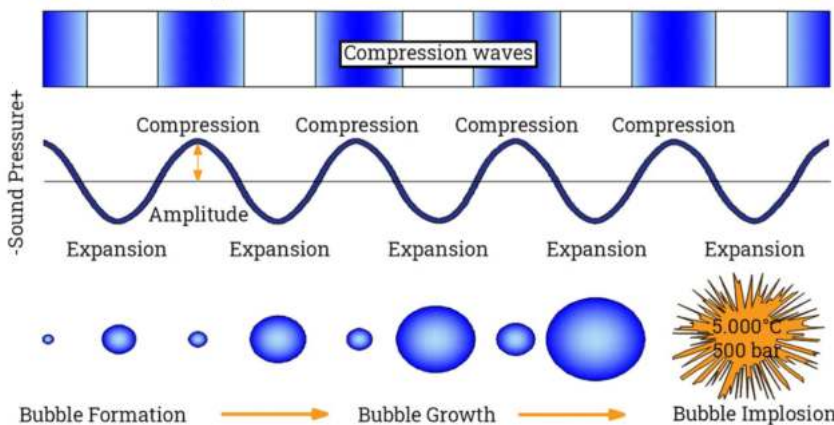
By providing precise and realistic energy consumption data, accurate energy characterization techniques can help to overcome potential barriers and alleviate concerns regarding the economic feasibility of ultrasound technology. This, in turn, can encourage industries to explore and invest in this promising technology, ultimately contributing to the development of more sustainable and efficient water treatment solutions.

While ultrasound technology holds promise for water treatment, further research and optimization are needed to address challenges such as energy consumption, scalability, and integration with existing treatment systems.



Sahara Industry leads the water treatment sector with a commitment to innovation and overcoming challenges in scaling cutting-edge water treatment technologies.

Principle of Ultrasonic Cavitation



SAHARA INDUSTRY: DRIVING INNOVATION IN WATER TREATMENT

Recognizing the need for sustainable and technologically advanced water treatment solutions, Sahara industry, a leading player in the field, is making significant investments to enhance the development of new systems and processes. As a frontrunner in the water treatment sector, Sahara Industry is dedicated to driving innovation and overcoming the challenges associated with implementing cutting-edge

technologies for water treatment on a larger scale.

Sahara Industry's business strategy emphasizes fostering collaborations with industry and technology partners to address the complexities of water treatment. Drawing on the knowledge and expertise gained through the implementation of numerous water treatment projects over the years, the company aims to develop comprehensive and holistic approaches to meet the demand for clean water for the people and industries.

Through its substantial investments and commitment, Sahara industry is paving the way for the innovation in water treatment facilities. By addressing the challenges of quality and energy efficiency, the company is positioning itself as a pioneer in delivering sustainable and technologically advanced solutions to address the water crisis.

CONCLUSION

The growing water scarcity and deteriorating quality demands the development and implementation of innovative water treatment technologies. The challenges posed by escalating contamination levels, rising energy costs, and the need for sustainable solutions require a determined effort from researchers, industries, and policymakers alike.

Emerging technologies such as ultrasound treatment, membrane filtration, and advanced oxidation processes offer promising avenues for addressing these challenges. By leveraging the unique properties of these technologies, we can achieve effective contaminant removal, disinfection, and water purification while minimizing environmental impact and energy consumption.

As we navigate the complexities of water treatment in the 21st century, a commitment to continuous innovation, sustainability, and cross-sector collaboration will be important. By embracing cutting-edge technologies and fostering an environment conducive to research and development, we can pave the way for a future where clean, safe, and accessible water is a reality for all.

About the Author



Abdul Rahman Mohammed
CEO, Sahara Industry

Abdul Rahman Mohammed, the dynamic CEO of the Sahara Industry, is a young entrepreneur propelling the company's growth as a leading manufacturer of high-quality water and wastewater treatment solutions in India. Armed with a degree in marketing and finance, he has skillfully steered Sahara Industry through contemporary business strategies, technological innovations, and dynamic leadership.

Under his guidance, the company has witnessed efficient growth, with a group turnover exceeding INR 1200 million. His visionary approach, coupled with a commitment to delivering cutting-edge products and services, has solidified Sahara Industry's position as a prominent player in the water treatment sector.

EAW

19th EVERYTHING ABOUT WATER EXPO
SOUTH ASIA'S LARGEST WATER EXHIBITION AND CONFERENCE **2024**

10-12 SEP 2024
YASHOBHOOMI, IICC, DWARKA
NEW DELHI, INDIA

Book Your Space Today

Where the Water Community Comes Together