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UNVEILING INNOVATIVE SOLUTIONS: THE CASE STUDY EDITION 2024

Dear Readers,

Welcome to the 16th Special Case Study Edition of EverythingAboutWater Magazine! This edition remains a flagship for professionals across the water industry, offering valuable, real-world insights from users and experts alike. In the ever-evolving landscape of water management, learning from the practical experiences and solutions implemented worldwide is not just beneficial but essential.

The Case Study method, which dates back to the 1960s at Harvard Business School, continues to be a vital educational tool. By exploring real-life dilemmas, challenges, and outcomes, the method enables us to dive deep into the intricacies of decision-making and problem-solving in the water sector. From addressing complex water-related issues to navigating uncertainties, the Case Study approach allows professionals to view situations from multiple angles, fostering collaborative thinking and innovation.

The global water sector faces immense challenges – from scarcity and contamination to aging infrastructure and climate change. This edition brings together groundbreaking solutions from across industries, showcasing the cutting-edge technologies and innovative strategies being adopted to address these pressing concerns. With a focus on mechanical, civil, hydraulic, and chemical engineering, as well as new advancements in instrumentation and process management, this issue offers a holistic view of the diverse tools and methodologies revolutionizing water treatment, distribution, and conservation.

While the road to sustainable water management is not without its obstacles, it is through the exchange of expertise and the sharing of experiences that we unlock the potential for transformative change. Our goal with this edition is to empower professionals to apply these lessons in their own projects and communities, reinforcing the collective responsibility we share in ensuring a water-secure future for all.

I extend my deepest thanks to all contributors, readers, and industry leaders for your continued support. Your involvement enriches the conversation and fuels progress in the water sector. As you explore this year's Case Study Edition, may the insights shared inspire new ideas and action, driving us closer to a sustainable, resilient, and water-secure world for generations to come.

Thank you and warm regards,
Simran Arora
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DROPLETS

NAMAMI GANGE PAVILION BECOMES A CENTRE FOR GANGA CONSERVATION AND AWARENESS

The Namami Gange Pavilion, set up by the Namami Gange Mission in Prayagraj, is attracting a significant number of visitors every day, at the Mahakumbh-2025,. This pavilion has become an innovative medium for spreading awareness about the cleanliness and conservation efforts undertaken by the Government for the Ganga River. The pavilion begins with an interactive biodiversity tunnel that offers visitors an experience of the Ganga's biodiversity and natural beauty. Equipped with modern projection technology, this tunnel showcases the chirping of birds living on the banks of the Ganga and highlights the importance of the life-giving Ganga.

The main attraction of the pavilion is the digital exhibition, which presents the various efforts for the cleanliness and conservation of the Ganga in an engaging and educational manner. Another highlight is the Prayag Platform, which displays real-time data on the Ganga-Yamuna rivers and their tributaries. This platform provides information on water levels, cleanliness, and pollution-related statistics.

The pavilion also showcases riverfront development and the functioning of sewage treatment plants along the banks of the Ganga. This exhibition helps visitors understand how the government and organizations are making technical and structural efforts to maintain the cleanliness of the Ganga. The pavilion features replicas of creatures found in the Ganga, such as the Ganga dolphin, turtles, crocodiles, and fish. This initiative is proving to be educational, especially for children and youth, allowing them to understand the Ganga's biodiversity and the importance of its conservation.

The Namami Gange Mission has appealed to the devotees coming to the Mahakumbh to recognize that the Ganga is not just a river but an integral part of India's culture, history, and economic life. Keeping it clean and preserved is the duty of every citizen. This state-of-the-art and creative pavilion is not only successful in conveying the importance of the Ganga but has also become one of the major attractions of Mahakumbh-2025.





J&K SET TO TRANSFORM SANITATION LANDSCAPE WITH USED WATER MANAGEMENT PROJECT

The Union Territory of Jammu and Kashmir is launching the Used Water Management (UWM) project under Swachh Bharat Mission (SBM) 2.0 to enhance its sanitation infrastructure. This initiative aims to modernize wastewater management by constructing advanced Sewage Treatment Plants (STPs) and Faecal Sludge Treatment Plants (FSTPs).

The project will establish essential infrastructure, including sewerage networks and pipelines for efficient wastewater collection, treatment, and disposal, all compliant with Central Pollution Control Board (CPCB) standards. A comprehensive study will assess the current sewerage systems and treatment facilities to identify deficiencies and estimate wastewater generation based on population trends. Key components include building new STPs and FSTPs, upgrading existing facilities, and developing efficient transport networks for wastewater. The initiative will also explore recycling treated water for non-potable uses like irrigation.

To ensure sustainability, advanced technologies and monitoring systems will be implemented throughout construction. Once operational, the project is expected to reduce environmental pollution from untreated wastewater and improve public health. The Housing and Urban Development Department has engaged expert consultants to prepare a Detailed Project Report (DPR) within six months. While the project's cost is not specified, timely completion within the SBM 2.0 mission period is essential.

TIRUNELVELI MEMBER OF PARLIAMENT ROBERT BRUCE SUBMITTED BEFORE HIGH COURT THAT THE CENTRE AGREED TO RELEASE FUNDS FOR CLEANING TAMIRABHARANI AND THE STATE HAD TO PREPARE A DETAILED PROJECT REPORT

Vaigai and Tamirabharani, two historically significant rivers in southern Tamil Nadu mentioned in Sangam literature, have supported civilizations for over 2,000 years.

ATER NEWS

The Madurai Bench of the Madras High Court has been hearing multiple public interest litigation petitions regarding river rejuvenation. In March 2024, responding to writer S. Kamaraj's petition, the court directed authorities to prevent sewage discharge into Tamirabharani and ordered the Public Works Department to inspect and address sewage entry points. In December 2024, the court initiated proceedings following reports on Vaigai river pollution, based on a Madurai Nature Cultural Foundation study. Notices were issued to several district Collectors, and the State government was asked to prepare an action plan.





According to Rajan, Chief Organiser of Vaigai Nadhi Makkal Iyakkam, while sewage discharge points into Vaigai river in Madurai city decreased from 68 to 36, the discharge volume remains high. Studies suggest installing pumping stations and treatment plants to address the pollution. Muthalakurichi Kamaraj identified over 17 sewage discharge points along a seven-kilometer stretch of Tamirabharani in Tirunelveli city. He emphasized the need for comprehensive monitoring of all administrative bodies and suggested following London's Thames river cleanup model. Recently, Tirunelveli MP Robert Bruce informed the High Court that the Centre had agreed to release funds for cleaning Tamirabharani, pending

DROPLETS

AMIT SHAH INAUGURATES BARRAGE FOR SABARMATI RIVER COSTING RS. 235 CRORE

Union Home and Cooperation Minister Amit Shah said Prime Minister Narendra Modi had "quenched Gujarat's thirst for water" as the then chief minister of the state as he inaugurated various developmental projects worth Rs. 241 crore in Ahmod, Mansa in Gandhinagar district — including a barrage on the Sabarmati river — on Wednesday.

The barrage will be built at the cost of Rs. 235 crore. The other projects include a Mansa circuit house, a check dam, and a protection wall near a temple in the region. Shah also said that efforts are on to build 14 dams on the river so that it is full of water throughout the year.

"When a river remains full of water, the water levels (in the nearby areas) rise by 40-50 feet," Shah said. Shah is a native of Mansa. He said, "Narendrabhai has done the work of quenching Gujarat's thirst (for water). I distinctly remember. I became an MLA for the first time in 1997. I went to the Assembly for the first time. All the MLAs from north Gujarat were seeking permission from the government to make borewells. It was not being granted because of (the area being marked as a) dark zone."





a detailed project report from the State.

BENGALURU WATER AUTHORITY PLANS TO BUILD 17 NEW SEWAGE TREATMENT PLANTS

City plans new plants with a combined capacity of 583 million litres per day, costing Rs. 2,200–Rs. 2,400 crore, to address treatment capacity shortfall. To prioritise the treatment and reuse of wastewater generated in the city, the Bangalore Water Supply and Sewerage Board (BWSSB) has proposed the construction of 17 Sewage Treatment Plants (STPs) with a combined capacity of 583 million litres per day (MLD). Currently managing over 11,894 kilometres of underground drainage, the BWSSB supplies 2,225 MLD of water daily from the Cauvery, located 100 kilometres away. Of this, 85-90% is discharged as wastewater. While 33 existing STPs with a combined capacity of 1,381 MLD are operational, there remains a requirement to process an additional 907 MLD of wastewater. To address this, BWSSB plans to build new STPs at an estimated cost of Rs.2,200–Rs.2,400 crore.



Increasing wastewater generation

An official said, "Before implementing the Cauvery Stage V project, the city received 1,450 MLD of water daily, generating 1,440 MLD of wastewater. The current STPs process approximately 1,200 MLD. With the addition of the Cauvery Stage V supply, 775 MLD of water is being provided to 110 villages, increasing the total wastewater generated in the city to 2,200 MLD. To manage this surge, the construction of 17 new STPs has become imperative."

Treated water for lakes

An official added, "Under the Koramangala-Challaghatta Valley project, BWSSB plans to release 400 MLD of treated water daily to rejuvenate 145 lakes, including five in Kolar, Chikkaballapur, and rural Bengaluru. However, only 265 MLD is currently being pumped, with an additional 135 MLD required. The surplus treated water will be directed to lakes once the additional STPs are operational. Proposals will soon be submitted to the government for approval to address the growing need for wastewater treatment and sustainable water management in Bengaluru."

Proposed STPs

The proposed locations for the new STPs in city include Madiwala with a capacity of 75 MLD and Kadubeesanahalli with 50 MLD. Kadugodi and Koramangala are set to have STPs with a capacity of 20 MLD each, while Basavanapura will have one with a capacity of 10 MLD. A significant addition will be made in Bellandur with a 60 MLD facility, Mailasandra and Doddabele each housing STPs of 100 MLD capacity. Other locations include Kogilu (15 MLD), Jogikere (5 MLD), and Abbigere (5 MLD). Additionally, UM Kaval will have a 10 MLD capacity STP, and Hulimavu and Chikkabegur will each host facilities with 15 MLD capacity. Channasandra will add another 20 MLD, Soukere will have a 28 MLD STP, and Anjanapura will feature a 35 MLD facility.

REVIVING THE GANGA: PIVOTAL SEWERAGE PROJECTS APPROVED IN NMCG'S 59TH EXECUTIVE COMMITTEE MEETING

The National Mission for Clean Ganga (NMCG) recently approved several significant projects aimed at river conservation and sanitation management. During the 59th Executive Committee meeting, chaired by Director-General Shri Rajeev Kumar Mital, projects worth ₹272 crore were sanctioned for Chandauli and Manikpur in Uttar Pradesh, along with a ₹257 crore initiative for Buxar, Bihar.



In Chandauli, a project costing ₹263 crore will establish a 45 MLD capacity Sewage Treatment Plant (STP) utilizing a hybrid annuity model. This initiative is designed to reinforce the river management system, with operation and maintenance ensured for the next 15

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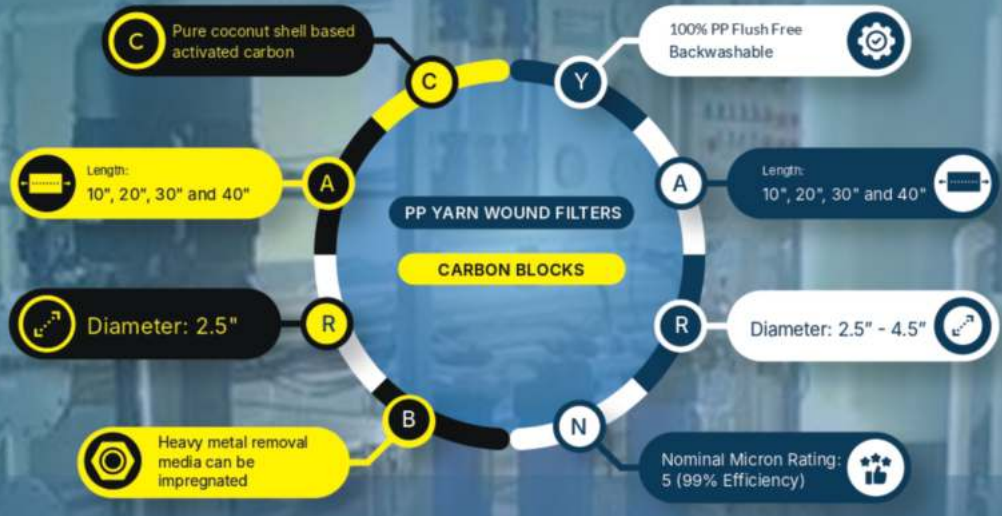


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years. Additionally, a ₹9 crore Faecal Sludge Management Project in Manikpur will develop a 15 KLD capacity treatment plant and a solar power facility, ensuring eco-friendly waste management solutions. In Buxar, Bihar, an ambitious project has been approved at a cost of ₹257 crore. This initiative will construct a 50 MLD STP along with supporting infrastructure, ensuring robust operation and maintenance for the next 15 years. A key aspect of this project is the construction of an additional 1 MLD capacity STP using nature-based solutions, along with three interception pumping stations and an 8.68 km long sewer network.

To further accelerate river rejuvenation and sanitation management in West Bengal, several initiatives have been approved for Uttarpara-Kotrung Municipality. An integrated septage treatment plant will be established at a cost of ?8 crore, featuring a 22 KLD faecal sludge treatment plant based on the DBOT model, with provisions for operation and maintenance over the next five years. Through these efforts, the mission continues to lay a strong foundation for effective river rejuvenation and enhanced sanitation management across multiple states.

JAL SHAKTI MINISTRY EYES 2025 TO COMPLETE TAP WATER CONNECTIONS IN RURAL INDIA, ACHIEVE SANITATION GOALS



The Jal Shakti Ministry aims to achieve the ambitious targets of the Jal Jeevan Mission (JJM) and Swachh Bharat Mission-Gramin (SBM-G) by 2025, following a shortfall in meeting the 2024 deadline for providing tap water connections to all rural households. The Ministry also seeks to ensure universal Open Defecation Free (ODF) Plus status for villages while advancing ecological restoration under the Namami Gange Programme. Currently, over 15.37 crore rural households have tap water connections, leaving around four crore still uncovered. Jal Shakti Minister C.R. Patil expressed optimism about achieving full coverage, highlighting ongoing coordination with states and Union Territories. Eleven states and Union Territories have achieved complete rural tap water coverage, but larger states like Rajasthan, Jharkhand, Kerala, and West Bengal lag behind with less than 60% coverage. Sanitation remains a priority, with 95% of villages in India declaring themselves ODF Plus, which includes toilet construction and waste management. Of the country's 5,86,707 villages, 5,60,897 have reached this status. The Ministry is confident that the remaining villages will achieve ODF Plus by 2025. Under the Namami Gange Programme, significant ecological progress has been made, including the reintroduction of gharials and turtles into the Ganga. The Ministry also aims to complete afforestation on 1,34,104 hectares within the Ganga basin by 2025 to enhance ecological balance

SIRUTHULI REVIVES MARIAMMAN TEMPLE CHECK DAM IN COIMBATORE CITY

Coimbatore City Round Table 31 and Coimbatore City Ladies Circle 16, two NGOs working towards the welfare of Coimbatore city in various sectors, on Tuesday launched the Mariamman temple check dam, Kovaipudur – the first pond restoration project that was executed by water conservation leader Siruthuli. The endeavour is backed by Stalwart Group of Companies and was inaugurated in the presence of Deputy Mayor R. Vetriselvan, managing trustee of Siruthuli Vanitha Mohan, Coimbatore City Round Table 31 chairman Tr. Lakshmiganth Krishnan, and Coimbatore City Ladies Circle 16 chairperson R.S. Vidhya. Mr. Krishnan said the check dam nestled between Arivozhi Nagar and Kovaipudur, lies along a stream originating from the Western Ghats. The region, grappling with rapid urbanisation, has faced a severe water crisis. Borewells in Arivozhi Nagar and Kovaipudur ran dry, even at depths of 1,000 feet, highlighting the dire need for effective water conservation measures, he said.

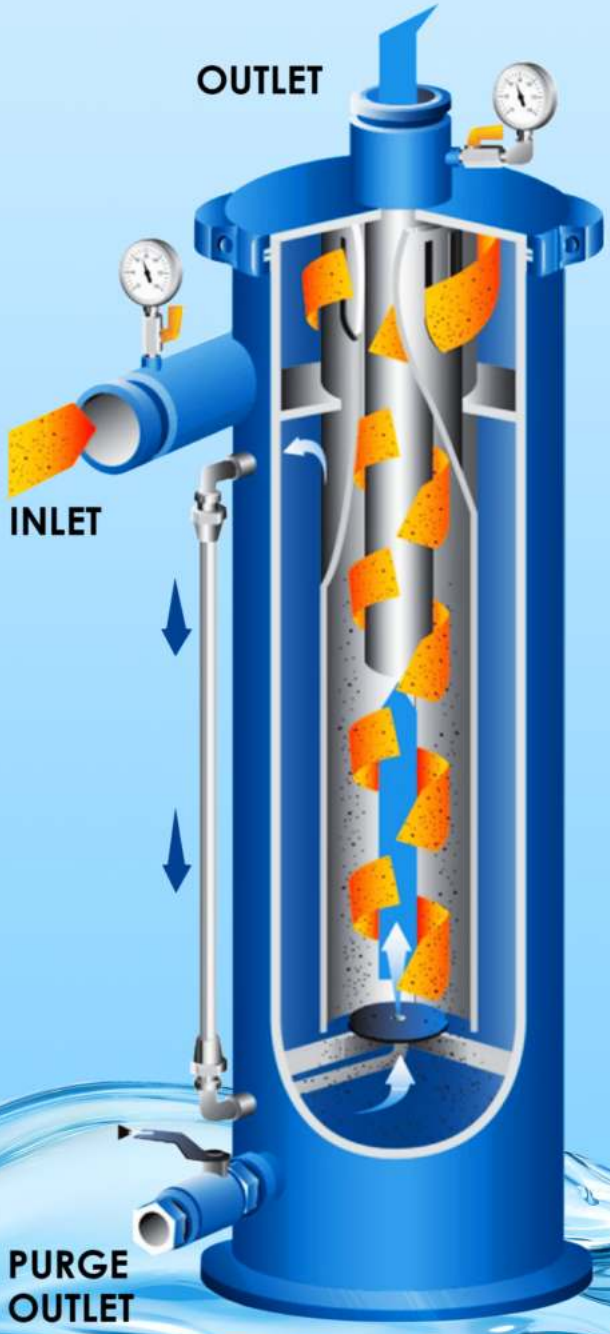


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Over time, the existing check dams in the area had fallen into disuse, unable to retain rainwater, which flowed downstream without replenishing groundwater reserves. This left the land parched and borewells unproductive. Recognising the urgency of the situation, Siruthuli, Coimbatore City Round Table 31 and Coimbatore City Ladies Circle 16, undertook the rejuvenation of the Mariamman Temple check dam, he added.



Siruthuli initiated the desilting and restoration in October and as of today, it had already filled thrice and contributed by storing and recharging 24 million litres of water. He said that saving water and sewage treatment are the most important needs and thanked Siruthuli for executing the project on time at a cost of ₹9.22 lakh. He also thanked Christopher Arvinth, MD, Stalwart Group of Companies for his contribution. Vanitha Mohan, managing trustee, Siruthuli said that the pond will help recharge the groundwater level in a short time and cater to not just the humans, but birds, trees and animals. "We plan to undertake plantations around the check dam and desilt multiple upstream structures to further enhance water conservation," she added.

PM TO UNVEIL RS 40,000 CR PROJECT LINKING 11 RIVERS IN RAJASTHAN: CR PATIL



Prime Minister Narendra Modi will dedicate a project worth about Rs. 40,000 crore to link 11 rivers in Rajasthan that is projected to make it a water-surplus state, Union Jal Shakti Minister C R Patil said on Sunday. Speaking at the inauguration ceremony of semiconductor plant of Suchi Semicon, Patil appealed to corporates to work on water harvesting to address the issue of water crisis in the future. "Rajasthan faces severe water crisis. The project that Modi Saheb is going to dedicate there on December 17 will link 11 rivers. This project, worth about Rs. 40,000 crore, will be announced by Modi Saheb. After this, Rajasthan will have maximum water," Patil said.

The Rajasthan and Madhya Pradesh governments signed a memorandum of Understanding (MoU) with the Ministry of Jal Shakti in January 2024 to prepare detailed project reports (DPRs) and onbroad planning of the Modified Parbati-Kalisindh-Chambal (MPKC) link project, integrated with the Eastern Rajasthan Canal Project (ERCP). The project is expected to improve water crisis in Madhya Pradesh and Rajasthan.The MPKC link project, inter alia, involves major rivers, viz; Chambal and its tributaries Parbati, Kalisindh, Kuno, Banas, Banganga, Ruparail, Gambhiri, and Mej.



According to the information shared in Parliament, the project is envisaged to provide water to the 21 newly constituted districts, including Jhalawar, Kota, Bundi, Tonk, Sawai Madhopur, Gangapur, Dausa, Karauli, Bharatpur, Alwar, etc, in Rajasthan to the districts of Guna, Shivpuri, Sheopur, Sehore, Shajapur, Rajgarh, Ujjain, Mandsaur, Morena, Ratlam, Gwalior, etc, in Madhya Pradesh.

UNION MINISTER SH. KIRTI VARDHAN SINGH LAUNCHES 'NANO BUBBLE TECHNOLOGY' FOR CLEANING AND PURIFYING WATER IN NATIONAL ZOOLOGICAL PARK, DELHI TO PROMOTE THE HEALTH OF AQUATIC ANIMALS

Union Minister of State for Forest, Environment and Climate Change Sh. Kirti Vardhan Singh on Tuesday launched 'Nano Bubble

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Technology' for cleaning and purifying the water of the National Zoological Park, Delhi to promote the health of aquatic animals. This technology can clean dirty pond water by removing algae and similar growths. It is being tested in the zoo for the first time as a 15-day trial. If successful, it will be used in the zoo. Union Minister of State Shri Singh explained that the goal of this technology is to keep water clean, ensuring the health and well-being of aquatic creatures. Clean water prevents foul smells, algae buildup, and discoloration often caused by dirty pond water. This new technology will improve water quality and benefit the animals.

National Zoological Park Director Sanjeet Kumar, Senior Officers of the Ministry and Anand Kapoor from the Nano Bubble Company were also present on the occasion.

MCC PROPOSES TO REJUVENATE FOUR MORE WATER BODIES AMID CONCERNS OVER FLOW OF SEWAGE TO ALREADY DREDGED BODIES

The Mangaluru City Corporation (MCC) has proposed to spend ₹26.95 crore for the rejuvenation of four additional waterbodies and the development of three parks under the second phase of the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) 2.0. This proposal was approved during a council meeting on November 28. The allocated funds include ₹1.95 crore for operation and maintenance. The waterbodies targeted for rejuvenation are Jogimatta and adjacent lakes (₹2.4 crore), Byradi lake (₹ 1.35 crore), Baggundi lake (₹ 14 crore), and Kadekar Mallikarjuna lake (₹ 3.7 crore). The parks include Souharda lane park (₹ 55 lakh), Kodical Kallakanda Park (₹ 2.2 crore), and Kadri Park (₹ 2.75 crore).



Despite previous investments in rejuvenating some lakes, concerns remain regarding water quality, as many still face sewage inflow issues. For instance, Gujjarakere, which received ₹10 crore for its rejuvenation, remains non-potable due to sewage seepage. Nemu Kottari from the Gujjarakere Teertha Samrakshana Samithi emphasized that without addressing sewage inflow, investments in beautification are ineffective. The MCC's plans also include preparing detailed project reports for three new STPs in Knowledge Park-V, Knowledge Park-VI, and MU. Currently, the authority operates four functional STPs in the city, with ongoing efforts to improve sewage treatment and water quality in Mangaluru's waterbodies.

GREATER NOIDA AUTHORITY TO BUILD 5 SEWAGE TREATMENT PLANTS

The Greater Noida Authority has approved the construction of five sewage treatment plants (STPs) to enhance wastewater management and recycling for irrigation purposes. Among these, a ₹40 crore estimate for a 12 MLD STP in Sector IT City received in-principle approval from CEO Ravi Kumar NG after IIT Delhi endorsed the detailed project report. The planned STPs include a 45 MLD plant in Sector 45, a 50 MLD plant in Knowledge Park V, a 42 MLD plant in Ecotech VI, and a 72 MLD plant in Sector MU. The CEO emphasized the importance of these projects in developing infrastructure that supports the city's ecological sustainability.

Work on the 12 MLD STP is expected to begin within three to four months, addressing sewage treatment needs in IT City, Murshadpur, and Gharbara village. The authority has also issued tenders for the 45 MLD plant in Sector 1, with an estimated construction cost of ₹80 crore and plans to start work by January-end 2025.

Additionally, the CEO has requested the water works department to prepare detailed project reports for three more STPs in Knowledge Park-V, Knowledge Park-VI, and MU. Currently, Greater Noida operates four functional STPs, including the largest one with a capacity of 137 MLD located in Kasna. These initiatives aim to improve sewage treatment and promote environmental conservation in the rapidly growing city.

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DROPLETS

INTERNATIONAL WATER LEADERS SHARE INSIGHTS DURING GLOBAL DIALOGUE ON WATER REUSE

The WateReuse Association (WateReuse) and the International Desalination and Reuse Association (IDRA) are collaborating on a Global Dialogue on Water Reuse examining the drivers, challenges, and opportunities for accelerating the adoption of water reuse around the world. The organizations will produce a white paper later this year reflecting the consensus of experts participating in this initiative, which began at the 2024 WateReuse Symposium, March 11-14, 2024, in Denver, CO, and continued at the IDRA 2024 World Congress, December 8-12, 2024, in Abu Dhabi, UAE. Supporting organizations include Veolia, the International Code Council or ICC, and the North American Development Bank.

Inspired by a discussion on water reuse that began at the United Nations 2023 Water Conference and continued later that year in Seville at IDRA's Water and Climate Change Summit, WateReuse and IDRA embarked on an ambitious effort to unite international thought leaders for a comprehensive, global conversation about the future of water recycling.

The Global Dialogue on Water Reuse explored four topic areas crucial successful water recycling projects: communications, financing, governance, and treatment technology. Participants shared their knowledge on the drivers, challenges, and opportunities to accelerate the adoption of water recycling as a resiliency tool to help countries around the world.

WateReuse and IDRA are now working to synthesize the discussions into a Global Dialogue on Water Reuse White Paper. The White Paper will summarize key takeaways, best management practices, and lessons learned from these practitioners to help guide both public and private sector water professionals across the globe as they seek to implement water reuse projects in their respective countries. The analysis will highlight drivers, challenges, and opportunities for water reuse from the perspective of water professionals who have undertaken water recycling projects and offer practical insights for how others can get started deliver enhanced value to our customers, employees and other stakeholders."





NRW PUBLISHES INTERIM STATE OF NATURAL RESOURCES REPORT

Experts at Natural Resources Wales (NRW) are calling for urgent and collective action to address the degradation of natural resources in Wales, as outlined in the interim State of Natural Resources Report (SoNaRR 2025). This report highlights the pressing challenges posed by climate change, pollution, and biodiversity loss, threatening both the environment and community well-being. The full SoNaRR 2025 report will be published at the end of 2025, providing a comprehensive evidence base for sustainable resource management in Wales. The interim report emphasizes the need for immediate action to reverse environmental damage and outlines key challenges, priorities, and opportunities for future sustainability.

While progress has been made in areas like net-zero ambitions and recycling rates, the evidence of ongoing nature decline is stark. NRW urges collaboration across governments, businesses, and society to embed pro-nature thinking in decision-making processes. Sir David Henshaw, Chair of NRW, stressed that natural resources are vital for health and economic stability. He highlighted the opportunity for action presented by this interim report as Wales approaches a key election year in 2026. The report serves as a roadmap for reversing damage and building a sustainable future. Derek Walker, Future Generations Commissioner for Wales, echoed the urgency for action, noting that existing solutions for restoring nature must be prioritized. The full report will further detail insights and recommendations for safeguarding Wales' natural resources.

BARKING UP THE RIGHT TREE – ANOTHER FIRST IN PHOSPHORUS REMOVAL FOR UNITED UTILITIES

United Utilities has become the first water company in the UK to implement an innovative plant-based method for phosphorus removal, addressing a significant environmental challenge. Excess phosphorus is the leading cause of water quality failures in England and Wales, prompting increasing regulatory pressures and investments in wastewater

ATER NEWS

management. Currently, UK water companies spend approximately £39 million annually on metal-based chemicals for phosphorus removal, with rising demand and costs. This chemical approach poses challenges for small, rural sites due to higher investment needs and logistical limitations. Last year, United Utilities led a nationwide project to test alternative phosphorus removal methods, supported by Ofwat's Water Breakthrough Challenge. The project evaluated three methods: electrocoagulation, natural coagulation, and reactive media. Following a successful six-month trial at their Woolton wastewater treatment works in Merseyside, United Utilities is now introducing a natural coagulant derived from tree bark at several small rural facilities.



Callum Grundy, Principal Engineer (Innovation) at United Utilities, emphasized the project's significance in enhancing phosphorus removal while reducing reliance on chemical dosing. The trial showed promising results in effectively settling suspended solids and significantly reducing excess iron and phosphorus in treated wastewater. United Utilities is collaborating with Veolia Water Technologies to expedite the rollout of this plant-based solution. This initiative aligns with the company's broader commitment to sustainable treatment processes and improving environmental outcomes across its operations.

ENVIRONMENTAL PROJECT UNDERWAY TO PROTECT THE NORTH TYNE

Work has started to install a storm water storage tank in a Northumberland sewage treatment works to help to protect and improve water quality in the River North Tyne. Northumbrian Water is investing £2.5m in the upgrades at its site in Bellingham. Work is being carried out by the water company's partners, Esh Stantec. The tank will hold storm water and wastewater from homes at times of heavy rainfall, ready to be treated when flows reduce, protecting against the risk of spills to the environment. Work will be substantially complete by the end of March 2025, followed by finalisation works on site through the summer. The project builds on other investments around the North Tyne, including a £3.5m project to triple capacity at Wark Sewage Treatment Works, which is

DROPLETS

MIRALIVING LAUNCHES A RANGE OF CONTEMPORARY HOME DECOR ACCESSORIES

LANXESS India has won two prestigious Global Environment and Energy Foundation (GEEF) Global Awards - Safety award in the platinum category and the WaterTech award in the Sustainable Water Management category for the year 2024. These accolades are a testament to our commitment towards excellence in safety standards and sustainable water management practices.

The GEEF Global Safety Award recognizes LANXESS India's outstanding achievements in maintaining the highest safety standards within the chemical industry. The platinum category win displays the organization's dedication to ensuring a safe working environment for all its employees and stakeholders. LANXESS has strict group-wide directives on health protection, occupational & process safety. These directives focus primarily on identifying risks in advance and implementing measures designed to prevent accidents and rapidly detect and respond to incidents.

Key features of the safety systems include active involvement of the employees in building operating procedures, job safety analysis, more focus on the behaviour-based safety programs, robust work permit system, contractor management systems, programs to improve employee health, implementation of strong technical control measures, increased focus on reporting of unsafe conditions and unsafe acts, incident management system, trainings and effectiveness check.

The Global WaterTech Award in Sustainable Water Management category highlights LANXESS India's innovative approach towards sustainable water management. Water plays a central role in LANXESS's strategy. As a chemical company, the organization faces up to its responsibility to decouple its own water consumption from economic growth and pursues clear goals: reducing specific water consumption overall and local water consumption, especially at sites where water is scarce. To this end, a water risk analysis is regularly carried out at LANXESS' sites to accurately measure what is known as "water stress," i.e. the relationship between water withdrawal and renewable water supplies.





close to completion. Jonathan Shaw, Northumbrian Water's Project Manager, said: "We know how important water quality in our rivers and coasts is to our customers and we share that passion. This project helps us to protect and improve water quality in the River North Tyne, as well as adding resilience to Bellingham Sewage Treatment Works itself.

"We are working to keep customers in the area, who will see our teams working on the outskirts of the village, informed as we progress, and we have set up a project page on our community portal, where updates will be made available. "We would like to thank the community for its patience and understanding while we carry out this important work to protect the environment."

USING NATURE-BASED SOLUTIONS TO SUPPORT WATER QUALITY IMPROVEMENTS IN PEMBROKESHIRE



A Natural Resources Wales (NRW) project on the Western Cleddau river in Pembrokeshire is utilizing tree planting to combat nutrient pollution and enhance water quality. Approximately 6,500 trees have been planted along the riverbanks near its confluence with the Eastern Cleddau to absorb excess nutrients from agricultural runoff. These tree corridors, averaging 14 meters in width, serve as buffer strips between farmland and the river and have been established on non-productive land with the landowner's support. In addition to improving the river's health, the new trees will connect with existing woodlands, benefiting local wildlife. The planting was carried out by contractors Coed Porffor/Purple Trees over five days, and over 1,000 meters of fencing has been installed to prevent livestock from accessing the river. Andrew Lewis from NRW highlighted the ecological significance of the Western Cleddau and Milford Haven estuary, which are home to various rare species. The project addresses significant water quality challenges in the Western Cleddau, primarily due to nitrate, phosphate, and sediment pollution. Funded by the Welsh Government's Water Capital Programme, it supports broader initiatives aimed at restoring the river's ecosystem and improving water quality in the region.

CUTTING-EDGE WASTEWATER TREATMENT TECHNOLOGY PROVIDES A MORE SUSTAINABLE WATER SUPPLY IN COLORADO, USA



The city of Lafayette, Colorado, is addressing the critical challenge of sustainable water treatment by constructing a new high-performance wastewater treatment plant. Since 2022, this facility has been integrating state-of-the-art technologies, including the installation of 13 HYPERCLASSIC®-Mixing and Aeration Systems from INVENT, specifically designed for demanding wastewater conditions. These systems enhance sludge stabilization through efficient mixing and aeration, significantly reducing biological and chemical oxygen demand in aerated basins. The technology optimizes sludge quality and improves aeration efficiency while minimizing energy consumption and maintenance costs. Lafayette has a history of collaborating on major water projects to bolster regional resilience against climate change. The new plant will support the city's water supply needs, with a capacity of up to 6.4 million gallons per day.











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This initiative reflects Lafayette's commitment to modernizing its water treatment infrastructure and ensuring reliable water quality for its growing population.

TRANSFORMING THE UK WATER INDUSTRY: PREDICTIONS FOR 2025



The UK water industry is undergoing significant transformation, driven by the need for urgent improvements in clean, waste, and environmental operations, alongside increased accountability. As companies navigate an evolving regulatory landscape, three key predictions for 2025 emerge:

Data and Performance as Critical Success Metrics

Meter read performance will be essential for meeting regulatory targets set by Ofwat. Companies that achieve the required daily reads will avoid financial penalties and be able to reinvest in reducing leakage and consumption. Efficient management of meter rollouts, such as installing meters street-by-street, will enhance operational efficiency and data reliability.

Changes to Incentives and Penalties

The conversation around penalties and incentives will intensify in 2025, particularly regarding smart metering's role in Operational Delivery Incentives (ODIs) for leakage and per capita consumption. Water companies may face challenges with dual penalties related to smart meter deployment, prompting discussions on revisiting Price Control Deliverables (PCDs) to ensure fair outcomes.

Proactive, Real-Time Data Analysis

The industry is expected to shift from biannual meter reads to up to 24 reads per day, enabling real-time leak detection and water usage assessments. This transition will require water companies to adapt their operations for efficient data interpretation and customer engagement, integrating insights into their IT infrastructure for tangible environmental benefits. As the UK water sector prepares for these changes, success will depend on capturing accurate data, leveraging managed service providers for rollouts, and deriving valuable insights from the influx of new information. This proactive approach aims to deliver substantial value for both customers and the environment as the industry moves forward into a new regulatory era.

INTEGRATED CATCHMENT SYSTEMS: A PARADIGM SHIFT IN SUSTAINABLE MANAGEMENT

Water is a scarce and at-risk resource, facing pressures from climate change, population growth, urbanization, and pollution. Mike Morris, Technical Director at Stantec, highlights the need for a holistic approach to water management that considers the interconnectedness of various factors within defined catchment areas.

Integrated Catchment System Management (ICSM) aims to ensure sustainable management of water and related resources by recognizing the interactions between social, political, and environmental elements. This approach encourages collaboration among stakeholders to develop shared visions for river catchments. For example, United Utilities partnered with Greater Manchester Combined Authority and The Environment Agency to create an Integrated Water Management Plan that reflects both environmental and cultural values.



The benefits of ICSM include improved water quality, reduced flood and drought risks through nature-based solutions, enhanced biodiversity, and increased social and economic opportunities. By fostering community engagement, ICSM effectively addresses water-related challenges while promoting sustainable development.



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Stantec has joined other organizations in signing the Catchment Management Declaration, committing to collaborative strategies for managing water resources and tackling global environmental challenges.

STRATEGIES FOR SAFE AND EQUITABLE ACCESS TO WATER: A CATALYST FOR GLOBAL PEACE AND SECURITY

A recent study published in *Nature Water* highlights the critical role of water in fostering peace and security while preventing conflicts. Conducted by an international team led by the University of Birmingham, the research outlines a seven-point strategy aimed at ensuring equitable and sustainable access to clean water globally, which is essential for mitigating tensions arising from water scarcity and inequitable distribution.



The study emphasizes the need for local collaboration on global water issues to empower communities and enhance resilience. Involving local populations in governance can help prevent conflicts, particularly during times of scarcity, by promoting transparency and trust. Integrating indigenous knowledge and nature-based solutions with technical infrastructure is also recommended to bolster community resilience. Furthermore, the researchers stress the importance of recognizing existing inequalities in water access when developing policies. Ensuring safe access to water for women and girls is crucial, as they often bear the burden of water collection. Improved predictive measures for water-related changes and international cooperation through treaties are also vital for managing transboundary water resources effectively.

Lead author Professor Stefan Krause noted that when managed sustainably and equitably, water can serve as a powerful tool for peace, fostering cooperation among nations and communities. The study advocates for initiatives like the UN Water Convention to facilitate joint management of shared water resources, ultimately contributing to a more just and resilient future for all.

AQUEOUS VETS® AWARDED CONTRACT FOR WOODBURY, MINNESOTA'S PERMANENT WATER TREATMENT PLANT PROJECT



AqueoUS Vets, a leading provider of innovative PFAS treatment solutions, has been awarded the contract for the City of Woodbury, Minnesota's new water treatment plant project. Once complete, this cutting-edge facility will remove PFAS from groundwater wells used to supply drinking water to the city.The project includes the installation of 17 miles of underground pipeline, connecting Woodbury's 20 wells to a centralized treatment plant. The plant is expected to be fully operational by 2028, providing the community with a reliable, indefinite solution for PFAS removal. Currently, nine of the city's wells are being treated at a temporary water treatment plant and three additional interim treatment facilities at various well sites.

"We are honored to be selected for the City of Woodbury's new permanent water treatment plant project," said Dr. Mirka Wilderer, President & CEO of AqueoUS Vets. "This contract is a testament to our commitment to providing tailored, high-performance treatment systems that not only address critical water quality challenges but also address lowering the total cost of ownership for the City. We look forward to supporting the community with AV's reliable solutions providing safe, clean water for generations to come." As part of its contract, AqueoUS Vets will fabricate and deliver 21 custom PFAS treatment systems. Each system will include two, 12-foot diameter vessels with 14-foot side shell heights, piping manifolds, media slurry piping valves, and associated equipment for a complete system package. AqueoUS Vets will oversee the freight to the site, installation supervision, commissioning support, and operator training, following its industry-preferred concept-to-commission approach.

"We are pleased to have AV as a partner on this critical project, "said Jim Westerman, Woodbury's assistant public works director and project lead. "This work will better the lives of our residents and visitors by delivering high-quality drinking water for generations to come."

WABAG RANKED 3RD AMONG "WORLD'S TOP 50 PRIVATE WATER OPERATORS"

VA TECH WABAG LIMITED has achieved a significant milestone by being ranked 3rd globally in the "World's Top 50 Private Water Operators" by Global Water Intelligence (GWI) for the second consecutive term. This recognition highlights the company's commitment to providing safe and clean drinking water and sanitation to over 95.93 million people worldwide. The biennial list published by GWI serves as a benchmark for excellence in the water sector, and WABAG's ranking reflects its dedication to sustainable water management practices. Chairman and Managing Director Mr. Rajiv Mittal expressed pride in this accomplishment, emphasizing the company's ongoing innovation and advanced technologies in water and wastewater treatment.

WABAG's initiatives align with the United Nations Sustainable Development Goal 6, which aims to ensure clean water and sanitation for all by 2030. The company also adheres to the ESG (Environment, Social, Governance) Sustainability Index, reinforcing its leadership in sustainable practices. With over 100 years of experience and operations in more than 25 countries, WABAG continues to set benchmarks in the water sector while striving to serve millions globally.

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PLASTICS PIPE INSTITUTE ESTABLISHES, FILLS SUSTAINABILITY & ADVOCACY DIRECTOR POSITION





Donnie Johnson, Director of Sustainability & Advocacy, the Plastics Pipe Institute, Inc.

IRVING, TX - January 22, 2025

The Plastics Pipe Institute, Inc. (PPI) announced today that Donnie Johnson has joined the association as its new Director of Sustainability & Advocacy. The position was created as a result of the growing membership's desire to increase PPI's contributions to public policy and legislative initiatives with a focus on sustainability and resiliency plus government advocacy. Prior to joining PPI, Johnson served in executive and senior advisor roles for several of the nation's largest healthcare and education unions, and brings more than 16 years of expertise in legislative advocacy, electoral strategy, and public relations to the leading North American trade association.

"Donnie Johnson's ability to align stakeholders, develop strategic messaging, and deliver measurable results makes him the ideal leader to drive PPI's sustainability and advocacy initiatives forward," stated PPI President, David M. Fink.

"His leadership will enhance our efforts to champion the environmental and economic benefits of plastic piping systems while advocating for policies that support our industry.

"PPI is excited to welcome Donnie as a driving force in advancing our mission to promote the performance, sustainability, and resilience of plastic piping systems in today's evolving infrastructure."

In his new position, Johnson will influence public policy and legislative priorities that benefit the industry. His duties include serving as lead staff member for the PPI Umbrella Government Advocacy and the Sustainability Committees; directing lobbying efforts and maintaining key legislative initiatives on behalf of PPI; coordinating proposals and initiatives in collaboration with lobbyists and aligned associations; plus collaborate with industry to amplify the organization's voice. Founded in 1950 and now with nearly 300 members, PPI has five divisions: Building & Construction, Energy Piping Systems, Drainage, Municipal & Industrial, plus Power & Construction.

In addition to his work in labor, Johnson has spearheaded energy development projects in the Midwest and South. Most notably, he played a key role in securing $342 million in Graduate Medical Education funding, marking the largest investment in New Jersey's history for medical education. Fink commented, "This experience has prepared him to excel in advancing PPI's advocacy and sustainability goals."

Fink concluded, "He is bringing his extensive leadership experience in public policy, advocacy, and strategic planning to the organization. Donnie's proven track record in healthcare advocacy, green energy development, workers' rights, and education policy positions him as a key figure in advancing PPI's mission to promote the sustainability and resilience of plastic piping systems."



GRUNDFOS PARTICIPATES IN THE 57TH CONVENTION OF INDIAN WATER WORKS ASSOCIATION





The exhibition aims to spark insightful discussions on adoption of innovative water technologies across India

Chennai, 09 January 2025:

Grundfos a global leader in intelligent and energy-efficient pumping solutions, is all set to participate in the 57th annual convention of the Indian Water Works Association (IWWA) at Raipur in stalls 23 to 28. The convention that will unfold over the next three days, will be held to inspire and drive action towards a more sustainable water future. It will also seek to showcase innovative technologies and best practices to empower government, individuals, communities and industry to adopt solutions that ensure the availability of clean water for the next generation.

The theme 'Water 360° innovative technologies in water, wastewater treatment and sustainable management' stands to create dialogue together with manufacturers, technocrats, scientists and consultants to deliberate on pressing issues concerning water and wastewater management. The event will also include technical sessions, lectures, and paper presentations to address field issues and focus on case studies relevant to the industry.

"Our participation in the IWWA convention reinforces Grundfos' commitment to supporting India's water sustainability initiatives", said Raveendra Bhat, Area Sales Director, Grundfos (Water Utility) INDO Region. "We see it as a good platform to showcase our insights on innovation, sustainability and wastewater management. With our innovative solutions, we aim to empower utilities, industries, and communities to adopt more sustainable and efficient water management practices."

The conference will also feature other sub-themes such as Water Quality Mitigation – Desalination Processes, Advanced Wastewater Treatment Technologies, Smart Water Systems and Digital Technologies, and Energy Efficiency in Treatment Technologies. Grundfos is participating in the convention as part of its larger efforts to build a sustainable and water-positive future and collaborate with stakeholders across the water industry.





WABAG: CELEBRATING 100 YEARS OF EXCELLENCE IN GLOBAL WATER MANAGEMENT



INTERVIEW WITH

Mr. Rajiv Mittal
Chairman & Managing Director
VA Tech WABAG Limited

Q. What have been the key milestones and transformative moments in WABAG's 100-year journey, and how have they contributed to its status as a global leader in water treatment solutions?

A. WABAG's century-long journey embodies resilience, innovation, and an unwavering commitment to sustainable water management. Established in 1924 as Wasserfilterbau in Breslau, the company's evolution has been marked by pivotal milestones that have shaped its status as a global leader in the water sector.

The establishment of VA TECH WABAG Ltd. in Chennai in 1996 represented a transformative step, enabling the company to address the unique challenges of emerging markets through localized expertise. The 2005 management buyout, backed by ICICI Venture, catalyzed WABAG's independent growth trajectory. This momentum was further amplified by the 2007 acquisition of the WABAG Austria Group from Siemens, which reunited the global WABAG family and solidified its position as a pioneer in water technology.

WABAG's public listing in 2010 underscored its commitment to transparency and growth, setting a strong foundation for future endeavors. The successful execution of landmark projects such as the 110 MLD Nemmeli Desalination Plant, the 110 MLD Kodungaiyur Power Neutral WWTP, and the 45 MLD TTRO plant in WABAG's ability to tackle water scarcity with cutting-edge innovation. Furthermore, projects like PETRONAS' Effluent Treatment Plant in Malaysia and the One City, One Operator initiative in Agra and Ghaziabad showcase the company's holistic expertise in water and wastewater management.

WABAG's pivotal role in India's Namami Gange program highlights its dedication to revitalizing India's water ecosystems. Notably, the company executed the first and largest sewage treatment plant (STP) under the mission in Varanasi, which was dedicated to the nation by the Hon'ble Prime Minister of India, Shri Narendra Modi. The 400 MLD Perur Desalination Plant, the largest in South-East Aisa, is another milestone in WABAG's growth journey.

Q. How has WABAG's vision for sustainable water management evolved over the decades, and what distinguishes the company from its competitors in the global water industry?



A. WABAG's vision for sustainable water management is driven by the belief that access to clean water is a fundamental right and essential for global sustainability. Over the decades, this vision has evolved in response to pressing challenges such as climate change, urbanization, and increasing water demands from agriculture, industry, and households. Today, WABAG is at the forefront of promoting a circular water economy, where recycle and reuse form the cornerstone of sustainable water management.

We have progressed from traditional water treatment practices to pioneering alternative, drought-proof water resources through innovative solutions like "Manufactured Water." Exemplifying this shift are our TTRO plants in Chennai and Ghaziabad, and the desalination plants in the coastal regions, reducing dependence on freshwater resources. By integrating energy-efficient technologies into desalination and wastewater treatment processes, we not only reduce operational costs but also significantly lower carbon footprints, reinforcing our commitment to environmental sustainability.

What sets WABAG apart is its singular focus as a pure-play water technology company. Unlike many general contractors, WABAG leads in developing and delivering cutting-edge water treatment technologies at affordable cost. Our innovation is powered by a robust R&D ecosystem, boasting over 125 in-house intellectual property rights, which enables us to provide tailored, cost-effective, and high-quality solutions to address diverse global water challenges.

Delhi; Kodungaiyur, Chennai; and AMAS, Bahrain, illustrate how treated wastewater can be repurposed for irrigation. By transforming wastewater into a valuable resource, these projects alleviate pressure on natural water bodies, conserve freshwater for critical uses, and enhance agricultural productivity.



One of the most transformative advancements in our journey is the integration of digital technologies such as Artificial Intelligence (AI) and the Internet of Things (IoT) into water treatment operations. These technologies enable real-time monitoring, predictive maintenance, and operational optimization, resulting in enhanced efficiency and reduced costs. For instance, at our Koyambedu TTRO plant in Chennai, AI-driven technology has set new standards for performance and resource management. Additionally, our Remote Monitoring System, based at our Global Headquarters, allows us to seamlessly monitor and optimize the performance of plants across the globe.

WABAG's unwavering commitment to innovation, sustainability, and technological excellence distinguishes it as a leader in the global water industry, making a tangible impact on communities, industries, and ecosystems worldwide.

Q. With competing demands from agriculture, industries, and households, how can these needs be effectively balanced to ensure sustainable water management?

A. Balancing the water demands of agriculture, industries, and households requires a holistic and multi-faceted approach rooted in sustainability, innovation, and collaboration. At WABAG, we advocate for circular water management principles that optimize every available water resource while minimizing environmental impact.

For agriculture, treated wastewater offers a sustainable and viable alternative to freshwater sources. WABAG-built sewage treatment plants, such as those in K&C Valley, Bengaluru; Pappankalan, New

This exemplifies the power of circularity, where resources are reused to support sustainability.

In industries, where water needs are substantial, prioritizing alternative sources of water are paramount. Advanced technologies like Desalination, Tertiary Treatment Reverse Osmosis (TTRO), and Zero Liquid Discharge (ZLD) enable industries to leverage alternative water sources and minimize dependence on freshwater. For example, our TTRO plants in Chennai and Ghaziabad demonstrate how municipal wastewater can be treated and reused efficiently for industrial applications. Additionally, WABAG has developed captive desalination plants for clients like Reliance and MRPL, ensuring self-reliance and reducing industrial strain on natural water reserves. These initiatives not only conserve freshwater but also help industries comply with stringent environmental regulations.

For households, the focus lies in fostering water conservation through awareness and responsible usage. Simple yet impactful measures, such as installing water-saving fixtures, repairing leaks, and practicing mindful water consumption, can collectively make a significant difference. Community-driven initiatives and public education campaigns are critical for instilling a culture of conservation and encouraging sustainable practices at the grassroots level. Partnerships between governments, NGOs, and private enterprises can amplify these efforts, driving long-term behavioral



change.

By addressing the unique challenges of each sector through innovation, technology, and collaboration, we can create a sustainable balance between the competing demands of agriculture, industries, and households, ensuring equitable access to water resources for all.

Q. Can you share details about some of WABAG's most impactful projects in India and the lessons learned from addressing complex water challenges?

A. WABAG's legacy of building over 6,500 plants globally over the past century reflects our expertise in tackling some of the most complex water challenges. Among our projects, several in India stand out for their innovation, scale, and transformative impact.



- The 110 MLD Nemmeli Desalination Plant in Chennai, the largest municipal desalination plant in India, is a prime example of addressing water scarcity in the costal India. By converting seawater into potable water, this plant ensures a sustainable and drought-proof water source for millions of residents.
- The 45 MLD Koyambedu TTRO plant in Chennai is one of India's largest water reuse facilities, designed to treat municipal wastewater for high-quality industrial use. This project demonstrates how treated wastewater can alleviate pressure on freshwater sources, promoting the principles of a circular water economy.
- The 140 MLD Dinapur STP in Varanasi is a flagship project under the Namami Gange Programme. As the first and largest sewage treatment plant in the region, it has played a pivotal role in reducing pollution and revitalizing the Ganga River. This project exemplifies the importance of advanced technologies and collaborative efforts in large-scale environmental restoration.
- Globally, WABAG's contribution to innovative water solutions includes the Direct Potable Reuse (DPR) plant in Windhoek, Namibia, which is the world's first facility of its kind. Built over two decades ago, this project continues to set a benchmark in advanced water reuse by directly converting treated wastewater into drinking water, showcasing the potential of circular water management.
- Another impactful initiative is the 110 MLD Kodungaiyur WWTP in Chennai, a power-neutral wastewater treatment plant that has generated over 60,000 MwH of green energy. This project underscores the importance of integrating sustainability into water treatment processes by utilizing energy recovery mechanisms.
- Under the One City, One Operator model implemented in Agra and Ghaziabad, WABAG manages the operation and maintenance the wastewater infrastructure of the entire cities. This holistic approach ensures the sustainable management of water resources and provides a healthier environment for local communities. Recently in Agra, we have introduced robotic machines for cleaning the manholes in the sewer network.

Q. How is WABAG addressing the issue of water scarcity in India, and what steps has the company taken to ensure long-term sustainability in water management?

A. WABAG is tackling water scarcity in India through innovative, sustainable solutions such as Circularity for Sustainability and Manufactured Water, which focus on efficient resource recovery and the creation of reliable alternative water sources.

Circularity for Sustainability embodies our commitment to a resource recovery-based circular economy. By transforming wastewater treatment plants into hubs for energy and nutrient recovery, we maximize resource utilization while minimizing environmental impact. A notable example is the Pappankalan WWTP in New Delhi, which not only treats wastewater efficiently but also recovers biogas and energy. This integrated approach supports sustainable urban water management, reduces reliance on natural resources, and promotes the recycling of valuable by-products.

Manufactured Water complements this vision by providing drought-proof and reliable water sources through desalination and advanced reuse technologies. The 110 MLD Nemmeli Desalination Plant in Chennai stands as a flagship project, converting seawater into high-quality potable water and ensuring water security for millions. Similarly, our TTRO plants in Koyambedu, Chennai, and Ghaziabad showcase how treated wastewater can serve as an alternative to freshwater for industrial use. These facilities highlight the potential of circular water management to sustainably address urban and industrial water demands.

As a proud contributor to the Namami Gange Programme, WABAG plays a key role in rejuvenating the Ganga, ensuring it flows clean and uninterrupted. Through the design, construction, and round-the-clock operation of advanced sewage treatment



plants, WABAG treats over 190 crore liters of water daily, underscoring its responsibility as a leading Indian multinational.

To ensure long-term sustainability, WABAG leverages robust R&D capabilities and a portfolio of intellectual property rights developed in house to drive innovation in water management technologies. By aligning its efforts with global sustainability goals, WABAG continues to pioneer solutions that address India's water challenges while fostering environmental conservation and resource optimization.

Q. As a leader, what values and strategies have guided you in shaping WABAG's growth and maintaining its leadership position in the water industry?

A. As a leader, my approach to shaping WABAG's growth has been guided by a core set of values and strategies that prioritize purpose, innovation, people, adaptability, and sustainability. These principles have not only driven our success but have also solidified our position as a global leader in the water industry.

At the heart of WABAG's journey is a purpose-driven vision: "water is too precious to be used just once" and its sustainable management is both our mission and responsibility. Every decision, strategy, and project aligns with this vision of preserving resources, protecting the environment, and powering economies. This clarity of purpose has allowed us to stay focused on delivering meaningful and measurable impact, even in the face of challenges.

Innovation has been pivotal to WABAG's growth. With over 125 intellectual property rights, we have consistently invested in research and development, ensuring that we remain at the forefront of water technology. By pioneering solutions such as "Circularity for Sustainability" and "Manufactured Water", we have addressed some of the most pressing global water challenges, reinforcing our leadership through cutting-edge technologies.

I firmly believe that our greatest asset is our team. Fostering collaboration, nurturing a growth mindset, and investing in talent development have been fundamental to building a high-performing and motivated workforce.



Empowering individuals to take ownership and fostering a culture of continuous learning have been instrumental in achieving organizational excellence.

Adaptability has been a defining trait in navigating the dynamic water industry. From overcoming geopolitical and technological challenges to strategically entering high-growth sectors such as desalination, water reuse, and resource recovery, we have consistently evolved to meet global demands. For instance, our projects like the 400 MLD Perur

Desalination Plant and 40 MLD TTRO plant in Ghaziabad highlights our ability to tackle water scarcity with innovative and scalable solutions.

Vision and strategy are meaningless without effective execution. At WABAG, we emphasize speed, precision, and excellence in project delivery, ensuring that our solutions exceed client expectations and strengthen trust with partners. This execution-focused culture has been critical to translating strategies into tangible outcomes that create value for all stakeholders.

True leadership lies in balancing immediate objectives with long-term impact. Sustainability is deeply embedded in WABAG's ethos. By aligning our initiatives with global sustainability goals and focusing on circular water management, we ensure that our work contributes to a cleaner, greener and bluer planet. This commitment not only differentiates us from competitors but also ensures our relevance in a rapidly evolving industry.

Q. How do you see innovation and entrepreneurship driving change in the water industry, and are there any startups or emerging technologies that have caught your attention recently?

A. Innovation and entrepreneurship are at the forefront of transformative change in the water industry, offering sustainable and scalable solutions to challenges like water scarcity, pollution, and climate change. Start-ups and emerging technologies are playing a pivotal role in driving this transformation by addressing critical gaps in areas such as digitalization, decentralized water systems, and advanced treatment technologies.

One of the most promising developments is the integration of digital tools like Artificial Intelligence (AI), the Internet of Things (IoT), and data analytics into water management. These technologies enable real-time monitoring, predictive maintenance, and resource optimization, significantly improving operational efficiency and reducing costs. Emerging technologies like membrane bioreactors (MBR), solar desalination, and forward osmosis are redefining possibilities for water reuse and desalination by improving energy efficiency and reducing environmental impact.

Additionally, start-ups focusing on wastewater nutrient recovery, low-energy desalination, and



biosensors for water quality are poised to make significant contributions to the industry.

At WABAG, we are committed to fostering this entrepreneurial spirit through BLUE SEED, our flagship initiative to invest in and support innovative water technology start-ups. BLUE SEED is a platform designed to identify and accelerate early-stage ventures with high growth potential in the water sector. By providing start-ups with resources, mentorship, and access to our extensive industry expertise, BLUE SEED aims to cultivate a vibrant ecosystem of "Waterpreneurs" who can collaboratively drive global water security and resilience.

Q. What role do you believe government policies, private sector initiatives, and community involvement play in creating a more sustainable future for water management?

A. A sustainable future for water management relies on the seamless collaboration of government policies, private sector initiatives, and community involvement. Each plays a distinct yet interdependent role in ensuring that water resources are managed efficiently, equitably, and responsibly.

Governments provide the strategic framework and resources necessary to address critical water challenges. In India, various flagship initiatives have made significant progress in this area. For instance, the Swachh Bharat Mission has transformed the nation's sanitation landscape while Namami Gange focuses on rejuvenating the Ganga River. Programs like Catch the Rain emphasize rainwater harvesting and water conservation, and Arth Ganga integrates economic development with river conservation. Additionally, the Atal Bhujal Yojana aims to ensure long-term water security by promoting sustainable groundwater management. These policies not only set the stage for tackling water-related challenges but also foster collaboration with private enterprises and communities to implement practical and scalable solutions.

The private sector plays a critical role in complementing these efforts by driving innovation, operational efficiency, and advanced technological solutions. Companies like WABAG contribute significantly through initiatives such as Circularity for Sustainability, which focuses on resource recovery from wastewater, and Manufactured Water, which creates reliable alternatives like desalination and treated wastewater for reuse. By providing expertise and state-of-the-art technology, private enterprises help bridge infrastructure gaps and enable the deployment of sustainable solutions on a large scale. Moreover, public-private partnerships amplify the reach and impact of government programs, ensuring a more integrated approach to water management.

Community involvement is equally crucial in achieving sustainable water management. Grassroots participation ensures that conservation efforts are effective and long-lasting. Programs that educate communities on water conservation, reuse, and responsible consumption foster a sense of shared responsibility. Initiatives like rainwater harvesting and pollution control thrive when local stakeholders actively participate in their planning and implementation. Empowering communities to take ownership of water resources not only promotes sustainable practices but also creates a cultural shift

toward conservation and accountability.

The integration of government policies, private sector expertise, and active community participation creates a powerful synergy, transforming water management into a cohesive and sustainable strategy. This collaboration ensures that resources are utilized efficiently, the needs of agriculture, industries, and households are met, and resilience is built to tackle future water challenges. Together, these stakeholders form the foundation of a sustainable future for water, one that balances environmental preservation with economic and social well-being.

Q. What is WABAG's vision for the future, and how does the company plan to address emerging challenges and opportunities in the global water sector over the next decade?

A. WABAG's vision for the future is firmly anchored in tackling global water challenges while seizing emerging opportunities through innovation, strategic market expansion, and sectoral specialization. Over the next decade, we aim to remain at the forefront of sustainable water management by adopting a forward-thinking, transformative approach.

A core focus is the expansion of the Manufactured Water segment, encompassing advanced desalination and water reuse technologies. These solutions are pivotal in addressing water scarcity by creating viable, reliable, affordable and sustainable water sources for industrial and municipal use. WABAG is advancing its expertise in energy-efficient desalination and cutting-edge wastewater reclamation systems, leading the transition toward circular water management globally. By transforming wastewater into valuable resources, we are setting new benchmarks for sustainability and resilience in water management.

Emerging high-growth sectors are also a strategic priority. Industries such as solar PV manufacturing, semiconductors, and green hydrogen require ultra-pure water and specialized treatment solutions. WABAG's extensive experience and innovative technologies position us to cater to these critical sectors, which are integral to the global energy transition. Furthermore, we are exploring opportunities in green energy initiatives, such as Compressed Biogas (CBG) projects. By harnessing the potential of sewage treatment plants to generate Bio-CNG for mobility applications, WABAG is supporting a circular economy while contributing to carbon emission reduction and aligning with global sustainability goals.

Geographic expansion remains a key driver of our growth strategy. Rapid urbanization and industrialization in Southeast Asia, the Middle East, Africa, and CIS countries present immense opportunities for tailored water management solutions. With decades of operational experience in these regions, WABAG is committed to strengthening its presence and addressing the specific needs of diverse geographies, becoming the preferred partner for sustainable water infrastructure.

Technological innovation lies at the heart of WABAG's strategy. Investments in Smart Water Systems powered by AI and IoT are transforming how water infrastructure is monitored and managed. These technologies enable real-time optimization, predictive maintenance, and enhanced operational efficiency, ensuring smarter and more sustainable water solutions for a rapidly evolving global landscape.

Through these interconnected pillars—innovation, sectoral specialization, and regional expansion—WABAG is not only addressing emerging challenges in the water sector but also shaping a sustainable and resilient future for global water management. By aligning with global sustainability goals and fostering partnerships across sectors, WABAG continues to lead the way in preserving resources, protecting the environment, and powering economies.

Q. As WABAG celebrates 100 years of excellence, what initiatives are being undertaken to commemorate this milestone, and what message would you like to convey to all stakeholders?

A. Celebrating 100 years is a monumental achievement that reflects WABAG's legacy of innovation, resilience, and unwavering commitment to sustainability.

This centennial milestone is not just a celebration of our past but a powerful reaffirmation of our mission to preserve resources, protect the environment, and power economies.

To commemorate this historic achievement, WABAG has launched a series of global events that highlight our journey and recognize the invaluable contributions of our employees, partners, and customers. The celebrations began with a grand event in Vienna, followed by subsequent events in Riyadh and New Delhi, symbolizing the global reach and impact of WABAG. These gatherings showcased the diversity of our achievements, including the introduction of the 'Handbook of Water and Used Water Purification,' a testament to our thought leadership in the water sector.

As part of our centennial initiatives, we are reinforcing our commitment to innovation and sustainability. Programs like BLUE SEED, designed to support and accelerate early-stage water technology start-ups, exemplify our focus on nurturing the next generation of innovators. These initiatives underscore WABAG's role as a catalyst for transformative solutions in the global water industry.

This milestone is also an opportunity to express deep gratitude. To our employees, you are the foundation of WABAG—your dedication, ingenuity, and resilience have been instrumental in building this legacy. To our partners and customers, your trust and collaboration have been pivotal in our journey. Together, we have made remarkable progress in addressing global water challenges, and we are excited to continue this partnership into the future.

As we step confidently into the next century, WABAG's vision remains steadfast: to innovate, collaborate, and create sustainable solutions that ensure water security for generations to come. My message to all stakeholders is simple yet profound—let us continue to make every drop count as we collectively build a resilient and water-secure future.




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OPTIMIZED MANAGEMENT OF MUNICIPAL SOLID WASTES FOR ENVIRONMENTAL SUSTAINABILITY: TECHNIQUES AND TECHNOLOGIES

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Former AGM, Quality Control Dept, GNFC Ltd, Bharuch, Gujarat – TC Member & Resource Person, BIS – Trainer - Technical Writer - Book Editor.

Municipal solid waste, commonly known as trash or garbage, consists of everyday items discarded by households, businesses, and institutions. By definition, it includes waste from various sources such as domestic wastes, commercial establishments, institutions, industries, and construction. It typically includes the following with varying proportions depending on the location, socioeconomic factors, and consumption patterns of the society:

Organic Waste: Food scraps, garden trimmings, and other biodegradable materials.

Recyclables: Paper, cardboard, plastics, metals, and glass.

Hazardous Waste: Batteries, electronic waste (e-waste), and chemicals.

Inert Waste: Construction debris and other non-biodegradable materials.

The waste generation has seen a substantial rise over time, primarily due to population expansion, urban development, rapid industrialization and ever-increasing consumption. Municipal solid waste (MSW) management is, hence, a significant environmental concern in developing countries because inadequate waste management systems lead to environmental pollution, health hazards, and economic losses. These issues are exacerbated by the lack of reliable waste collection services, limited source separation of waste types, and reliance on unmanaged landfills and open dumps for disposal. These ways of disposal create vast, toxic mountains of wastes that pollute the air, contaminate the water, endanger public health, and hasten climate change.

INTERESTING BUT ALARMING STATISTICS

With an average of 0.74 kilograms of waste per person per day, the worldwide annual waste production is amounting to approx 2 billion metric tons as per estimate made in year 2016.

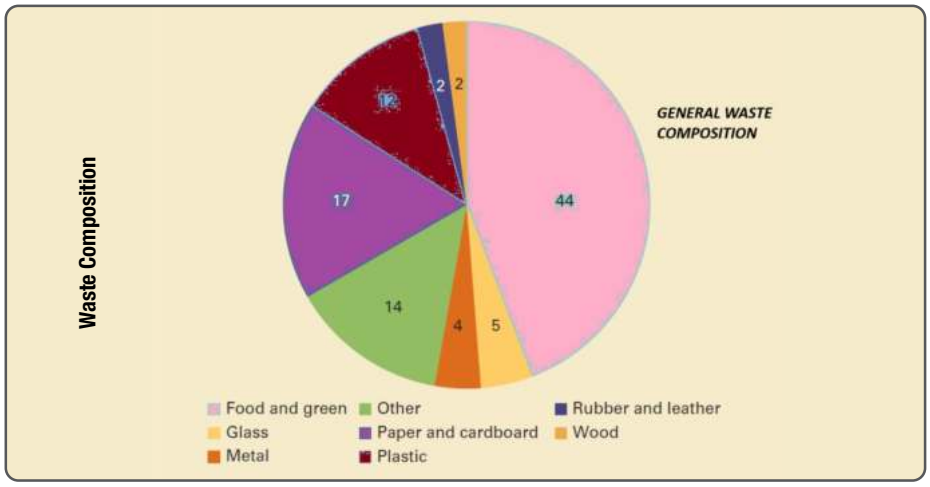
The developed and high-income countries harbouring 16% population of the world contributes to 34% of the world's waste. Waste composition differs across income levels reflecting varied patterns of consumption. High-income countries generate relatively less food and green waste, and generate more dry waste that could be recycled, including plastic, paper, cardboard, metal, and glass. Middle- and low-income countries generate higher food and green waste, amounting more than half proportion of total waste.

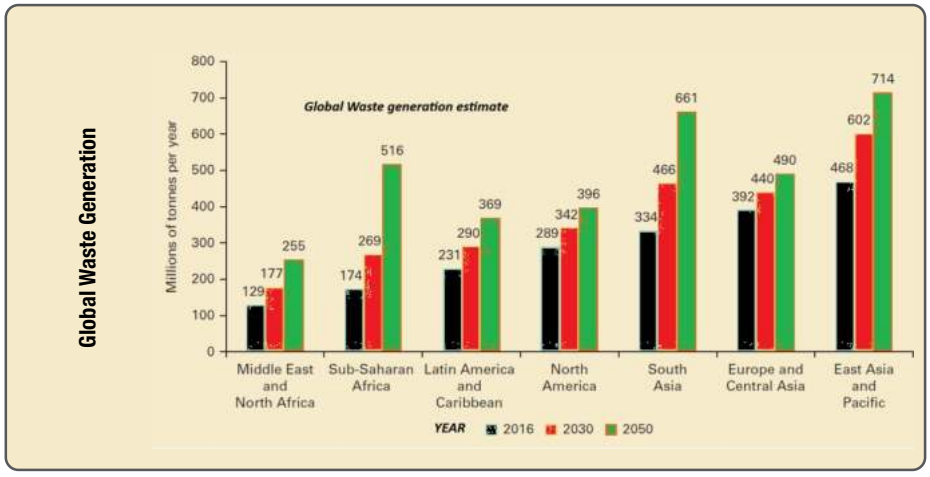
World Bank has anticipated 70% increase in global waste production by 2050, which projects the figure of waste generation to rise to 3.4 billion metric tons. A significant portion of the rise is originating from developing nations – with most getting generated in Asia, followed by Europe, Africa, and North America. Municipal Solid Waste is responsible for 20 percent of the world's human-related methane emissions.

And, at a potency 80 times that of carbon dioxide, these emissions will continue to wreak environmental and economic havoc if left unchecked.

The proliferation of plastic waste — discarded bottles, bags, containers of all sorts — is responsible for the majority of debris found in rivers and oceans, causing serious risks to marine life and coastal livelihoods. According to UNESCO, plastic debris kills more than 1 million seabirds every year, as well as more than 100,000 marine mammals.

in 2021-22, India generated over 1.7 lakh metric tons





of municipal solid waste per day. Central Pollution Control Board (CPCB) reported collection efficiency of 95.4% of the total generated waste. It is also reported that approx. 50% of the waste is treated, 18% land filled and 32% is unaccounted. Maharashtra, UP, Delhi and Gujarat are leading waste generating states in that order.

Globally, Canada was a leading country in the list of waste generation per capita, according to estimate of year 2019. It was followed by countries like Bulgaria and USA. In terms of plastic waste, USA was the largest producer in 2019 with a figure of 73 million tonnes, which was followed by China having generated 65 million tonnes. These two countries constituted almost 40% of the global plastic waste. Asia dominated in E-waste generation in year 2022.Food waste has often been thought to be concentrated in wealthier countries. However, China and India produced more household food waste in year 2020 than any other country worldwide, at an estimated 92 million and 69 million metric tons, respectively.

HANDLING OF WASTE IN DEVELOPING COUNTRIES AND AFTEREFFECTS

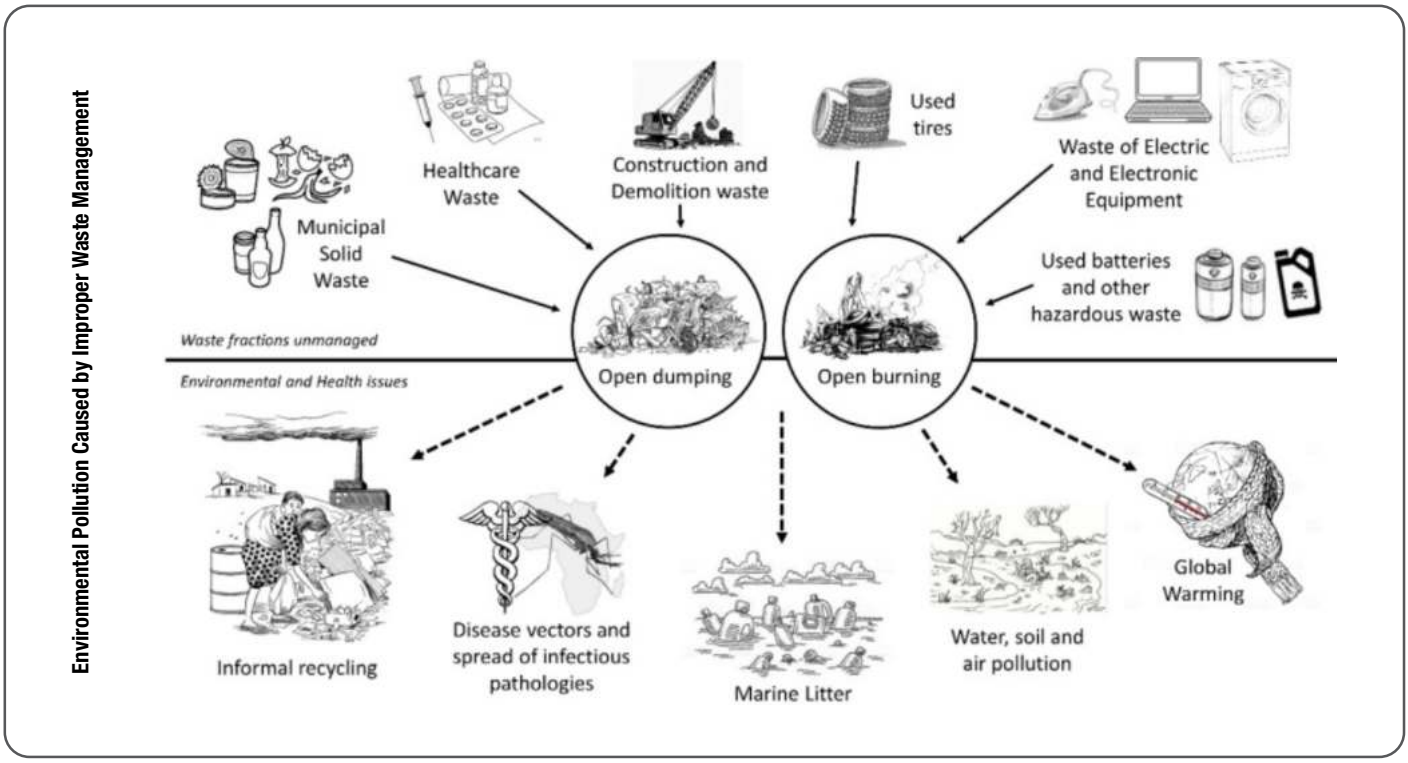
Most of the municipal solid waste in developing countries is dumped on land in a more or less uncontrolled manner. These dumps make very uneconomical use of the available space, allow free access to waste pickers, animals and flies and often produce unpleasant and hazardous smoke from slow-burning fires. Because of insufficient collection and disposal infrastructure, a significant portion of the solid waste is either incinerated or deposited in uncovered areas, contaminating the atmosphere, water, and soil. The buildup of refuse in public spaces results in an increase in disease-carrying insects and rodents, which contribute to transmitting diseases such as dengue fever and cholera. The unregulated burning of waste leads to environmental contamination, the spread of disease, and the generation of methane, which contributes to climate change. Uncontrolled disposal in open spaces near water bodies corresponds to public health issues. All these actions consolidate into visual impacts on environment, air contamination, odours, green-house gases emission, vectors of diseases, surface water and groundwater pollution, etc

WASTE MANAGEMENT

The most effective way to solve the problem of solid waste is by reducing the waste in the first place i.e. stopping waste before it happens. First priority should be the source reduction. The second option is Recycling and Composting. Disposal in the landfills should be the last option. Generally waste management methods include source reduction and reuse, recycling, composting, vermiculture, engineered landfills, incineration, pyrolysis, gasification and land application. A combination of these methods is often necessary to achieve sustainable waste management.

Waste Minimization: The easier method of waste management is to reduce creation of waste materials thereby reducing the amount of waste. Waste reduction, prevention or minimization means reducing waste by not producing it. Waste minimization is defined as activities to reduce the amount of material in products and packaging before that material enters the municipal solid waste management system. It can be done through recycling the items instead of buying new one, avoiding use of disposable products like plastic bags, reusing second hand items, and buying ecofriendly items.

Waste Recycling: Recycling is the process of converting waste products into new usable products to prevent energy usage and consumption of fresh raw materials. The idea behind recycling is to reduce energy consumption, manufacturing cost, volume of landfills, air and water pollution, greenhouse gas emissions and preserve natural resources for future use and sustainable development. Paper, plastic, aluminium, glass etc. are commonly recyclable materials.



Composting: The conversion of waste material into humus is known as composting. It is an easy and natural bio-degradation process, in which the organic waste, under controlled conditions, turns into nutrient rich food i.e. humus, which acts as an organic fertilizer for the plants and soil, thus reducing the needs of fertilizers and pesticides. Composting is one of the best methods of waste disposal as it can turn unsafe organic products into safe compost. It is a slow process and takes a lot of space. Community composting initiatives and home composting kits empower individuals and neighbourhoods to manage organic waste locally. The composting process is becoming increasingly popular in waste disposal, as it also simplifies the separation of recyclable materials. This method is the best option for soil remediation and restoring soil nutritional content. Challenge to composting is requirement of segregation of organic waste at the source and its limited scalability in urban areas.

Vermiculture: Organic waste is decomposed with the help of Earthworms (burrowing type). They produce very useful organic manure known as Vermicast, which contains earthworm excreta. Vermiculture is a simple, cheap and appropriate biotechnology to degrade the organic waste.

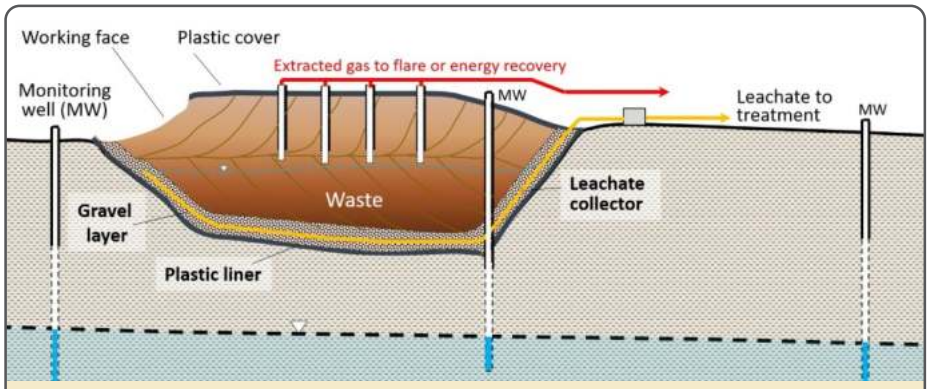
Waste to Energy: Waste-to-Energy, also widely recognized by its acronym 'WtE' is the generation of energy in the form of heat or electricity from waste. This process involves conversion of non-recyclable waste items into useable heat, electricity, or fuel through a variety of processes. It can also help to reduce carbon emissions by offsetting the need for energy from fossil sources.

Use of sewage-sludge- and food-waste-based biochar as an alternatives and supplementary fuel in coal-fired power plants is a WtE process. Coal-fired power plants play a significant role in global primary energy consumption. Nevertheless, coal combustion is also a notable source of air pollution. Biomass co-firing in coal-fired power plants is an effective strategy to reduce CO_2 emissions into the atmosphere. In order to mitigate the air pollution, the co-combustion of biomass such as agricultural residues, algae, wood processing residues, sewage sludge, food waste etc is done along with coal. Sewage sludge, while a potential option, faces challenges due to its high concentration of heavy metals, which can contribute to atmospheric pollution.

Landfill: The use of landfills represents the simplest, cheapest, and most common way to manage the disposal of municipal solid waste. However, it is the least environmentally friendly approach to waste disposal. The use of landfills compromises the efficiency of waste disposal and can lead to serious issues such as groundwater contamination and air pollution due to the release of harmful gases from landfills, as well as soil contamination. Open dumping of solid waste, not only contaminates groundwater and degrades the soil, but also attracts disease carrying rats and insects as well as catches fire sometime.

Properly designed, constructed and managed engineered landfill is the best alternate to the open dumping. Engineered landfill has an earthen or synthetic layer to protect the groundwater contamination from leachate. It has a gas capture system to vent, burn, or collect methane.

The selection of the landfill site is a relevant and necessary issue for waste management. It is an extremely complex task as it must take into account various environmental, economic, and sociopolitical criteria that need to comply with stringent regulations. The arbitrary and non-scientifically based selection of sites for solid waste disposal implies potential



Engineered Landfill

threats to the health of the local population, especially those residing in the vicinity.

Mechanical-Biological Treatment (MBT): This treatment combines mechanical sorting of recyclables and biological treatment like composting or anaerobic digestion of organic waste to reduce landfill volume. It improves resource recovery rates and reduces environmental impact of landfilling.

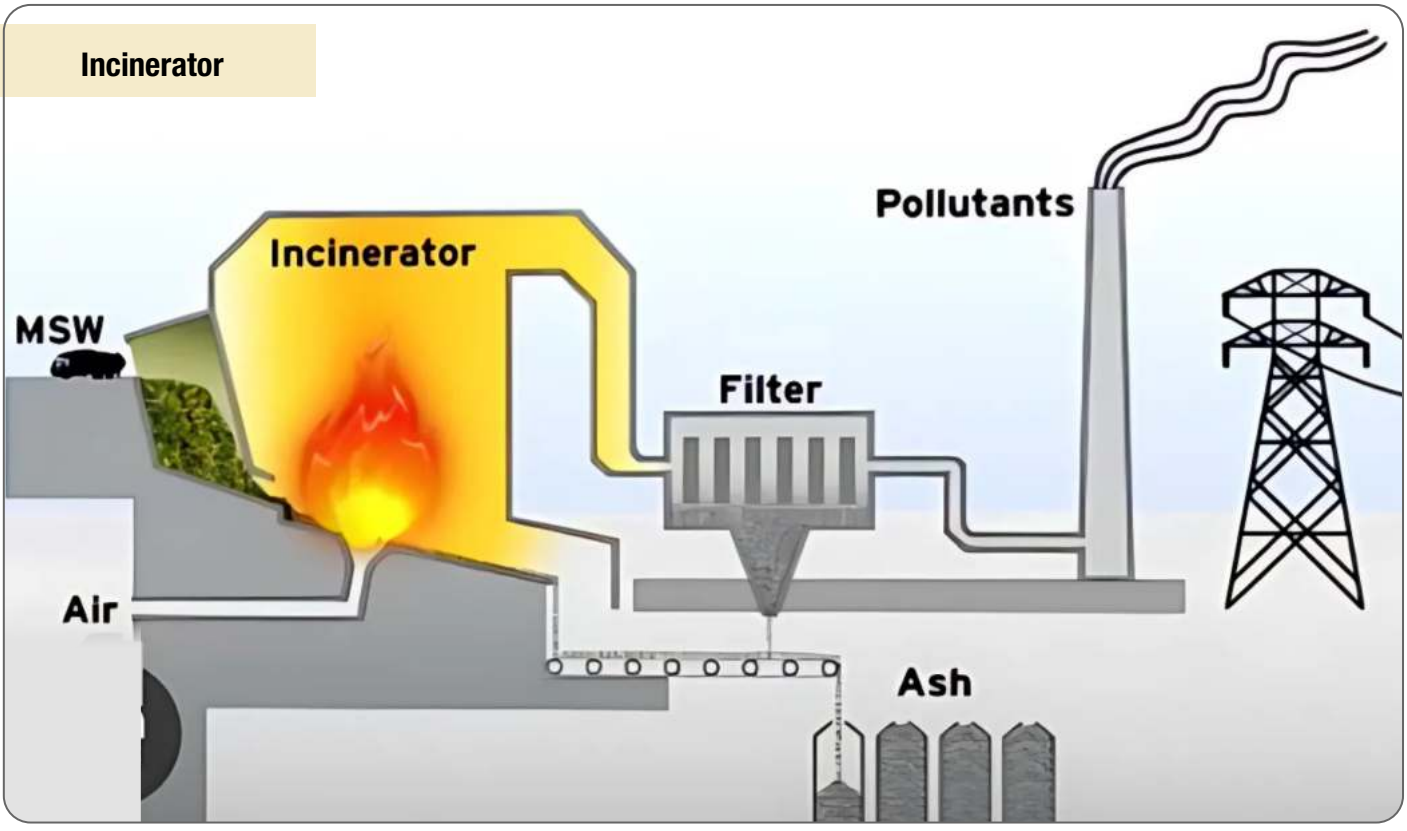
The mechanical element is usually an automated mechanical sorting stage or manual sorting by hand picking. This either removes recyclable elements from a mixed waste stream (such as metals, plastics, glass, and paper) or processes them. The biological treatment is either through anaerobic digestion or composting. Anaerobic digestion harnesses anaerobic microorganisms to break down the biodegradable component of the waste to produce biogas and soil improver. The biogas can be used to generate electricity and heat. In composting, the organic component is broken down by naturally occurring aerobic microorganisms into carbon dioxide and compost.

THERMAL TREATMENT:

There are 3 techniques for managing municipal waste by thermal treatment : (1) Incineration or Combustion, (2) Pyrolysis and (3) Gasification.

Incineration / Combustion: The controlled burning of waste, known as incineration, takes place in specific furnaces designed for this purpose. It is an exothermic, oxidative process that generates heat, carbon dioxide, and water. Municipal solid wastes are burned at high temperature under controlled condition and converted into ash and other gaseous products. It is an effective method for reducing waste volume by up to 95%, but its main disadvantage is the high cost. Incinerators necessitate an initial investment, maintenance, and operation. Although incineration generates electricity, it raises concerns due to the emission of micropollutants during the combustion process.

Incinerator

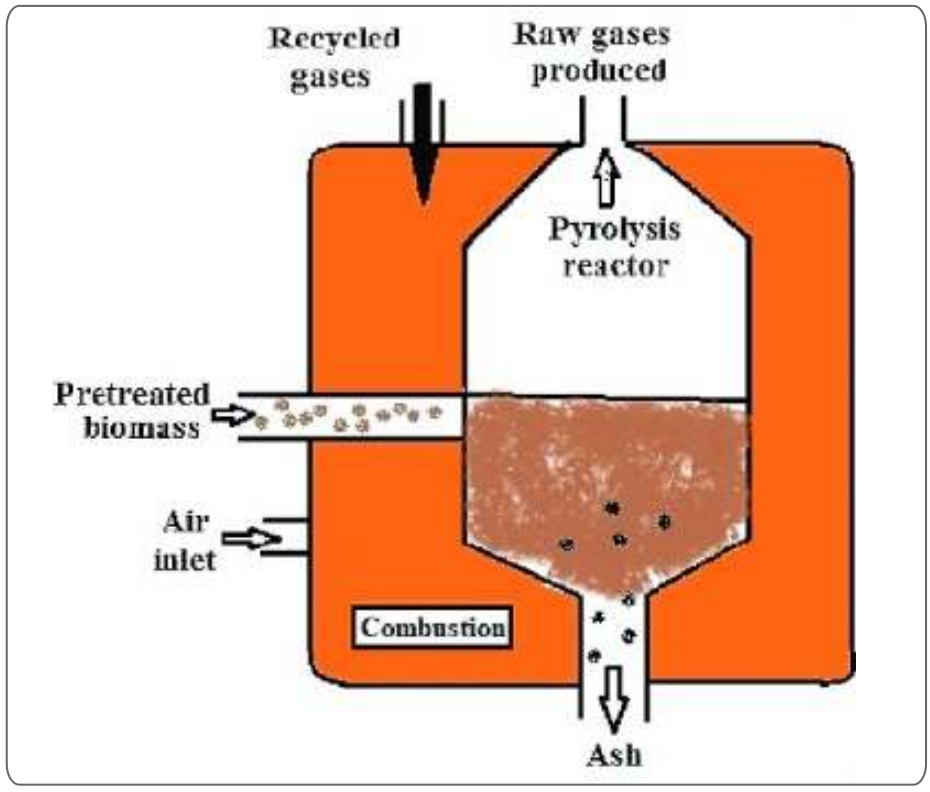


This technology has been identified as environmentally friendly technology .

Gasification: This process takes place in the presence of lesser amount of oxygen than that is required stoichiometrically for complete combustion. The gasification process represents significant advances over incineration. Incineration literally means to render to ash. Incineration uses waste as a fuel, burning it with high volumes of air to form carbon dioxide and heat, whereas gasification converts waste to a usable synthesis gas, or syngas. In this partial oxidation or gasification process, the municipal waste is not just a fuel but a feed stock for high temperature chemical conversion process, by which Hydrogen, Carbon Monoxide and Carbon Dioxide gases are obtained which, in turn, are converted into higher value commercial products such as transportation fuels, chemicals, fertilizers, and even substitute natural gas.

Chemical processing of plastics: Technologies such as chemical recycling break down plastics into their raw materials, enabling the recycling of previously non-recyclable items. These are complementary solutions to existing mechanical recycling to recycle mixed or contaminated plastic waste that otherwise would be incinerated or sent to landfill. While mechanical recycling involves processing plastic waste into products without significantly altering the material's chemical structure, the chemical recycling converts polymeric waste back into secondary raw materials or recycled feedstocks, reducing the need for virgin fossil resources. Chemical processing changes the structure of the polymeric waste and transforms it into chemical building blocks, including monomers, which can then be used one more time as raw material in chemical processes. Chemical recycling includes processes such as gasification, pyrolysis, and depolymerisation.

E-Waste: E-waste represents a considerable challenge to current management practices. The increase in e-waste is a direct consequence of population growth, which has gained significant attention from governments, industries, the academic community, and civil society organizations, as it is one of the fastest-growing waste streams globally. Proper management of these wastes is crucial, as they contain hazardous substances such as heavy metals, flame retardants, and chlorofluorocarbons, which impact both human health and the environment. Generally adopted disposal methods are landfilling and incineration.



Pyrolysis

However, electronic waste also represents an attractive resource base for urban mining as it contains precious metals of very high value. Recycling of E-waste is a sustainable disposal method, which involves dismantling electronic waste to recover valuable materials and safely manage hazardous components. This process includes the recycling of printed circuit boards, plastics, cathode-ray tubes (CRTs), non-ferrous metals, mobile phones, hard drives, fax machines, wires, and memory chips. Proper recycling reduces the presence of heavy metals and hazardous heavy metals such as mercury, cadmium, beryllium, and lead, minimising the risks to human and animal health and the environment.

LET US FIX THE ISSUE

There are still obstacles that must be addressed to achieve true sustainability in waste management. These challenges include a lack of awareness and education, inadequate infrastructure and limited funding and resources, gaps in policy and regulations, technological limitations, and changing waste compositions influenced by social and behavioural factors. Addressing these challenges requires a comprehensive approach involving education and awareness campaigns, investment in infrastructure and technology, policy reform, and community involvement. By tackling these challenges, we can progress towards sustainable and environmentally friendly waste management.

The flip side of this gloomy scenario is that it is a fixable problem. Unlike other complex climate- and development-related challenges that will require major innovation and technological advances to address, scalable methods to curb waste-generated pollution and methane emissions already exist in practice. These solutions enable energy recovery and a circular approach to production and consumption that emphasizes reuse, recycling, and regeneration to minimize environmental impacts. They also offer the promise of inclusive job creation and business opportunities that can uplift entire communities.

These circular pathways begin with modernizing the waste collection process — increasing the scope and scale of recycling to reclaim materials such as plastics, glass and metals, and organic waste for composting and energy value. This cuts down on what is sent to landfills and yields new income streams for municipalities and waste management companies,

which can help offset the cost of asset upgrades. It also gives producers an opportunity to reduce their own carbon emissions by limiting the amount of new raw material and energy.

As there are challenges that limit the widespread adoption of sustainable waste management practices, regulations that support and enforce proper waste collection, recycling, energy recovery, and disposal are vital. Extended producer responsibility (EPR) regulations offer potential for boosting circularity, while reducing the burden on municipal waste management operators.

EPR legislation places responsibility on producers and manufacturers to collect the waste they create — such as plastic packaging — and reuse or recycle it — rather than sending it to landfills.

Like with other essential infrastructure services like electricity and water, there is a need for ensuring that households, businesses, and municipalities pay for managing the waste that they generate. Public-private financing approaches with concessional finance and business models will also be required that extract value and revenue sources from waste. Fixing the world's waste problem is 100 percent a doable task. But we must come together — public and private sector, governments, regulators, investors, international development institutions, climate activists, and civil society — to elevate the dialogue, spur action, and trigger more investment. By accomplishing these, we will have a far better shot at realizing the dream of a cleaner, greener, and healthier future.

CONCLUSION

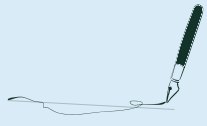
Waste management is not a glamorous topic or activity. In fact, even in the international discourse on climate and development, addressing waste has not been high on the agenda. But if we are to succeed at addressing the global climate, pollution, and biodiversity-loss crises, we need to talk more about waste — and do more, globally and locally. The treatment of municipal solid waste is a multifaceted challenge that requires a holistic approach. Combining traditional methods with innovative technologies and fostering community participation is essential for sustainable waste management. By reducing waste generation, enhancing recycling efforts, and investing in advanced treatment technologies, societies can minimize the environmental footprint of municipal solid wastes and move towards a more sustainable future.

ABOUT THE AUTHOR



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WATER FILTRATION – AN ART TO PROTECT AND ENHANCE LIFE OF MEMBRANES & HUMAN HEALTH

Dr. TNVV Rao, **Technical Advisor at Depth Filtration Technologies Pvt. Ltd.**

Water… water… everywhere but there is no water for drinking! This is a popular sentence for us to understand that every water is not potable. Though plenty of water is available, all the water is not potable. Ground water and surface water are the two major water sources for drinking and other uses. Water may contain large numbers of contaminants which includes physical, chemical and microbiological. Physical contaminants include sand, silt, mud, etc. Chemical contaminants include inorganic chemicals like heavy metals, chlorides, sulphates, iron, nitrates, nitrites etc. and organic chemicals like pesticides, insecticides, amines, etc. Bacteria, virus and protozoans comes under microorganisms, in which pathogenic (disease causing) microorganisms are to be considered for treatment / removal.

In this case study, let us talk about physical contaminants in detail and their effective removal using various cartridges.

Physical contaminants are solid particles that are suspended in water and can affect its appearance, colour and clarity. They can be caused by natural sources like storms and erosion, or human activities like construction and land development, etc. Examples of physical contaminants include: sediments, dust, and other suspended solids.

The Safe Drinking Water Act defines the term "contaminant" as meaning any physical, chemical, biological, or radiological substance or matter in water. Therefore, the law defines "contaminant" very broadly as being anything other than water molecules. Drinking water may reasonably be expected to contain at least small amounts of some contaminants. Some drinking water contaminants may be harmful if consumed at certain levels in drinking water, while others may be harmless. The presence of contaminants does not necessarily indicate that the water poses a health risk.

Physical contaminants primarily impact the physical appearance or other physical properties of water. Examples of physical contaminants are sediment or organic material suspended in the water of lakes, rivers and streams from soil erosion.

Everyone wants to drink water that is contamination free. And yet, keeping drinking water clear of contamination can be difficult. In most cases, the presence of tiny amounts of foreign substances do not pose a health risk, but we should still pay attention to the content of our local drinking water.

Providing safe drinking water for all is a challenging task. Many different compounds and substances, both natural and man-made, find their way into the water supply, and it can be difficult to remove all traces of contaminants from the water. In this article, we dive into physical contaminants that can be found in drinking water.
The presence of contaminants is not necessarily a problem in itself. Many of the substances found in drinking water are harmless at low levels and some, like certain minerals such as calcium, magnesium, sodium, potassium, may even be beneficial. But in some cases, contaminated water can cause health problems or lead to waterborne diseases, if the level of harmful substances is beyond the drinking water guidelines. Drinking water can be affected by many different factors and most contamination can be reduced with water filtration.

Access to clean drinking water is a fundamental human right, yet many people across the world face the challenges of contaminated water. Lack of access to clean drinking water isn't only a problem in developing countries; it's also an issue in developed countries where the presence of tiny amounts of foreign substances in tap water can pose a potential health risk, highlighting the necessity of monitoring and ensuring water quality.

WHAT IS WATER FILTRATION, AND WHY IS IT IMPORTANT?

Water filtration is a crucial process that ensures the purity of drinking water by reducing harmful contaminants. It is an essential safeguard against a wide array of pollutants that can compromise the quality of water, making it unsafe or unpleasant to consume. The water filtration process involves passing water through filters, such as sediment filter, carbon filter and disinfection by ultraviolet,

ultrafiltration, nano filtration or reverse osmosis. Few reasons why water filtration is essential for everyone is given below:

Health protection: The primary importance of water filtration lies in its ability to protect public health. Contaminated water can carry many harmful pathogens, which may lead to severe illnesses and outbreaks of waterborne diseases. By filtering these biological contaminants, water filtration systems will help in preventing water borne diseases such as cholera, dysentery and giardiasis. Ultra, nano & reverse Osmosis membranes are used for removal of pathogenic microorganisms.

Aesthetic improvement: Physical contaminants such as sand, silt, mud and organic matter can affect the taste, smell, and appearance of water. While these contaminants may not always pose a direct health risk, they can make water unpalatable and unpleasant to drink. Filtration systems reduce these impurities, improving the overall sensory qualities of water and making it more palatable to drink. For the removal of physical impurities, various types of cartridges are used which includes PP Yarn wound cartridge, PP meltblown cartridge or thermobond cartridges. For removal of chlorine, chlorination by-products, organic chemicals, bad odour, bad smell, etc. activated carbon filters (Granular carbon or carbon blocks) are used. Photos are provided in this article.

Environmental impact: Human activities, including agriculture, industrial processes and improper waste disposal, contribute significantly to water pollution. Filtration systems help mitigate the environmental impact by reducing pollutants from water sources, thus protecting ecosystems and maintaining the balance of natural water bodies.

Removal of suspended particles from various types of water like ground water, surface water, industrial wastewater, sewage water, etc. are of great importance. Filtration and removal of sediments / suspended particles is the first and foremost important step in water treatment.

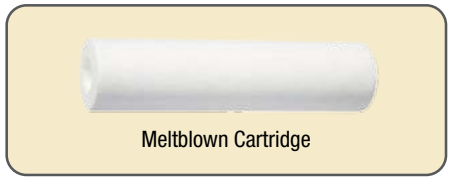
For drinking water treatment of various capacities, various treatment methods are used. For biggest capacity water treatment, people use sand filters, glass beads filters, etc. as pre-treatment. For domestic and commercial plants people use Polypropylene (PP) yarn wound cartridges of various sizes, PP meltbolwn and polyester thermobond cartridges. Each of these cartridges have their own merits and demerits. Reverse Osmosis plants of capacity 1000 Litres per hour use micron filters to .protect RO membrane. Usually, people use meltblown or PP yarn wound cartridges of 1 to 5 microns. For better life and more dust holding capacity, one can rely on yarn wound cartridge.

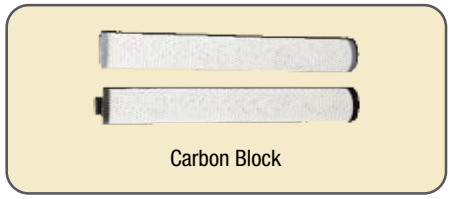
In any water treatment system, it is important to select sediment removal system based on the type of sediments and quantity of water to be treated. Similarly Activated carbon filter/cartridge is required to be present in any water purification system.

In any water treatment system, it is important to select sediment removal system based on the type of sediments and quantity of water to be treated. Similarly Activated carbon filter/cartridge is required to be present in any water purification system.

Few sediment removal systems are given below:


PP Yarn Wound Cartridge


Meltblown Cartridge


Carbon Block


Sand Filter

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Dr. T.N.V.V. Rao is a renowned expert in water management, with over 34 years of experience in the water field. He holds a Ph.D. in Environmental Chemistry and an MBA, making him a highl qualified professional in his area of expertise. Dr. Rao is passionate about developing innovative technologies to address global water treatment challenges. He brings his extensive knowledge to help create cutting-edge solutions for water purification.

To share your feedback or enquire about the author, write to us at editor@eawater.com

NANOBUBBLE TECHNOLOGY: TRANSFORMING THE LANDSCAPE OF SUSTAINABLE WATER MANAGEMENT

Dr. Aditi Mullick, Managing Director at Prasinos Tech Innovations Pvt. Ltd.
Dr. Anupam Mukherjee, CEO at Prasinos Tech Innovations Pvt. Ltd.

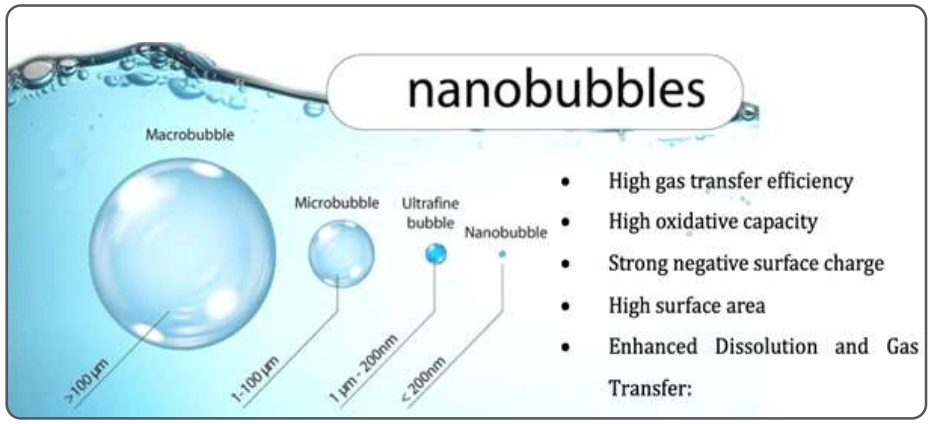
In the face of escalating global water challenges, innovative solutions are critical for ensuring sustainable management of this vital resource. Nanobubble technology, an emerging advancement in water treatment, is revolutionizing how industries, agriculture, and municipalities address water quality, conservation, and reuse.

WHAT IS NANO-BUBBLE?

Imagine bubbles so small that they're nearly invisible to the naked eye — yet powerful enough to transform industries and ecosystems. Welcome to the world of nanobubbles.

These ultra-tiny gas bubbles, smaller than 200 nanometers in diameter (about 500 times smaller than a human hair!), are breaking the rules of traditional bubbles. Unlike their larger counterparts, nanobubbles don't rise to the surface and pop. Instead, they defy gravity and stay suspended in liquids, thanks to their unique structure and high internal pressure.

But it's not just their size that makes them extraordinary. Nanobubbles have incredible surface properties that allow them to remain stable in liquids, delivering gas in a form that's more efficient and long-lasting. From improving water quality to boosting plant health, nanobubbles are proving to be a game changer.



WHY ARE NANOBUBBLES SO SPECIAL?

- **Unmatched Stability:** Nanobubbles stay intact far longer than regular bubbles. This allows them to work their magic in water, air, and even in industrial applications, without floating away.
- **Bigger Impact:** With a surface area vastly larger than their size suggests, nanobubbles deliver powerful results — from cleaning and oxygenating water to enhancing agricultural systems.
- **Versatile and Eco-Friendly:** Nanobubbles don't just stay in water, they can improve processes across industries like agriculture, aquaculture, water treatment, and even medical applications.



NanoCav-Blister: Advanced Nanobubble Generator



Field Installation at STP

UNIQUE SELLING PROPOSITION

- **Patented Technology:** State of Art **"Make in India"** Product serving global needs at affordable price.
- **Customizable:** Comes in different models according to customer needs.
- **Safe for humans and the environment:** Designed to ensure safety for human health and minimal impact on the environment.
- **Great Performance:** Intelligent LCD Display for Monitoring and Control.
- **Easy Installations:** By accessing the front panel, you can oversee and manage the operation of the entire system.

AREA OF APPLICATIONS

- Water Treatment Plant
- Aquaculture
- Agriculture
- Healthcare
- Oil & Gas
- Lakes & Ponds
- Horticulture
- Hydroponics
- Concrete & Co2
- Carwash Services

CONCLUSION

Nanobubble technology by Prasinos Tech Innovations represents a ground-breaking solution for sustainable water management. Leveraging ultrafine bubbles, this innovative approach enhances oxygenation, improves water quality, and offers efficient solutions for diverse applications such as aquaculture, agriculture, and wastewater treatment. Its ability to combat environmental challenges and promote eco-friendly practices aligns with global environmental goals. By harnessing the power of nanobubbles, Prasinos is driving a paradigm shift in resource conservation and sustainable development. This technology underscores our commitment to creating impactful innovations that address critical environmental challenges while fostering resilience and ecological balance for a healthier, sustainable future.

ABOUT THE AUTHOR



Dr. Aditi Mullick, (Ph.D., Chemical Engg) is the Managing Director of Prasinos Tech Innovations Pvt. Ltd. She has worked in the field of sustainable water treatment technologies and material processing with a research experience of more than 10 years. Her domain of expertise include Ultrasound & Sonochemistry, Cavitation Technology for Process Engineering & Intensification.

Dr. Aditi Mullick, Managing Director at Prasinos Tech Innovations Pvt. Ltd.



Dr. Anupam Mukherjee (Ph.D., Chemical Engg), is the CEO of Prasinos Tech Innovations Pvt. Ltd with expertise in membranes and adsorption technology specializing in greywater treatment, industrial dye treatment, skid-mounted mechanized sewage cleaning systems, point-of-use treatment units for recycling handwash water and solar-assisted membrane distillation unit for desalination applications.

Dr. Anupam Mukherjee, CEO at Prasinos Tech Innovations Pvt. Ltd.

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REDUCTION OF DOMESTIC CARBON FOOTPRINT: A CASE STUDY ON HUMAN INTEREST STORY

Dr. M.N.Roy, Founder and President at SIGMA Foundation
Dr. Debasri Mukherjee, Senior Research Officer at SIGMA Foundation
Sohini Tarafdar, Research Officer at SIGMA Foundation
Aslam Ali, Field Operations Specialist at SIGMA Foundation

INTRODUCTION

In a densely populated village nestled amidst lush green fields, stands tall the two storied house of Elias Ali. It is situated in the 16 Miles village of the Beernagar-II Gram Panchayt under Kaliachak-III Block of Malda district of West Bengal. Elias Ali is 72 years old who lives with his wife and two sons and grandchildren. He is a road construction contractor by profession. His native settlement, Porandarpur Village was washed out in the erosion of river Ganges, hence he migrated to the 16 Miles village in Birnagar-II, Gram Panchayat in 1971. His family used woods and leaves of the trees as fuel for cooking and it was a burden for the women in the family. Due to long exposure to the smoke in the kitchen the women suffered from many diseases. Apart from his road contraction job, Elias also reared four cows and sold milk in the local market to add to his earnings. At present he has six cows whose milk is sold in the market to augment his family income.



ABOUT THE INITIATIVE

Elias was a visionary who believed in innovation for sustainable living. He wanted to seek more knowledge on using waste as a resource. He knew that his cows not only provide him with milk but also with valuable resource- cow dung. Instead of letting the cow dung go waste as he saw the potential wealth in it. He learnt about biogas plants and how they could convert cow dung into a clean and renewable source of energy.



In the year 1996 when the use of LPG Cylinder was becoming increasingly expensive and scarce, Elias thought of making a biogas plant in his backyard with locally available construction materials. Using his knowledge and determination, Elias Ali built the plant with the help of two construction workers from the nearby town. Total expenditure in 1996 prices was just Rs 15,000/. The process was not easy, but Elias's perseverance paid off when the plant started producing biogas.

THE ACHIEVEMENT

The plant is a cylindrical brick tank covered with cement blocks having passage for the cow dung to enter into the tank along with equal quantity of water. The cow dung with water resides into the tank and produces biogas. The biogas is easily obtained through plastic pipes connected within the kitchen. There is also a discharge canal to release the cow dungs into a big soak pit where the cow dungs turn into natural compost. The family use the manure for growing vegetables and fruits in the kitchen garden in their backyard. The block administration noticed this innovative practice and rewarded Mr Ali with a Memento.



He was also rewarded a cash prize of Rs 6,000/ by a local NGO (RDS) of 16 Miles. Now his family of 8 persons uses this biogas as fuel and it is sufficient for them. Since 1996 Elias has no need to use any fire wood or buy any LPG cylinder for cooking. This innovation of converting the waste into cooking gas was not only cost-effective, but it also reduced the carbon footprint by around 150 MT, in a conservative estimate, in the last 28 years by avoiding any firewood. Actual benefit to the environment has been more since the manure from the biogas plant has substituted chemical fertilizer.

LESSON FOR OTHERS

With each passing year, Elias's biogas plant became more efficient, thanks to his continuous efforts to improve and optimize its performance. He experimented with different feeding ratios, temperature controls, and maintenance techniques, ensuring that his plant operated at maximum capacity. More than two decades went by, and Eilas's biogas plant continues to thrive. Not only did it fulfill all his household cooking energy needs, but it also became a symbol of human ingenuity and success in harnessing the power of domestic waste. Elias's story inspired many others to similar practices, leading to widespread movement towards sustainable living in the area. In the year 2024, on the 28th anniversary of his biogas plant, Elias looked back his journey with pride and satisfaction. He had not only achieved self-sufficiency but had also become a beacon of hope for future generations. And as he looked out at his flourishing farm and the smiling faces of his family and neighbors, Elias knew that his decision to embrace cow dung gas had truly been a path to success and prosperity.

ABOUT THE AUTHOR



Dr. M.N. Roy retired from the Indian Administrative Service as Additional Chief Secretary of the Government of West Bengal in 2012. He did his M.Tech in electronics from Calcutta University before joining the IAS and afterwards he did his Ph.D from the Tata Institute of Social Sciences, Mumbai. engaged in improving local governance, decentralized planning, monitoring and evaluation and promotion of delivery of services in the field of water supply & sanitation, public health & nutrition, waste management and application of ICT and GIS in development for more than nine states in India and also handling UN, Asian Development Bank (ADB) and World Bank Project. He has 40 years of working experience on various fields and last 10 years was on programme evaluation and monitoring. He has many National and International Publications based on environmental issues.

Dr. M.N.Roy, Founder and President at SIGMA Foundation



Dr. Debasri Mukherjee did her PhD from Delhi School of Economics on Water Resource Management. She is now the Senior Research Officer in SIGMA Foundation. Before this she worked for many renowned organizations including IIT, TERI, UNICEF Kolkata, and PHED-West Bengal. She is specialized with water resource management, schemes related issues and in-depth knowledge of water safety and security plan implementation. She is well experienced in working in various geographical zones across the country which covers the significant climatic zones. She handled more than 100 hundred projects on water, climate resilient WASH, IEC/SBCC from esteemed organizations namely, UNICEF, Asian Development Plan (ADB), Aga Khan Foundation, AMRUT etc. She has more than 20 years of working experience in the field of water resource and quality management. She received many awards and having many national and international publications.

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Sohini Tarafdar did her M.E by Research in Chemical Engineering from CSIR- NEERI Nagpur followed by a PGD in Environment & Sustainable Development. She is specialised in water engineering and community engagement. She has been working for 10 years in the diversified arena of water research in the development sector with a special focus on water security and safety, WASH, water technology and circular water management for enhancement of water use efficiency. She has worked in various organisations including CSIR-NEERI (Nagpur and Kolkata Zonal Laboratory), CMPDI (Coal India Ltd.), SOS Children's Village Kolkata, Riddhi Foundation and SIGMA Foundation. She has handled major projects of Government and international donor agencies like UNICEF, ADB, AMRUT, Aga Khan Foundation, Sign of Hope, and Germany etc. She is a full-time member of Organization for Women in Science for the Developing World (OWSD)- An UNESCO Unit since August, 2022.

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Mr. Aslam Ali did his Masters of Social work from Annamalai University and has a work experience of 14 years in the field of community development and social safeguard. He is specialised in field mobilization, data collection on quantitative and qualitative research, capacity building, management of field operations and supervisions. He has worked on major flagship programs like WBDWSIP (funded by ADB), JJM (funded by UNICEF), etc.

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E-WASTE : TRASH OR TREASURE?

Dr. Mayur J. Kapadia
Former AGM, Quality Control Dept, GNFC Ltd, Bharuch, Gujarat – TC Member & Resource Person, BIS – Trainer - Technical Writer - Book Editor.

E-Waste, as a generic term, describes all types of old, end-of-life or discarded electrical and electronic equipments including all components, sub-assemblies and consumables, which are part of the product at the time of discarding.

This form of waste encompasses

- Small IT equipments like cell phones, laptops, tablets, routers;
- Consumer electronics like televisions, audio sets, video recorders;
- Household appliances like coffee machines, refrigerators, washing machines, air conditioners, LED lamps, vacuum cleaners, toys, microwave ovens; and
- Medical devices and equipments which are damaged or obsolete.

All the listed items and many others add ease, comfort, and luxury to the modern life and have therefore become an indispensable part of modern societies. However, short lifespan, limited repair options and fast-changing technology is turning a high proportion of electronic gadgets into waste upon the end of its usable life due to damage, non-working, operational risks, or availability of better alternatives.

The causes for generation of E-waste can broadly be categorised as under :

- **Population:** With a rising global population, the number of electronic device users is expanding.
- **Consumerism:** The rise in disposable income of the families and demand for the latest technology contribute to higher consumption of electronic gadgets and their disposal rates.
- **Technology:** Rapid innovation leads to frequent product upgrades, resulting in shorter product lifecycles.



- **Obsolescence:** Manufacturers often design products with limited lifespans to drive repeat purchases, contributing to e-waste.

GENERATION

E-waste is generated by residential buildings, commercial businesses, industries and institutes like schools, hospitals etc. The rate of generation of e-waste at the global level has increased substantively in recent years. While the annual growth rate of e-waste generation was 3 – 4 % upto year 2018, it has gone high to around 6% after year 2019. In year 2020, the global per capita generation was 7.3 kg per person. This rate amounted to approx 55.5 million metric tons of e-waste worldwide, which was higher by 20% than that of year 2015. In 2022, an estimated 60 million tonnes of e-waste were produced globally. By year 2030, global e-waste is expected to reach upto around 75 million tonnes annually.

Region-wise distribution of year 2019 show highest generation in Asia (24.9 million MT ~47% of global e-waste), which was followed by Americas (13.1 million MT ~24%), then Europe (12 million MT ~22%), Africa:(2.9 million MT ~5%) and Oceania: (0.7 million MT ~1%). The per capita generation has been highest (16+ kg per person) in Europe and Oceania.

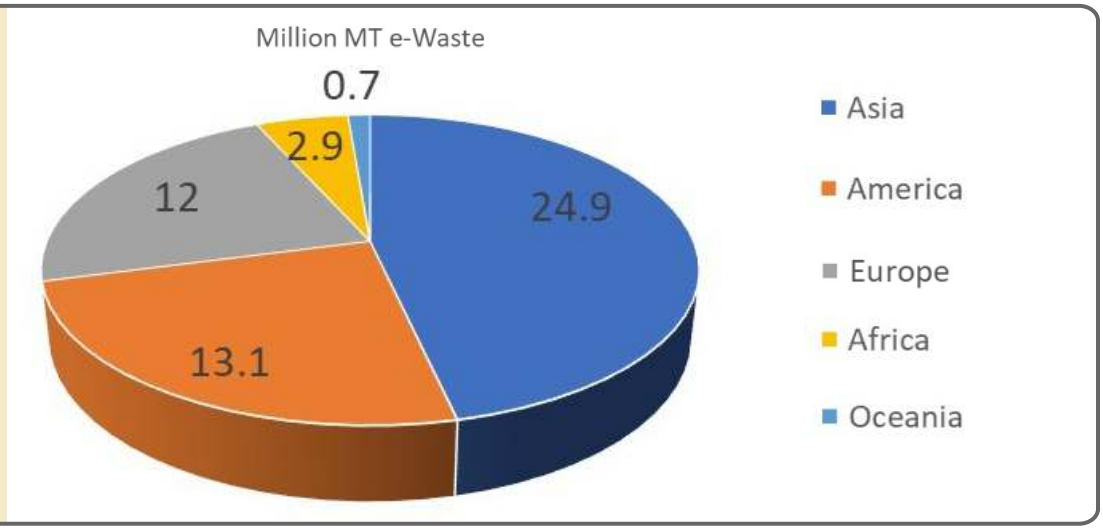
EXPOSURE & HAZARDS OF E-WASTE

E-waste can release up to 1000 different toxic chemical substances into the environment if disposed off using unhealthy practices. However, users of electrical and electronic items are unlikely to have contact with the toxic substances contained in these items, as long as the items are functional. When they become waste, these toxicants can be released into the environment if the devices are managed using environmentally-unsound practices and activities.

Many unsound practices have been observed at e-waste sites including:

- Dumping on land or in water bodies
- Landfilling along with regular waste
- Burning or heating in open premises
- Scavenging
- Acid leaching
- Stripping and shredding of plastic coatings
- Manual disassembly of equipment

Continent-Wise E-Waste Generation



When e-waste is recycled using unsound activities, it can release up to 1000 different chemical substances into the environment, including known neurotoxicants such as lead. In addition to environmental hazards, e-waste is also a health hazard, particularly for pregnant women and children. Indirectly, e-waste also causes social and economic disturbance.

Environmental Hazards

- Hazardous materials like lead, mercury, cadmium, and brominated flame retardants leach into soil and water.
- Burning of wires to extract metals release harmful chemicals into the atmosphere.
- Improper disposal can lead to the accumulation of toxins in ecosystems affecting agriculture and aquatic life.

Health Hazards

- Lead and Mercury exert toxic effects on central and peripheral nervous systems, hemopoietic system, genitourinary system and reproductive systems of males and females.
- When inorganic mercury spreads out in the water, it is transformed into methylated mercury, which bio-accumulates in living organisms and concentrates through the food chain, particularly by fish.
- Cadmium is a potentially long-term cumulative poison. Toxic cadmium compounds accumulate in the human body, especially in the kidneys.
- Polycyclic aromatic hydrocarbons (PAH) affect lung, skin and bladder.
- Workers in informal recycling sectors face direct exposure to hazardous substances, leading to respiratory issues, skin disorders, and neurological damage.
- Children living near e-waste processing sites are particularly at risk of developmental issues due to their heightened sensitivity to toxins.

Economic and Social Hazards

- Valuable metals like gold, silver, and palladium are lost through discarded electronic items.
- Poor working conditions and lack of safety measures in informal recycling hubs cause exploitation of workers, which perpetuates cycles of poverty.

Children and pregnant women are especially vulnerable to the effects of hazardous pollutants from informal e-waste recycling activities. Children are often involved in waste picking and scavenging, burning discarded e-waste and manual dismantlement of items into component parts. In some countries, children may serve as a source of cheap labour and their small hands give them an advantage in taking apart the smallest items. These activities directly expose children to injury and high levels of hazardous substances. Working as a waste picker is hazardous labour and is considered one of the worst forms of child labour by the ILO. In case of pregnant women, infants and children; E-waste exposure can be linked to adverse neonatal outcomes, including increased rates of stillbirth and premature birth, neurodevelopment, learning and behaviour outcomes, reduced lung and respiratory function and increased asthma incidences.

COLLECTION & RECYCLING OF E-WASTE

E-waste generated at the household level in most of the countries is managed in three ways:

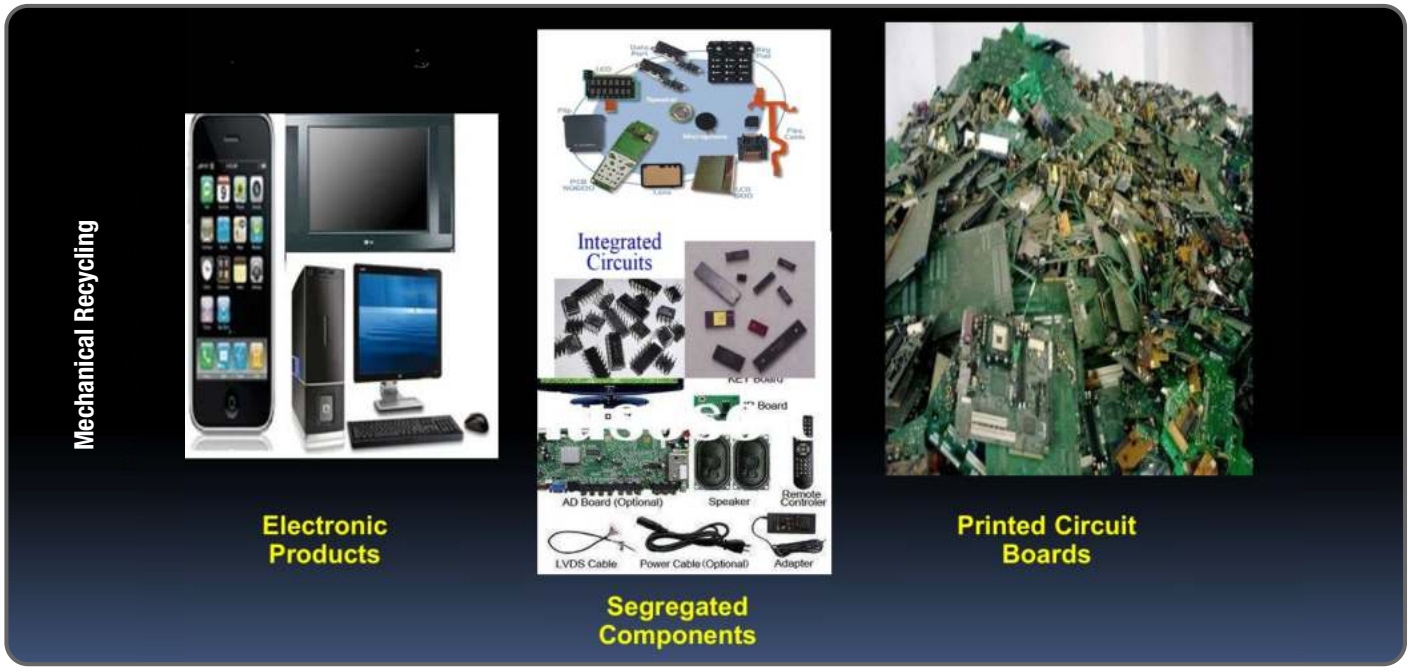
- by dumping it to waste bins,
- through formal collection by government recognized bodies, and
- collection outside the formal system by individual waste dealers and companies

Formal Recycling: E-waste collected through authorized commercial and/or municipal collection points and pick-up services is usually recycled at facilities having advanced technology and machinery and infrastructure for safe and efficient removal of valuable materials.

Informal Recycling: On the other hand, the e-waste collected outside the formal system by individual waste companies or dealers is mostly processed and recycled under sub-optimal conditions with primitive techniques and usually without any provisions to reduce the emission of hazardous chemicals into the environment.

E-waste dumped into landfills or sold to peddlers often end up by polluting the environment through leaching into soil and groundwater, and via emission into the surrounding air, soil, and surface water. A substantial amount of valuable resources are also lost through disposing or during recycling under inferior conditions.

Formal e-waste recycling is the safest way to manage e-waste. However, in 2022, only 22.3 % e-waste was



documented as formally collected and recycled. This suggests that most of the e-waste is managed by the informal sector. Presence of multiple precious metals (e.g. gold, platinum, palladium, ruthenium, rhodium, iridium, copper, and silver) along with other valuable materials such as iron, aluminium, cobalt, indium, germanium, bismuth, and antimony, make e-waste an attractive source of economy among local scrap dealers, dismantlers and recyclers.

RECYCLING TECHNOLOGIES

E-waste recycling, which comprises systematic collection of e-waste and its treatment for recycling of useful materials, offers a valuable tool to minimize the escalating heap of e-waste, supplement the shortage of some primary resources and support the economy. The rapid advancement of technology offers promise for a more sustainable future in managing e-waste. Adoption of innovative solutions can enhance resource recovery and contribute to a healthier and more sustainable environment for future generations.

MECHANICAL PROCESSES

Automated Sorting Systems: These systems make use of sensors, conveyor belts, artificial intelligence and robotics to efficiently categorize and separate electronic components based on their materials and properties in the waste streams. These systems improve the speed and accuracy of the sorting process, reducing the need for manual labour, and in turn, improve efficiency and ensure a higher recovery rate of valuable materials for recycling.

Shredding and Size Reduction: This technology involves breaking down electronic devices into smaller pieces or particles. This process facilitates subsequent separation and extraction of valuable components from various materials, such as plastics, metals, or electronic waste and makes the downstream processing easier.

Electrostatic Separation: This method utilizes electrical charges to separate different types of materials based on their conductivity. It is commonly employed to separate metals from non-metals, providing an efficient means of recovering valuable metals such as copper, gold, and silver from complex waste streams.

PYROMETALLURGICAL PROCESSES

Pyrometallurgical processes include the use of high temperatures to extract valuable metals from recycled materials. Techniques like smelting, roasting, incineration are employed to separate metals like aluminium, copper, lead in molten form the metallic portion of the segregated waste materials, which are derived through mechanical processes of recycling.

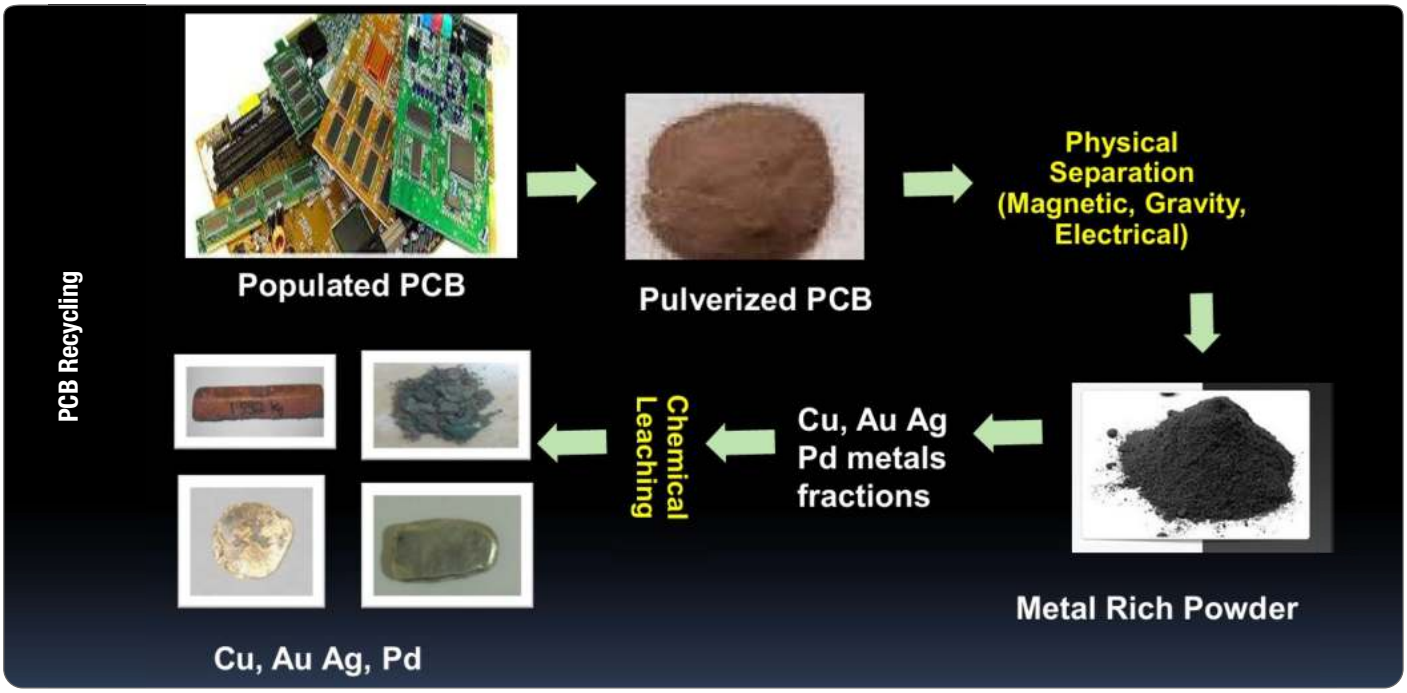
Advances in this technology, such as applying microwave energy or using reactive gases can enhance recovery efficiency and environmental performance. Another emerging and cutting-edge technology is Plasma Arc technique that uses plasma torches to heat e-waste to extremely high temperatures, breaking down electronic waste into its constituent elements. This process also enables the recovery of valuable materials with minimal environmental impact.

HYDROMETALLURGICAL PROCESSES

These processes involve the use of liquid solutions, typically acids or other chemicals, to dissolve metals of recycled materials. Processes like leaching and solvent extraction are employed. This technology is particularly effective in recovering precious metals, including gold, silver, and palladium, in a more controlled and environmentally friendly manner.

ELECTROCHEMICAL PROCESSES

These processes carry out selective recovery of metals in pure forms from the leachate solutions coming out of the acid digestion of e-waste. Processes like electrodeposition, electrorefining and electrowinning are employed for selective metal



recovery with reduced solvent and energy consumption. Electrorefining and Electrowinning reduce the use of reagents causing environmental pollution and therefore are preferable methods. For the purpose of reduction of metal ions, electrodeposition uses the selective reduction potential of each metal ion, while constant potential is applied to the electrodes immersed in the leachate solution.

BIOLOGICAL TREATMENT

These methods employ microorganisms or enzymes to break down and decompose organic components, such as plastics, in e-waste. This technology is utilized in composting and anaerobic digestion, contributing to the reduction of organic waste in landfills and promoting sustainable waste management practices. It offers a sustainable alternative to traditional methods of waste disposal.

REFURBISHMENT

Electronic component refurbishment involves the testing of used electronic components and their restoration to extend their lifespan and functionality. This sustainable approach reduces the need for new manufacturing, contributing to resource conservation. At the same time, the reuse of same item minimizes electronic waste generation.

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CIRCULAR APPROACH

The power of innovation and research can result into a circular approach in e-waste management. Here, the electronic waste is recycled responsibly, contributing to a cleaner and greener future for all. Closed-loop recycling system for Recycling and Manufacturing processes can help minimize the need for new raw materials as they involve refurbishment, remanufacturing or reintroduction of end-of-life products into production process. By minimizing the extraction of virgin resources, these systems can reduce environmental impact and contribute to a more sustainable and eco-friendly electronic production cycle. Unlike the traditional linear economy, which follows a "take-make-dispose" pattern, the circular economy promotes a closed-loop approach where resources are continually reused, recycled, and regenerated to minimize waste and maximize the value of products and materials. The development of biodegradable electronics represents a sustainable approach to e-waste management. These devices are designed to degrade naturally at the end of their lifecycle, reducing the environmental impact of electronic waste disposal. These devices incorporate biodegradable materials such as bioplastics and organic substrates, ensuring minimal harm to the environment.

Researchers and innovators have been constantly exploring novel recycling methods and technologies to address the challenges of e-waste management. From 3D printing of recycled materials to innovative e-waste upcycling techniques, these initiatives can create value from electronic waste while minimizing environmental impact.

Blockchain technology is also a tool to enhance transparency and traceability in the e-waste recycling process. By creating immutable records of e-waste transactions and supply chain activities, blockchain can help verify the authenticity of recycled materials and ensure compliance with regulatory requirements, promoting responsible recycling practices.

Forward-thinking product design can play a crucial

role in creating a more sustainable electronics ecosystem by lengthening device lifespans and promoting the reuse and recycling of components. Modular design with interchangeable parts in electronic items can reduce the need to replace entire devices when a single component fails.

Modular design with interchangeable parts in electronic items can reduce the need to replace entire devices when a single component fails. Modular designs can facilitate easier repair, lengthen product lifespans and reduce e-waste generation.

Standardization in electronic components and connectors can simplify recycling and reuse processes, minimizing the amount of e-waste that ends up in landfills. Replacing hazardous or non-recyclable materials with more sustainable alternatives can reduce environmental impact and facilitate recycling.

CONCLUSION

E-waste is both a challenge and an opportunity. While its improper management poses severe risks to the environment and human health, adopting sustainable practices and innovative solutions can unlock its economic potential. The use of combination of recycling technologies can transform the Trash into Treasure, unlocking valuable resources and reducing environmental impact. Nevertheless, it is necessary to initiate concrete actions to protect communities from unsound e-waste recycling activities.

Some of these actions are…

- Adoption and Enforcement of high-level international agreements
- National e-waste management legislation that protects public health and its implementation
- Proper & strict monitoring e-waste sites and surrounding communities
- Strategic interventions to improve and minimize informal e-waste recycling activities
- Education of the work force involved in e-waste recycling
- Elimination of child labour.

Collaborative efforts from governments, industries, and individuals are crucial to creating a sustainable future where technology not only protects environment & public health, but also recovers valuable materials. It is essential for stakeholders, policymakers, and the public to support and implement appropriate combination of technologies to establish a circular economy for electronic waste.

ABOUT THE AUTHOR



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Former AGM, Quality Control Dept, GNFC Ltd, Bharuch, Gujarat – TC Member & Resource Person, BIS – Trainer - Technical Writer - Book Editor.

Dr. Mayur J Kapadia, MSc, PhD, former Add General Manager & Laboratory Head of GNFC Ltd, Bharuch, possesses professional industrial experience of 4 decades in the fields of Quality Control, New Laboratory Set up, Cooling Water Management, ISI certification, Technical Education, Research, Waste Water Treatment, Supplier development, Cost Reduction and Administration. His technical articles on 'Water Sector' have been regularly getting published in magazines. He also has co-edited a book published by 'Elsevier'. He is an active member as well as a 'Resource Person' of Bureau of Indian Standards (BIS). He has been rendering technical services to various organizations for quality improvement, new product development, process trouble-shooting, analytical aspects, publications and training purposes. He has also been providing full day formal classroom training to industry professionals in the fields of Quality Improvement, Water / Air analysis, Instrumental methods of analysis, NABL, BIS certification, Cooling Water Treatment, Boiler Water treatment and other areas.



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BAD ODOUR REMOVAL FROM HAZARDOUS WASTE MANAGEMENT SITE

Ashutosh Vadanagekar, Managing Director at Amalgam Biotech
Rajesh Narayan, Business Development Manager at Amalgam Biotech

BACKGROUND

Hazardous waste management sites are source of emission of toxic gases, strong fumes, stringent chemicals and mixed odour. This Hazardous waste management facility is located near Ahmedabad, Gujarat. This 50 meters * 20 meters campus provides facility for hazardous waste collection, segregation from nearby areas of Ahmedabad.

ABOUT SITE

This waste management site collects daily 100 tonnes of hazardous waste, which consist of- fluoride, chlorides, Sulphate and acid material from nearby industrial belt. Collected waste is mixture of substances from which 50 tonnes is segregated waste like metal, plastic, wood and 50 tonnes waste is disposed.

CHALLENGE

Approximately known measurable 24 gases are released from this hazardous waste management facility. These gases caused adverse impact on the environment and occupational health of the workers.

Ammonia detection found to be 234 ppm. Acetaldehyde was 1655 ppm, however permissible limits of 8 hours exposure, as per factories Act 1948 is 100 ppm. Also, Ethyl acetate was 345 ppm, Methyl mercaptan was 143 ppm. Methyl Sulfide was 254 ppm which is in higher concentration and caused nuisance to the society and industrial area.

TABLE 1: EMISSIONS AT HAZARDOUS WASTE MANAGEMENT FACILITY

No.	Emissions in PPM	No.	Emissions in PPM
1.	Ammonia	13.	Methyl Sulfide
2.	Aacetaldehyde	14.	N - Butyraldehyde
3.	I - Valerate / Butyl Butarate	15.	Propionaldehyde
4.	I - Butanol/ Butanol -1	16.	N - Valeraldehyde
5.	Methyl Disulfide/ Di Methyl Disulfide	17.	Propionic Acid
6.	Ethyl Acetate	18.	N - Valerate
7.	Hydrogen Sulphide	19.	Styrene
8.	N - Butyric Acid / ISO Butanol	20.	Tri Methylamine
9.	I - Butyl Aldehyde	21.	Toluene
10.	I - Valeraldehyde / ISO Valeraldehyde	22.	VOC
11.	Methyl Isobutyl Ketone	23.	Xylene
12.	Methyl Mercaptan	24.	SO2

METHODOLOGY FOR STUDY

Amalgam Biotech took an initiative of testing concentration of such 24 gases emitted at this site. Our technical partner was well equipped for on-site testing. This testing was witnessed in presence of Mr Rajesh Narayan, Business Development Manager, Amalgam Biotech, in Nov 2022.

OBSERVATION

Very stringent, strong odour found during 1st monitoring for all 24 gases. Propionic acid fumes concentration was 950 ppm, Hydrogen sulphide concentration was 504 ppm. Monitoring team was equipped with protective covering for safety & health aspects, as initial odour concentration was high and



unacceptable.

SOLUTIONS TO THE PROBLEM

The bad odour molecules were engulfed by our odour control product 'OdoServe'. OdoServe was misted in the hazardous waste facility for 3 hours intermittently which proved e□ective. After use of odoserve, for the 1st time and 2nd time, percentage reduction (%) achieved was huge as observed in the table below:

No.	Name	Unit	Before use of odour control Product	After use of Odoserve-odour control Product 1st time	% Reduction -1st	After use of OdoServe-odour control Product-2nd time	% Reduction -2nd
1.	Ammonia	ppmm	234.0	36.2	84.5	34.5	85.3
2.	Acetaldehyde	ppmm	1655.5	30.5	98.2	38.2	97.7
3.	I - Valerate / Butyl Butarate	ppmm	15.4	12.1	21.4	8.2	46.8
4.	I - Butanol / Butanol -1	ppmm	178.7	36.6	79.5	31.0	82.7
5.	Methyl Disulfide / Di Methyl Disulfide	ppmm	0.9	1.2	-33.3	1.2	-33.3
6.	Ethyl Acetate	ppmm	345.0	50.5	85.4	19.8	94.3
7.	Hydrogen Sulphide	ppmm	504.5	29.4	94.2	36.1	92.8
8.	N - Butyric Acid / Iso Butanol	ppmm	334.0	28.1	91.6	15.9	95.2
9.	I - Butyl Aldehyde	ppmm	221.3	9.1	95.9	4.0	98.2
10.	I - Valeraldehyde / Iso Valeraldehyde	ppmm	343.5	23.3	93.2	3.9	98.9
11.	Methyl Isobutyl Ketone	ppmm	231.5	7.1	96.9	14.6	93.7
12.	Methyl Mercaptan	ppmm	143.6	6.0	95.8	10.8	92.5
13.	Methyl Sulfide	ppmm	254.9	4.9	98.1	10.7	95.8
14.	N - Butyraldehyde	ppmm	122.0	6.6	94.6	9.3	92.4
15.	Propionaldehyde	ppmm	680.9	18.3	97.3	17.9	97.4
16.	N - Valeraldehyde / Pentanal	ppmm	283.9	12.0	95.8	4.5	98.4
17.	Propionic Acid	ppmm	949.8	56.3	94.1	50.3	94.7
18.	N - Valerate / Pentonic Acid	ppmm	294.0	29.1	90.1	34.0	88.4
19.	Styrene	ppmm	111.9	1.9	98.3	2.4	97.9
20.	Tri Methylamine	ppmm	31.1	2.0	93.6	2.9	90.7
21.	Toluene	ppmm	53.7	3.4	93.7	2.1	96.1
22.	VOC	ppmm	161.1	3.6	97.8	118.5	26.4
23.	Xylene / Xylene-m	ppmm	161.1	4.5	97.2	1.1	99.3
24.	Sulphur Dioxide SO2	ppmm	114.1	11.9	89.6	4.6	96.0

HIGHLIGHT

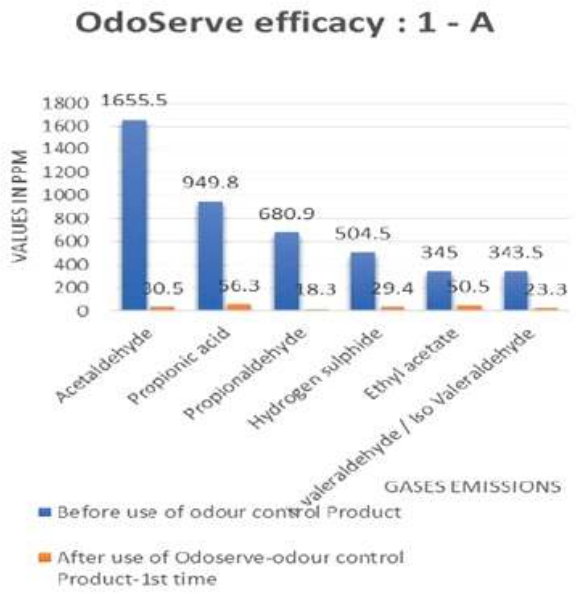
We have achieved...

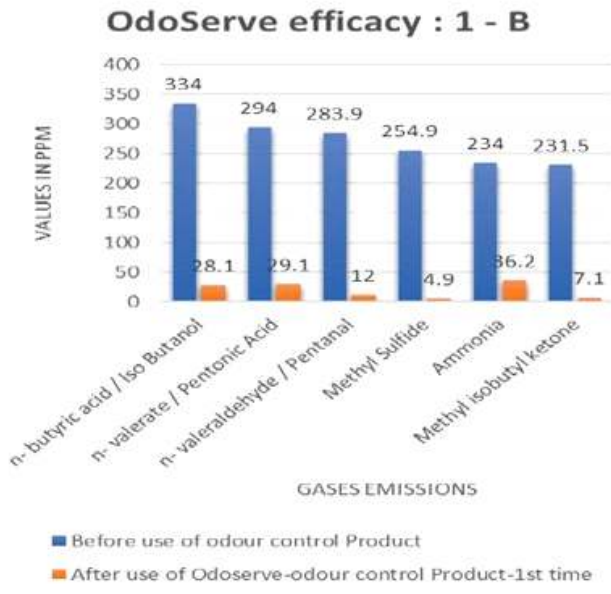
- 95% reduction in Acetaldehyde, Iso Butanol, Methyl Sulfide, Sulphur Dioxide SO2, Xylene were observed.
- Also, reduction in concentration value is below permissible limits for Ethyl acetate, Methyl isobutyl ketone, Toluene and ammonia.
- Considerable reduction in concentration of Methyl Sulfide that is 98%, Styrene also 98%, VOC 97% were achieved, which is favorable for

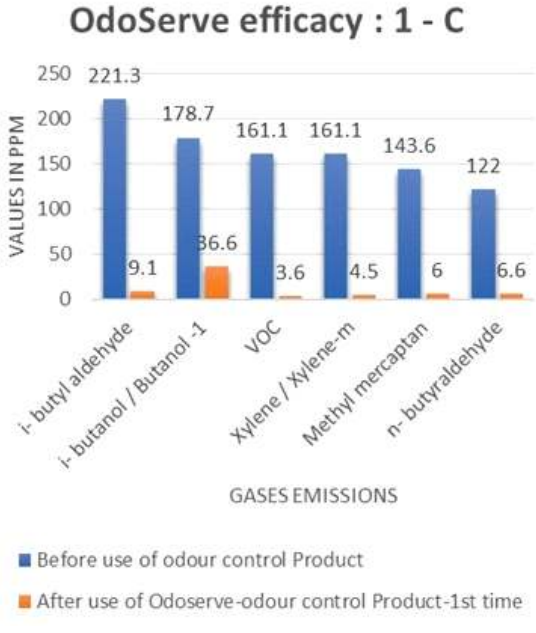
toxicological, ecological & occupational health aspects.

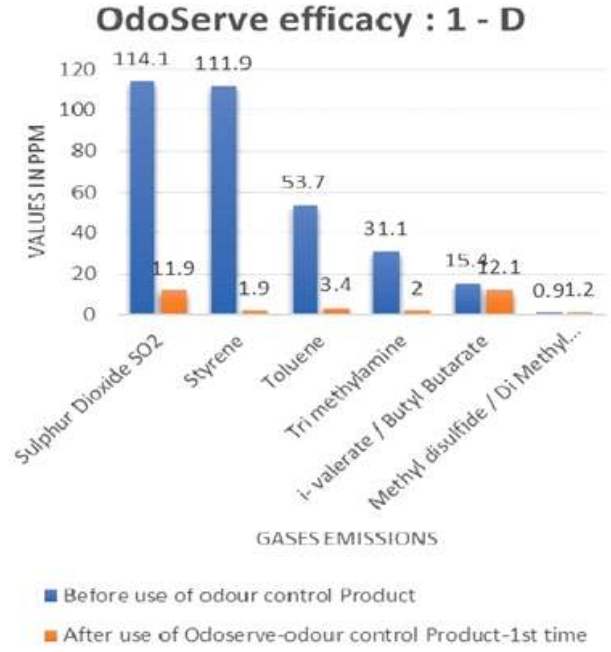
- Methyl mercaptan has OSHA limit of 10 ppm & after OdoServe misting it was detected to 6 ppm from 143 ppm on site.
- Quantity of odoserve dosed was 4 lit/day and 90% of all bad odour was gone.

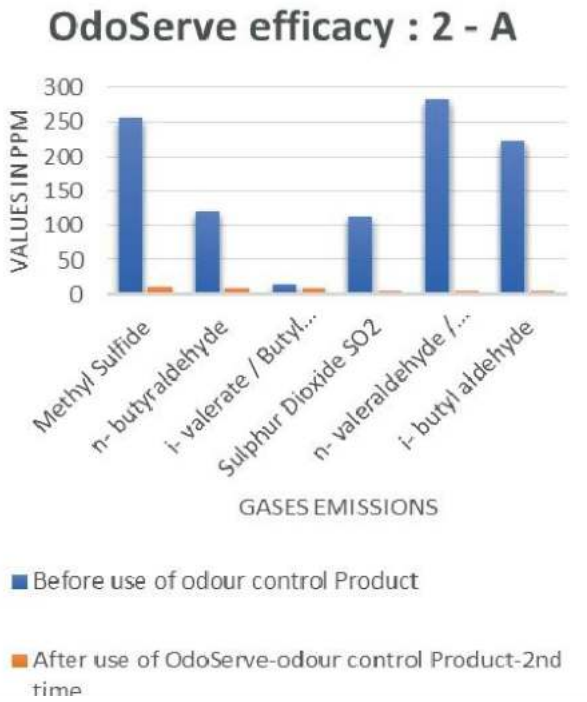
GRAPHICAL PRESENTATION OF ODOSERVE MISTING EFFICACY - BEFORE & AFTER:

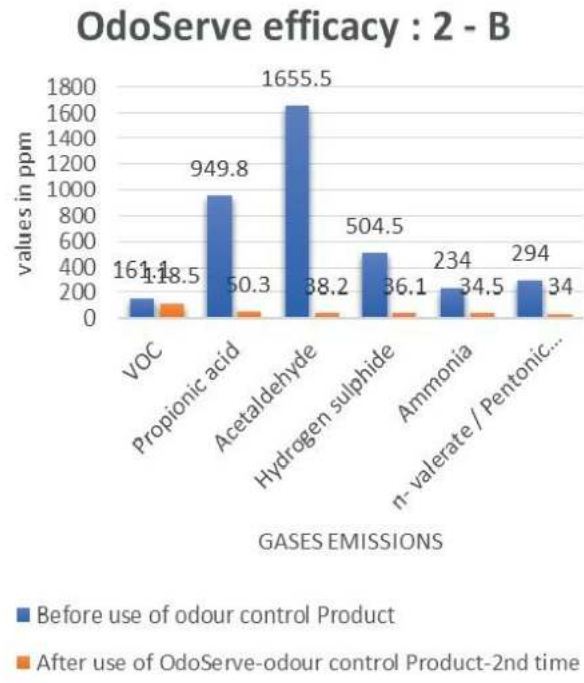


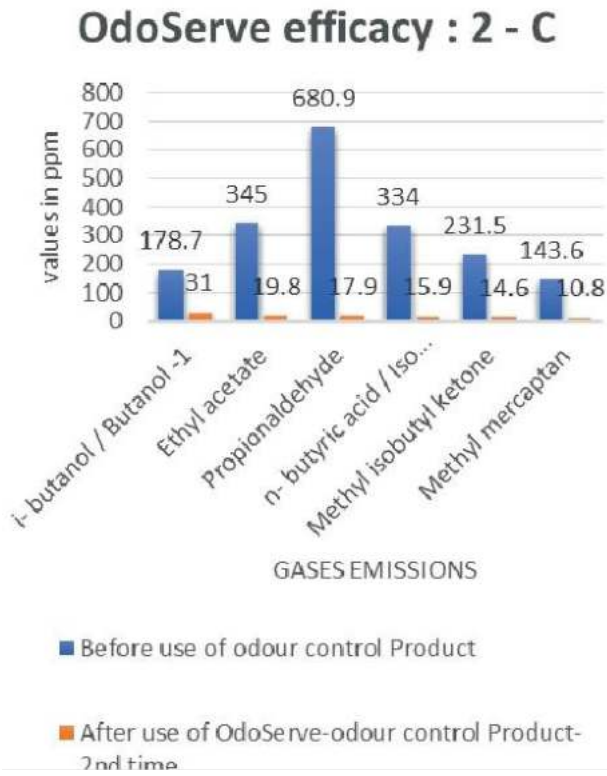


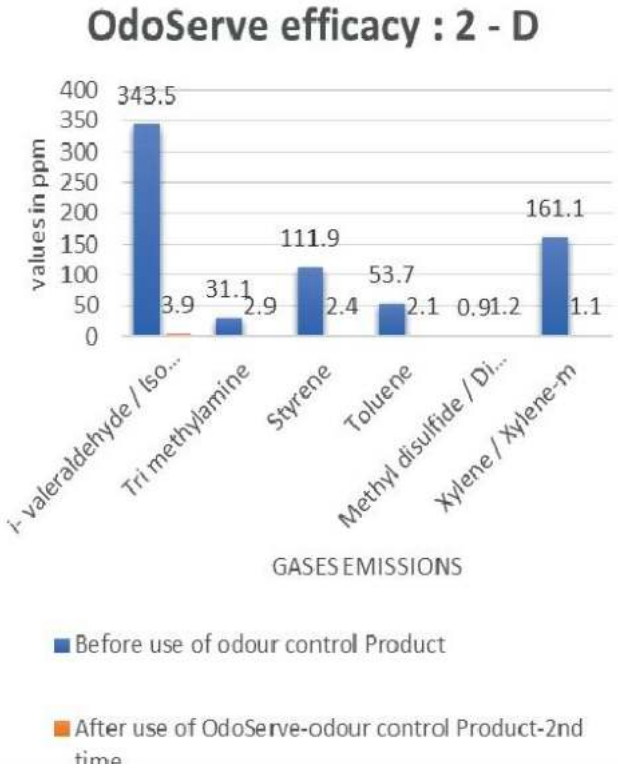





OdoServe efficacy : 2 - A
VALUES IN PPM
300
250
200
150
100
50
0
Methyl Sulfide
n- butyraldehyde
i- valerate / Butyl...
Sulphur Dioxide SO2
n- valeraldehyde /...
i- butyl aldehyde
GASES EMISSIONS
Before use of odour control Product
After use of OdoServe-odour control Product-2nd time


OdoServe efficacy : 2 - B
values in ppm
1800
1600
1400
1200
1000
800
600
400
200
0
161.1
118.5
949.8
50.3
1655.5
38.2
504.5
36.1
234
34.5
294
34
VOC
Propionic acid
Acetaldehyde
Hydrogen sulphide
Ammonia
n- valerate / Pentonic...
GASES EMISSIONS
Before use of odour control Product
After use of OdoServe-odour control Product-2nd time


OdoServe efficacy : 2 - C
values in ppm
800
700
600
500
400
300
200
100
0
178.7
31
345
19.8
680.9
17.9
334
15.9
231.5
14.6
143.6
10.8
i- butanol / Butanol -1
Ethyl acetate
Propionaldehyde
n- butyric acid / Iso...
Methyl isobutyl ketone
Methyl mercaptan
GASES EMISSIONS
Before use of odour control Product
After use of OdoServe-odour control Product-2nd time


OdoServe efficacy : 2 - D
values in ppm
400
350
300
250
200
150
100
50
0
343.5
3.9
31.1
2.9
111.9
2.4
53.7
2.1
0.9
1.2
161.1
1.1
i- valeraldehyde / Iso...
Tri methylamine
Styrene
Toluene
Methyl disulfide / Di...
Xylene / Xylene-m
GASES EMISSIONS
Before use of odour control Product
After use of OdoServe-odour control Product-2nd time

EXECUTIVE SUMMARY

Wherever there are pharmaceutical, chemical, fertilizer, textile industries, hazardous waste is generated & different types of gaseous emissions are experienced at such sites. By using our product 'Odoserve', for such a short duration, we could achieve desirable results- like 90% reduction in emissions at this site.

Odoserve is an excellent odour removing solution!!

ABOUT THE AUTHOR



Ashutosh Vadanagekar is the Managing Director of Amalgam Biotech. Ashutosh's expertise is his knowledge of Production process industries because of his past experience of commissioning close to 55 different ETPs & ZLD plants in India & overseas. He has an overall experience of 24 years, of which 12 years have been spent at Wastewater sites in commissioning & troubleshooting the plants. Ashutosh undertakes wastewater training & consulting assignments at an individual level. His work profile in Amalgam Biotech is focused on New product development & site troubleshooting.

Ashutosh can be reached at +91-9657711558 – ashutosh@amalgambiotech.com

Ashutosh Vadanagekar, Managing Director at Amalgam Biotech



Rajesh Narayan has experience of 25+ years in the field of Sales and Marketing including Channel Sales Management and Direct Marketing. Since last 6 years he is working as Business Development Manager with Amalgam Engineering, Pune which is mainly into Waste Management – Wastewater and Solid which includes Hazardous waste site and Wet Waste Management sites.

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Rajesh Narayan, Business Development Manager at Amalgam Biotech

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ULTRASOUND BASED SILENT SOUND THERAPY FOR ALGAL BLOOM PREVENTION AND WATER QUALITY MANAGEMENT

Dr. Aditi Mullick, Managing Director at Prasinos Tech Innovations Pvt. Ltd.
Dr. Anupam Mukherjee, CEO at Prasinos Tech Innovations Pvt. Ltd.
Sobhan Ghosh, Chemical Engineer, Process Research Consultant with Managing Innovation

INTRODUCTION

Water, which was perceived as a plentiful resource until the last century and the notion of conserving or reusing water was not given much serious consideration, moving towards the latter part of the preceding century, this perspective began to shift. Presently, water is recognized as one of the most crucial resources in both industrial and domestic sectors. While there is significant emphasis on purification and treatment for recycling or reuse, insufficient attention is often paid to maintaining water quality parameters, particularly concerning bacterial and biomass/algae growth during storage. Controlling these parameters (biomass/algae and microorganisms) is essential depending on the intended use of stored water.

Furthermore, Bloom-forming cyanobacteria, commonly referred to as blue-green algae, present a significant threat to both inland waters and estuarine environments when left unaddressed and this Harmful algal blooms (HABs), though occurring naturally, have witnessed a troubling surge in occurrence across lakes, reservoirs, and oceans in recent times. This global escalation of HABs, driven by harmful algal species, has evolved into a significant environmental concern. They have adverse effects on aquatic ecosystems and public health leading to fish mortality, animal deaths, human health risks, and disruptions in food and water supplies. The increase in the frequency, severity, duration, and geographic spread of these blooms correlates closely with the rise in CO2 levels and global temperatures. Increasing global temperatures, changing precipitation patterns, and more frequent and severe droughts collectively contribute to the spread of CyanoHABs. Prominent examples include the Bargi and Gandhisagar Dams in Madhya Pradesh, Ukai Dam in Gujarat, Stanley Reservoir in Tamil Nadu, and Chilika Lagoon in Odisha, as well as coastal waters along India's eastern and western coasts. A study conducted in 2012, which examined CyanoHAB occurrences in India, revealed a notable increase of up to 15 percent over the preceding 12 years. It is plausible to assume that the frequency of CyanoHAB occurrences in India has continued to rise since 2012.

In the industrial context, biofilm poses a significant challenge in water systems. It develops on the inner surfaces of storage tanks and can lead to complete blockage of pipelines, pumps, or filtration equipment if left unchecked. The formation of biofilm is a highly intricate process. Once it establishes a stable slimy foundation on the surfaces of storage vessels, it becomes a haven for bacteria growth, accumulating organic debris from the water to sustain microbial activity. Consequently, it rapidly expands into a thick layer that can intermittently detach and obstruct water flow lines and pumps. Moreover, these biofilm deposits accelerate corrosion. Treatment typically involves chemical based routes such as coagulation, settling, and the addition of chlorine/ozone or specific chemicals. However, elevated levels of biomass or algae result in increased consumption of these chemicals. Conversely, preventing the formation and uncontrolled growth of biofilm poses significant challenges and expenses. Effective control of biofilm on cooling tower surfaces and sumps is crucial to prevent corrosion throughout the process lines and equipment such as heat exchangers, pumps, and filters.

ULTRASOUND: A CHEMICAL-FREE NON-INVASIVE WAY OF BIOMASS CONTROL

Ultrasound encompasses sound waves beyond the upper audible threshold of human hearing (20 kHz). At designated frequencies, these waves hold the capacity to manage algae growth. For a considerable time, it has been recognized that ultrasound possesses the ability to eliminate microorganisms and algae in water. Nonetheless, the widespread adoption of ultrasound technology has been hindered by its substantial energy requirements and challenges in technical feasibility for large-scale implementation. However, in recent years, this chemical-free, environmentally friendly solution has been garnering increased attention owing to its straightforward application, extended service life, and minimal maintenance needs.

There is a distinction between high-power ultrasound that causes cavitation and the low-power ultrasound. The first category system operates at high power, utilizing cavitation as its primary mechanism to

effectively eradicate algae and microorganisms. However, it demands significant investment and energy. Typically, these ultrasound systems are installed within flowing water lines.

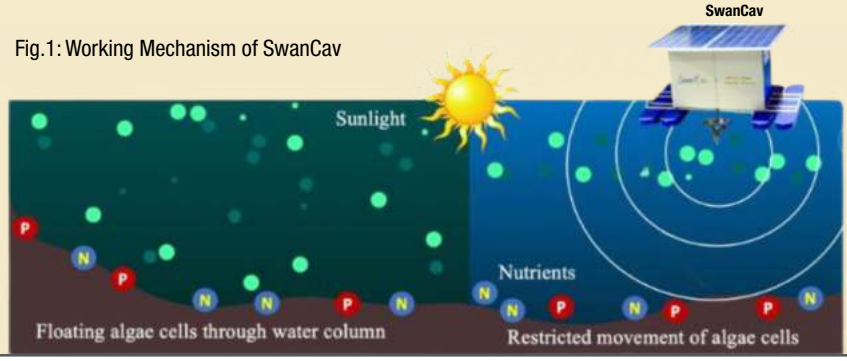
The second type of ultrasound devices operate on a fundamentally different principle compared to their high-power predecessors. They are characterized by simplicity and remarkably low power consumption. Operating at levels significantly below the cavitation threshold, these devices do not rely on cavitation to eliminate algae and microorganisms. Instead, they proactively inhibit the growth of these organisms. Unlike high-power systems, these devices are typically installed in static bodies of water. Through the continuous, gentle vibration of random multiple frequencies generated by the ultrasound system, these low-power devices effectively disrupt algae colonies, impeding their reproductive cycles, disturbing the float-sink cycle of cyanobacteria and preventing the formation of biofilm on surfaces. The straightforward installation process, minimal initial investment, low energy consumption, reduced maintenance requirements, and prolonged lifespan have contributed to a notable increase in the adoption of low power ultrasound devices in recent times. The emergence of low-power ultrasound systems for algae control began at the turn of the century, but it wasn't until the last decade that their widespread adoption took hold. With an escalating number of systematic reports detailing large-scale field trials across various regions worldwide, these systems have demonstrated their efficacy and cost-effectiveness. Initially employed primarily for algae growth reduction, it also quickly became apparent that these systems were highly effective in biofilm control as well.

The following section describes an advanced ultrasound based algae control system and its working mechanism followed by some field studies undertaken by Prasinos Tech Innovations Pvt. Ltd.

SWANCAV: A SMART ALGAE CONTROLLER

SwanCav comprises a group of advanced ultrasonic algae control devices that efficiently eliminate algal biomass growth and prevent biofilm formation, completely replacing the need for algicides. This significant contribution aids in the restoration of water bodies. With multiple models featuring varied configurations and specifications tailored to specific applications, SwanCav emerges as the premier solution for algae remediation across industries, large water surfaces, and smaller bodies of water.

Fig.1: Working Mechanism of SwanCav



It operates on the mechanism of very low power variable frequency ultrasonic wave that prevents the growth for both algae and microorganisms. The continuous mild vibration generated by the ultrasound system reduces the colonies of algae thereby interferes with their reproductive system and prevents the deposit of biofilm on the surface. Algae cells float in the water column in a vertical movement while accessing the sunlight from surface during day time and acquiring the nutrients from the bottom at night. With a varying frequency range as emitted from the submerged transducers, the ultrasound restrict their vertical movement by resonating with their frequency of vibration and cause damage to their reproductive mechanism without cell breakage. Fig. 1 below shows how the sound wave emitting from the ultrasonic transducers are modulating the buoyancy of the algae cells and restricting their vertical movements whereas Fig. 2 shows the pictorial view of SwanCav.

UNDERSTANDING THE SCIENCE BEHIND AND THE OPERATING PRINCIPLES THE SMART BUOY

- Multiple ultrasonic transducers covering 360 degree surrounding the buoy and emitting ultrasound waves at a varying frequency range (20-60 kHz)
- Integrated solar panels for using solar energy as the power source with power storage and charge controller
- Multiple water quality monitoring probes for in-situ water quality measurements
- UV-resistive floaters fitted to the platform
- Integrated anchoring facility
- Integrated alarm system for security

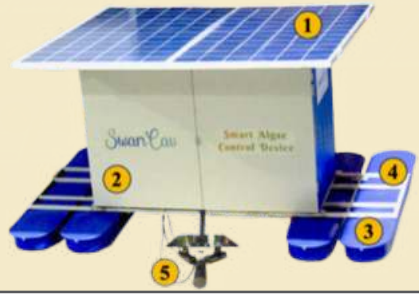
The major areas of applications of this device include:

1. Recreational lake/large pond
2. Industrial water storage
3. Swimming pool/pond at golf course
4. Aquaculture
5. Municipal water storage
6. Irrigation reservoir
7. Hydroelectric dam

A CASE STUDY

Pimpri-Chinchwad is a city in the Indian state of Maharashtra. The city is about 15 km (9.3 mi)

Fig. 2: Pictorial View of SwanCa



1. Solar Panels
2. Control Panel & Bettery
3. Floaters
4. UV Resistive Metal Frame
5. 3 Nos Ultrasonic Transducers

northwest of the historic city of Pune. Maharashtra The city is about 15 km (9.3 mi) northwest of the historic city of Pune. Under Pimpri-Chinchwad Municipal Corporation, also known as "PCMC", Chikhali Sewage Treatment Plant (capacity of 36 MLD) plays a vital role in treating the sewage of the Pimpri-Chinchwad city mostly the raw water collected from Newale Wasti Pump House. Fig. 3 shows the overall process flow of the sewage water treatment which primarily uses Extended aeration process. Post treatment, the treated water is stored in a lake spanned over an area of 3.8 acres and used for recreational purpose, such as boating, gardening, and other non-potable purposes such as cleaning, toilet washing etc.

Table.1 shows the inlet and outlet water quality parameters from the treatment plant

Parameter	Treatment unit- I		Treatment unit- II	
	Inlet	Outlet	Inlet	Outlet
pH	6.1	7.29	6.09	7.33
DO	Nil	2.5	Nil	2.7
TSS	140	9.0	142	8.5
COD	400	36	408	36
BOD	105	9.2	105	9.0
MLSS	3953		3870	

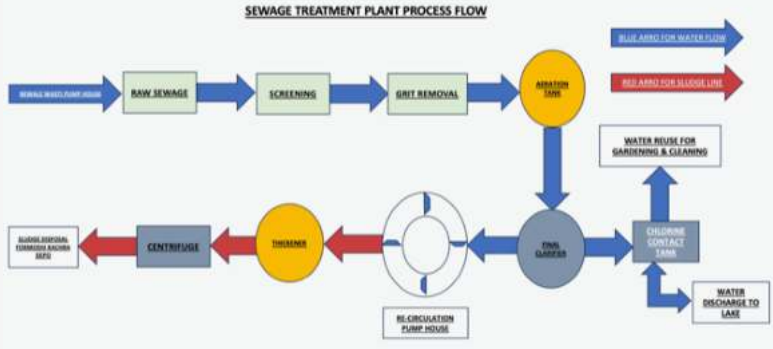


Fig. 3: Sewage treatment plant process flow at Chikhali

The primary challenge in restoring this water body was the frequent occurrence of algae and algal blooms, which not only marred its aesthetic appeal but also leads to:

- Reduced dissolved oxygen levels or complete absence of it,
- Decreased transparency,
- Elevated chlorophyll content,
- Foul odors
- Unsuitable for aquatic life

Such a large and uneven water body is much prone to algae growth and accumulation. There is no practical way to control this except by manual cleaning. SwanCav is the only alternative solution to frequent cleaning. Also, despite attempting other conventional methods such as aeration and chemical algicides, the management sought a sustainable, chemical-free solution that wouldn't harm the environment.
Owing to that, a field trial was conducted with the advanced buoy- SwanCav for preventing algal blooms and restoring water quality in the water body.

Remarkably, visible improvements were observed

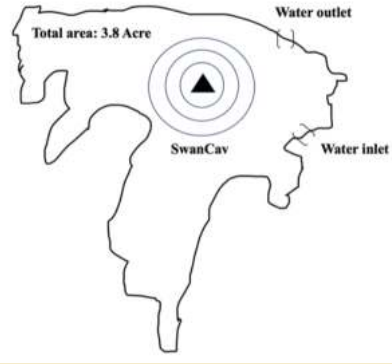


Fig. 4: The schematic of the water body

There are two treatment units in the plant and from both the units outlet, the treated water comes and is stored in the lake inside. Fig. 4 shows the schematic of the water body:

- Reduction in Biochemical Oxygen Demand (BOD) to below 5 mg/L
- Minimal turbidity and chlorophyll content
- Elimination of foul odors
- Healthier aquatic lives and eco-habitats

The observations are:

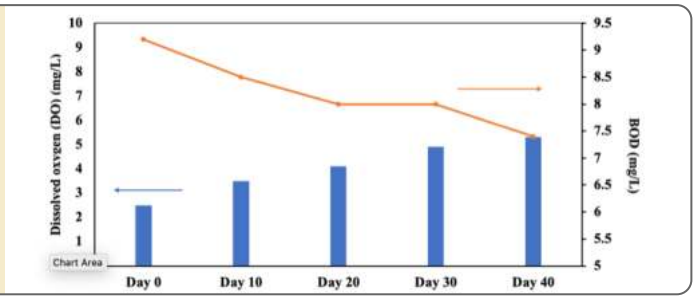
- Within few days after installation, some debris were found floating on the water surface generated from dead algae already present in the water body.
- After removing those debris, significant improvement was observed in terms of DO, pH and transparency of the water.
- The BOD level reduced from 9.2 to below 8 mg/L which is well within the State Pollution Control Board Limit.

Considering the Techno-economic analysis of SwanCav, it is completely solar power operated with battery back-up, the installation and maintenance cost is also minimal. Also no supervision is required. The system is indigenous and self operated.



Fig. 5: Change in waterbody after treatment

Fig. 6: Change in DO and BOD of the water during field testing



Parameters	Day 0	Day 10	Day 20	Day 30	Day 40
Dissolved oxygen (DO) (mg/L)	2.5	3.5	4.1	4.9	5.3
BOD (mg/L)	9.2	9.0	8	8	7.4
Chlorophyll (mg/m^3)	0.05	0.026	0.029	0.021	0.017
Turbidity (NTU)	0.5	0.1	0.1	0.08	-
pH	7.2	7.3	7.15	7.1	7.15

Table.2: Shows the improvement in water quality parameters

CONCLUSION

Utilizing advanced ultrasonic technology, the device which emits high-frequency sound waves is capable of disrupting algal cell structures, effectively inhibiting their growth and proliferation. By targeting algae at its source without the use of chemicals or harmful additives, this device offers an effective approach to water management. In spite of all, this technology is not yet grown or established in commercial scale due to various challenges such as high power consumption, high attenuation rate of the sound wave, possible unknown side effects on other aquatic lives over long exposure and difficulty to scale up. Alternatively, low power ultrasonic algae control devices offer an innovative solution to combat algae proliferation in various aquatic environments. By emitting low-frequency ultrasonic waves, these devices disrupt the growth and reproduction cycles of algae without harming other aquatic organisms. The gentle yet effective nature of these waves ensures minimal energy consumption while effectively managing algae blooms. Operating at low power levels makes them environmentally friendly and cost-effective alternatives to traditional treatment methods. These devices are versatile, suitable for use in ponds, lakes, and even wastewater treatment facilities, providing a sustainable approach to algae management while preserving the ecological balance of aquatic ecosystems.

ABOUT THE AUTHOR



Dr. Aditi Mullick, (Ph.D., Chemical Engg) is the Managing Director of Prasinos Tech Innovations Pvt. Ltd. She has worked in the field of sustainable water treatment technologies and material processing with a research experience of more than 10 years. Her domain of expertise include Ultrasound & Sonochemistry, Cavitation Technology for Process Engineering & Intensification.

Dr. Aditi Mullick, Managing Director at Prasinos Tech Innovations Pvt. Ltd.



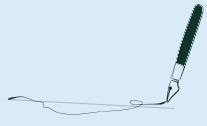
Dr. Anupam Mukherjee (Ph.D., Chemical Engg), is the CEO of Prasinos Tech Innovations Pvt. Ltd with expertise in membranes and adsorption technology specializing in greywater treatment, industrial dye treatment, skid-mounted mechanized sewage cleaning systems, point-of-use treatment units for recycling handwash water and solar-assisted membrane distillation unit for desalination applications.

Dr. Anupam Mukherjee, CEO at Prasinos Tech Innovations Pvt. Ltd.



Dr. Sobhan Ghosh Chemical Engineer, is a Process Research Consultant with Managing Innovation, a technology driven organization devoted towards searching for novel technologies and providing technical support for industrial realization.

Sobhan Ghosh, Chemical Engineer, Process Research Consultant with Managing Innovation



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AMAGUA C.E.M. DESIGNS SOLAR-POWERED WATER TREATMENT AND DISTRIBUTION NETWORK FOR ECUADOR'S SAMBORONDÓN DISTRICT

Neda Simeonova, Senior Product Marketing Manager at Bentley Systems

Using Bentley Technology Saved USD 1.2 Million in Costs and Helped Eliminate 6,905 Tons of Carbon Emissions

ADOPTING SOLAR ENERGY FOR A NEW INTEGRATED WATER SYSTEM

Amagua C.E.M. provides drinking water and wastewater management for the La Puntilla Parish in the Samborondón district of Ecuador. Committed to offering a quality, efficient water supply and sewerage service, they also provide complementary preventive system management, as well as consulting for network design, construction, and maintenance of residential facilities. To streamline operations and ensure a reliable water supply, Amagua decided to build an integrated water capture, transportation, and treatment system. "To have operational autonomy, we determined the need for an integrated collection, conduction, and treatment system that allows it to supply […] a complete flow of 880 liters per second (l/s)," said Leonidas Dávila, engineer and project director at Amagua.

The project was divided into two phases, providing a flow of 440 l/s in the first phase and an additional



Amagua's project involved designing a self-sustainable, energy-efficient plant, using all solar panels to power the pumps.

specifications and energy considerations, Amagua also had to address semi-undulating terrain and irregular topography, as well as avoid problems with transients in the 4.2-kilometer-long pipeline in the high elevation area.

To identify and mitigate potential problems that could affect the pressure and flow and compromise operations, as well as ensure that the solar panels could generate the necessary power to deliver a reliable water supply, Amagua had to perform various modeling scenarios. They needed an integrated 3D design and hydraulic modeling and analysis solution to optimize optioneering, determine the most effective network arrangement, and validate the use of solar energy.

LEVERAGING BENTLEY'S 3D DESIGN AND HYDRAULIC MODELING AND ANALYSIS APPLICATIONS

"It was proposed that MicroStation and OpenFlows Water be used to optimize the execution of the project," said Leonidas Dávila. Amagua selected MicroStation to design the entire architecture of the system in 2D and 3D, as well as OpenFlows Water to model and analyze the pipeline arrangement of the network and estimate energy consumption costs, based on both electricity and renewable energy. The advanced algorithms and 3D visualization features of Bentley's applications allowed Amagua to perform digital simulations of numerous scenarios, verifying the optimization of both the existing and future distribution networks, and validating the use of solar panels as the most efficient source of renewable energy. "Thanks to the usefulness of OpenFlows Water's energy cost module, we were able to model energy costs when using fossil fuels and when using solar panels, as well as their contribution to the carbon footprint," said Leonidas Dávila. The digital models will also be used throughout the construction and operations phases of the project.

DIGITAL SIMULATION REAPS SAVINGS AND SUPPORTS SUSTAINABILITY

Using Bentley's advanced 3D design and hydraulic modeling and analysis applications, Amagua reduced modeling time by 80%. Working in a connected digital platform improved efficiencies in data federation and data exchange processes by 75% and 80%, respectively. Through accurate modeling and simulation, Amagua shortened the planning stage by 15 days, identifying and eliminating 3,530 collisions during the design phase that was equivalent to a potential savings of USD 50,000. The integrated technology solution shaved 97 days off the construction schedule to save USD 1.2 million while achieving an optimal design that saved 40,000 tons of concrete.



Using MicroStation and OpenFlows Water optimized design, shortening the construction period by 97 days.



Bentley's applications reduced Amagua's modeling time by 80% and saved material costs.

In addition to time, cost, and material savings, the digital simulations supported the use of solar panels, delivering significant environmental and sustainability benefits by reducing energy consumption and the carbon footprint of the project. The solar panels reduced dependency on fossil fuels, eliminating 6,905 metric tons of carbon emissions. "As a result, we were able to achieve a 95% reduction in fossil fuel energy used per year," said Leonidas Dávila. Compared to conventional pumping systems, the solar-powered pumps are easier to maintain and are especially useful in rural or remote areas where electrical infrastructure may be limited, providing autonomous and reliable access to drinking water, improving the quality of life for communities. "The use of water pumping systems with solar panels offers significant environmental, economic, and social benefits," said Leonidas Dávila.

Project Summary

Organization: Amagua C.E.M.
Solution: Water and Wastewater
Location: Samborondón, Guayas, Ecuador

Project Objectives:

- To deliver an integrated water capture, transportation, and treatment system.To achieve a more sustainable, economic water supply.

Project Playbook: MicroStation, OpenFlows Water

Fast Facts

- Amagua provides drinking water and wastewater management for La Puntilla Parish.
- They determined a need for an integrated water capture, transportation, and treatment network.
- The project involved designing a self-sustainable, energy-efficient plant, using solar panels to power the pumps.

ROI

Using MicroStation and OpenFlows Water optimized design, shortening the construction period by 97 days. Bentley's applications reduced Amagua's modeling time by 80% and saved on material costs.

Callout Quote: "By harnessing solar energy, the environmental impact is reduced, and a more sustainable and economical water supply is achieved over the long term." – *Leonidas Dávila Viera, Engineer and Project Director, Amagua C.E.M.*

ABOUT THE AUTHOR



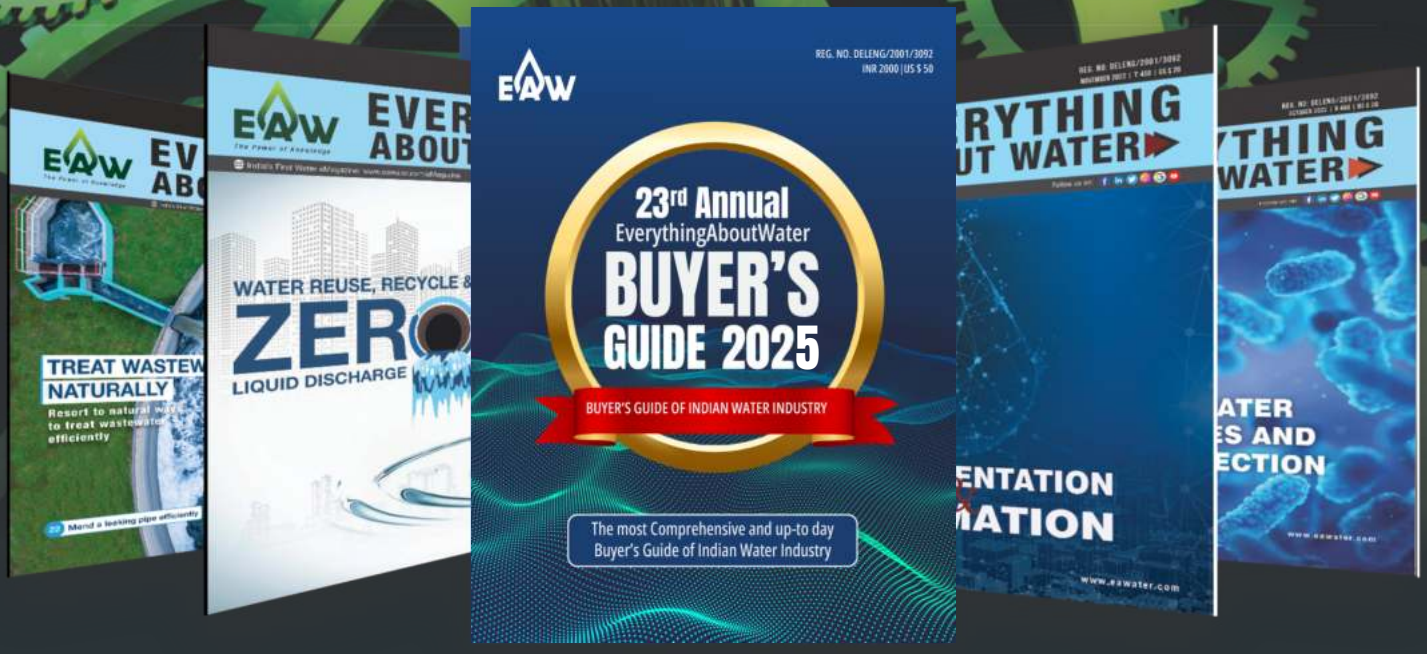
Neda Simeonova is a senior product marketing manager, water, at Bentley Systems. She has been involved in the water, wastewater, and stormwater infrastructure industry for over 20 years, including as the former editorial director of Water & Wastes Digest, Storm Water Solutions, and Water Quality Products magazines where she focused on industry trends, technology advancements, and water policies.

Neda Simeonova, Senior Product Marketing Manager at Bentley Systems

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ODOUR ABATEMENT IN FOOD PROCESSING INDUSTRY

Ajinkya Brahmane, Assistant Manager at Amalgam Biotech

BACKGROUND

Molasses, a thick and dark syrup produced as a by-product of the sugar-making process, can sometimes emit a strong, unpleasant odor.

The unpleasant odor of molasses comes from sulfur compounds or fermentation. Intense and prolonged odor exposure can cause respiratory problems such as coughing, throat irritation, and shortness of breath. Strong, unpleasant odors triggers headaches, nausea, vomiting.

One of our clients, uses molasses as a fermentation raw material to manufacture additives for bakery, distillery, food and pharmaceutical sectors. During the manufacturing process, raw materials undergo anaerobic digestion and are heated to 70-80°C. The wastewater collected in high COD MEE tank emits foul odour.

CHALLENGE

To neutralize & completely eliminate the foul odours generated in equalisation tank of ETP. The odours are because of its typical fermentation process which uses molasses as its raw material.

Odour Sources

Sr. No.	Odour Sources	Area (m^2)
1.	High COD MEE feed tanks (3 No's)	1500
2.	Equalization tank (1 No's)	250
3.	Vacuum pump vents (2 No's)	20

Malodourous Gases

Sr. No.	Gas Name	Chemical Formula
1.	Acetaldehyde	CH3COH
2.	Acetic Acid	CH3COOH
3.	Ammonia	Nh3
4.	Ethanol	C2H5OH
5.	Hydrogen Sulphide	H2S
6.	Methyl Mercaptan	CH4S
7.	Methyl sulphide	CH3S
8.	Propionic Acid	CH3CH2COOH
9.	Trimethylamine	(CH3)3N
10.	TVOC	----
11.	Sulphur dioxide	So2

Special Technical Solution

Amalgam Biotech solved the problem by undertaking:

- Onsite odour audit (with relative gas analysis)
- Onsite pilot plant trial

Additionally, we've equipped them with wheel mounted machine, capable of covering the entire surface area of these tanks with its high fog throwing capacity about 30-60 feet, in 0-60 degree angle of rotation.

FOG cannon fine mist nozzles provide < 50 microns sized water droplet.

We have recommended them to operate this fogging machine whenever they feel odour by diluting the 1 litre of 'OdoServe- Gold BI' chemical into 1000 litres of RO water.

Results

Measurement of concentrations of odorous compounds/ Gases done by on-site gas analyser. The instrument has a range of 0.1 ppm to 20,000 ppm.



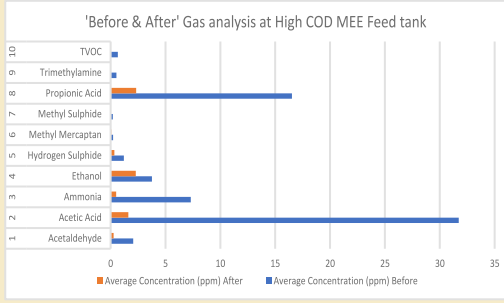
FOG Odour Control System OYI Shirval



Fog Odour Control System - Equipment OYI Shirval

A. High Cod Mee Feed Tank:

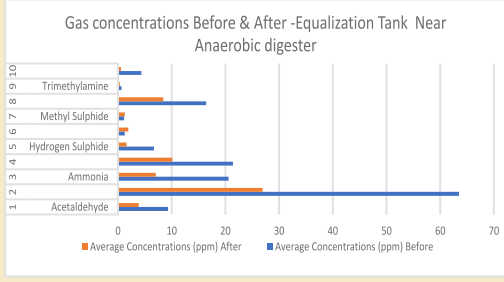
Sr. No.	Compound Name	Average Concentration (ppm)		% Reduction
		Before	After	
1.	Acetaldehyde	2.06	0.27	87.07
2.	Acetic Acid	31.73	1.62	94.91
3.	Ammonia	7.31	0.50	93.16
4.	Ethanol	3.77	2.29	39.31
5.	Hydrogen Sulphide	1.21	0.34	71.76
6.	Methyl Mercaptan	0.22	0.06	72.73
7.	Methyl Sulphide	0.20	0.02	91.67
8.	Propionic Acid	16.52	2.33	85.93
9.	Trimethylamine	0.53	0.00	100.00
10.	TVOC	0.66	0.00	100.00



Graphical presentation of Before & After Gas analysis at High COD MEE Feed tank

A. Equalization Tank Near Anaerobic digester:

Sr. No.	Compound Name	Average Concentration (ppm)		% Reduction
		Before	After	
1.	Acetaldehyde	9.34	3.87	58.56
2.	Acetic Acid	63.50	26.94	57.57
3.	Ammonia	20.60	7.03	65.90
4.	Ethanol	21.41	10.13	52.70
5.	Hydrogen Sulphide	6.70	1.58	76.42
6.	Methyl Mercaptan	1.25	1.91	-53.00
7.	Methyl Sulphide	1.12	1.27	-13.52
8.	Propionic Acid	16.42	8.43	48.68
9.	Trimethylamine	0.65	0.34	47.25
10.	TVOC	4.34	0.54	87.48

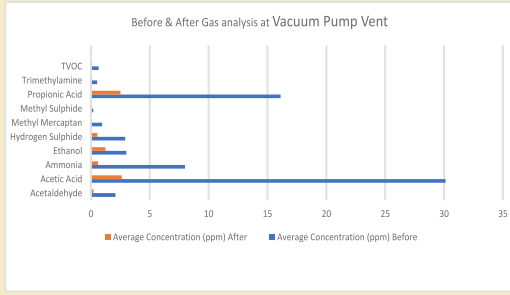


Graphical presentation of Before & After Gas concentrations- Equalization Tank Near Anaerobic digester

B. MEE Vacuum Pump Area

2 vacuum pumps emitting the foul odour through the vent.

Sr. No.	Compound Name	Average Concentration (ppm)		% Reduction
		Before	After	
1.	Acetaldehyde	2.09	0.22	89.47
2.	Acetic Acid	30.13	2.62	91.30
3.	Ammonia	7.99	0.6	92.49
4.	Ethanol	3.01	1.23	59.14
5.	Hydrogen Sulphide	2.91	0.55	81.10
6.	Methyl Mercaptan	0.95	0.09	90.53
7.	Methyl Sulphide	0.2	0.05	75.00
8.	Propionic Acid	16.11	2.51	84.42
9.	Trimethylamine	0.53	0.1	81.13
10.	TVOC	0.66	0.1	84.85



Graphical presentation of Before & After Gas analysis at Vacuum Pump Vent

ABOUT THE AUTHOR



Ajinkya Brahmane
Assistant Manager at
Amalgam Biotech

Ajinkya Brahmane, an Assistant Manager After Sales Services at Amalgam Biotech, has spent 14 years pioneering solutions in water and wastewater treatment. He played a crucial role in developingOdoServe, a high-pressure misting system aimed at neutralizing odorous gases, showcasing hiscommitment to addressing environmental challenges.

Experience: Water and Wastewater Treatment Specialist

- Led site assessments for wastewater projects, tailoring solutions for diverse needs.
- Spearheaded innovative systems like OdoServe to address environmental concerns.
- Ensured optimal system functionality, minimizing downtime and interruptions.
- Maintained a strong record of compliance with environmental regulations.

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THE EXPLOSION OF DATA VALIDATION: THE GREAT CHALLENGE OF WATER DIGITALISATION ACCORDING TO KISTERS

Stefano Vincenzo De Simone, Operational Water Solution Area Manager at Kisters

As urban water utilities face mounting challenges, digital transformation has become essential. In this interview, Stefano Vincenzo De Simone, Operational Water Management Solution Area Manager at KISTERS, discusses the role of data validation in these shifts and how technologies like IoT, AI, and big data are reshaping water management.

KISTERS is a global leader in water, weather, and environmental data management solutions, known for its scalable platforms and instrumentation. With decades of experience and expertise in managing complex data ecosystems, KISTERS helps organisations worldwide improve operational efficiency, ensure compliance, and build resilient strategies in the face of growing climate pressures and urbanisation.

WHAT ARE THE MOST SIGNIFICANT DRIVERS PUSHING URBAN WATER UTILITIES TOWARD DIGITAL TRANSFORMATION?

The way ICT has advanced so quickly has really driven down the cost of sensors, while making them a lot more reliable for measuring and transmitting data. This shift has opened the door to installing more sensors across the board, which means we're seeing an explosion in the amount of data being generated. On top of that, costs of IT infrastructure have dropped, making it easier to store and process all this data.

Urban water utilities, which often operate with a mix of private ownership and public oversight, now face a double challenge. On one hand, they have to meet strict environmental regulations, and on the other, they need to boost operational efficiency to stay profitable. At the same time, they're under pressure from rising customer expectations for reliable, high-quality water services. And with climate change adding in extreme weather events and growing water scarcity, there's an urgent need for water management strategies that are both resilient and adaptive.

> Digital transformation is essential for urban water utilities facing mounting challenges and rising customer expectations.



Digital transformation really offers the tools utilities need to deal with these pressures. It allows them to optimise their performance, stay compliant with regulations, tackle climate challenges head-on, and manage water sustainably, all while serving growing urban populations.

HOW ARE NEW TECHNOLOGIES LIKE IOT, AI, AND BIG DATA ANALYTICS RESHAPING THE WAY WATER UTILITIES MANAGE THEIR OPERATIONS?

IoT devices have really changed the game in water management by allowing real-time monitoring of things like water levels, flow rates, temperature, pH etc. This makes it possible to quickly address issues like leaks or contamination as soon as they happen. But with all this technology comes a huge amount of data, which means you need strong storage and management solutions in place. That's where companies like KISTERS come in — they use advanced analytics to make sense of the data, optimising operations by spotting patterns and predicting how the system will behave. Adding AI into the mix takes it even further, enabling predictive maintenance and smarter decision-making, which helps utilities use their resources more efficiently.

> Urban water utilities must balance strict environmental regulations with the need for operational efficiency to remain profitable

WITH ALL THIS NEW DATA BEING GENERATED, WHAT KINDS OF CHALLENGES ARE UTILITIES ENCOUNTERING WHEN IT COMES TO DATA QUALITY?

No sensor system is flawless, and if you use raw data without proper validation, it can lead to bad decisions. Data validation is a big challenge for water utilities because it takes time and expertise, plus there are concerns around integrating all that data and keeping it secure. Without the right tools, there's a real risk of falling into the "garbage in, garbage out" trap. That's where solutions like KISTERS' DataValidation Web Application come in — it makes the process easier, ensuring data quality and integration so utilities can stay focused on delivering reliable service and meeting regulatory requirements.



SO WHAT ARE SOME OF THOSE OPERATIONAL RISKS FOR WATER UTILITIES IF THEY FAIL TO ADDRESS DATA VALIDATION IN THEIR DIGITAL TRANSFORMATION EFFORTS?

Without proper data validation, utilities are taking big operational risks. Basing decisions on bad data can mean skipping necessary maintenance, facing expensive equipment replacements, or missing system failures altogether — ultimately driving up costs. Not to mention, failing to meet strict regulatory standards can lead to legal trouble and financial penalties. Inaccurate data also puts public health at risk and can leave customers unhappy. On top of that, poor data quality makes it harder to make informed, strategic decisions, which can affect long-term infrastructure planning.

HOW DOES DATA VALIDATION FIT INTO THE BROADER PROCESS OF ENSURING OPERATIONAL EXCELLENCE IN WATER UTILITIES?

Data validation is key to running things smoothly because it ensures the information you're using to make decisions is reliable. Effective validation processes, like the ones built into systems like KISTERS' WISKI Data Management System, have quality checks at every stage of data handling — from SCADA systems and operational logs to long-term storage. This kind of integration helps utilities streamline operations, make better use of resources, and improve service delivery. Plus, beyond just keeping things efficient, strong data validation supports strategic planning, keeps utilities compliant with regulations, and builds customer trust by ensuring the data is always accurate and reliable.

> IoT devices enable real-time monitoring of water levels, flow rates, temperature, and pH, allowing quick responses to issues

IN YOUR EXPERIENCE, WHAT BEST PRACTICES SHOULD UTILITIES FOLLOW TO ENSURE THEIR DATA IS BEING VALIDATED AND REFINED PROPERLY?

Ensuring proper data validation is all about balancing automated and manual processes, customised to fit the type of data, where it's coming from, and how it's transmitted. The best approach combines automated validation tools with expert oversight to tackle different data quality issues. Utilities should work closely with software providers and data science experts to design and fine-tune their validation processes. Regular training and updates are also key to keeping up with changing data needs. Having a partner with deep expertise and advanced data management solutions, like KISTERS, can really help ensure high data quality and keep operations running smoothly.

KISTERS HAS A LONG HISTORY IN ENVIRONMENTAL DATA MANAGEMENT. HOW DOES THIS EXPERIENCE TRANSLATE TO ADDRESSING THE NEEDS OF URBAN WATER UTILITIES?

KISTERS' long experience in managing environmental data naturally led us to support urban water utilities as well. Our approach combines advanced software development with deep domain knowledge, which is why we offer solutions like WISKI and KISTERS Analytics — highly scalable systems built to handle massive data loads. Many of our team members are environmental and hydraulic engineers, so they truly understand the challenges of water management, making it an easy transition for us to serve urban utilities.

When it comes to data aggregation, water utilities often have similar needs to our environmental clients, but they also have unique requirements. These can include specific interfaces and processes, and we customise our solutions to fit those needs. While some companies provide open-source platforms, KISTERS delivers a comprehensive, commercial solution that's reliable for customers who don't want to spend time developing custom tools. With WISKI, we offer a quick-to-configure, out-of-the-box system that's robust, allowing utilities to focus on operational excellence instead of software development.

Data validation is a significant challenge for utilities, requiring time, expertise, and robust integration tools to avoid bad decisions



ARE THERE ANY SPECIFIC CASE STUDIES OR EXAMPLES FROM KISTERS' ENVIRONMENTAL WORK THAT ILLUSTRATE HOW YOUR SOLUTIONS CAN ADDRESS THE UNIQUE NEEDS OF URBAN WATER UTILITIES?

Yes, we have a few great examples. One project that stands out is our work with VEOLIA (Keyhops), a big name in the water utilities sector. In this project, we focused on validating data streams from their legacy systems using our WISKI platform. What really made a difference for VEOLIA was WISKI's scalability, which let them handle large amounts of data efficiently without losing performance. Plus, we integrated data from all kinds of formats and sources, which is something KISTERS has a lot of expertise in, making the transition to a modern data management system really smooth.

Another example is our collaboration with the Dirección General del Agua in Spain. With WISKI, we helped them centralise and validate data from a nationwide network of hydrometeorological, groundwater, channel, and reservoir monitoring stations. This system now plays a key role in Spain's national water management platform, the Observatorio Nacional del Agua. Both of these projects show how KISTERS can meet the complex needs of urban water utilities, offering robust and scalable solutions that go beyond the capabilities of standard open-source platforms.

AS UTILITIES CONTINUE TO INVEST IN DIGITAL INFRASTRUCTURE, WHAT EMERGING TRENDS DO YOU SEE IN THE WAY WATER DATA WILL BE MANAGED AND UTILISED OVER THE NEXT 5-10 YEARS?

One of the biggest trends will be the integration of AI into predictive and prescriptive analytics. This shift will pave the way for creating sophisticated models that need a lot of computational power, which is why cloud-based deployment is going to be so crucial. We'll also see an increasing need for data sharing among industry players to effectively train these models, leading to the development of collaborative data ecosystems.

HOW DO YOU ENVISION KISTERS EVOLVING TO MEET THE CHANGING NEEDS OF URBAN WATER UTILITIES AS THESE DIGITAL TRENDS TAKE HOLD?

KISTERS has a strong track record of innovation and adaptability. We're committed to continually integrating new technologies and maintaining our industry-leading product expertise. By combining data science with our domain knowledge, we're in a great position to meet the evolving demands of urban water utilities and help them navigate the future of digital water management.

FOR UTILITIES JUST STARTING ON THEIR DIGITAL TRANSFORMATION JOURNEY, WHAT WOULD BE YOUR KEY PIECE OF ADVICE REGARDING DATA MANAGEMENT AND VALIDATION?

For utilities at the beginning of their digital transformation journey, prioritising data quality is crucial. It's important to start by working with data management experts to set up solid validation processes. Use advanced tools and systems that can effectively handle and refine data, even if it's not perfect at first. Ensuring that your data is accurate and reliable is essential for making informed decisions and achieving operational excellence.





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SMART WATER METERS: DRIVING BEHAVIORAL CHANGE FOR SUSTAINABLE WATER USE

Raghunandan Prasad, Managing Director at Konarak Meters

Smart water meters have revolutionized the way we manage and conserve water. Beyond providing accurate and real-time consumption data, these innovative devices profoundly impact behavioral change. By leveraging technology and psychological insights, smart water meters encourage households and businesses to adopt water-efficient habits.

INCREASED AWARENESS

Smart water meters provide users with detailed, real-time information on their water consumption. This transparency fosters awareness, enabling individuals to understand their water usage patterns. Studies have shown that simply being aware of one's consumption can lead to up to 10% reductions.

FEEDBACK LOOPS & TRANSPARENCY

Smart meters facilitate feedback loops, sending alerts and notifications when usage exceeds predetermined thresholds. This immediate feedback encourages users to adjust their behavior, making conscious decisions to conserve water.

At the same time, this increased transparency in water supply will force water utilities to be more answerable to end customers, thus compelling them to address complaints and service requests promptly.

GOAL-SETTING AND BENCHMARKING / GAMIFICATION

Many smart meter platforms allow users to set consumption targets and compare their progress with similar households or businesses. This benchmarking fosters a sense of competition, motivating individuals to reduce their water footprint.

Many smart water meter apps incorporate features that allow users to set water usage goals or participate in conservation challenges.

PERSONALIZED RECOMMENDATIONS

Advanced smart meter systems analyze consumption data and offer tailored suggestions for improvement. These recommendations empower users to make informed decisions, such as fixing leaks or upgrading to water-efficient appliances.

FINANCIAL INCENTIVES

Smart meters enable utilities to implement dynamic pricing structures, charging higher rates for excessive usage. This financial incentive encourages water conservation, as households and businesses seek to minimize costs.

COMMUNITY ENGAGEMENT

With data from smart meters, utilities can offer community-wide programs that encourage neighborhoods to reduce water usage collectively. Public awareness campaigns using data from these meters can also foster a culture of conservation, where water-saving becomes a shared goal. Studies show that individuals are often influenced by the behaviors of their neighbors and peers; if one household reduces its water usage and shares this achievement, others may follow suit, creating a ripple effect that promotes community-wide water conservation.

LEAK DETECTION AND PREVENTION OF WATER WASTE

Smart meters can detect leaks quickly, enabling consumers to address leaks promptly.

Smart meters will revolutionize the way utilities monitor and manage NRW (non revenue water) and UFW (unaccounted-for water)

MANPOWER UTILIZATION

Smart meters will transform the way water utilities/ municipal corporations manage their manpower. Humans will no longer be required to fulfil monotonous tasks and can focus on more complex, high-value-adding jobs.

Tasks prone to human error, like reading the meters, calculating consumption, and delivering bills, can be automated, no longer requiring physical access to the property/ meter site. This makes the entire process of reading and billing hassle-free and transparent for both the end consumer and the utilities.

CHALLENGES AND LIMITATIONS

While smart water meters offer many benefits,

challenges include:
1. User resistance to new technology.
2. Lack of motivation to change habits.
3. Privacy concerns.

Smart water meters are indeed a powerful tool for promoting water conservation by influencing consumer behavior. By providing real-time data, alerting users to leaks, enabling goal-setting, and encouraging community-wide initiatives, these devices empower individuals to take active steps toward sustainable water use.





ABOUT THE AUTHOR



Raghunandan Prasad
Managing Director
at Konarak Meters

Raghunandan Prasad is a third-generation industrialist and innovative leader in the smart water management industry. As the Managing Director of Konarak Meters, he spearheads the development of cutting-edge smart water metering solutions, addressing India's critical water conservation challenges.

Mr Prasad holds an Industrial Engineering degree from the Dayanand Sagar University, coupled with an MBA from the elite Indian School of Business, Hyderabad. This academic excellence equips him to navigate complex industrial challenges while driving innovative business solutions.

Carrying forward his family's legacy, Mr. Prasad's passion for innovation drives the continuous refinement of products and services in the water metering industry. His experience spans across multiple sectors, showcasing his versatility and innovative approach to problem-solving. Beyond his role at Konarak Meters, he serves as a partner in precision engineering ventures including SLS Tool Company and KLAS Technology Ventures.

Under Mr. Prasad's guidance, Konarak Meters is transforming the water management solutions landscape with both conventional and smart water meters. The company has pioneered smart water metering solutions in major Indian cities, including Bangalore, Delhi NCR, and Bhubaneswar. Through long-term collaborations with government agencies like BBMP (Bruhat Bengaluru Mahanagara Palike) and MCGM (Municipal Corporation Greater Mumbai), Konarak is leading the way in national water conservation efforts.

Mr. Prasad's technical expertise and business acumen have led to the implementation of IoT-based water management systems that have successfully reduced water losses by up to 25%-30% across the country. A standout achievement is the installation of 900,000 active meters in Bangalore alone, which now record an impressive 900 million liters of water daily, serving 12.9 million people and potentially saving 250 million liters daily in the city.

By developing sustainable water management solutions, Mr. Prasad is playing a crucial role in tackling one of India's most pressing environmental challenges. His work demonstrates how innovative technology can drive meaningful progress in resource management, positioning him as a key figure in India's water conservation efforts.

To share your feedback or enquire about the author, write to us at editor@eawater.com

BUILDING A SUSTAINABLE WATER SUPPLY WITH SMART METERING

Kriti S. Golwalla, Marketing Manager at Kamstrup



Shirpur Warwade is the first town in India to implement smart water meters and automatic meter reading system for 100% connections. Today, with the data received from 13500 smart meters installed, the daily water supply has reduced by 33% and time spent on the entire billing process has become one-third than earlier. Finally, the citizens of Shirpur have a new appreciation of the water they are consuming.

Despite its only 80,000 inhabitants, Shirpur Warwade in the Dhule district in the north of Maharashtra is a progressive town well-known within the areas of education and innovation. In 2013, Shirpur-Warwade Municipal Council (SWMC), the public utility managing the water supply in the draught-prone city, launched a milestone project of establishing 24x7 water supply throughout.

Until then, Shirpur citizens had intermittent water supply, which led to improper water usage by most intermittent supply made the pipeline network vulnerable to bursts and leakages and little attention was paid towards repairs, as timely information was not available.

In its endeavour to ensure each household clean water 24x7, SWMC was looking for a smart water metering solution that would allow them to efficiently measure and manage consumption as well as introduce fair billing for its customers.

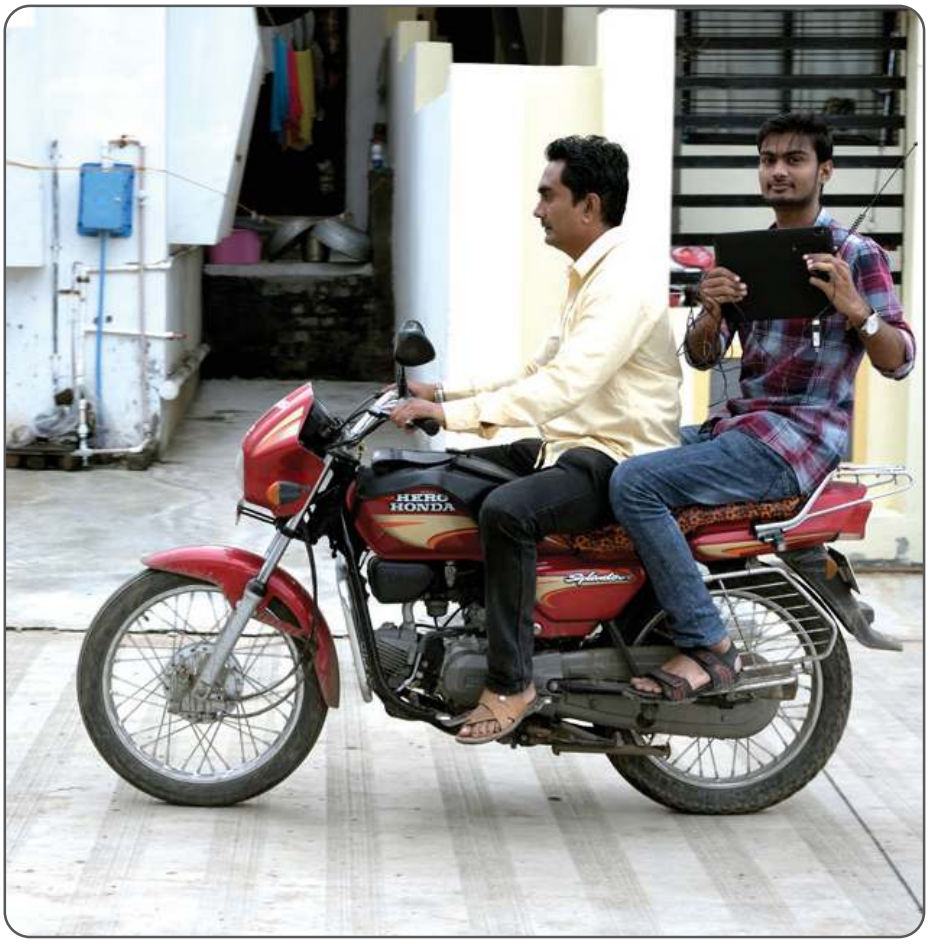
CHOOSING THE RIGHT SOLUTION

The council's primary focus was finding reliable quality meters and a dependable Automatic Meter Reading (AMR) solution with long-term operations and maintenance. Kamstrup checked all the boxes and in 2014, SWMC chose them as the city's smart metering solution provider.

Kamstrup smart meters overcome the shortcomings of traditional meters like air measurement, low flow challenges and recalibration and repair every few years. In addition to their life-long pinpoint accuracy, they include smart alarms that detect incidents like leak, burst and tamper. And their robust AMR solution drastically reduces manual efforts and risks of human error.

A CHALLENGING STARTING POINT

Since the beginning of meter installation in 2014,



	Pre meter installation	Post meter installation
Water consumption	No estimate of water consumption per capita	Exact data on water consumption per capita
Water usage	No control on water consumption, excess water usage	Citizens have become conscious about their consumption and it has drastically gone down
Daily water supply	120 million litres	80 million litres
Billing structure	Flat rate billing	Consumption based billing
Bill generation	Annually	Quarterly
NRW information	No data available	Detects leak, burst, dry with the smart alarms of the meter
Meter reading	No accountability of water	Automatic Meter Reading
Meter reading and billing	50 – 60 days	Within 5 days
Conncetion holders	High number of unauthorized connections resulting in theft of water	High number of authorized connection holders eliminating any theft
Customer service	Disconnect between the council and consumers as no data was available for meter reading	Trust and transparency between the council and consumer due to accurate meter reading

Kamstrup has been actively involved with SWMC as a change management partner. As the citizens of Shirpur were initially resistant to the new metering policy, this included conducting training sessions and reading trials for council employees to empower them with grievance handling and preparing consumer demos to ensure transparency and trust between the council and its customers.

The actual installation was not troublefree either. As an example, narrow lanes and dense housing infrastructure made it impossible to install the meters in the traditional horizontal position. However, thanks to the ultrasonic technology, Kamstrup meters work equally well in any direction and could therefore be installed in the vertical position.

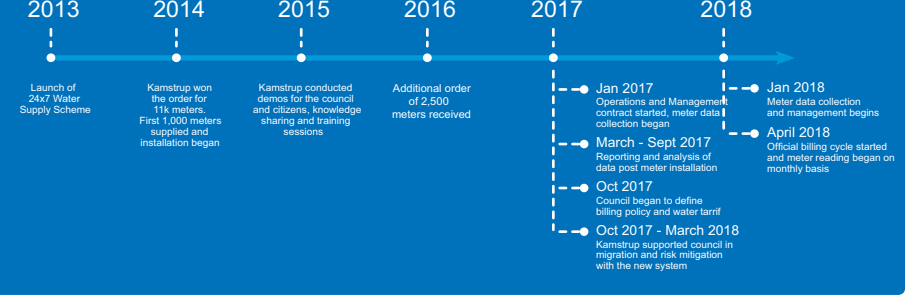
Operations and Maintenance (O&M) began in January 2017 along with meter data collection. Then followed a six-month collaborative effort with the council and the contractor, Balraj Tech, to get the data foundation right. This included physical meter/consumer data verification and creating DMA and sub-DMA for master data preparation for efficient meter reading and reporting purposes.



Kamstrup performance in the last 5 years

- 100% accurate meter data collection, meter failure rate is reported <0.15%
- Minimal human error led to increase in process efficiency
- Increased level of service from the council boosted employee performance and morale
- Offer clarity on misconceptions about metering and billing to end consumers

Project timeline



DAILY WATER SUPPLY REDUCED BY 33%

Shirpur began the official cycle for water bills in April 2018 and have already seen great results in terms of both water and time saved. With the Kamstrup metering solution, they are now recording monthly readings and issuing quarterly bills based on volume consumption, which has benefitted both SWMC and Shirpur citizens. "Today, it is much easier to track consumption and customer complaints have reduced a lot", says Shri Ulhas Agarwal, then HOD – Water Supply, SWMC. In addition, improved ease of operation in day-to-day tasks and supply process efficiency translates into an increased level of service from the field service department and boost employee performance and morale.

COMMITMENT TO WATER PRESERVATION

The efforts SWMC put into generating awareness about water conservation and consumptionbased billing has paid off. In the last 2 years, the number of high-volume consumers show a sharp decline and the otherwise low consumption consumers are now seen on the map due to the transparent and automatic meter reading mechanism.

The council has also realised and converted many unauthorised connections, thereby adding accountability at each step. Previously, most Shirpur citizens worried that their water bill would increase once the meters were installed but after seeing their exact consumption readings and being billed accordingly, they are now committed to conserving water.

"We now know how much water we are consuming on a daily basis and we are using it carefully. Even with the scarcity of water and depleting rainfall, we are assured that we will have an equitable water supply since we are paying as per consumption. This meter is very useful for that" says, Harish Mahajan, citizen of Shirpur. The effect of increased awareness is very noticeable and promising for the future, says Shri Amol Bagul, CO, SWMC: "We usually see a huge spike in water consumption in May compared to April due to the summer season, but this time, thanks to customer awareness and meter installation, we have actually been able to save 15 million litres of water in May, 2018."

Furthermore, he boasts about the 100% revenue collection the council experiences since smart metering solution came into operation.



ABOUT THE PROJECT

No. of smart meters installed
13,500

Add-ons
10 years of Operations & Maintenance with extended warranty

Contractor
Padmavati Constructions

O&M Contractor
Balraj Tech. Solutions

Kamstrup solution
flowIQ® 2101 ultrasonic smart water meter, automatic meter reading solution with USB meter reader and software.

ABOUT THE AUTHOR



Kriti S. Golwalla
Marketing Manager
at Kamstrup

Kriti S. Golwalla is a passionate marketer who enjoys working closely with customers. It is intriguing for her to create impact through consumer insights, especially in this challenging market of energy and water consumption and drive business benefits. As Marketing Manager for APAC and Middle East region at Kamstrup, her focus is on developing new markets and customer segments and identify innovative ways to interact and engage with them.

To share your feedback or enquire about the author, write to us at editor@eawater.com

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LEWA DIAPHRAGM PUMPS USED IN WAO TREATMENT OF TOXIC, HAZARDOUS INDUSTRIAL WASTEWATER FROM ETHYLENE PLANTS AND REFINERIES

LEWA GmbH

Wastewater from ethylene production in chemical and petrochemical industries as well as in petroleum refineries poses a particular challenge in terms of water treatment. As it contains hazardous pollutants such as sulfides and mercaptans, that do not respond to traditional treatment methods, chemical companies and refineries resort to Wet Air Oxidation (WAO). With elevated temperature and high pressure, this method is able to achieve oxidation of the critical compounds, making the liquid suitable for subsequent biological treatment.

The Best Available Technique (B.A.T.), as acknowledged by the European Union IPPC Commission, is the TOP – Wet Air Oxidation process developed by the Italy-based process equipment provider 3V Group. Based on this technology, 3V Tech manufactures industrial scale modular systems that reduce the chemical oxygen demand (COD) of spent caustic up to 99%, with the residual COD being detoxified, decolored and almost entirely biodegradable. To handle the spent caustic water, however, the process requires hermetically tight, high pressure pump technology that is suitable for dangerous fluids and allows for adjustable flow rates as well as high positioning accuracy. For their TOP plants, 3V Tech therefore relies on LEWA diaphragm pumps, whose patented PTFE diaphragm heads provide highest chemical resistance.

"When it comes to industrial wastewater from petrochemical and chemical plants, the effluent is contaminated with heavy and complex organic molecules. These are particularly difficult to deal with," explains Camilla Navicello, Sales Expert from LEWA Italy Srl. "Spent caustic liquors are not just odorous and highly colored, but, more importantly, contain sodium sulfides, mercaptans, phenols and emulsified hydrocarbons.

Wet Air Oxidation (WAO) is used to degrade the complex organic loaded caustic water at high pressures and temperatures with the addition of oxygen in an efficient, environmentally friendly and flexible way." Through this process, most hazardous pollutants can be degraded into easier treatable substances such as carbon dioxide, water vapor, sulfite and sulfate, and simpler organic forms, which are biodegradable in a second conventional process stage.

Among the world market leaders in terms of WAO ranks the Italy-based 3V Group with the TOP – Wet Air Oxidation process. In a process similar to flameless burning, this method is able to oxidize heavy and complex molecules at high temperature and pressure levels, reducing the COD of the hazardous liquid up to 99% and permanently removing any odor and color. Subsidiary company and process equipment provider 3V Tech realizes this method on an industrial scale, manufacturing turn-key modular systems specifically for the toxic, non-biodegradable spent caustic.

HERMETICALLY TIGHT AND SAFE PUMPS HANDLING HAZARDOUS FLUIDS

To withstand the heavily polluted and odorous water, TOP – Wet Air Oxidation plants must be equipped with a hermetically tight and safe pump. In that respect, 3V Tech approached LEWA Italy, as the pump specialists have extensive experience in this type of application. Drawing on the joint expertise of the teams from LEWA Germany and LEWA Italy, the latter thus recommended energy efficient LEWA ecoflow diaphragm pumps for this challenging project: "Our diaphragm pumps are characterized by the material as well as design of the patented sandwich diaphragm itself," explains Navicello. "Firstly, it is made from PTFE, which has higher chemical resistance than conventionally used materials like EPDM.

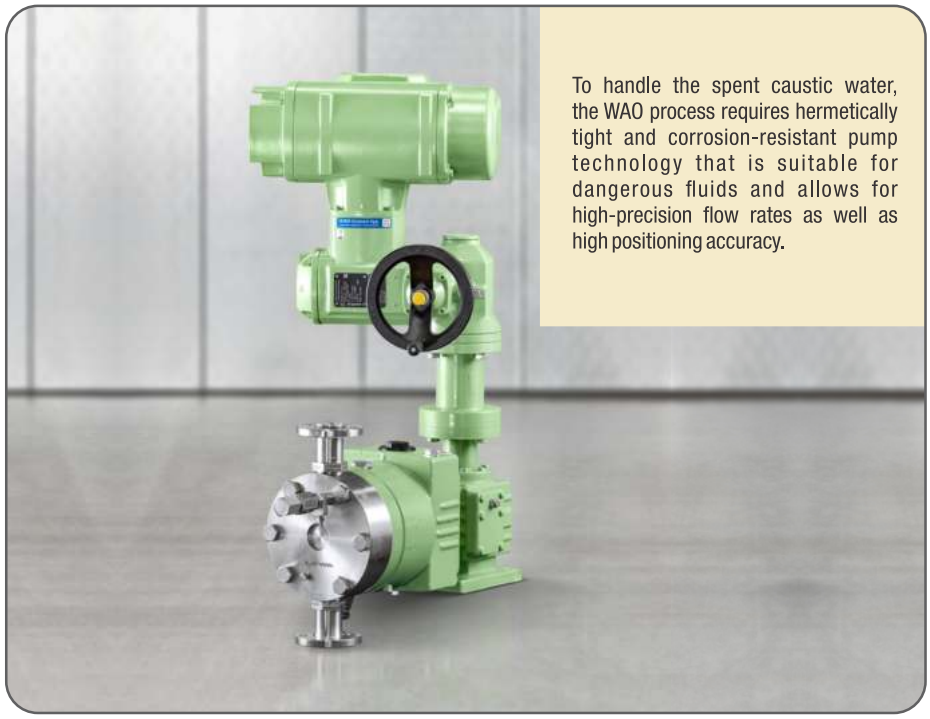
Secondly, the pump is continuously monitored by the reliable DPS diaphragm protection system." The DPS instantly detects if one of the diaphragms is damaged, while the sandwich diaphragm design is keeping the entire pump head hermetically tight even after damage has occurred. This particular construction and the special diaphragm system are the key to providing the state-of-the-art pump characteristics required for efficient and safe WAO plants.

Regarding the material of the other wetted components of the LEWA ecoflow pumps, standard 316/316L high-grade steel is usually fine to prevent corrosion even with highly aggressive spent caustic containing sulfide. Depending on the specific fluid consistency and operating temperatures, however, it may be necessary to choose special alloys such as Ti-Alloy or Hastelloy, which provide even higher chemical resistance. Ex-proof designs are manufactured, depending on the safety zone requests on site. "All pump components are designed to reliably maintain their excellent suction and overall operating conditions for extended periods of time and require low maintenance," adds Navicello. "The reliability, process safety and operator friendliness of theses pumps are outstanding. They are essential qualities when dealing with such toxic and odorous types of wastewater for very different locations worldwide."

MODULAR PUMP DESIGN FOR VARIOUS ETHYLENE AND REFINERY APPLICATIONS

Through their cooperation with 3V Tech and supplying LEWA diaphragm pumps for TOP – Wet Air Oxidation for spent caustic plants, LEWA Italy has gained extensive experience with different WAO applications. Depending on the amount of wastewater to be treated, LEWA pumps in different designs are used, with the very robust and compact LEWA triplex pump series being best suited for lager installations.

Thanks to their variable modular design, LEWA can realize specific pump solutions for WAO applications to meet all kinds of requests. Some locations even require challenging documentation and pump tests, which are also provided by the pump manufacturer. "Although LEWA Italy is in charge of the 3V Tech project, we would like to thank our colleagues from Germany for their close cooperation. With LEWA's international presence, we are capable of realizing these types of WAO solutions all over the world," Navicello concludes.



To handle the spent caustic water, the WAO process requires hermetically tight and corrosion-resistant pump technology that is suitable for dangerous fluids and allows for high-precision flow rates as well as high positioning accuracy.



For their TOP plants, 3V Tech relies on LEWA diaphragm pumps, whose patented PTFE diaphragm provides higher chemical resistance than conventional materials.

WATER SUSTAINABILITY IN AUTO DEALERSHIPS AND SERVICE CENTRES

Mr. Vivek Datta, MD & CEO at Globe Toyota

In the rapidly changing world, environmental consciousness and responsibility are paramount. As the population grows and industrialization expands, the global water demand escalates to alarming levels. Businesses in the dealership and service and maintenance of vehicles sector face increasing pressure to conserve water. It is essential to recognize the critical role played by water conservation in sustainable business practices. In today's time, it has become imperative to proactively reduce water usage, meet regulatory requirements, and contribute to global sustainability goals. At Globe Toyota, we stand at the forefront of this movement by taking proactive measures to conserve water and reiterate our commitment to environmental stewardship within the larger industry.

CHALLENGES OF WATER SUSTAINABILITY IN THE AUTO DEALERSHIP AND SERVICE INDUSTRY:

The auto dealership and service and maintenance industry faces several challenges when it comes to water consumption:

1. Demand for Water: By the nature of the business, dealerships and service centers require large amounts of water for their operations. Activities like vehicle washing, cooling systems, equipment maintenance, and domestic consumption of water create a high demand that can strain the local water resources, especially in areas where drought-like conditions persist. On average, a car wash requires 180 liters of water. However, Toyota's Eco-Wash car service consumes just about 5% of the water as compared to traditional car wash. The Eco car wash method offers several benefits. It helps reduce water consumption and prevents soil contamination that often arises with the use of chemical products in conventional vehicle wash.

2. Quality of Water: When it comes to tasks like vehicle washing and cooling systems, the quality of the water affects the performance and outcomes. It is essential to maintain water quality by implementing additional filtration and treatment measures. This makes the process more complex and adds to the costs of operations. For example, in traditional car washing soft water is required to uphold service quality. Impurities, sediment, and minerals in substandard quality water would bind to the chemicals used in car washing and lead to a significant loss in the quality of the service. A water treatment plant adds to the cost of operations.

3. Regulatory Compliances and Environmental Impact: There must be strict adherence to the regulatory requirements when it comes to water consumption as well as the discharge of wastewater. If there is failure to comply with the regulations, it may result in fines and penalties, loss of license, and damage to the brand's reputation. Improper water management has an adverse impact on the environment- water pollution, habitat destruction, and ecosystem degradation. It is essential to minimize environmental impact while maintaining the standards of operational efficiency. For eg. The National Water Policy of 2012 calls for recycle and reuse of water, a refund for properly treated water, and heavy fines for polluted effluents.

4. Seasonal Variability: Water consumption patterns fluctuate seasonally. Hot weather conditions require more water; industrial and domestic water usage at dealerships and service and maintenance centers increases substantially in the summer months. In India, unreliable monsoon seasons also affect the availability of water. These fluctuations require effective planning of water usage and water practices which is quite challenging and requires flexibility, planning, and adaptability.

5. Increased Costs: There is a significant cost involved for water consumption in dealerships and service centers. Procuring water requires significant funds depending on the water resources available. Implementation of water conservation measures also requires investments that might only show returns in the long term. Technology and infrastructure upgrades, employee training and upskilling, and water management facilities all require financial planning and prioritization.

Addressing these challenges not only requires technical expertise but also a holistic approach towards environmental stewardship. By proactively managing water consumption and implementing sustainable practices, the dealership and service industry can manage to mitigate risks and reduce operational costs while contributing towards a responsible and sustainable future.

POSSIBLE MEASURES:

By implementing the below strategies, auto dealerships demonstrate their commitment to sustainability and inspire positive change:

1. Dry Wash Campaigns: Dry washing campaigns involve cleaning vehicles without using copious amounts of water. Instead of traditional water-based washing, dry wash techniques utilize specialized products such as waterless car wash sprays that remove dirt, grime, and contaminants from the vehicle's surface.

By eliminating the need for water-intensive washing this method conserves a significant amount of water. These dry-wash products are designed to minimize runoff and prevent harmful chemicals from entering water bodies.

2. Low-Flow Fixtures and Equipment: A low-flow fixture is a water-saving plumbing fixture designed to achieve water savings by having a lower flow rate of water. Low-flow fixtures reduce water usage by at least 20% compared to standard fixtures. Lower water consumption translates to reduced utility bills for auto dealerships. This method of low-flow fixtures in faucets, showerheads, and toilets uses significantly less water compared to conventional fixtures.

3. Rainwater Harvesting: Rainwater harvesting involves collecting and storing rainwater for various purposes. Auto dealerships can capture rainwater from rooftops, parking lots, and other surfaces. This water can be used for landscaping and irrigation as well as domestic use with proper treatment.

Methods:

- Catchment- This method helps to collect rainwater from rooftops and direct it to storage tanks or reservoirs.
- Conveyance System- In this method they transport harvested water to designated areas where it gets collected for reuse.
- Filtering- This method helps to remove pollutants and debris from collected rainwater.
- Storage Tanks- Once this water gets filtered then it is ready to store and use.

4. Effluent Treatment Plant (ETP): Effluent Treatment Plant is a process engineered to manage and treat industrial wastewater for either reuse or safe disposal into the environment. This system operates in compliance with environmental regulations and purifies industrial effluents by eliminating hazardous pollutants. This helps to mitigate ecological footprint and plays an important role in promoting sustainable water practices.

GLOBE TOYOTA'S EFFORTS FOR WATER SUSTAINABILITY

As a leading auto dealership, we are committed to reducing our environmental footprint. We have implemented a range of water conservation strategies to minimize impact on water resources while setting new standards for sustainability.

1. Rainwater Harvesting: We have invested in state-of-the-art rainwater harvesting systems across our dealership facilities. This system captures rainwater runoff from rooftops and paved surfaces, storing it for various non-potable purposes such as landscape irrigation and vehicle washing. Since implementing rainwater harvesting systems, we have reduced reliance on municipal water sources by 40%, resulting in significant cost savings and a measurable decrease in water consumption.

2. Efficient Irrigation Practices: Recognizing the importance of responsible water use in landscaping, we have adopted efficient irrigation practices. This includes the use of a drip irrigation system, soil moisture sensors, and native plantings to minimize water waste and optimize irrigation efficiency. By transitioning to efficient irrigation practices, we have reduced outdoor water usage by 30% compared to conventional irrigation methods, while maintaining lush and attractive landscaping throughout its facilities.

3. Water-Efficient Fixtures and Equipment: We have upgraded our facilities with water-efficient fixtures and equipment, including low-flow faucets, toilets, and dishwashers. These upgrades help to reduce water consumption in restroom facilities, service areas, and employee kitchens. The installation of water-efficient fixtures and equipment has led to a 25% reduction in water usage. This led to resulting in tangible cost savings and a more sustainable model.

4. Continuous Monitoring and Optimization: To ensure the effectiveness of water conservation efforts, we conduct regular monitoring and optimization of water usage. This includes tracking water consumption data, conducting audits, and implementing targeted efficiency measures to further reduce waste. Through continuous monitoring and optimization, we have achieved a cumulative water savings of over 50 million gallons since the implementation of its water conservation initiatives, underscoring the dealership's commitment to sustainable resource management.

CONCLUSION

In conclusion, the exploration of the link between sustainable practices and water conservation highlights the critical role businesses play in addressing environmental challenges. Through innovative strategies and proactive measures, organizations like ours demonstrate how sustainable practices can effectively mitigate water scarcity while promoting ecological balance. As we continue to witness the interconnectedness of environmental stewardship and corporate responsibility, it becomes evident that prioritizing water conservation not only preserves vital resources but also fosters long-term sustainability and resilience. By embracing sustainable practices, businesses not only contribute to a healthier planet but also pave the way for a more sustainable future for generations to come.

ABOUT THE AUTHOR



Mr. Vivek Datta
MD & CEO,
at Globe Toyota

Mr. Vivek Datta, is the MD-CEO of Globe Toyota, a JCBL Group Company. He is a graduate of Delhi University with a Postgraduate Diploma in Business Studies from IMT Ghaziabad and possesses a refined strategic management acumen. Over the years, Mr. Datta honed his skills through diverse experiences at The JCBL Group, showcasing proficiency in international business, manufacturing procurement processes, and excelling in sales. Mr. Datta further enriched his expertise through a short-term management program at IIM Ahmedabad. He also attained a Certificate of Mastery in Sales from Business Coach India. These cumulative experiences became pivotal in his contributions to leading dealership groups, steering them toward sustainable success.

Mr. Vivek Datta's journey reflects a seamless integration of academic knowledge and practical expertise, making him a professional capable of navigating complex business landscapes and driving sustainable growth.

To share your feedback or enquire about the author, write to us at editor@eawater.com

CATALYZING WATER SECURITY IN RURAL INDIA

'INDUSTRY-CSR & CIVIL SOCIETY ORGANIZATION' COLLABORATION

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Niti Saxena, Chief Technology Officer at S M Sehgal Foundation

INTRODUCTION

India's development hinges on water security, yet it ranks 2nd in water consumption[4] and 132 in water availability per capita[5], highlighting a critical challenge. The country's agrarian economy relies heavily on water, with 80 percent[1] used for agriculture. India's water crisis is essentially an issue of the growing population rate of about 0.8% per year[6], with the United Nations[7] and other demographic studies estimating that India's population may stabilize only around the 2060s, at about 1.7 billion. India has the ability to 'survive' till then and beyond and provide clean and adequate water to its population, through (i) efficient water conservation (ii) infrastructure development (iii) policy reforms, and (iv) the public developing a 'water conscious mindset'.

Success depends on each stakeholder taking shared responsibility for the country's water security by effectively fulfilling their unique role and actively seeking synergistic collaborations to achieve optimal outcomes. The Industry-CSR[8] and Civil Society Organization (CSO) partnerships play a highly significant role in the national fabric.

S M Sehgal Foundation implements Industry-CSR projects focused on a major and vital section of the Indian population, the economically and developmentally challenged small and marginal farmers, who make up about 117 million people which is over 80% of the farming population, who produce around 60% of the total food grains and over half of the country's fruits and vegetables.[9] India cannot meaningfully, and sustainably prosper without progress reaching this segment of people. Since 2000 till date, about 25+ Industry partnerships have been implemented by the S M Sehgal Foundation in rural India, covering a population of about 5.27 million people in over 2,700 villages, 71 districts and 13 states.

Water security in villages is a complex phenomenon with intrinsically inter-dependent technical and social aspects that requires an integrated approach to create impact. This effort needs to be community-led with the active participation of women and the introduction of processes like water-budgeting. The essential features of rural water management include *— creating water conservation structures, promoting water conservation practices, improving water quality, equitable distribution, awareness, and capacity building, empowerment of women, convergence with government, strengthening existing local institutions, and setting up new water-focused 'Community-Based Organizations' (CBOs).*

The 3 case studies that have been elucidated here demonstrate (i) how rural women entrepreneurs have taken charge of a water issue that was profoundly affecting the quality of life of their community and specially the women, on a daily basis (ii) impact of a check dam (iii) utilization of modern, environmentally sustainable solar power-source in irrigation.

WOMEN-LED ENTERPRISE ENSURES SAFE DRINKING WATER IN UTTAR PRADESH

In block Chhata of district Mathura in Uttar Pradesh, an initiative led by community women in village Guheta 10 Biswa has helped the village attain drinking water security. With no natural source of drinking water near the village, the women were forced to bring water from ponds, wells, and other sources. Manjulata recalls, *'We collected three types of water for domestic use viz; drinking, washing, and bathing—since the level of cleanliness was different across water sources.'*

Omvati says, *'We had to go a long way to get a bucket of drinking water, but the water was contaminated and caused stomach infections.'* Shyamvati reveals, *'Often it was tough for us to carry such a heavy ghada (pitcher), which led to fatigue but there was no respite from this daily chore.'* The Total Dissolved Salts (TDS) in the water that they fetched was more than 1700, much higher than the permissible limit of 500 mg/L, according to the Bureau of Indian Standards (BIS).

Several activities aimed at holistic village development have been undertaken in 15 villages of the Chhata block of Mathura under the HDFC Bank Parivartan project implemented by S M Sehgal Foundation.

Village Development Committees (VDCs) formed in each village facilitate development initiatives alongside the project team. During community meetings organized by the project team, VDC members from Guheta 10 Biswa highlighted the critical issue of unsafe drinking water in their village, reporting that the water sources were contaminated with sewage, salt water, and industrial and domestic waste.

VDC members also formed a specialized group called the 'Water Users Group' (WUG) with 22 members—17 women and five men, working primarily to resolve water-related challenges in the village. WUG together with the project team came up with the concept of 'Jal Minar' (Water Tower), which could provide the whole community with clean drinking water through the use of a gravity filter, within the village. The group decided to build the Jal Minar near the government school for easy accessibility by the women. The Jal Minar was set up in March 2023 with project support and a monetary contribution of Rs 70,000 from the community, including a kilometer-long pipeline from the water source arranged by the panchayat. This collective effort strengthened the community's involvement in the initiative. However, this was not the end of the struggles. To the WUGs' disappointment, the filter that had been installed in the water tower could not adequately remove the high TDS levels in the water.

Now the task at hand for the WUG was to regain the trust of the community.

Although uncertain about the definitive solution, the team held discussions to explore further options, including the installation of a Reverse Osmosis (RO) system. This required additional financial contribution and active buy-in by the community. Five women from the WUG came forward to form a Joint Liability Group (JLG) micro-enterprise, each contributing Rs 25,000 and taking the responsibility of managing the water tower. In November 2023, with the assistance of the project team, a solar-powered RO system was installed in the Jal Minar. This resulted in both round-the-clock water availability and empowerment of women.

Being able to access clean, potable water without the hardship of walking long distances felt like a dream come true for the women. Omvati says, *'We had never thought that this would ever be possible.'* Manjulata, head of JLG, enthusiastically explains, *'The Jal Minar operates from 7 am to 10 am and 3 pm to 7 pm. The rates fixed by the group are Rs 5 for 20 liters, Rs 3 for 10 liters, and Rs 2 for 5 liters. We also supply water for marriage functions and other celebrations which allows us to earn extra income.' Another member of the WUG, Vimla adds, 'The Jal Minar lifts and stores 3,000 liters of untreated source water, which is then purified by a solar-powered RO system at the rate of 1,000 liters of water per hour. The overall storage capacity of the filtered water in the tank is 4000 liters, which is sufficient to meet the demand during peak times and ensure a steady supply of safe drinking water.'* The RO reject wastewater is repurposed for use in the school toilets, nearby. Now, Shyamvati, Vimla, Sunita, Omvati, and Manjulata are contributing to their family income. Manjulata proudly says, *'The enterprise is rewarding as we can take home Rs 4,000-5,000 a month after meeting all the operating costs and setting aside some money for repair and maintenance.'*

The Gram Panchayat has also supported the initiative by constructing an approach road, fencing around the water tank to prevent damages, and bearing electricity expenses for the operation of Jal Minar. To further strengthen the enterprise, JLG now plans to start a battery-operated vending cart to supply water directly to households and a chiller for Jal Minar.

Jal Minar is a collaborative success of the project, the community, and village-level institutions. Women managing the water tower as a micro-enterprise is a positive social change that empowers women both socially and economically.



Jal Minar caters to drinking water needs of the village

KHOHAR CHECK DAM, RAJASTHAN

India accounts for 25 percent of the world's extracted groundwater and contamination is a grave delinquent all over the country, with many crucial agricultural regions suffering from both groundwater over-exploitation and pollution. Central Ground Water Board also reports that Rajasthan follows Punjab among the states of India in the rate of groundwater depletion in India.

Conventionally, in India, water was stored through various water conservation and harvesting techniques for the dry seasons of the year. Tankas, kund, kundi, Talab, Vadis, step wells, and others are just a few means to practice conservation and harvesting. However, these traditional water harvesting technologies have been outdated due to negligence over time. The literature suggests that 'check dams' are the most commonly constructed structure in water conservation programs.

Recharge check dams, built across seasonal streams, natural drainage channels, and rain-fed runoff pathways, offer a cost-effective solution for replenishing groundwater aquifers, on which rural communities rely for irrigation, drinking water, and other essential needs. These structures act as barriers, slowing the rush of water and allowing it to seep into the soil, effectively recharging the underground water sources. Without them, the precious water rapidly and wastefully flows downstream, becoming lost to the area.

Among the villages of Rajasthan, Khohar village in Ramgarh Taluk, Alwar district has a unique significance due to its acute water scarcity and distress migration. The area is inhabited by approximately 150 households with an estimated population of 890 (census, 2011). Understanding the multitude of benefits of constructing a check dam, S M Sehgal Foundation with support from Mosaic Company Foundation, implemented the construction of check dam for rainwater harvesting in Khohar. Located at the foothills of Aravalli, the village has a vast potential for harvesting rainwater, but due to the lack of water storage structures, the rainwater runoff into the village farmland is extensively causing damage to the soils along with minimal groundwater replenishment.

An analysis of water scarcity challenges in Khohar village advocates that water security is one among the main problems that hinder the economic development and food security of the area. The village has an acute water shortage due to constant depletion of groundwater with the depths of bore wells stretching from 1000 to 1200 feet since 2016. Maximizing water productivity is the primary challenge to agricultural sustainability in Khohar. Depletion of groundwater sources is magnified by both demand-side practices of the villagers and the specific hydrogeological settings of the aquifer. Despite significant challenges, solar desalination, wastewater management, and groundwater recharge provide opportunities for improving the water security in the region.

After organizing focus group discussions, community mobilization meetings, and site identification during this period, the foundation team initiated work in July 2014. The average dimensions of the Khohar check dam are 185 meters long and 3 meters high with a capacity to hold 320 million liters of rainwater annually. Water that is retained by the check dam percolates in the ground within 48 hours and excess rainfall sometimes results in water overflow. Apart from the wall which is called the spillway, there are four nallah bunds, four loose stone structures, and two recharge wells. Nallah bunds and freestone structures act as speed breakers for flowing water; recharge wells are constructed to facilitate the infiltration of flowing water.



Check Dam in Khohar, Rajasthan

Low recharge along with excessive exploitation is the primary cause of rapid ground water depletion. Therefore, the planned recharging of groundwater along with proper irrigation is proving to be a promising solution to reduce Water Foot Print. Construction of the check dam has permitted the seasonal monsoon rains to be retained for far longer, maximizing the accessibility of a natural resource ecologically. This practice, in turn, has enabled farmers to become significantly more efficient and has made agriculture more profitable.

Key impacts post check dam construction include area under wheat cultivation increasing from 11 Ha in 2004 to 73 Ha in 2018 and, fallow land during Rabi season decreasing from 74 Ha to 42 Ha in 2014 demonstrating the significant impact of check dam. Availability of water in the village has also led to a shift from jowar based production system to cotton based production system in Kharif season and wheat-based production system from mustard in Rabi season. However, the switch to water intensive crops needs to be checked through introduction and consistent use of water efficient irrigation systems to avoid water distress in the long run.

Constructing a check dam in Khohar has been helpful in curbing the water struggle and has increased the agricultural output, provided food security, enhanced groundwater resources, and will potentially reduce poverty of the village in the coming time.

SOLAR WATER PUMPS: PROMISING ALTERNATIVES FOR IRRIGATION, IN HARYANA

'The path to the country's prosperity passes through the fields and barns of the villages.' — Chaudhary Charan Singh, fifth prime minister of India.

The availability of water is reaching a tipping point due to the relentless challenge of feeding India's ever-increasing population. So a shift to using sustainable agricultural methods is imperative. One such method is solar pumps, which are promising alternatives for making use of renewable energy and providing water for irrigation.

Jahul is a progressive farmer from Nasirbas village, Firozpur Jhirka block, district Nuh, Haryana. His family of eight members has five acres of land and the family's income comes from farming, livestock, and seasonal labor. Jahul procured a micro-irrigation system, through a subsidy from a government program.

The 320 farmer families of Nasirbas mostly grow mustard, wheat, millet, sorghum, and onions. They have electricity-operated tube wells for irrigation, which can also run on diesel. However, electricity is erratic, and diesel is a significant expense including for transportation to the farm with its supply also being unreliable, as well as it is a polluting fuel. Those farmers who depend on electricity have to cope with drudgery, as they even have to operate their pumps in the wee hours whenever electricity is available. This often leads to water shortages for irrigation.

HDFC Bank Parivartan began a three-year development project implemented by S M Sehgal Foundation, beginning in 2021. Project Parivartan aims at integrated village development of the area, including natural resource management, agriculture, education, and skill development. The project introduced solar-powered water pumps to the farmers to promote the use of renewable energy for irrigation. Irrigation through a solar water pump was a



Solar Water Pump Enables Irrigation

new idea for many farmers, including Jahul, who attended the meeting. A demonstration had to be done for the farmers to see its benefits. Through a selection process by the community, Jahul was selected for the solar pump demonstration. The pump cost of Rs 5 lakhs was covered by the project, except for Rs 88,500 which Jahul gave as the beneficiary contribution.

Some of Jahul's friends loaned him money to cover his contribution cost, and the 10 HP unit was installed in his field in February 2022.

Due to the assured and adequate water availability for irrigation from the solar pump, Jahul was able to diversify into vegetables giving him additional returns. The table below shares his additional income from vegetable cultivation in 4 acres of land, as against his previous average income of approximately Rs 1,00,000 from cereal crops in the same area of land and during the same period.

Jahul's solar pump also irrigated 34 acres of land for six other farmers who hired this facility in two seasons.

Season	Crop	Area Covered	Income (Rs)	Input Cost (Rs)	Profit (Rs)
Rabi (2022-23)	Cauliflower	0.5 acre	45,000	20,000	25,000
Kharif (2023-24)	Radish	2.5 acre	1,76,000	66,500	1,10,000
Rabi (2023-24)	Tomato	1 acre	1,80,000	30,500	1,50,000
Total					2,85,000

These farmers too were able to shift to cultivating high-value crops such as tomatoes, radishes, eggplants, and cauliflower because of the assured availability of adequate water for irrigation.

"Earlier, accessing water from the tubewell using electricity was inconvenient due to the unpredictable power supply, which comes and goes at any time of day or night. The solar water pump ensures water availability during the day."

On the whole, while there are upfront costs associated with solar pumps, which can potentially be addressed with the help of government subsidies, the benefits like minimal operating costs, and long-term savings on energy can make them a viable and cost-effective option for Indian agriculture in the long run. Along such lines, the Parivartan project is inspiring farmers to use better farming techniques to boost crop harvests and farm incomes.

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AQUA RELIES ON HYDRAULIC MODELING TO ASSIST DURING ILLINOIS EMERGENCY OUTAGE

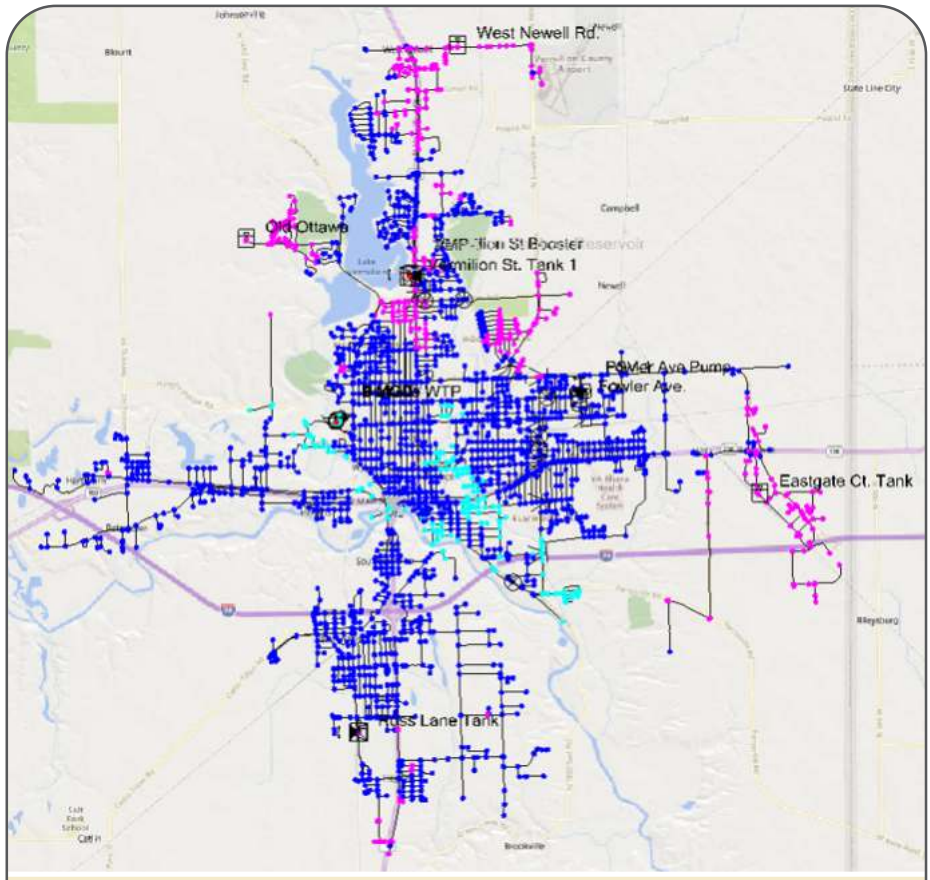
Neda Simeonova, Senior Product Marketing Manager at Bentley Systems

Leveraging OpenFlows Water accelerated the recovery schedule and reduced impacted customers by 90%.

THE DANVILLE DEEP FREEZE

AQUA, the owner and operator of over 1,700 public water and wastewater systems across their eight-state platform, provides drinking water to approximately 3 million people and wastewater service to about 250,000. TheirIllinois branch serves a total of 280,000 people spanning 14 counties, with about 20,000 connections alone in the city of Danville. In January 2024, the city experienced a deep freeze that impacted the treatment plant and, subsequently, the water service throughout the distribution system that produces an average of 6 million gallons of water a day. Rain caused increased water flows and turbidity at Lake Vermillion, Danville's water source, which was immediately followed by extreme cold temperatures. The combination of conditions severely strained AQUA's treatment facility and damaged equipment, requiring them to operate at a lower production level.

Committed to providing safe and reliable services and minimizing the number of customers impacted by the emergency, AQUA implemented digitalization efforts to facilitate effective communication with regulatory officials and the community and propose a timely recovery plan. The project included performing hydraulic modeling to provide reasonable estimates for when normal water service was going to be resumed so that families and businesses could plan accordingly. "The objective of the project was to implement real-time modeling using the previously calibrated hydraulic model and 'semi-live' system



AQUA used OpenFlows Water to create a digital replica of the entire system, providing real-time insight into network operations.

data through the supervisory control and data acquisition (SCADA) system," said Elizabeth Loughnane, senior hydraulic modeling and planning engineer at AQUA.

A NEED FOR OPERATIONAL INSIGHT AND COMMUNICATION

With AQUA's hydraulic modeling and planning group in their corporate engineering department located in Pennsylvania, more than 600 miles from the emergency event, going digital was key to support the local Danville operations team. The corporate team needed to have the same operational insight as the local team on site to effectively issue water boil advisories and to develop and communicate a timely recovery plan for reinstated service. "Communications were a pinch point that needed to be addressed [...] It was integral to get a communication plan together between local operations, my corporate team, and the outward community," Loughnane said.

To ensure that accurate network information was timely communicated, it was vital to have a digital model for real-time evaluation and insight into the water system to identify damaged equipment and compromised areas. One of the biggest challenges that AQUA faced was communicating system operations over the course of the event. They wanted to develop procedures to remotely and regularly transfer operational data between the corporate engineering team and local operations staff. AQUA realized that they needed a hydraulic modeling solution to generate a digital representation of the system. "This was crucial to get insights to parts of the system where there is no data logging and save the [local] operations team from needing to continually survey the system," Loughnane said.

LEVERAGING OPENFLOWS WATER FOR HYDRAULIC MODELING

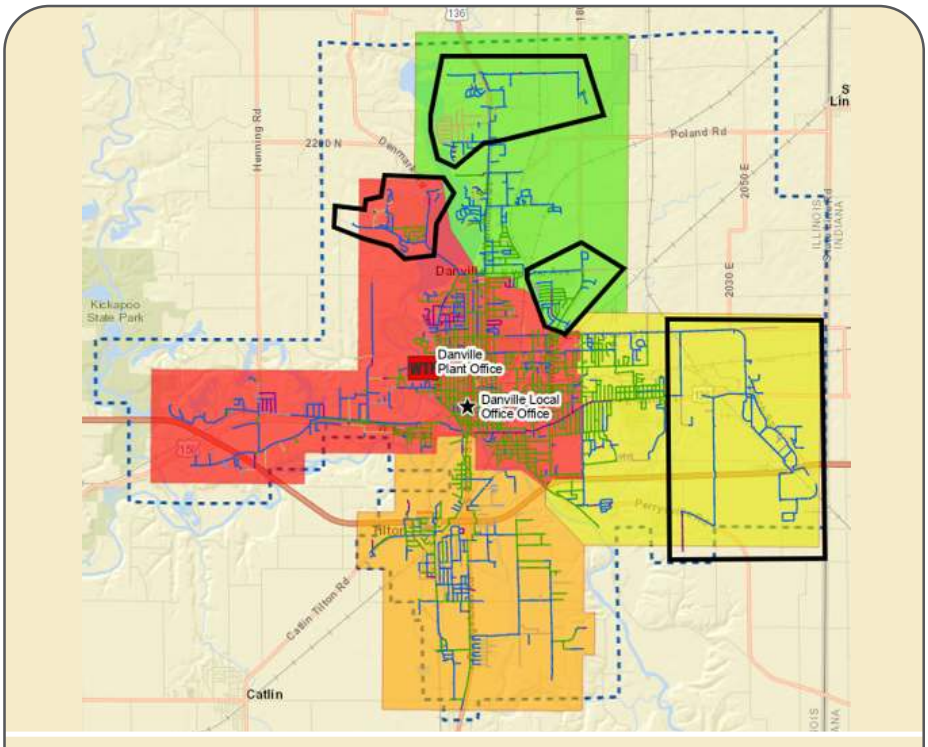
AQUA selected OpenFlows Water to perform hydraulic modeling and generate a virtual replica of the entire system. Working in an open, real-time modeling environment streamlined information sharing between the dispersed engineering and operations teams to accurately identify the impacted areas, make data-driven decisions, and forecast a recovery plan. The digital representation served a dual purpose. "First, it allowed us to denote areas of the system that dropped under the required 20 pounds per square inch; and secondly, the hydraulic model was key in creating the recovery plan," Loughnane said.

Based on the hydraulic model, AQUA had real-time, accurate insight into network performance to strategically communicate and provide support to the community, local authorities, and regulators. "We [were able to] check in on a regular frequency three times a day to discuss operational changes and run the model for forecasted results," Loughnane said. Bentley's OpenFlows application was crucial during the emergency outage to notify customers of the extent of damage and where the necessary steps could be taken to ensure their water was clean and safe to use. The model facilitated collaboration with the Illinois Department of Environmental Protection to develop and execute a timely and effective recovery plan, supporting a structured timeline and process for returning to normal operations.

DIGITALIZATION OPTIMIZES EMERGENCY RESPONSE AND SUPPORTS RESILIENCY

Developing a hydraulic model using OpenFlows was the most efficient way to identify the impacted areas and forecast the recovery, optimizing AQUA's emergency response. The model delineated the boil water advisory areas at the click of a button rather than requiring field staff to conduct pressure surveys on the system. "It allowed us to create smaller boil water advisory areas and bring the number of affected customers down from 20,000 to only 2,076," Loughnane said. Utilizing the hydraulic model, AQUA was also able to determine how long it would take to get the tanks back to their normal operating levels. They used that information to communicate a timeline to regulators and the public, positively impacting those relationships and advancing the recovery schedule. "We estimate the model approach accelerated the recovery schedule by a few days and reduced downtime, consequently," Loughnane said.

The project has become an example of what emergency response can look like for AQUA's other 1,700 systems, mitigating the costs of traditional response efforts. Moreover, hydraulic modeling can be used to detect asset conditions and ensure the network can handle an asset failure. While AQUA has always reaped benefits through hydraulic modeling, these typically have been related to capital planning, growth, and building business. This project proved that hydraulic modeling provides vital operational and asset insights to specifically address emergencies and asset health. "One of the biggest takeaways from this project is the consideration of resiliency in the system," Loughnane said.



AQUA relied on hydraulic modeling to assist with communications and the recovery plan during the emergency outage.

PROJECT SUMMARY

Organization: AQUA
Solution: Water and Wastewater
Location: Danville, Illinois, United States

Project Objectives:

- To implement hydraulic modeling for real-time operational insight.
- To minimize customer impact during emergency outage and accelerate creation of a recovery plan.

Project Playbook: OpenFlows Water

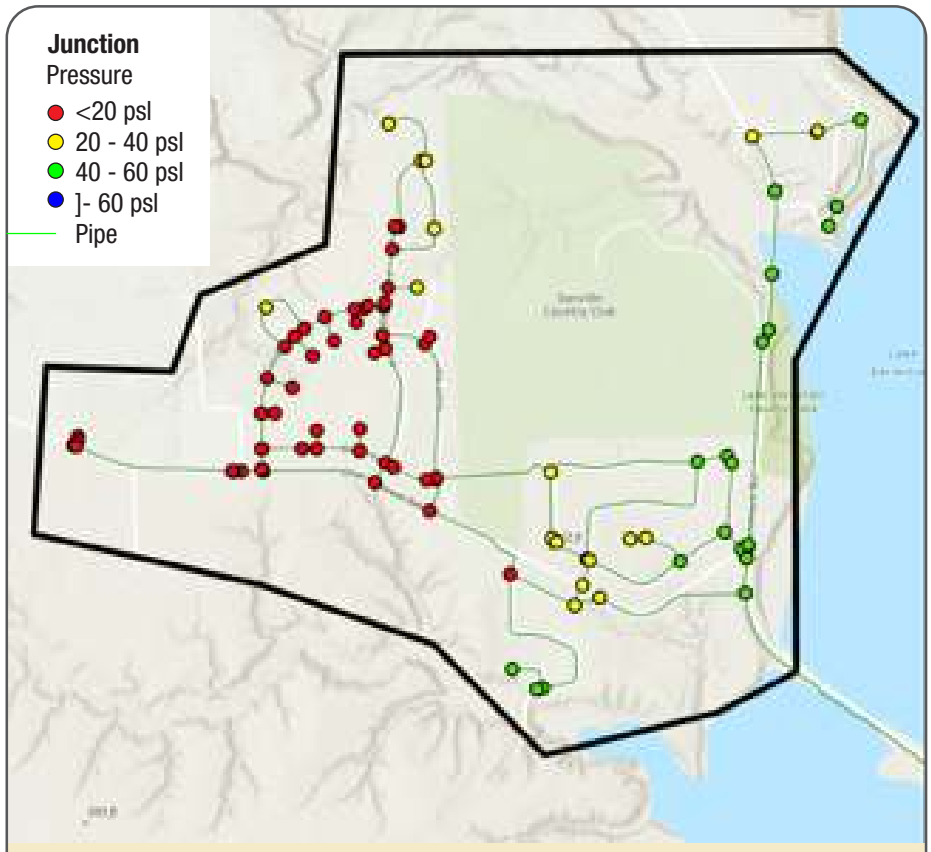
Fast Facts

- The Danville deep freeze in January 2024 impacted water service to city residents.
- AQUA relied on hydraulic modeling to assist with communications and the recovery plan during the emergency outage.
- They used OpenFlows Water to create a digital replica of the entire system, providing real-time insight into network operations.

ROI

Hydraulic modeling enabled AQUA to reduce customers under boil water advisories by 90%.

Callout Quote: "The approach to use Bentley software during this outage was the most efficient way to identify the impacted areas and forecast the recovery." – *Elizabeth Loughnane, Senior Hydraulic Modeling and Planning Engineer, AQUA*



Hydraulic modeling enabled AQUA to reduce customers under boil water advisories by 90%.

ABOUT THE AUTHOR



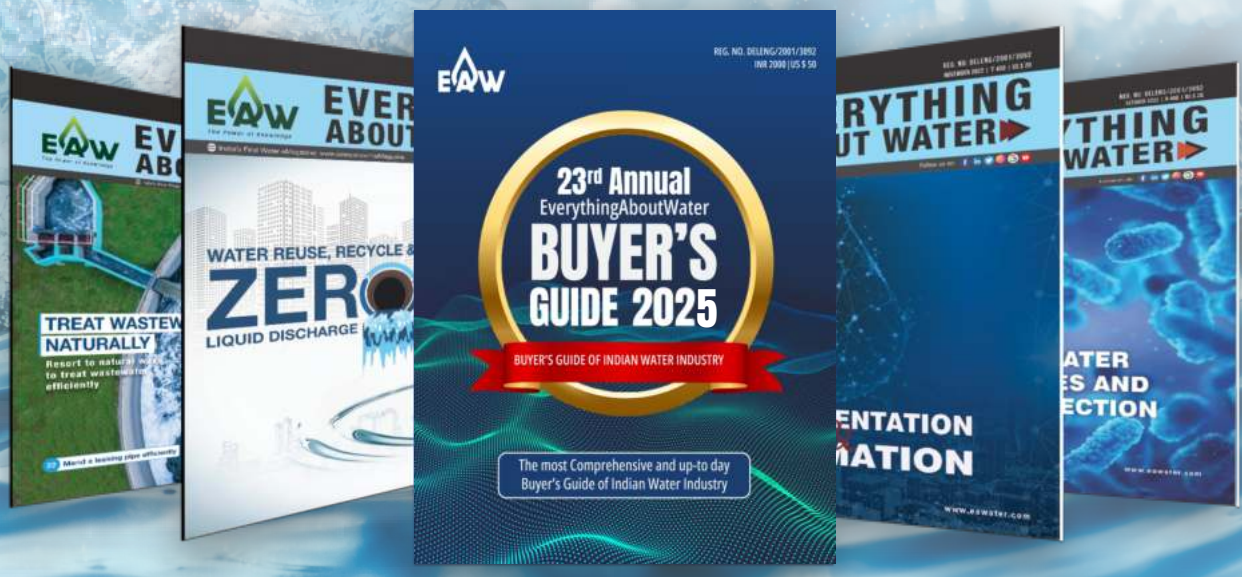
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A DEEP DIVE INTO INDIA'S HYDROPOWER REVOLUTION

Akshita Jain

The importance of hydropower in India's energy landscape, a pivotal player in the face of escalating energy needs and the global push towards sustainability. In our pursuit to decrease dependence on fossil fuels and tackle the obstacles posed by climate change, the multifaceted advantages of hydropower have emerged as a prominent solution, leading us towards a future of energy that is both sustainable and resilient.

A NEED FOR STABILITY WITH RENEWABLE ENERGY

In the realm of renewable energy, solar and wind power, while champions of cleanliness, pose a unique challenge with their intermittent nature, relying on the unpredictable availability of sunlight and wind.

This intermittency introduces stability concerns for the electric grid, prompting the need for dependable counterparts. Enter thermal power and hydropower – the unsung heroes offering the essential stability the grid craves.

The technical prowess of hydropower becomes the linchpin in stabilizing our dynamic grid. Its nimble start-stop abilities, black-start features, spinning reserve attributes, and adept voltage and frequency regulation make it the perfect candidate to navigate the intricacies of our modern energy infrastructure.

INDIA'S ENERGY LANDSCAPE - A CALL FOR RENEWABLES

As India steers towards accelerated economic growth, the thirst for energy is set to soar in the next decade. The pursuit of planned GDP growth and the urgent call to address climate change align seamlessly. Balancing the burden of significant financial outlays for coal, oil, and natural gas imports with escalating environmental concerns underscores the critical shift towards renewables.

India's bounty of rivers becomes a strategic asset in this pursuit.

Tapping into hydroelectricity from these water bodies not only signifies a clean and sustainable energy source but aligns perfectly with the nation's commitment to cleaner energy generation.

COP 26 COMMITMENTS TOWARDS A BOLD VISION FOR INDIA

Recent commitments made by the Indian government at the COP 26 events in Glasgow solidify the nation's resolve to confront its carbon emissions. India has set a high emissions target for the future, even though it is already the fourth-largest emitter in the world.

Moreover, India has outlined a comprehensive set of five pivotal elements, akin to the essence of nectar (Panchamrit), as part of its climate action agenda:

1. Attain a Non-Fossil Energy Capacity of 500 GW by 2030.
2. Source 50% of its Energy Needs from Renewable Energy by 2030.
3. Curtail Total Projected Carbon Emissions by One Billion Tonnes from the Present to 2030.
4. By 2030, the economy's carbon intensity should be lowered by 45% from 2005 levels.
5. Strive to Achieve Net Zero Emissions by the Ambitious Year 2070.



These commitments mark a paradigm shift in India's energy priorities, placing a premium on clean energy initiatives and supportive policies for renewables. Post the Paris Agreement ratification, the government's increased budgetary allocation to the renewable energy sector reinforces its steadfast dedication to fostering a more sustainable energy mix.



HOW IS HYDROPOWER BENEFICIAL FOR INDIA?

Hydropower emerges as a linchpin in this clean energy revolution, offering an array of benefits that extend beyond carbon emission reduction. Its ability to reach new remote locations with electricity not only improves living standards but also opens up new opportunities for communities. Let us understand the advantages of Hydropower are:

1. It's Eco-Friendly and Enduring
Hydropower stands out as a clean and sustainable energy source, ushering in electricity without releasing harmful greenhouse gases or pollutants. By reducing the use of fossil fuels, it will help us in reducing air pollution and combating climate change as well.

What makes it even more remarkable is its reliance on rivers and streams, part of the natural water cycle, ensuring a continuous and renewable energy supply. Importantly, hydropower plants do not deplete water resources from the environment; any water taken is fully returned over time, making its water footprint exceptionally low.

2. Flexibility at Its Core
Hydropower plants demonstrate remarkable flexibility, adapting to variations in water availability. These systems require minimal energy to come online, allowing even large plants to transition from idle to full power and vice versa within minutes. The adaptability relies on the turbine type used and effective water flow management.

3. Grid Stability and Intermittency Prevention
Pumped storage hydropower plants act as energy reservoirs, effectively addressing the intermittency challenge. Excess electricity generated during favourable weather conditions by wind or solar plants is utilized to pump water into upper reservoirs. This stored water is later employed to generate electricity through turbines during periods without sunlight or wind, thereby providing stability to the power grid.

4. Flood Risk Reduction
Hydropower plants not only generate electricity but also play a role in mitigating flood risks. By allowing precise control over the release of water, these plants significantly reduce the chances of flooding during heavy rainfall, benefiting both the environment and downstream irrigated areas.

5. Reviving Nature's Balance
Hydropower plants not only generate energy but also actively contribute to environmental restoration. They play a crucial role in reclaiming marshy areas by regulating water flow and preventing the build-up of stagnant water. Additionally, the infrastructure of these plants aids in improving river navigability by capturing solid objects like branches and trees.

6. Tourism Flourishes, Water Adventures Beckon
Hydropower installations create inviting pedestrian paths around reservoirs, initially designed for operational purposes but equally enjoyed by tourists. Enhancing these areas with bicycle paths adds to their aesthetic charm.

7. Preserving Biodiversity Havens
The reservoirs formed by hydropower plants become havens for biodiversity, fostering vegetation growth that attracts a diverse range of animals. These areas often transform into sanctuaries for various species, aided by features like channels and passage ramps that facilitate fish migration.

8. Unlocking Gravitational Energy
The colossal mass of water at higher altitudes holds an abundance of gravitational potential energy, establishing hydropower as a formidable energy source. Capturing even a fraction of this potential translates into a significant and dependable energy supply.

9. Economic Wisdom in Investment
Despite the substantial initial investment required for setting up a hydropower plant, its economic viability in the long run surpasses that of other energy sources. Once the infrastructure is in place, maintenance demands are minimal compared to the upfront investment. The integration of digital technologies further bolsters efficiency, reducing waste and optimizing overall operations.

10. Propelling Innovation Forward
The world of hydropower is a hub of ongoing innovation, with emerging technologies continually enhancing machinery efficiency. Technology plays a pivotal role in ensuring robust maintenance practices and maximizing safety standards, steering the industry toward a sustainable and innovative future.

CHALLENGES WITH NAVIGATING THE PROJECTS

Despite its vast potential, the hydropower sector in India faces formidable challenges. With an estimated hydropower potential of 1,45,320 MW (excluding small hydro projects), the realization of this potential has been hampered by contractual conflicts, environmental litigations, local disturbances, financial stress, and the reluctance of purchasers.

In a bold move in March 2019, the Indian government accorded renewable energy status to large hydroelectric projects (HEPs), paving the way for these projects to access concessions and green financing akin to other renewable energy ventures.

Yet, obstacles endure, spanning from the lengthy task of acquiring land to the complex matters of relocating and rehabilitating communities (R&R), obtaining clearances for forests, facing financial constraints, and ensuring the development of essential infrastructure like roads and bridges.

A CALL FOR A HYDROPOWER REVIVAL

To meet the ambitious target of generating 500 GW of electricity from renewable sources, hydropower must be granted greater focus and recognition.

The recent assurance from the power minister regarding enhanced attention to hydropower instils confidence that India is poised for a significant upswing in hydropower generation in the years to come.

The synergy of solar, wind, hydropower, and green hydrogen presents a formidable arsenal in India's quest to achieve its clean energy targets. By strategically integrating these diverse sources, India can pave the way for a sustainable and resilient energy future.

INDIA GREENLIGHTS AMBITIOUS DIBANG HYDROPOWER PROJECT AMID CHALLENGES

In a significant move to bolster its renewable energy portfolio, India has given the nod to its largest hydropower venture to date. The Dibang project, nestled in the mountainous north-eastern region bordering China, has received government approval with an estimated investment of 319 billion rupees ($3.9 billion). The nation's electricity grid is set to receive a boost of 2,880 megawatts through a colossal nine-year undertaking led by NHPC Ltd., the state-run hydropower generator.

Key Points:

1. Renewable Push
India's green energy agenda receives a boost with the approval of the Dibang project, marking a significant step in the nation's transition from coal to renewable sources. Hydropower is a significant source of renewable energy essential for preserving grid stability when dealing with the intermittent nature of solar and wind power.

2. Environmental Concerns
Despite the renewable benefits, large-scale hydropower projects often come under scrutiny for environmental damage and community displacement. The Dibang project, spanning over 5,000 hectares of forest land, raises concerns about potential environmental risks and community dislocation.

3. Project Timeline
NHPC Ltd. envisions a nine-year timeline for the Dibang project's completion. However, scepticism arises, with critics highlighting the challenges posed by local protests and geological complexities.



Such hurdles have previously led to delays in Himalayan region projects, impacting construction schedules.

4. Cost-Benefit Analysis
Himanshu Thakkar, coordinator for the South Asia Network on Dams, Rivers, and People, questions the viability of the Dibang project, anticipating higher costs and lower benefits. Environmental concerns and potential delays due to protests could make the project economically less feasible.

5. Government Support
The approved investment includes a significant sum of 67.2 billion rupees earmarked for government support, focusing on flood moderation and essential infrastructure like roads and bridges. These backing aims to address some of the challenges associated with the project.

Despite the hurdles, India's ambitious move reflects its commitment to expanding renewable energy capacity. The Dibang hydropower project, while facing scrutiny, marks a significant stride in the nation's pursuit of a sustainable and diversified energy landscape.

EMBRACING THE PROMISE OF HYDROPOWER FOR FUTURE GENERATIONS

In wrapping up, hydropower emerges as a promising force in India's journey towards a greener and more sustainable energy blend. Striking a balance between environmental considerations and the crucial need for a stable grid, hydropower takes centre stage in India's shift towards becoming a renewable energy hub.

India has the capability to unlock the immense advantages of hydropower by focusing on diligent



endeavours, progressive policies, and a collective resolve to overcome obstacles. This will pave the way for an era of plentiful energy that resonates with the aspirations and ambitions of future generations.

FAQs

Q1: What is the hydropower potential in India?

A: India boasts a hydropower potential of approximately 1,45,000 MW. At a 60% load factor, this potential can effectively meet a demand of around 85,000 MW.

Additionally, there's an estimated potential of 20,000 MW for power generation from Small Hydropower Projects.

Q2: What percentage of electricity in India comes from hydropower?

A: Hydropower contributes to about 22% of the electricity generated in India. This diversification in the energy mix sees thermal power plants leading at 65%, nuclear power plants at 3%, and the remaining 10% from alternative sources like solar and biomass.

Q3: Which is the largest hydroelectric power plant in India?

A: The Tehri Hydropower Complex takes the lead as the largest hydroelectric power plant in India, boasting a capacity of 2,400 MW. Situated in Uttarakhand, it stands as the highest hydroelectric power project in the country. Commissioned in 2006, its construction commenced in 1978 with technical collaboration from the former USSR.

ABOUT THE AUTHOR



Akshita Jain, a former college student, possessed numerous ambitions and dreams. Despite being an average student and struggling with coding in college, she explored various fields. After acquiring new skills and delving into marketing, content writing, and SEO, Akshita decided to fully commit to these areas. Engaging in online projects and networking with individuals who supported her growth, she is now working diligently to realize her dreams. Akshita believes that taking the right actions at the right time can work wonders for one's aspirations.

Akshita Jain

To share your feedback or enquire about the author, write to us at editor@eawater.com



ALGAE OUTBREAKS IN RESERVOIRS THREATEN OUR NATION'S POTABLE WATER SUPPLY

Jeff Elliott, **California -Based Technical Writer**

The U.S. has over 84,000 reservoirs, ranging from large-scale ones like Lake Mead to small municipal reservoirs. Their combined storage capacity exceeds 600 million acre-feet of water. These reservoirs serve various purposes, including drinking water supply, recreation, irrigation, flood control, and hydropower. Some are exclusively for drinking water, some are recreational, and many are multi-use.

As public utilities, reservoirs are subject to more stringent management standards and must meet requirements for a range of water quality parameters that are not typically a concern for recreational water bodies. Those responsible include federal agencies (e.g., U.S. Army Corps of Engineers, Bureau of Reclamation), state governments, municipal water districts, and private organizations. Drinking water reservoirs often fall under the jurisdiction of local water utilities and health departments.

For these agencies, maintaining consistent water quality is essential for the effective operation of water treatment plants. Seasonal changes such as stratification of the water column can result in reductions in dissolved oxygen levels and increases in pH, levels of dissolved metals such as iron and manganese, taste and odor problems due to geosmins, total organic content, algae levels and in extreme cases, toxic cyanobacteria bloom events.

Algae outbreaks can release toxins like microcystins, which contaminate drinking water supplies. This contamination can cause water treatment disruptions, increased costs, and health risks like liver damage or gastrointestinal illness. Notable incidents include Toledo, Ohio's 2014 crisis, where residents were unable to use their tap water for days.

With greater volatility in weather and climate, seasonal changes in water quality are becoming more frequent and pronounced. This leaves many treatment plant operators battling to respond and cope. Many are now actively seeking solutions that can minimize fluctuations in water quality consistency to reduce chemical costs, eliminate plant downtime for backwashing, and assist in meeting compliance standards for potable water.

ALGAE OUTBREAKS

Algae outbreaks are more common in areas with high nutrient runoff, such as agricultural regions in the Midwest and Southeast. Outbreaks have been reported annually in states like Florida, Ohio, Oregon and California, with increasing frequency due to rising temperatures and nutrient pollution.

High levels of algae in the upper water column and deoxygenated water in the lower column can create numerous issues. In the upper column, excessive aquatic plants and algae can clog plant intakes and filtration equipment. In the lower column, geosmins, high levels of dissolved metals, high organic content, and hydrogen sulfide can lead to taste and odor problems that result in customer complaints. The problem can become so severe that water drawn from deeper gates can become untreatable despite purification treatment.

Changes in raw water quality can result in elevated algae levels that block treatment plant filters, requiring frequent backwashing which disrupts production and increases chemical treatment and costs. Increased chlorination produces disinfection by products which can negatively impact compliance.

Algae blooms also contribute to the build-up of sediment, as well as fish kills that impact local wildlife in the food chain and can impact recreational activities such as fishing.

THE SEARCH FOR EFFECTIVE SOLUTIONS

Despite significant financial investments over many years, there has been little improvement in the condition of US lakes. In fact, according to a GAO report on water quality published in June of 2022 (https://www.gao.gov/products/gao-22-104449), the health of our lakes has deteriorated consistently over the past two decades.

Conventional approaches to addressing inconsistent water quality often involve the use of treatment chemicals and auxiliary treatment processes, which can increase plant operation costs and, in the case of chemical usage may generate potentially harmful byproducts.

Chemicals can also lead to a detrimental cycle that accelerates the deterioration of the reservoir's ecosystem. The elimination of algae results in the release of toxins, leading to the destruction of more beneficial organisms and favoring the proliferation

and dominance of the harmful organisms in the lake. Over time, the continued application of algaecides causes lake algae blooms to worsen. In other words, the symptoms are treated temporarily, but the patient never gets better

"Fortunately, there are more effective natural, chemical-free processes that can be implemented to address the root causes of water quality degradation, not just the symptoms," says Dave Shackleton, president of Clean-Flo International, a US-based leader in biological water management solutions for managing water quality,

"The focus should be on maintaining the reservoir's balance of nutrients, organic matter, and dissolved oxygen, and promoting desirable aquatic organisms that help maintain a natural balance in the reservoir's ecosystem that ensures nutrient clearance," adds Shackleton.

To ensure a reservoir is suitable for public water supply, its quality must be consistent throughout the water column, and throughout the year, with a proper balance of nutrients and dissolved oxygen distributed evenly.

Sediment accumulation must also be addressed, which can become part of the permanent morphology of the lake. Simply physically removing and dumping sediment elsewhere through dredging techniques doesn't allow the nutrients to be recycled within the lake ecosystem. Bioaugmentation, which involves the use of enzymes to break down organic muck, like a compost pile is a better solution.

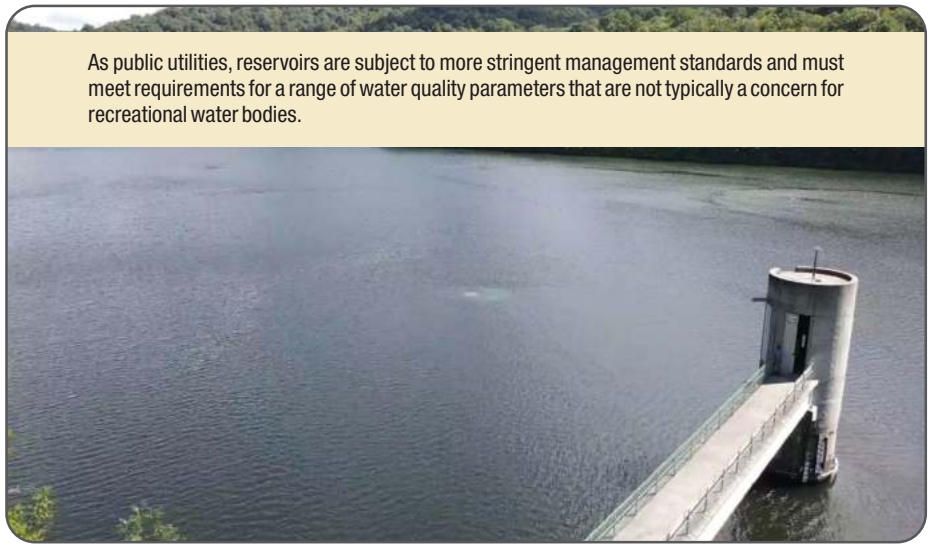
Critical micronutrients can also be introduced to stimulate the growth of organisms that form the foundation of a productive food web.

The good news is that consistent use of these products over time reduces nutrient availability and helps maintain clean, healthy water.

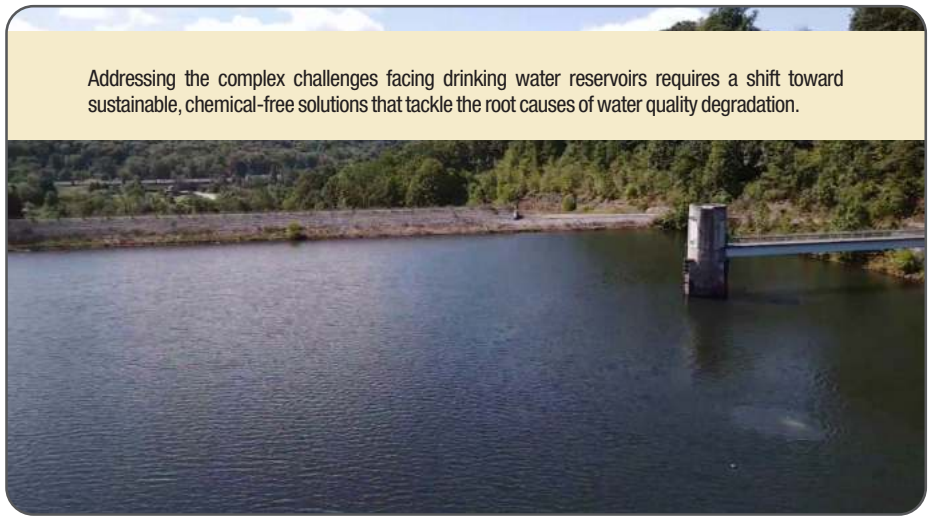
In applications in the United States and in other countries, documented improvements in pH levels, increases in dissolved oxygen, reduced levels of manganese, iron, algae, turbidity, total organic carbon, dissolved organic carbon, nitrates, nitrites, hydrogen sulfide, and geosmins can occur within even a few months. The result is more consistent reservoir water quality, reduced chemical usage, and lower operating costs of treatment plants.

CASE STUDY: BOWLING GREEN, OHIO, DRINKING WATER RESERVOIR

The city of Bowling Green, Ohio, draws water from the Maumee River into its reservoir prior to treatment to supply safe potable water to its citizens. In summer, the Maumee River is typically overwhelmed by toxic cyanobacteria for several months. Because the reservoir only holds about 30 days' supply, the city is forced to draw this cyanobacteria ladened water into the reservoir.



As public utilities, reservoirs are subject to more stringent management standards and must meet requirements for a range of water quality parameters that are not typically a concern for recreational water bodies.



Addressing the complex challenges facing drinking water reservoirs requires a shift toward sustainable, chemical-free solutions that tackle the root causes of water quality degradation.

For several years this became a problem as cyanobacteria began to dominate the phycological profile of the reservoir to the same degree as it does in the reservoir.

To resolve the issue, in the late 2000's a bottom based aeration system was installed in the reservoir, but this did not control the cyanobacteria and by 2016 it proved necessary to add the use of a peroxide-based algaecide to the reservoir.

These two interventions combined were unable to control the situation. In late 2016 the proportional dominance of cyanobacteria in the river and in the reservoir were still about the same at approximately 68%. The absolute numbers in terms of cell count were slightly reduced in the reservoir due to the application of algaecide, but this did nothing to constrain the dominance of cyanobacteria.

In April 2017, the City of Bowling Green decided to install Rapid Acting Dissolved Oxygen Restoration (RADOR) technology from Clean-Flo International. Numerous studies have demonstrated that high, stable oxygen levels reduce nutrients and minerals in the water column and can keep phosphorus locked into the organic sediments.

"By increasing dissolved oxygen levels throughout the

water column, the RADOR system initiates a sequence of events that bio-dredge mucky sediment, control aquatic weeds, improve water quality, reduce organic muck, nutrients, odor, harmful gases, and coliform bacteria. This helps to restore the nutrient clearing capacity of the food web by improving fish growth and health," explains Shackleton.

Clean-Flo designs its RADOR systems using compressors of various sizes based on the lake and application, along with self-sinking airline and diffusers that maintain full oxygenation from the bottom to the surface of the water.

Data collected a year later showed that the total phycological cell count was reduced by around 75% and cyanobacteria were all but eliminated completely. By 2018, despite having to draw water from the river at a time when cyanobacteria levels were extremely high, total cell count, and cyanobacteria levels were well controlled in the reservoir.

"The implementation of the… RADOR system enhanced water quality and it is an important tool for its reservoir management." Daryl Stockburger, Assistant Director of Utilities, City of Bowling Green.

CASE STUDY: TOA VACA, PUERTO RICO, DRINKING WATER RESERVOIR

Toa Vaca reservoir in Puerto Rico, built in 1972 and covers 836 acres and is over 51 meters deep when full. By 1985, the reservoir showed serious symptoms of water quality deterioration due to eutrophication.

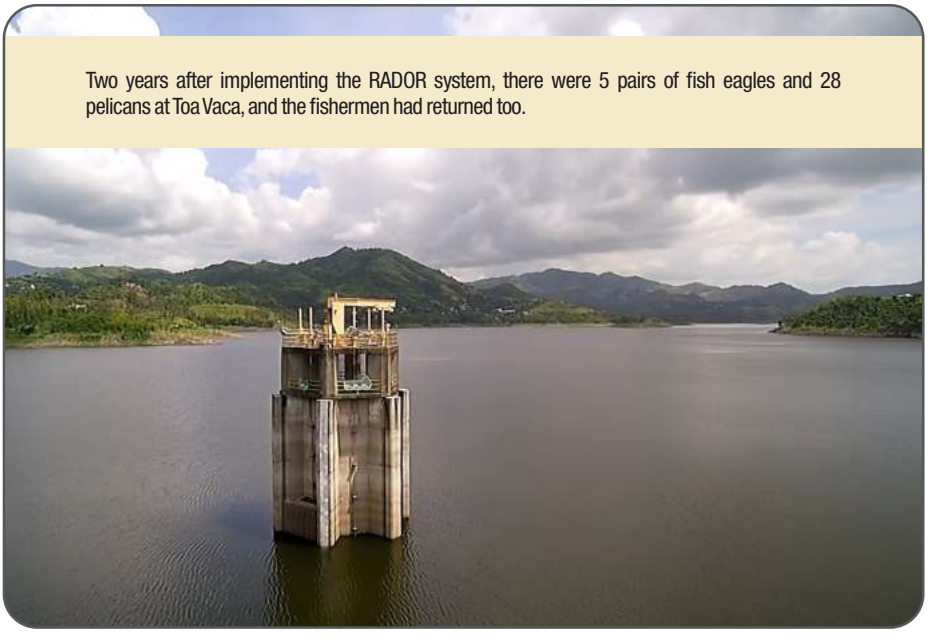
The intake tower consists of six gates, numbered one to six from bottom to top. As early as 2009, due to eutrophication, only the upper two abstraction points (gates five and six) could be used to draw water for purification treatment.

Water from deeper gates was untreatable due to high levels of manganese and contaminants causing foul tastes and odors, such as geosmins and hydrogen sulfide. However, drawing water from the upper levels also presented problems, as high algae levels clogged filters and required the use of high levels of flocculants and chlorine in the purification process, generating excessive levels of trihalomethanes (TTHMs), a carcinogenic byproduct of chlorination.

By 2012, high levels of manganese, hydrogen sulfide, and toxic cyanobacteria in the upper water column made it increasingly difficult to produce potable water that met regulated standards. The future prognosis for the reservoir was poor, with fish kills becoming so common that recreational fishermen and birds of prey had abandoned the reservoir.

Recognizing that conventional aeration would not achieve the necessary improvements due to the reservoir's size, depth, and chemical and biological problems, including severe manganese and cyanobacteria issues, the utility sought experienced engineering and specialized technology.

"In seeking a solution for the problems at Toa Vaca we knew that conventional aeration would not achieve the necessary improvements.



Two years after implementing the RADOR system, there were 5 pairs of fish eagles and 28 pelicans at Toa Vaca, and the fishermen had returned too.

The problems were both chemical and biological with the severe algae and cyanobacteria problems. We needed experienced engineering and specialized technology," says Carlos Gonzalez, GIT Puerto Rico.

Initial bathymetric analysis revealed that the reservoir is up to 51m deep, but drought can cause the water level to drop by over 20m. Ensuring full oxygenation across the scale and scope of these variations required RADOR oxygenation technology.

Several key parameters were closely monitored during the first 3 months and significant improvements almost immediately observed in the quality of potable water produced by the two purification plants drawing water from the reservoir.

Specifically, the goal to increase dissolved oxygen (DO) levels to at least 4mg/l at the surface was achieved within approximately a month and maintained thereafter. The target was also achieved and maintained at 70 feet or 21m depth within the first 3 months of operation.

Establishing adequate dissolved oxygen levels is a critical prerequisite to being able to address the other problems being encountered such as high levels of dissolved nutrients, and manganese and taste and odor issues. The ability to de-stratify and oxygenate the water column of a large deep body of water such as this rapidly is what distinguishes RADOR technology from conventional aeration and oxygenation.

A 75% reduction in total phosphorus levels to no more than 0.02mg/l at the surface was achieved within the first two weeks and the target limit was achieved after 3 months. The target was also achieved and maintained at 70 feet or 21m depth within the first three months of operation.

Excessive levels of metals such as iron and manganese are a common problem in reservoirs where dissolved oxygen levels are depleted. At Toa Vaca the problem was high manganese concentrations and a target level of no more than 0.05mg/l was achieved and maintained after approximately 2 months of operation. Initial manganese levels were higher at depth due to the deoxygenation of the water column, but the target was also achieved and maintained at 70 feet or 21m depth within the first three months of operation.

Within the first year of implementing the RADOR solution, cyanobacteria and algal blooms were reduced to such an extent that chemical treatment costs at the water purification plant were halved, as were the levels of TTHMs.

The deterioration of water quality in Toa Vaca reservoir not only affected the water supply but had resulted in frequent fish kills and a significant reduction in the fish-life in the dam. This resulted in a dramatic reduction in birds of prey; there was just a single remaining pair of fish eagles and only 5 pelicans remaining. Fishermen had abandoned Toa Vaca as a site for recreational fishing. Two years after implementing the RADOR system, there were 5 pairs of fish eagles and 28 pelicans at Toa Vaca, and the fishermen had returned too.

Addressing the complex challenges facing drinking water reservoirs requires a shift toward sustainable, chemical-free solutions that tackle the root causes of water quality degradation. Algae blooms and nutrient imbalances pose significant risks not only to public health but also to the long-term viability of these vital water sources. By implementing natural processes that restore the ecosystem's balance, water management agencies can improve reservoir water quality and reduce the reliance on costly chemical treatments.

With proven results in improving reservoir health, these approaches offer a path forward to safeguard clean, potable water for communities while fostering healthier ecosystems. It's time for water management agencies to prioritize these innovative and nature-based solutions to secure our nation's future water supply.

For more information, visit www.clean-flo.com; email contact@clean-flo.com; or call 1-800-328-6656.

ABOUT THE AUTHOR



Jeff Elliott is a Torrance, Calif.-based technical writer. He has researched and written about industrial technologies and issues for the past 20 years.

Jeff Elliott, California -Based Technical Writer

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TRANSFORMING INDIA'S WATER MANAGEMENT: AECOM'S ROLE IN BUILDING SUSTAINABLE WATER SYSTEMS

Sharad Bhushan, Executive Director, Environment, Water and Energy at AECOM

India's rapid urbanization and industrialization have created significant pressure on the country's water resources, making sustainable water management one of the most pressing challenges of the 21st century. From erratic rainfall patterns to rising industrial demands, India faces a complex water management landscape that requires innovative, climate-resilient solutions. AECOM, a global leader in infrastructure consulting, has been at the forefront of transforming India's water management approach by delivering sustainable, technology-driven solutions that meet the needs of both urban and industrial sectors.

AECOM'S PIONEERING ROLE IN WATER MANAGEMENT

AECOM has consistently been a leader in developing integrated infrastructure plans that address both the growing demand for water and the need for environmental sustainability. The company's approach focuses on utilizing cutting-edge technologies, adopting climate-resilient designs, and ensuring efficient operations to provide sustainable water solutions. AECOM's work spans a variety of sectors, including urban water management, industrial wastewater treatment, and stormwater management, contributing significantly to India's smart city initiatives and industrial water management projects.

KEY CONTRIBUTIONS OF AECOM IN INDIA'S WATER MANAGEMENT LANDSCAPE

1. Smart Cities and Urban Water Solutions

India's ambitious Smart Cities Mission aims to transform urban centers into sustainable, efficient, and livable environments. AECOM has played a pivotal role in this transformation by developing and implementing advanced water management systems that ensure optimal water use while promoting sustainability.

A prominent smart city in South India: AECOM was instrumental in the creation of a water master plan for this smart city project, which was designed to optimize water supply, minimize losses, and ensure sustainable water use for both residential and industrial sectors. The integration of District Metering Areas (DMA) and smart metering helped to monitor and reduce water wastage, ensuring that water resources were used efficiently. The project also included the development of water reuse systems, which helped to conserve freshwater resources and meet the growing demands of the city.

2. Industrial Water Management

India's industrial sector is another major consumer of water, often leading to the depletion of freshwater resources. AECOM's expertise in industrial water management has played a crucial role in developing sustainable solutions that address the water needs of industrial operations while minimizing environmental impact.

A major industrial corridor project across Delhi-Mumbai: This project of AECOM was developed to become a state-of-the-art industrial hub. AECOM contributed to this project by designing and implementing robust water supply and wastewater recycling systems. The company ensured that industrial-grade water systems were integrated with advanced wastewater treatment plants that recycle and reuse water within industrial operations. This significantly reduced the region's reliance on potable water while minimizing the environmental impact of industrial activities.

3. Addressing Pollution and Wastewater Treatment

With urbanization comes the challenge of wastewater management, especially in densely populated areas where untreated sewage often finds its way into rivers and water bodies. AECOM has been a key player in upgrading sewage treatment facilities and implementing pollution abatement measures across the country.

An important Sewage Treatment Project under PPP mode: Under a Public-Private Partnership (PPP) model, AECOM led the efforts to upgrade sewage treatment plants in this area of Uttar Pradesh. The project focused on intercepting untreated sewage to rejuvenate the city's river system, as well as integrating renewable energy solutions such as biogas and solar energy into the treatment process. This project not only addressed the pollution but also created a scalable, sustainable model for managing wastewater.

4. Climate-Resilient Solutions and Zero-Discharge Facilities

As climate change leads to more extreme weather events and altered rainfall patterns, building climate-resilient water management systems is becoming increasingly important. AECOM's work on designing zero-discharge sewage treatment facilities for industrial clients is an example of how climate resilience can be integrated into water systems.

Zero Discharge Sewage Treatment Facilities: AECOM designed and implemented sewage treatment systems for a key client that meets the highest standards for industrial water reuse.

The treatment process was optimized to ensure that the treated water was suitable for reuse in industrial operations, helping the company reduce its dependency on freshwater sources. The project's zero-discharge facility was a step towards creating a sustainable water cycle within industrial settings, reflecting AECOM's commitment to climate resilience.

PUBLIC-PRIVATE PARTNERSHIPS: SCALING IMPACT ACROSS INDIA

AECOM's success in water management projects is largely attributed to its ability to collaborate effectively with both public and private stakeholders. By leveraging its expertise and technological innovation, AECOM has played a key role in developing scalable water management solutions that are financially viable and adaptable to different regional needs. The company's ability to work within a variety of public-private partnership (PPP) frameworks has enabled it to scale projects across the country, ensuring that water management solutions are sustainable, efficient, and accessible in both urban and industrial settings.

CONCLUSION

Building a Sustainable Water Future for India

AECOM's contributions to India's water management sector have been transformative. Through its work on smart cities, industrial hubs, wastewater treatment facilities, and climate-resilient water systems, AECOM has demonstrated the importance of integrating technology, sustainability, and innovation to address the nation's water challenges. The company's efforts to balance the water needs of urban centers and industrial sectors, while also considering the environmental impact, are a model for future infrastructure projects.

As India continues to grow and urbanize, AECOM's commitment to sustainable water management will play a crucial role in ensuring that the country's water resources are preserved for future generations. Through continued innovation and collaboration, AECOM is shaping the future of India's water management, creating resilient, future-ready systems that benefit both communities and industries across the nation.

ABOUT THE AUTHOR



Sharad Bhushan
Executive Director
Environment, Water and Energy at AECOM

Sharad Bhushan is a seasoned engineer and visionary leader with over 22 years of expertise in design management, project planning, and delivering complex infrastructure projects. His journey spans diverse geographies, from the urban landscapes of India to the intricate regulatory frameworks of the UK, the arid terrains of the Middle East, and the dynamic economies of Central Asia and the USA.

As the Executive Director for the Environment, Water, and Energy (EWE) business at AECOM India, Sharad drives strategic initiatives to deliver sustainable and innovative solutions across sectors. His tenure in leadership roles at renowned organizations like Atkins, WSP, and SJ-SMEC International highlights his ability to lead multidisciplinary teams, optimize processes, and consistently exceed client expectations, even under challenging timelines and budgets.

Professional Expertise and Sustainability Leadership

Design and Delivery Excellence: Sharad excels in developing large-scale urban regeneration and infrastructure projects. His expertise encompasses water and wastewater management, smart city development, environment and ecology conservation, and energy transition and integration.

- **Global Leadership:** With senior roles, Sharad has led multidisciplinary teams with clear vision to deliver high-impact projects, meeting complex challenges within tight timelines & budgets and thus driving exponential growth to the business.
- **Sustainability and Innovation:** Sharad's work integrates green technologies, energy efficiency, and digital tools, ensuring project execution aligns with global best practices and sustainability goals.
- **Urban Regeneration and Smart Cities:** His approach revitalizes cities through integrated infrastructure solutions, focusing on water, wastewater, and energy management to foster resilient urban ecosystems.
- **Green Innovations and Technological Advancements:** Sharad seamlessly blends sustainability with technology, incorporating renewable energy integration and digitized workflows to enhance project outcomes.

To share your feedback or enquire about the author, write to us at editor@eawater.com

WATER CARE SERVICES IN PAKISTAN: TEXTILE WASTEWATER MANAGEMENT IN FAISALABAD

Abdul Aala Khurram, Technical Director at Water Care Services Pakistan

A CASE STUDY

WATER CARE INITIATIVES IN PAKISTAN: ENHANCING ESG ANDSDGS COMPLIANCE THROUGH WASTEWATER TREATMENT

BACKGROUND: POLLUTION CHALLENGES IN THE TEXTILE SECTOR

Faisalabad, known as the "Manchester of Pakistan," is a significant hub for the textile industry. The city is home to numerous textile mills that contribute substantially to the national economy through exports and employment. However, this booming industry has also led to severe environmental challenges, particularly concerning wastewater management.

The textile sector is notorious for generating large volumes of wastewater laden with dyes, chemicals, and other pollutants. Effluent from textile processing often contains toxic substances, including heavy metals, organic compounds, and colorants, which pose serious threats to both human health and the environment. In Faisalabad, untreated or inadequately treated wastewater has resulted in the contamination of local water bodies, affecting aquatic life and compromising the safety of drinking water sources.

Moreover, regulatory pressure has intensified in recent years, with the government and environmental agencies demanding compliance with increasingly stringent effluent discharge standards. The challenges faced by the textile industry in Faisalabad include:

High Volume of Wastewater: Textile mills generate substantial wastewater, often exceeding the treatment capacities of existing facilities.

Complex Composition: The diverse range of chemicals used in dyeing and finishing processes results in effluents with complex compositions that are difficult to treat.

Limited Awareness: Many textile manufacturers lack awareness or resources to implement effective wastewater management practices, leading to non-compliance with environmental regulations.

APPROACH: ADOPTION OF ADVANCED TREATMENT TECHNOLOGIES

To address the pressing challenges of wastewater management in Faisalabad's textile industry, Water Care Services Pakistan (WCSP) embarked on a project aimed at implementing advanced treatment technologies. The approach focused on the following key strategies:

1. Comprehensive Assessment and Planning

WCSP conducted a thorough assessment of the existing wastewater treatment facilities in various textile mills. This involved analyzing the quantity and quality of the effluent generated, identifying the specific pollutants present, and understanding the operational challenges faced by the mills.

2. Implementation of Bioremediation

The activated sludge process was chosen for its effectiveness in treating organic matter and reducing biological oxygen demand (BOD) in textile wastewater. This biological treatment method involves the following steps:

Anaerobic Digestion: The best remedy inwastewater to break complexed molecules and color is anaerobic digestion. One can easily remove the color, and we have proved it in digital ink printing effluent.

Aeration: The wastewater is aerated in a tank to promote the growth of microorganisms that consume organic pollutants.

Recycling: A portion of the settled sludge is recycled back to the aeration tank to maintain a healthy population of microorganisms for ongoing treatment.

This process significantly reduces the organic load of the wastewater, resulting in improved effluent quality.

3. Chemical sustainable Treatment for Dye Removal

A replenish able way, that is Advanced Oxidation Process (AOP) Key steps included:

Electrocoagulation: in small vicinity, smart solar based electrocoagulation is one on the good choice to treat colored wastewater to aggregate suspended particles and dyes, facilitating their removal.

Advanced Oxidation Processes (AOP): Techniques such as ozonation and Fenton's reagent (a mixture of hydrogen peroxide and iron salts) were employed to break down complex organic compounds and

enhance the treatment efficiency. We do use Ozone Generator and UV , and in few cases, Ozone and Hydrogen peroxide combination.

4. Monitoring and Compliance

To ensure compliance with local regulatory standards, WCSP established a comprehensive monitoring program that included regular testing of effluent quality parameters. This program enabled textile mills to track their progress and make necessary adjustments to their treatment processes.

RESULTS: IMPROVED EFFLUENT QUALITY AND COMPLIANCE WITH REGULATORY STANDARDS

The implementation of advanced wastewater treatment technologies by WCSP yielded significant results in Faisalabad's textile industry:

1. Enhanced Effluent Quality

The combination of activated sludge and chemical treatment effectively reduced key pollutants in the textile effluent, including:

Biological Oxygen Demand (BOD): Reduction levels often exceeded 70%, leading to water that is much less harmful to aquatic ecosystems.

Chemical Oxygen Demand (COD): Significant decreases in COD levels ensured that the organic load in the effluent was minimized.

Dye Content: Advanced oxidation processes achieved substantial reductions in color intensity, allowing for compliance with color discharge standards.

2. Regulatory Compliance

With improved effluent quality, textile mills in Faisalabad were able to meet or exceed local regulatory standards for wastewater discharge. This not only helped in avoiding penalties and legal issues but also contributed to a more sustainable operational model.

3. Environmental and Social Impact

The successful treatment of textile wastewater has had broader environmental benefits, including:

Reduced Pollution: Local water bodies experienced a decrease in pollution levels, benefiting aquatic life and improving water quality for surrounding communities.

Public Health: Improved wastewater management reduced the risk of waterborne diseases associated with contaminated water sources.

4. Economic Benefits

The implementation of effective wastewater treatment technologies also resulted in economic benefits for the textile industry, including:

Cost Savings: Reductions in water consumption and waste disposal costs provided significant savings for textile manufacturers.

Market Opportunities: Compliance with environmental standards opened up new market opportunities, particularly in export markets where sustainability is increasingly valued.

ENHANCING WATER MANAGEMENT TO ACHIEVE SDGS

Water care services through effective wastewater treatment play a vital role in achieving the following SDGs, by collaboration among governments, industries, and communities.

1. SDG 6: Clean Water and Sanitation
- Ensure availability and sustainable management of water and sanitation for all.
- Focuses on improving water quality by reducing pollution.

2. SDG 11: Sustainable Cities and Communities
- Make cities inclusive, safe, resilient, and sustainable.
- Prioritize sustainable urban drainage and effective sewage treatment systems.

3. SDG 12: Responsible Consumption and Production

- Ensure sustainable consumption and production patterns, particularly in reducing waste generation.
- Promote the treatment and recycling of wastewater.

4. SDG 13: Climate Action
- Taking urgent action to combat climate change and its impacts through improved management of water resources and wastewater.

5. SDG 15: Life on Land
- Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, and halt land degradation.
- Proper wastewater treatment helps protect freshwater ecosystems.

WASTEWATER TREATMENT: A KEY COMPONENT OF ESG SUCCESS

To fulfill Environmental, Social, and Governance (ESG) criteria through wastewater treatment and water care services in Pakistan, consider the following strategies:

Environmental

1. *Efficient Wastewater Treatment:* Implement advanced treatment technologies such as bioreactors and membrane filtration to improve treatment efficiency and reduce pollution.

2. Reuse and Recycling: Promote the reuse of treated wastewater for irrigation, industrial processes, and landscape maintenance to conserve freshwater resources.

3. *Energy Recovery:* Utilize biogas from wastewater treatment plants for energy production, reducing reliance on fossil fuels.

Social

1. *Community Engagement:* Involve local communities in the development and operation of water services to ensure their needs are met and to build trust.

2. *Job Creation:* Generate employment opportunities in water treatment facilities and related services, focusing on training and capacity building for local communities.

3. *Public Awareness Campaigns:* Develop educational programs on water conservation and hygiene to promote responsible water use and treatment practices.

Governance

1. *Compliance with Regulations:* Ensure adherence to local and international environmental laws and regulations related to wastewater treatment and water quality.

2. *Transparency and Reporting:* Regularly publish reports on wastewater treatment outcomes, community impacts, and sustainability efforts to maintain transparency with stakeholders.

3. *Stakeholder Engagement:* Establish a

governance framework that includes stakeholders' opinions, such as government, NGOs, and community leaders, to ensure inclusive decision-making.

By integrating these strategies, water care services in Pakistan has enhanced their ESG performance while contributing to sustainable development.



CONCLUSION

The case study of wastewater treatment in Faisalabad's textile industry highlights the critical role of innovative technologies and collaboration in addressing environmental challenges. By adopting advanced treatment methods, Water Care Services Pakistan not only improved effluent quality and regulatory compliance but also contributed to a more sustainable and eco- friendlier textile sector.

This project serves as a model for similar initiatives across Pakistan and beyond, demonstrating that effective wastewater management is not only essential for environmental protection but also for the long-term viability of industries reliant on water resources. Through continued investment in research, technology, and capacity building, the textile industry can move towards a more sustainable future, balancing economic growth with environmental stewardship.

ABOUT THE AUTHOR



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I am working as technical director Water Care Services Pakistan. I as water expert work on multiple water and climate change projects. My background in the water field, eligible me to work for international organization such as IWA Publishing & World Water Policy (WWP), Water Management & Services. I have a passion for water, environmental advocacy, and a commitment to sustainable practices. I am eager to bring my skills to your dynamic team, to serve in water science as Editor. Throughout my career, I have developed a solid foundation in water & Environmental Sciences, and well experiences in water policy, project management, community and stake holders' engagement, which I believe aligns well with the goals and mission of "Everything about Water". I am always keen in water innovation, news and information on drinking water, residential and commercial water treatment, source water protection and conservation, wastewater treatment, stormwater management, water resource management, technology advancement, policy and governance, business and investment, PPP and BOT, and waterworks infrastructure. In my previous role at Environment & Water Care Services, I worked on environmental management projects here. Additionally, my academic background in I have completed M.Sc. Applied Environmental Sciences and M.Sc. Chemistry from Punjab University Lahore Pakistan, with MS TQM and a rich projects and f ield experience of more than two decades, in Water, Environment and Climate Sciences equipped me with a strong understanding of the complexities surrounding climate change and the urgent need for collective action.

I am drawn to write for your journal "Everything about water", commitment to promote initiative or campaign, e.g., promoting water science, water management, review of water policies, blue economy, water innovation and updates, advocating for sustainable policies, and I am eager to leverage my skills to support these initiatives. My adaptability, team developing, raising competency and challenge taking, problem-solving mindset, innovative water tools & applications, and passion for sustainability make me a strong fit for a role that requires collaborative efforts and innovative solutions.

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Gaurav Garg, Regional Sales Manager at CIMCON Software India Private Limited



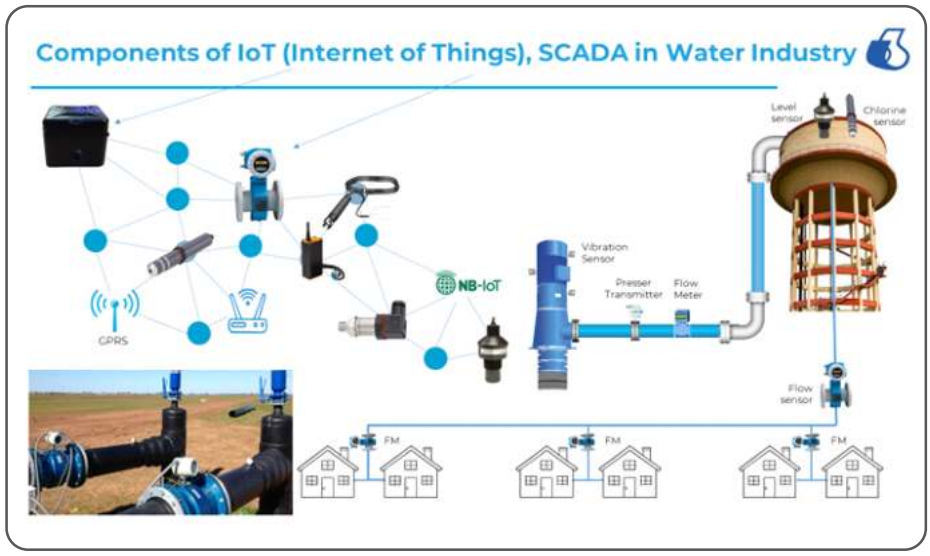
THE IMPORTANCE OF URBAN WATER MANAGEMENT

Urban water management is a critical aspect of sustainable development in modern cities. The growing urban population and increasing demand for water resources have put immense pressure on existing water infrastructure. The effective management of water resources in urban areas is essential for ensuring a continuous and reliable water supply for residents, businesses, and industries. Additionally, efficient water management is crucial for environmental sustainability and public health. With the rising challenges posed by climate change and population growth, the need for innovative and effective urban water management solutions has become more pressing than ever.

One of the key challenges in urban water management is the aging infrastructure of water systems in many cities. The deterioration of pipelines and water treatment facilities can lead to water losses, leakages, and contamination. Moreover, the uneven distribution of water resources and the lack of adequate storage and distribution facilities further exacerbate the challenges faced in managing urban water supply. These issues not only contribute to water wastage but also pose significant risks to public health and safety. Therefore, there is an urgent need to address these challenges through innovative technologies and strategies that can revolutionize urban water management.

The integration of advanced sensors and real-time monitoring systems in urban water management has the potential to transform the way water resources are managed in cities. By leveraging sensor technologies, water utilities can gain valuable insights into the condition and performance of their water infrastructure. Real-time data collection and analysis enable proactive maintenance and early detection of leaks, reducing water losses and ensuring the efficient operation of water networks. Furthermore, the integration of sensor data with advanced analytics and modelling tools can facilitate predictive maintenance and optimal resource allocation, leading to improved resilience and sustainability of urban water systems.

REVOLUTIONIZING WATER MANAGEMENT WITH SENSOR INTEGRATION



The integration of sensor technologies in urban water management represents a paradigm shift in the way water resources are monitored and managed. Traditional methods of manual inspection and periodic assessments are often time-consuming and resource-intensive, making it challenging to identify and address issues in a timely manner. In contrast, sensor integration enables continuous, real-time monitoring of various parameters such as water flow, pressure, quality, and temperature. This real-time data empowers water utilities to detect anomalies and potential failures promptly, allowing for proactive interventions and preventive maintenance.

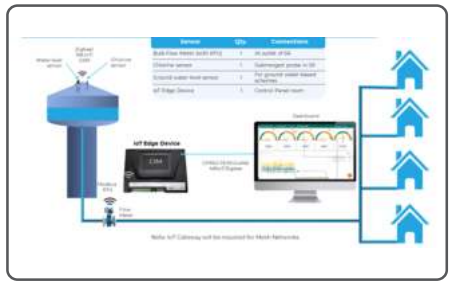
Sensors deployed in water distribution networks and treatment facilities can provide valuable information on the performance and condition of critical infrastructure components. For instance, pressure sensors can detect changes in water pressure levels, indicating potential leaks or bursts in pipelines. Additionally, water quality sensors can monitor the presence of contaminants and ensure compliance with regulatory standards. The use of advanced sensor technologies, such as acoustic and electromagnetic sensors, further enhances the capability to detect leaks and assess the structural integrity of pipelines, reducing the risk of water loss and infrastructure failures.

The integration of sensor data with geographic information systems (GIS) and asset management platforms enables water utilities to visualize and analyze the operational status of their water networks comprehensively. By utilizing real-time data and spatial analytics, utilities can prioritize maintenance activities, optimize resource allocation, and improve the overall resilience of water infrastructure. Furthermore, the implementation of sensor integration can support the development of smart water networks, facilitating the efficient management of water resources and enhancing the responsiveness of utilities to dynamic operational conditions.

REAL-TIME MONITORING IN WATER MANAGEMENT

Real-time monitoring systems play a pivotal role in enhancing the efficiency and reliability of urban water management. By continuously collecting and analyzing data from various sensors and monitoring devices, water utilities can gain actionable insights into the performance of their water infrastructure.

Real-time monitoring not only enables the early detection of abnormalities and potential failures but also supports the optimization of operational processes and resource management. With the advent of Internet of Things (IoT) technologies, real-time monitoring solutions have become more accessible and scalable, offering unprecedented visibility and control over water systems.



The deployment of real-time monitoring solutions in water management encompasses a wide range of applications, including remote sensing, telemetry, and supervisory control and data acquisition (SCADA) systems. These technologies enable the seamless transmission of data from sensors and monitoring devices to centralized control centers, allowing for instantaneous analysis and decision-making. Furthermore, the integration of real-time data with advanced analytics and machine learning algorithms can facilitate the development of predictive maintenance models, enabling water utilities to anticipate and mitigate potential issues before they escalate into critical failures.

Real-time monitoring also empowers water utilities to respond swiftly to changes in water demand, supply, and quality. By leveraging real-time data, utilities can optimize the operation of water treatment plants, distribution networks, and storage facilities to meet fluctuating demand and ensure water quality compliance. Additionally, real-time monitoring supports the implementation of demand-driven management strategies, enabling utilities to proactively address water distribution challenges and minimize the risk of service disruptions. The ability to monitor water systems in real time provides utilities with the agility and adaptability needed to navigate complex operational scenarios and deliver reliable water services to urban communities.

BENEFITS OF WATER INFORMATION MANAGEMENT SOLUTIONS

Water information management solutions encompass a suite of technologies and tools designed to capture, analyze, and leverage water-related data for informed decision-making and operational optimization. These solutions offer a comprehensive approach to managing water resources, infrastructure, and services, enabling water utilities to enhance their

efficiency, resilience, and sustainability. By integrating advanced data management and analytics capabilities, water information management solutions provide a holistic view of water systems, empowering utilities to address challenges and capitalize on opportunities for improvement.

By providing stakeholders with access to comprehensive and up-to-date information on water systems and services, utilities can foster greater public trust and engagement. Additionally, the integration of customer relationship management (CRM) functionalities within water information



One of the primary benefits of water information management solutions is the ability to centralize and integrate disparate data sources, including sensor data, operational records, customer information, and environmental data. By consolidating and harmonizing diverse data sets, utilities can gain a unified understanding of their water systems and performance metrics, facilitating evidence-based decision-making and strategic planning. Moreover, the integration of data management solutions with geographic information systems (GIS) and enterprise asset management (EAM) platforms enables utilities to visualize and analyse spatial and operational data, supporting efficient resource allocation and infrastructure management.

The application of advanced analytics and modelling tools within water information management solutions enables utilities to derive actionable insights from complex data sets. By leveraging predictive analytics, machine learning, and optimization algorithms, utilities can forecast water demand, identify potential risks, and optimize asset performance. Furthermore, the implementation of real-time data processing and visualization capabilities facilitates the monitoring of key performance indicators (KPIs) and the identification of trends and patterns, enabling utilities to proactively address operational challenges and drive continuous improvement in their water management practices.

Water information management solutions also play a crucial role in enhancing transparency and accountability in water management.

management solutions enables utilities to better understand and respond to customer needs, ultimately improving the overall quality of service delivery.

IMPLEMENTING WATER NETWORK ASSET MANAGEMENT SOLUTIONS

Water network asset management solutions are instrumental in enabling utilities to optimize the performance and lifespan of their infrastructure assets. These solutions encompass a range of technologies and methodologies aimed at enhancing asset reliability, resilience, and cost-effectiveness. By adopting a proactive approach to asset management, water utilities can minimize the risk of asset failures, optimize maintenance activities, and maximize the value of their investments in water infrastructure. The implementation of asset management solutions is essential for ensuring the long-term sustainability and operability of urban water networks.

One of the key components of water network asset management solutions is the utilization of asset performance monitoring and condition assessment technologies. These tools enable utilities to monitor the health and operational status of critical infrastructure components, such as pipelines, pumps, valves, and treatment facilities. By deploying sensors and monitoring devices, utilities can gather real-time data on asset performance, allowing for early detection of deterioration, defects, and potential failures. This proactive approach to asset condition assessment supports informed decision-making and prioritization of maintenance and rehabilitation efforts.

The integration of asset management solutions with risk assessment and investment planning methodologies enables utilities to develop comprehensive strategies for optimizing their asset portfolios. By conducting risk assessments and life cycle cost analyses, utilities can identify critical assets, evaluate potential vulnerabilities, and prioritize investment and maintenance activities. Furthermore, the implementation of asset performance modeling and predictive analytics supports the development of long-term asset management plans, facilitating the optimization of capital expenditures and the allocation of resources to maximize the reliability and resilience of water infrastructure.

Water network asset management solutions also facilitate compliance with regulatory requirements and industry standards, ensuring that utilities adhere to best practices in asset management and performance optimization. By leveraging asset management software and decision support tools, utilities can streamline regulatory reporting, track asset performance against established benchmarks, and demonstrate accountability in asset stewardship. Additionally, the integration of asset management solutions with enterprise resource planning (ERP) and work order management systems enables utilities to optimize their maintenance workflows and resource utilization, further enhancing the efficiency and effectiveness of asset management practices.

FUTURE TRENDS IN URBAN WATER MANAGEMENT

One of the key future trends in urban water management is the widespread adoption of Internet of Things (IoT) and sensor technologies to create interconnected and intelligent water networks. The deployment of IoT-enabled sensors throughout water infrastructure will enable utilities to gather real-time data on water flow, pressure, quality, and asset performance, empowering proactive maintenance and resource optimization. These interconnected systems will facilitate the development of smart water networks, capable of adapting to dynamic operational conditions and enhancing the overall reliability and efficiency of urban water supply and distribution.

Another prominent trend in urban water management is the integration of advanced analytics and artificial intelligence (AI) to derive actionable insights from vast volumes of water-related data. By harnessing the power of predictive analytics, machine learning, and optimization algorithms, water utilities can forecast demand patterns, identify potential risks, and optimize asset performance. The use of AI-driven decision support systems will enable utilities to make data-driven and evidence-based decisions, leading to more efficient resource allocation, improved

operational resilience, and enhanced service delivery to urban communities.

By leveraging sensor integration and real-time monitoring, utilities can detect leaks, reduce water losses, and ensure the efficient operation of water networks. Additionally, the application of advanced analytics and modelling tools enables utilities to forecast water demand, optimize treatment processes, and proactively address operational challenges. These capabilities support the conservation of water resources and the promotion of sustainable water use practices in urban environments.



THE ROLE OF TECHNOLOGY IN SUSTAINABLE WATER MANAGEMENT

One of the fundamental contributions of technology to sustainable water management is the ability to optimize water use and distribution through data-driven insights and operational efficiencies.



In addition, technology plays a critical role in promoting public awareness, engagement, and participation in sustainable water management initiatives. By leveraging digital communication platforms and smart metering technologies, utilities can provide consumers with real-time information on their water usage, encourage conservation practices, and foster a culture of responsible water stewardship. Furthermore, the integration of technology with community outreach and education programs enables utilities to empower residents with the knowledge and tools needed to contribute to sustainable water management efforts, ultimately creating a more informed and environmentally conscious society.

CONCLUSION

In conclusion, CIMCON Software India PVT. LTD plays a crucial role in advancing the transformative journey of urban water management through its cutting-edge solutions. With a commitment to innovation and collaboration, CIMCON contributes significantly to the integration of advanced sensor technologies and data-driven solutions. By leveraging their expertise, cities can harness the power of real-time monitoring, proactive leak detection, and comprehensive asset management.

CIMCON's role in providing water management solutions and water network asset management tools aligns with the broader technological shift towards sustainable water practices.

As cities optimize their water infrastructure, minimize wastage, and make informed decisions, CIMCON's contributions become integral to achieving the efficiency, resilience, and sustainability goals of urban water systems.

The partnership between technology and urban water management, exemplified by CIMCON, signifies a paradigm shift that empowers cities to overcome challenges and embrace a more sustainable and resilient future. Through this collaboration, CIMCON is instrumental in navigating the complexities of modern water management, paving the way for a future where water resources are managed with confidence and foresight. As cities continue to evolve in their approach, CIMCON's role remains pivotal in shaping a world where technology and innovation harmonize for the benefit of urban water systems and the communities they serve.

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Regional Sales Manager at CIMCON Software India Private Limited

An astute Sales professional & strategist having a proven track record of overachievement with over 14+ years in the domain of Automation and SCADA solutions on IoT Platform, SaaS & cloud based smart solution for water and Industry 4.0, handling key accounts in Government, PSUs, Smart Cities, ULBs, Industries.

He joined CIMCON, where he has been working for over 5 years. During his time at CIMCON, he played a pivotal role in successfully completing various Water and SCADA projects across India under the various Central and State Govt. scheme. Currently, he is actively involved in working on projects related to the Jal Jeevan Mission in different states of India.

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TURNING SEAWATER INTO GOLD: AN ALTERNATIVE TO DESALINATION PLANT

Dilip Yewalekar, Senior Vice President at Jain Irrigation Systems Ltd.
Manisha Kinge, Manager at Jain Irrigation Systems Ltd.

ABSTRACT

This article explores an innovative and economical greenhouse technique that utilizes solar radiation and wind to simulate an artificial hydrologic cycle (Fig. 1) for harvesting pure water and minerals from seawater. The method employs simple and sustainable technology to evaporate seawater, condense the vapor into pure water, and collect precipitated minerals for further processing. Compared to conventional desalination plants, this approach offers a cost-effective and environmentally friendly solution for addressing global water and mineral needs. The article outlines the methodology, theoretical foundation, financial analysis, and schematic design of this technique.

INTRODUCTION

The natural hydrologic cycle, driven by solar radiation, evaporates water from the oceans & surfaces into the atmosphere. The water vapour forms clouds and precipitates as rain, which is naturally the purest form of water, Rain, hail, sleet or snows – the various forms of precipitations. However, by the time rainwater reaches the earth, it accumulates contaminants, dust particles, pollutants, gaseous and other substances, necessitating treatment for drinking, industrial, and agricultural purposes.

With erratic monsoons, droughts, and overexploitation of groundwater, the world faces a severe water crisis. Available ground water is diminishing day by day and to cope up the water demand for domestic, agricultural and industrial consumptions, there is no more water left in the ground. Seawater, being an abundant resource, is a viable solution.

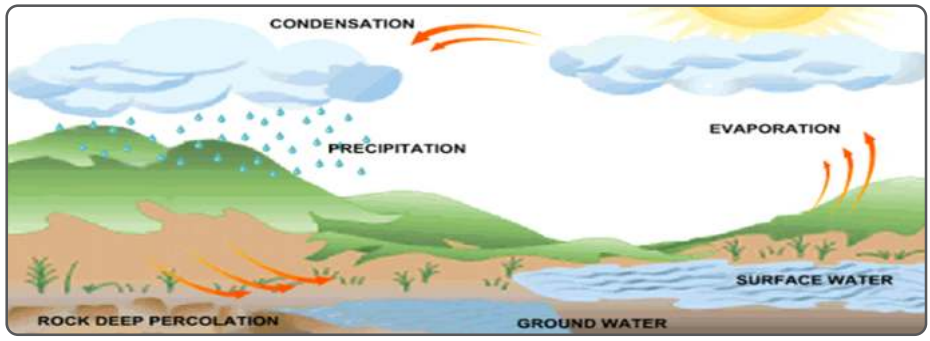


Fig 1. Natural Hydrologic cycle.

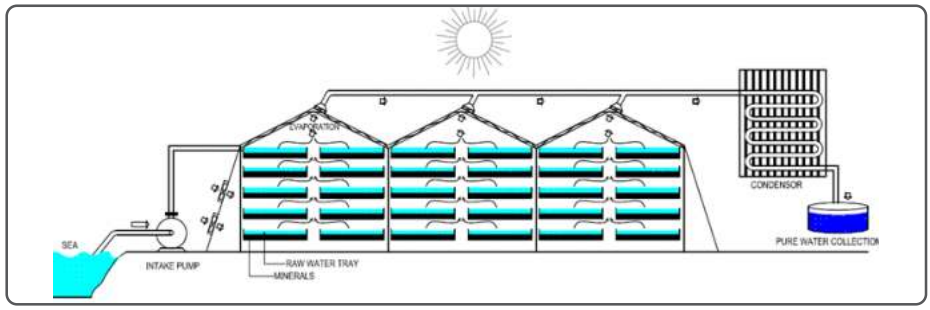


Fig.2. Artificial Hydrologic Model (Green House) to Harvest Water & Minerals (alternative to Desalination)

Unfortunately, sea water cannot be used directly as it is for drinking, industrial and agricultural purpose. However, it can be make suitable after certain treatment called desalination, which is expensive, both in terms of capital and operational costs. This article introduces a greenhouse-based technique that mimics the hydrologic cycle to produce pure water and harvest minerals, providing a sustainable and cost-effective alternative (fig.2).

COMPONENTS

Following components are involved in this technique (Fig 2: Model).

- **Green House Structure**: It consists of hot dip

- galvanized Steel foundations, columns, trusses, purlins, bracing, gutters & accessories
- **Translucent covering materials:** Translucent covering materials like polycarbonate sheet allow transferring direct solar radiation as a source of heat energy for speeding up the evaporation rates.
- **Axial Blower:** High capacity & speed axial blowers allow speeding up the rate evaporation in night as well as day time. Also it allows dehydrating the minerals during harvesting.
- **Exhaust cum suction Fan & Duct**: High capacity exhaust-cum suction fans are provided at root top to suck and convey the evaporation to condenser via duct.
- **Condenser:** Cool water is circulated around the evaporation duct to convert vapour to water drops.
- **Water collection Tank / Bottling plant:** Condense water drops are then collected either collection tank or directly bottling plants.
- **Mineral Processing unit:** Harvest precipitated minerals.

THEORY

Evaporation is the process by which water (liquid) is changed to vapours (the gaseous state) at the free surface, below the boiling point of water. The amount of energy used by a unit mass of water from the liquid state to vapour state at constant temperature is known as the latent heat of evaporation, which is about 585 calories per gram. Vapour molecules continuously leave the water during evaporation. The motion of these molecules produces a pressure on the water surface, which is known as vapour pressure. The partial pressure exerted by the water vapours at that stage is called the saturation vapour pressure (es). The saturation pressure increases with an increase in temperature. If the vapour pressure in the air above the water surface less than that of the water surface, evaporation continues. As soon as the vapour pressure reaches the saturation vapour pressure, evaporation stops.

The following factors are influencing the rate of evaporation.

Temperature : Higher temperatures increase evaporation rates.

Wind Velocity : Enhances vapor transfer.

Atmospheric Pressure : Lower pressure accelerates evaporation.

Mineral Concentration : Higher concentrations reduce evaporation.

Water Body Characteristic : Shallow and expansive surfaces promote evaporation.

DALTON'S LAW

The fundamental principle of evaporation from a free surface was enunciated by Dalton in the year 1882. Dalton states that the evaporation is a function of the difference in the vapour pressure of the water and vapours pressure of the air and is expressed as:

$E = (e_s - e_d)\ f(u)$.	E - rate of evaporation. e_s - saturation vapour pressure. e_d - saturation vapour pressure. $f(u)$ - a function of wind velocity.

ROHWER'S EQUATION

There are several empirical equations are available which are based on Dalton's law, however the most commonly used equation is Rohwer's equation:

E= 0.0771 (1.465-0.0 0073Pa)(0. 44+0.073 3Vo)(es-ed)	E = evaporation in cm per day. P_a = mean barometric pressure (mm Hg). V_o = mean wind velocity (km/hr) e_s = saturation vapour pressure (mm Hg) e_d = actual air pressure (mm Hg)

For evaporation to continue, the following three main conditions should be satisfied

a. There should be a constant supply of water.
b. There should be a constant supply of heat.
c. There should be a vapour deficit.

Below table indicates evaporation at various temperatures under normal wind conditions and open surfaces.

Mean Daily Temperature °C	Mean Evaporation Rate (mm per day)
7 to 10	8 to 10
11 to 15	11 to 12
+	12 to 14
18 to 20	14 to 15
21 to 25	15 to 16
26 to 30	16 to 17
31 to 35	17 to 18
35 to 40	18 to 19
41 to 45	19 to 20
45 to 50	20 to 21

(Note: Above values are given only for reference. However, actual evaporation rate has to be calculated based on the relative empirical formula under the prevailing conditions for the particular site.)

ADVANTAGES

1. Overall investment is low as compared to desalination plants.
2. Simple and easy to set up, easy to handle, operate and maintain.
3. Overall electrical consumptions/ charges and maintenance charges are very low.
4. No complicated technology involved.
5. Number value added by products can be harvested from it by using simple technology.
6. Rain water can be simply collected from roofs and re-used for condenser and as raw water so that it can lower the cost of pumping power.
7. It is not just suitable for desalination of sea water but also suitable for waste water treatment.

LIMITATIONS

1. Inconsistent water production during cloudy weather.
2. During cloudy and rain weather, non-consistence flow of water.
3. Under high humidity metal components are susceptible for corrosion so it needs to be painted periodically.
4. To process by product special technology has to be used.



FINANCIAL ANALYSIS

Sr.	Details	Values	Unit
1.	**Capex**		
	Green house structure with Polycarbonate covering, Civil works- foundations, flooring etc. Axial Exhaust fans and duct, water condensers, Axials blower, Intake pump motor & piping system. Water storage tank.	20,000.00	Rs/sqm
2.	**Opex**		
a.	Interest @ 15 % pa,	3,000.00	Rs/sqm pa
b.	Equated Principal (in 10 years)	2,000.00	Rs/sqm pa
c.	Depreciation 10 % pa	2,000.00	Rs/sqm pa
d.	Electrical charges 300 units pa.(@ 8.00 per unit)	2,400.00	Rs/sqm pa
e.	Administrative charges 5 %	1,000.00	Rs/sqm pa
f.	Maintenance charges 3 %	600.00	Rs/sqm pa
g.	Unforeseen expenses 3 %	600.00	Rs/sqm pa
h.	**Yearly repayment**	**11,600.00**	
3.	**ROI**		
a.	Yield (pure water) 20 litre per day for 300 days	6,000.00	Litre pa per sqmt
b.	Cost of generating water per litre	1.55	Rs per litre pa
c.	Rate of selling (After bottling) (Rate assumed)	3.00	Rs per litre
d.	Revenue	18,000.00	Rs pa
e.	Raw minerals @ 3000 ppm (assumed)	18	kg
f.	Revenue @ Rs 10 per kg (assumed)	180.00	Rs pa
g.	**Total Revenue (Rs)**	**18,150.00**	**Rs/sqm pa**
4.	**Net Profit (Rs)**	**6,550.00**	**Rs/sqm pa**
5.	**ROI**	**1.56**	**
6.	**Payback period**	**3**	**Years**

(Note: Above values are estimated, given for reference and subject to localized conditions,Govt Rules & regulations and allied factors.)

CONCLUSION

This greenhouse-based technique offers an economical and sustainable solution for addressing water scarcity and mineral recovery. By utilizing solar energy and simple technologies, it presents an innovative alternative to costly desalination plants, with potential applications in both water desalination and wastewater treatment.This technique is essential for communities facing acute water scarcity and a lack of economic opportunities. By providing access to clean water through a sustainable and low-cost method, it directly addresses health and hygiene challenges. Additionally, the mineral by-products offer economic benefits by creating new avenues for local industries. The system's minimal environmental impact ensures responsible resource use, fostering long-term sustainability and resilience against climate change-induced water crises.

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- Faculty: Micro Irrigation Course of ICID & CWC, Govt of India
- Reviewer –ICID Conference, Beijing, China 2023
- **AWARDS :**
  - The EEF Global Water Leadership Award – Global Water foundations.
  - Strategic Leader in Micro Irrigation – ABSA Award.
  - Professional Excellence Individual Award – Aqua foundations
  - Great Manager 250 Award, Economics Times, honored by Hon Kumar Mangalam, Birla Group.
- Best Innovative Article in Sabujeema International Magazine
- Overall all experience of 36+ years in Water Management – Irrigation, Agriculture, Civil Engineering, Planning, Designing, Execution, Management & marketing in India and Abroad.
- 125+ papers/publications at national/international conferences/magazines/books.



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- Manager –Design & Projects (Dom/Export)
- Faculty: Micro Irrigation Course of ICID & CWC, Govt of India.
- **AWARDS :**
  - Recipient of ABSA 2023 Award : Women Creating Impact in Agriculture - Micro Irrigation
  - Best Innovative Article in Sabujeema International Magazine
- Overall experience of 18+ years in Water Management – Irrigation, Agriculture -Planning, Designing, Execution, Management & marketing in India and Abroad.
- 35+ papers/publications at national/international conferences/magazines/books.



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INNOVATIVE SOLUTIONS FOR A MUNICIPAL WASTEWATER PLANT

Sanjay Bahl, CEO at Superweld Ecosolutions



Visual Representation of Defoaming Results

THE PROBLEM

Recently, a local water activist brought to public attention a disturbing phenomenon occurring in the Yamuna River in Delhi, India: vast quantities of white foam were polluting the sacred waterway.

The source of this foam was traced not to a single plant, but to multiple municipal wastewater treatment plants along the river. While these plants were treating the water, the discharge process itself was contributing to the problem. Treated water, flowing through channels at high rates, intersected with the city drains at points where there were steep falls. This created significant turbulence, resulting in the formation of the unsightly and environmentally damaging foam.

The turbulence trapped air in the surfactants present in the city drains. These surfactants, originating from phosphates and other pollutants commonly found in household detergents and industrial waste, combined with the air to create a dense, white foam that spilled directly into the Yamuna. This further contaminated the already polluted river, raising serious concerns about the health of the river and the people who depend on it.



Actual Site Photograph Before Solution was Implemented

WHY IT WAS CRUCIAL TO ADDRESS THIS PROBLEM

The foam pollution in the Yamuna River presented a multifaceted problem that demanded immediate attention.

Firstly, public health was at risk. The foam contained a cocktail of harmful pollutants that posed a threat to anyone coming into contact with the water.

This was especially concerning given the upcoming Chhath festival, a significant Hindu celebration where devotees traditionally immerse themselves in the Yamuna. Exposure to the contaminated water could lead to skin diseases, infections, and potentially even long-term health problems.

Thirdly, the incident damaged the reputation of the Delhi Jal Board (DJB), the agency responsible for water management in the city.

The activist's highlighting of the issue brought negative publicity and raised questions about the DJB's effectiveness in managing wastewater treatment and protecting the environment.

Finally, the pollution threatened the cultural and religious significance of the Yamuna River. The river holds a sacred place in Hinduism and is deeply intertwined with the cultural identity of the people of Delhi.

The presence of toxic foam in the river was seen as a desecration and caused widespread outrage and concern among the public.

Addressing the foam pollution in the Yamuna was therefore not just an environmental imperative, but also a matter of public health, social responsibility, and cultural preservation.





Foaming in Yamuna

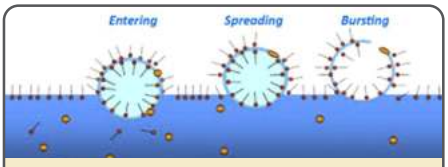
IN THIS PARTICULAR CASE

A major municipal wastewater treatment plant faced a challenging issue where treated water, flowing through a channel at an impressive rate of 8,000 m3 per hour, intersected with the city drain. At this intersection, a steep fall of 8-10 meters created significant turbulence, resulting in white foaming. This foam was not only unsightly but also raised environmental concerns. The incident attracted considerable public attention and demanded an immediate and effective solution.

THE SUPERWELD ECOSOLUTIONS APPROACH

Superweld Ecosolutions was called in to address this pressing issue. Our expert team carefully analyzed the situation and devised an innovative solution. The culprit behind the foaming was identified as the turbulence-induced aeration of surfactant-laden water. To mitigate this, we recommended applying our product, **SUPER FOAM NOT.**

SUPER FOAM NOT is a state-of-the-art defoamer made from nano-sized edible oil particles. Unlike conventional chemical defoamers, it is eco-friendly and highly effective in breaking down foam caused by surfactants.



How Defoamer Works

HERE'S HOW SUPER FOAM NOT WORKS:

- **Reduces Surface Tension:** Foam relies on surface tension to maintain bubble structure. SUPER FOAM NOT disrupts this, making it harder for bubbles to form and persist.
- **Disrupts Bubble Walls:** SUPER FOAM NOT interferes with the thin liquid film that makes up the bubble walls, causing them to weaken and collapse.
- **Promotes Drainage:** SUPER FOAM NOT can increase the rate at which liquid drains from the foam, further weakening the bubble structure and leading to faster breakdown.

SUPER FOAM NOT'S NANO-SIZED PARTICLES OFFER KEY ADVANTAGES:

- **Large Surface Area:** The tiny particles provide a large surface area for interacting with and destabilizing foam bubbles.
- **Enhanced Spreading:** The small particle size allows for better dispersion and penetration into the foam, ensuring contact with more bubbles.
- **Environmental Friendliness:** Being derived from edible oils, it is biodegradable and poses minimal risk to the environment, unlike many chemical alternatives.

This makes SUPER FOAM NOT a promising solution for tackling foam-related problems in various industries, including wastewater treatment, where it can help address issues like the foam pollution in the Yamuna River.

IMPLEMENTATION

The solution involved dosing SUPER FOAM NOT into the treated water channel at regular intervals of 45 minutes. Each dose consisted of 5 liters, with a total daily dosage of 20-25 liters. The dosing process was executed meticulously to ensure uniform application and maximum effectiveness.

RESULTS

The results were remarkable. immediately after implementation, the foaming at the intersection of the treated water channel and the city drain was drastically reduced. The site, which was previously a focal point of environmental criticism, became compliant with regulatory standards once again. The transformation was evident and widely appreciated by stakeholders.

BEFORE AND AFTER

Before: The steep fall at the intersection created significant turbulence, resulting in dense white foam that spilled into the river Yamuna. The foam was visible and raised concerns among environmentalists and the general public.

After: Post-treatment with SUPER FOAM NOT, the foam was almost entirely eliminated. The treated water flowed smoothly without causing visible foam, restoring the credibility of the wastewater treatment plant.

CONCLUSION

The successful application of **SUPER FOAM NOT** demonstrates the importance of innovative, eco-friendly solutions in addressing environmental challenges. At Superweld Ecosolutions, we take pride in providing cutting-edge technologies that ensure compliance, sustainability, and public satisfaction. This case serves as a testament to our commitment to making a positive impact on water resources and the environment.

www.superweld.in

ABOUT THE AUTHOR


Sanjay Bahl, CEO at Superweld Ecosolutions

Sanjay helps business and their leaders by providing Eco-logical solutions for pollution control and waste management problems. At Superweld Eco-Solutions, they create innovative products to treat wastewater, Malodors, Solid waste, Algae Treatment, Lake and Pond remediation. Sanjay has helped clients like Paper Mills, Pharma Companies, Hospitality Industry, Food and Beverage Industries to meet stringent wastewater discharge parameters. A post Graduate from Symbiosis College, Sanjay and his team act as technical advisors and trouble shooters to 900+ clients. They help companies Like CETPS, Dairy, STPs and ETPs improve their biological wastewater treatment. He strongly believes Indian biotechnology is among the best in the world. Along with his passion for transforming the wastewater treatment industry; he likes to read about the latest technologies and does social work in his free time.

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REVITALIZING VILLAGE SANITATION: A SUCCESS STORY FROM EAST CHAMPARAN

Tarun Kumar, Rural Development Department, Bihar



Minister Rural Development, Govt of Bihar Visited the Work Site.

In the heart of East Champaran district's Sugauli block lies the village panchayat of Dakshini Sugaon, where a significant transformation has taken place. The village, particularly wards number 02 and 03, was plagued by a public drain that had become a source of distress for its residents. The accumulation of dirt and waterlogging led to a polluted environment, exacerbating the spread of waterborne diseases and affecting the daily lives of the villagers.

For much of the year, especially during the monsoon season, the public drain collected rainwater, which turned into stagnant pools. The foul smell and unsightly conditions forced villagers to navigate through filth, impacting their health and well-being. Additionally, the contamination of hand pump water became a pressing concern, as the accumulated waste seeped into groundwater sources.

Recognizing the urgent need for intervention, the local panchayat, under the leadership of Praveen Mishra, the then MGNREGA program officer, mobilized the community to tackle the dire sanitation crisis. Together, they envisioned a comprehensive solution that would not only improve sanitationbut also promote health and hygiene in the village.

IMPLEMENTATION OF THE SOLUTION

The approach began with a thorough ground inspection and an estimation of the gray water generated from both wards.

The team identified that the water from approximately 150 families' hand pumps could be redirected through a series of drains into a main drainage system. The implementation involved several key steps:



Proposed Plan

Redirection of Gray Water: The hand pump water was channelled into a main drain, designed to carry only gray water. This careful planning ensured that the drain remained free from contaminants.

Construction of a Three-Chamber Tank: The main drain was extended to a central location in the village where land was available. Here, a three-chamber tank was constructed. The first chamber allowed for initial stabilization of the water, while the subsequent chambers facilitated further purification.

Water Purification and Recharge: The purified water was then directed into a dug well, where it underwent additional treatment. It was subsequently channelled towards a nearby canal. Before the water was released into the canal, storage tanks and recharge pits were constructed to enhance water recharge and ensure sustainable use.

Irrigation Support: The remaining water was released into the canal, significantly benefiting local agriculture by providing a reliable irrigation source.

The transformation of the drainage system has had a profound impact on the village. The once- polluted environment has been revitalized, leading to a reduction in waterborne diseases. Villagers can now traverse their community without encountering the health hazards associated with stagnant water. The improved water quality has also restored faith in the hand pump water, ensuring safer drinking options for families. The initiative not only addressed immediate sanitation concerns but also fostered a sense of community ownership and responsibility. The villagers, now aware of the importance of maintaining a clean environment, have become actively involved in the management of their water resources.

The successful revitalization of Dakshini Sugaon's sanitation system stands as a testament to the power of community action and effective leadership. It highlights how a collaborative approach can lead to sustainable solutions for pressing public health challenges. As other villages look to improve their sanitation and water management, Dakshini Sugaon serves as a model.


Community Engagement and Construction of Settlement Chamber


Construction of Dugwell

ABOUT THE AUTHOR


Tarun Kumar
Rural Development Department, Bihar

Sri Tarun Kumar stands out as a dedicated officer in the rural development department. With a passion for ecological sustainability, he has been instrumental in promoting initiatives that create pathways for economic growth with environmental stewardship, displaying a remarkable commitment to the welfare of the rural population.

One of Sri Tarun Kumar's hallmark initiatives in line with the broader vision of Rural Development Department, Bihar and under guidance of Senior Officials of the department, has been the promotion of the agroforestry model. Understanding that traditional farming practices often lead to deforestation and soil degradation, he advocates for integrating trees into agricultural landscapes.

In this article Tarun Kumar delves into Grey Water Management and Natural Purification Processes.

To share your feedback or enquire about the author, write to us at editor@eawater.com

EFFICACY OF OZONE ON COLOR REMOVAL

Over the last year, we have had many clients who want to look at Ozone to remove effluent color before re-use or discharge. However, clients are being misled into believing that Ozone can be used anywhere in the process stream and simple rule of thumb can be used to design Ozone dosage.Let us try to understand the various factors affect the efficiency of Ozone in color removal applications.

1. CORRECT LOCATION OF OZONE APPLICATION

Ozone is most effective when used as a polishing agent rather than a singular treatment method. For example, in wastewater treatment, ozone is often applied after biological treatment processes to remove residual color and improve water quality. In many cases Ozone and biological treatment are used together to achieve best results.

2. EFFECT OF TURBIDITY

Turbidity, caused by suspended particles in water, can significantly impact the efficacy of ozone. High turbidity levels can shield color-causing compounds from ozone, reducing its effectiveness. Effective pre-treatment methods such as coagulation and filtration can improve the overall efficiency of ozone treatment.

3. EFFECT OF ORGANIC CONTENT

The presence of organic matter in water can affect the required ozone dosage for effective color removal. Higher COD typically demands a higher ozone dose to achieve the same level of color removal.

As a general rule of thumb, we have found that 200-250 ppm of COD is the upper limit of economic viability of Ozone for color removal.

4. TYPE OF ORGANIC TARGETED

Ozone cannot remove all color sources. So it is important to understand the color causing compounds before committing to Ozone based solutions. For example, while direct, reactive, mordant, Sulphur and cationic dyes can be easily treated with Ozone, disperse and VAT compounds are often difficult to remove.

5. CONTACT TIME

The contact time between ozone and the water being treated is a critical factor for effective color removal. Optimal contact times can vary and the exact contact time may need to be adjusted based on the specific characteristics of the effluent.

6. EFFECT OF OZONE ON TDS

In many cases, clients have separate discharge streams of low and high TDS. Since dosing large amounts of Ozone too early in the process can increase TDS in the effluent, one must keep an eye on parameters other than just color during lab and pilot tests.

In short, it is imperative to undertake lab and pilot studies before investing in Ozone systems for large scale color removal applications. Our own experience suggests that only 30-40% of the cases are economically viable with Ozone.

ISSUED IN PUBLIC INTEREST BY:
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THE BOILING RIVER: AMAZON'S MYSTICAL CAULDRON



Deep within the Peruvian Amazon, hidden from the world by dense jungle, lies a mysterious and little-known natural phenomenon: the Boiling River, or "Shanay-timpishka," which translates to "boiled with the heat of the sun." Stretching nearly 4 miles, this river's waters reach scalding temperatures of up to 93°C (200°F), enough to cook small animals instantly and scald anyone who dares to enter.

What makes the Boiling River so enigmatic is its existence far from volcanic activity, defying traditional geothermal logic. Scientists speculate that water from distant mountain ranges seeps deep into the Earth's crust, heating up as it comes into contact with geothermal energy before surfacing in this isolated region. Despite years of research, much about the river's source and mechanics remains an unsolved mystery.

Shanay-timpishka is more than just a scientific curiosity. Local legends tell of its sacred significance to the Asháninka people, who believe the river was created by a serpent spirit, Yacumama, or "Mother of the Waters." Shamans regard its steaming waters as a site of powerful spiritual energy, used for rituals and healing.

The surrounding rainforest teems with rare flora and fauna, some adapted to the river's extreme heat, adding to its allure.

The river's most astonishing feature is its lethal power. Animals or insects that accidentally fall into its waters are boiled alive, their remains carried downstream by the current. Yet, the area around the river is strikingly serene, with lush greenery, birdsong, and the constant hissing of steam rising from the water's surface—a juxtaposition of tranquility and danger.

This hidden wonder, located near the town of Pucallpa, remains one of the Amazon's best-kept secrets. Accessing it requires a challenging journey through remote rainforest terrain, further preserving its mystique. Conservationists, however, warn that increased human activity and deforestation in the region pose a threat to this unique ecosystem.

The Boiling River stands as a testament to the Earth's mysterious and untamed power. It challenges our understanding of natural phenomena and reminds us of the delicate balance between humanity and the environment. For those willing to brave the journey, this cauldron of steaming water offers a glimpse into a world where science, myth, and wonder collide—a place that feels as otherworldly as it is real.

As the steam dances above its surface, the Boiling River invites explorers to witness its fiery heart, a reminder that the planet's most enigmatic treasures often lie in the least expected places.



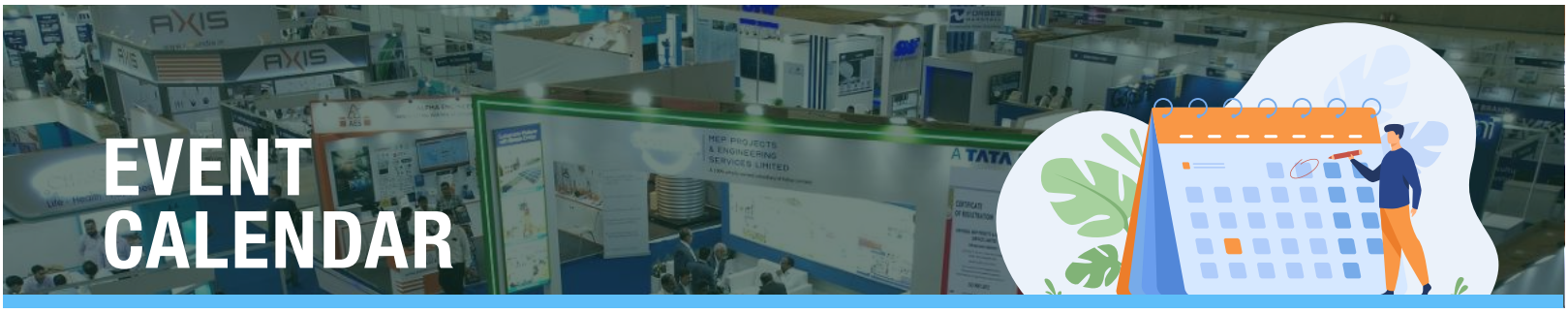
TENDER

Installation of Water Treatment Unit at Charjadubati			
Category	AMC, Repair, Maintenance, Installation Tenders		
Location	West Bengal, Chakdah		
Bid Open Date	**20 January 2025**	**Tender Value**	**3.49 Lac**
Doc Collection Date	**18 January 2025**	**FTID**	250113426430
Constn of Water Treatment Plant at Barua Uttarpara Near Banggori at Barua			
Category	Agro, Marine, Food Products Tenders		
Location	West Bengal, Murshidabad		
Bid Open Date	**24 January 2025**	**Tender Value**	**8.43 Lac**
Doc Collection Date	**21 January 2025**	**FTID**	2501134160200
Interception and Diversion Work for Tapping Nallah and Setup Sewage Treatment Plant for Used Water Management for Jaitwara Town			
Category	Construction, Infrastructure, Civil Work Tenders		
Location	Madhya Pradesh, Nagod		
Bid Open Date	**31 January 2025**	**Tender Value**	**2.30 Crore**
Doc Collection Date	**29 January 2025**	**FTID**	2501134188570
Const of Water Treatment Plant on the L/O Krishno Sarkar at Tripurapara Within Asannagar Gp Under Xvfc Fund for Fy 2023-24, Egs P.Code-5318775, Sl No- 01/2023-24, Activity Id- 107016231/2023-24			
Category	Agro, Marine, Food Products Tenders		
Location	West Bengal, Krishnanagar		
Bid Open Date	**22 January 2025**	**Tender Value**	**08.61 Lac**
Doc Collection Date	**20 January 2025**	**FTID**	2501134207160
Water Treatment Plant Near Amodpur Bottola Bazar, S-Vi. Under Chaital Gp			
Category	Agro, Marine, Food Products Tenders		
Location	West Bengal, Barasat		
Bid Open Date	**22 January 2025**	**Tender Value**	**5.65 Lac**
Doc Collection Date	**18 January 2025**	**FTID**	2501114160720
Jjm Wss to Chakkupallam Vandanmedu Karunapuram and Vandiperiyar Panchayats in Idukki District Design and Construction of 25 Mld Water Treatment Plant Structural Design Work			
Category	Construction, Infrastructure, Civil Work Tenders		
Location	LocationKerala, Thodupuzha		
Bid Open Date	**06 February 2025**	**Tender Value**	**1.62 Crore**
Doc Collection Date	**04 February 2025**	**FTID**	250111412460

TENDER

Construction of STP (Sewage Treatment Plant) Along with New Sewerage Lines and Storm Water Lines In B.S.E.H, Bhiwani (Providing Water Supply System and Sewerage System)			
Category	Construction, Infrastructure, Civil Work Tenders		
Location	Haryana, Bhiwani		
Bid Open Date	**22 January 2025**	**Tender Value**	**1.31 Crore**
Doc Collection Date	**21 January 2025**	**FTID**	250110452140
Reverse Osmosis Based Point of Use Water Treatment System for Drinking Purposes (V2) as per Is 16240, Potable Water Purification System with Inbuilt Water Cooler			
Category	Construction, Infrastructure, Civil Work Tenders		
Location	Assam, Dhemaji		
Bid Open Date	**20 January 2025**	**Tender Value**	**17.86 Lac**
Doc Collection Date	**20 January 2025**	**FTID**	2501104176890





EVENT CALENDAR

December 2024

GeoSmart India (GSI)
02 – 05 December 2024
Hyderabad, India
geosmartindia.net/2024/

Pak Water & Energy Expo 2024
03 - 05 Dec 2024
Karachi Expo Center, Karachi, Pakistan
www.pakwaterexpo.com

Exhibition on Water / Water Forum
04 - 06 December 2024
Belgrade Fair – Hall 3 / Belgrade / Serbia
www.sajamvoda.rs

Aquatech China 2024
11 - 13 Dec 2024
Shanghai New International Expo Centre (SNIEC), Shanghai, China
www.aquatechtrade.com/shanghai

January 2025

Water Exhibition & Conference
14 - 16 Jan 2025
ADNEC Centre Abu Dhabi, Abu Dhabi, UAE
www.worldfutureenergysummit.com

NEWEA Annual Technical Exhibition & Conference
26 - 29 Jan 2025
Boston Marriott Copley Place, Boston, USA
annualconference.newea.org

InterAqua
29 - 31 Jan 2025
Tokyo Big Sight, Koto, Japan
en.www.interaqua.jp

Michigan Onsite Wastewater Conference
07 – 08 Jan 2025
Kellogg Hotel and Conference Center, Lansing, USA
events.anr.msu.edu/event

February 2025

Indomach
06 - 08 Feb 2025
Adityapur Auto Cluster, Jamshedpur, India
indomach.in

World Ag Expo
11 - 13 Feb 2025
International Agri-Center, Tulare County, USA
www.worldagexpo.com

Mountain States Ground Water Expo
13 - 14 Feb 2025
Aquarius Casino Resort, Laughlin, USA
mountainstatesgroundwater.com

Water and Waste Expo
20 - 22 Feb 2025Pragati Maidan, New Delhi, Indiawatersolidwaste.in

World Water Tech Innovation Summit
25 - 26 Feb 2025
Park Plaza London Riverbank, London, UK
worldwatertechinnovation.com

Membrane Technology Conference & Exposition
24 - 27 Feb 2025
Long Beach, USA
www.amtaorg.com/awwaamta-membrane-technology-conference-exposition

Water Today's Water Expo
26 - 28 Feb 2025
Chennai Trade Centre, Chennai, India
www.waterexpo.biz

March 2025

International Conference on Advances in Water Treatment and Management
1 - 2 March 2025
Gandhinagar, Gujarat, India www.pdeu-h2o.com

Sioux Empire Water Festival
4 - 5 March 2025
Sioux Falls, USA
sewf.org

Hot Water & Hot Air
4 - 6 March 2025
Portland, USA
www.aceee.org/2025-hot-water-hot-air-forums

International Conference on Water Management Modeling
5 - 7 March 2025
Toronto, Canada
www.icwmm.org

Oman Sustainability Week
11 - 15 May 2025
Muscat, Oman
www.omansustainabilityweek.com

ISH - World's leading trade fair HVAC + Water
17 - 21 March 2025
Frankfurt, Germany
ish.messefrankfurt.com/frankfurt/en.html

Aqua Netherlands
18 - 20 March 2025
Evenementenhal Gorinchem, Netherlands
www.aquanederland.nl/en

Water & Clean Tech India Expo
19 - 21 March 2025
Pragati Maidan, New Delhi
www.smartcitiesindia.com

Water Phillipines Expo & Conference
19 - 21 March 2025
SMX Convention Center, Manila, Philippines
www.waterphilippinesexpo.com

April 2025

China Clean Expo Shanghai
31 Mar - 03 Apr 2025
Shanghai New International Expo Centre(SNIEC), Shanghai, China
www.chinacleanexpo.com/en

American Worlds Water Association Annual Conference
07 - 10 Apr 2025
Anaheim, USA
www.inawwa.org/event/2025-annual-conference-april-21-25th/

Baku Water Week
08 - 10 Apr 2025
Baku Expo Centerbakuwaterweek.az/en/

Water Environment Association of Ontario Annual Conference
13 - 15 Apr 2025
London Convention Centre, London, Canada
weao.org/about/

Smart Water Systems
14 - 15 April 2025
London, United Kingdom
www.smgconferences.com

MiningWorld Russia
23 - 25 Apr 2025
Crocus Expo International Exhibition Center, Krasnogorsk, Russia
miningworld.ru/en/

Our Ocean Conference KOREA
28 - 30 Apr 2025
Centum City Industrial Complex, Busan, South Korea
ourocean2025.kr

2025 Water for Food Global Conference
28 Apr - 02 May 2025University of Nebraska
waterforfood.nebraska.edu

May 2025

Water Management Show (WaterEx)
01 - 03 May 2025
ICCB, Dhaka, Banglade
shsavor-watermanagement.com

International Water Summit 2025
05 - 06 May 2025
Midreshet Ben-Gurion, Israelwww.watersummitziwr.com

Power of Water Canada Technical Conference & Trade Show 2025
07 - 09 May 2025
Niagara-on-the-Lake, Canada
powc25.vfairs.com/en/



EVENT CALENDAR

Stormwater and Wastewater Conference Saudi Arabia 2025
11 - 12 May 2025
Jeddah Hilton, Jeddah, Saudi
Arabiastormwaterandwastewaterksa.com

Commonwealth Chemistry Congress (CCC)
11 - 14 May 2025
Stellenbosch, South
Africacommonwealthchemistry.org

Industrial Water Management - Effective Process Water Treatment 2025
15 - 16 May 2025
ibis Styles Berlin Treptow, Berlin, Germany

Enlit Africa
20 - 22 May 2025
Cape Town, South Africa
www.enlit.world/events/enlit-africa-2024/

CWRA Annual Conference 2025
25 - 29 May 2025
Penticton,
Canadaconference.cwra.org/upcomingconferences/

June 2025

World Environment Expo 2025
04 - 06 Jun 2025
Greater Noida,
Indiaworldenvironment.in

Green Tech 2025
03 - 05 Jun 2025
Berlin,Germany
greentechfestival.com

AWWA Annual Conference & Expo 2025
08 - 11 Jun 2025
The Colorado Convention Center, Denver,
USAhttps://ace.awwa.org/

Water & Long-Term Value 202510 June 2025
Skytop Studio, Rome, USA

Infrastructure Africa 2025
11 - 12 Jun 2025
Johannesburg, South Africawww.infrastructure-africa.com

Future of Utilities Summit 2025
11 - 12 Jun 2025
QEII Centre, London, UK
futureofutilities.com/events/summit/

Groundwater Quality 2025
10 - 13 Jun 2025
Bordeaux INP, Talence, France
groundwaterquality2025.fr

DrinkTechAsia 2025
12 - 15 Jun 2025
Bangkok,Thailand
www.propakasia.com

China (Guangzhou) International High-end Drinking Water Industry Expo 2025
12 - 14 Jun 2025
Guangzhou, China
waterexpocn.com/en/

Michigan Water Environment Association Annual Conference 2025
15 - 18 Jun 2025
Boyne Mountain Resort, Boyne Falls, US
Awww.mi-wea.org

IFAT Brasil 2025
25 - 27 Jun 2025
Sao Paulo Expo, São Paulo, Braziifat.de/en/brasil/

July 2025

Thai Water Expo 2025
02 - 04 Jul 2025
Queen Sirikit National Convention Center, Bangkok, Thailand
www.thai-water.com

Qingdao International Water Conference 2025
02 - 04 Jul 2025
Hilton Qingdao Golden Beach, Qingdao, China
www.cda-apdwr2009.com/english/

Indo Fisheries Expo & Forum 2025
02 - 04 Jul 2025
Grand City Mall & Convex Surabaya, Surabaya, Indonesia
indofisheries.id

Frontiers in Water Biophysics 2025
12 - 16 Jul 2025
Centro Di Cultura Scientifica Ettore Majorana, Erice, Italy
www.waterbiophysics.eu/

Louisiana Rural Water Association Conference 2025
13 - 17 Jul 2025
Lake Charles Civic Center, Lake Charles, USA
lrwa.org/annual-conference/

International Forum on Water 2025
14 - 17 Jul 2025
Athens Institute For Education and Research (ATINER), Athens, Greece
www.atiner.gr/waterBuild

4Asia 202515 - 17 Jul 2025
AsiaWorld-Expo,
Hong Kong
www.build4asia.com

August 2025

AgriTech India 2025
01 - 03 Aug 2025
BIEC, Bengaluru,
Indiaagritechindia.com

ISWPT 2025
02 - 04 Aug 2025
Bangkok,
Thailandiswpt.org

Indo Water Expo & Forum 2025
13 - 15 Aug 2025
Jakarta,
Indonesiaindowater.com

World Congress on Mechanical, Chemical, and Material Engineering (MCM 2025)
19 - 21 Aug 2025
Paris,
Francemcmcongress.com

The Water Expo 2025
20 - 21 Aug 2025
Fort Lauderdale,
USAwww.thewaterexpo.com

KWEA & KsAWWA Joint Annual Water and Wastewater Conference 2025
26 - 28 Aug 2025
Topeka,
USAwww.kswaterwastewater.com

20th EverythingAboutWater Expo 2025
28-30 Aug 2025
Pragati Maidan, New Delhi
www.eawaterexpo.com

September 2025

WateReuse California Conference 2025
11 - 13 Sep 2025
San Diego, USA
www.acwa.com

Global Summit on Climate Change & Environmental Sustainability
18 - 19 Sep 2025
Los Angeles, USA
climatechangeconferences.org

WATEC Israel 2025
08 - 10 Sep 2025Jerusalem, Israel
watec-israel.com

EkvaTek 2025
09 - 11 Sep 2025
Crocus Expo, Moscow, Russia
ecwatech.ru

LGNSW Water Management Conference 2025
09 - 11 Sep 2025
Albury Entertainment Centre, Albury, Australial
gnsw.org.au

Water, Wastewater & Environmental Management Expo
17 - 18 Sep 2025
NEC Birmingham, UK
www.ess-expo.co.uk/wwem

BAYWATCH



Addressing water shortages and environmental issues on a global scale has become an urgent issue in order to create a sustainable society. In addition, Japan is experiencing a full-scale population decline and the risks of abnormal weather and social change are emerging, and we are entering an era in which further efforts and fundamental revisions are required. Corporate activities are no exception; corporate activities and management that incorporate perspectives such as a decarbonized society and response to SDGs are required.

InterAqua2025 will be held under the concept of" Exhibition of water business supporting sustainable corporate activities," and will cover not only innovative technologies but also examples that can be implemented right now.

This exhibition, now in its 16th year, will continue to grow together with you as a forum for solving water environment issues both at home and abroad, responding to the diversification and complexity of market needs. Please make use of this exhibition as a gateway to new business and a window for ongoing corporate activities.

Date: 29-31 January 2025
Venue: Tokyo Big Site, Koto, Japan
Website: en.www.interaqua.jp



The "INDOMACH" is a leading 'B2B Industrial Machinery and Engineering Exhibition' and a Showcase of Engineering Products and Services, Heavy and light Machines, Machinery Equipments and accessories, Tools and Part Technological Devices, Products, Engineering Tools and allied Products & Services. This B2B event strives to offer an extensive commercial platform to a wide range of Industries to gain excellent exposure among its prospective clients.

Our Exhibitions focuses basically on Engineering Machinery, Machine Tools, Automation & Robotics, Instrumentation, Hand Tools, Power Tools, CNC Machines, Material Handling Equipment, Hydraulics & Pneumatics, Welding Equipments, Measuring Equipments, Safety Products, Mining Machinery, Welding Equipments, Laser Technology and many more categories from Industrial & Engineering Sector. We have rich experience to organise and manage the Industrial & Engineering exhibitions across India and already organised 50+ Industrial Exhibitions in last decade.

Date: 06-08 February 2025
Venue: Adityapur Auto Cluster, Jamshedpur, India
Website: indomach.in

BAYWATCH



The 20th EverythingAboutWater Expo 2025 stands as a remarkable and all-encompassing annual event in India, spotlighting cutting-edge technologies and solutions within the water sector. This event serves as an exceptional gateway for stakeholders worldwide to immerse themselves in the expansive and dynamic realm of the Indian Water management Industry, facilitating the exchange of business opportunities, networking, and the exploration of innovative Water solutions.

India is currently on a trajectory towards severe water stress, with projections indicating a critical situation by 2030. The rapid pace of Industrialization and the burgeoning population have significantly widened the gap between water supply and demand, a matter of deep concern for both the Central and State Governments. Within the framework of the 20th EverythingAboutWater Expo 2025 unparalleled business prospects will emerge for both domestic and international players in the Water Industry. Attendees will have the opportunity to gain valuable insights, discover future trends, and navigate the evolving landscape of the Indian Water market.

Date: 28-30 August 2025
Venue: Bharat Mandpum, Pragati Maidan, New Delhi
Website: www.eawaterexpo.com



The World Future Energy Summit is the premier platform shaping and strengthening intellectual and corporate evolution, while offering solutions for actionable development in the transformation of future energy systems.

We exist to champion a sustainable planet for today and future generations. In this vital ambition, we believe that knowledge and collaboration are our most powerful currencies in order to propel our world forward in unprecedented ways. Ultimately, we're striving for a cleaner, greener tomorrow.

Our sole mandate is facilitating the meeting of minds and ideas, which lies at the heart of everything we do.

Date: 14 - 16 January 2025
Venue: ADNEC, Abu Dhabi
Website: www.worldfutureenergysummit.com

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01 **EverythingAboutWater Monthly Magazine & Annual Buyer's Guide:** India's first and most widely-read water magazine with 30,000+ subscribers and over 100,000 readers.

02 **EverythingAboutWater Expo & Conclave:** South Asia's largest water expo, bringing together global experts and industry leaders.

03 **Training Programs & Conferences:** 500+ training sessions and 200+ conferences that equip professionals with cutting-edge knowledge and insights.

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06 **Aqua Career:** Specialized recruitment services for the water sector.

EverythingAboutWater

India's Leading Knowledge & Marketing Solution Provider in Water & Wastewater Management.

For over two decades, EverythingAboutWater has been at the forefront of providing comprehensive solutions to the water industry. Whether through our highly-regarded publications, impactful events, or tailored digital marketing services, we are dedicated to empowering professionals and organizations with the knowledge and tools they need to thrive in the ever-evolving water and wastewater management sectors.

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to explore how EverythingAboutWater can help you stay ahead in the water and wastewater management industry!

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