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RIPPLES OF RENEWAL: NAVIGATING A SUSTAINABLE WATER FUTURE THROUGH RECYCLING

Dear Esteemed Readers,

In this edition of EverythingAboutWater Magazine, we embark on an engaging exploration into the theme of "Recycling for a Sustainable Water Future."

As the world grapples with environmental challenges, the focus on recycling practices in water management becomes paramount for fostering a sustainable future. Urban and industrial areas, integral to our society, must play a pivotal role in shaping responsible water management practices.

In this issue, we spotlight the crucial intersection between recycling technologies and water systems, unraveling the intricate dynamics that contribute to sustainable water practices. Within the following pages, anticipate a condensed yet insightful glimpse into the latest advancements propelling recycling for a sustainable water future. From innovative wastewater treatment solutions to cutting-edge recycling technologies, we delve into strategies promising a more resilient and eco-friendly tomorrow. This edition serves as a concise guide, directing leaders, communities, and policymakers towards solutions that integrate recycling seamlessly into urban and industrial landscapes. As you navigate through these impactful pages, envision a future where our commitment to recycling harmonizes with ecological stewardship, ensuring a water-secure world for generations to come. In conclusion, I extend my sincere appreciation for joining us on this exploration into "Recycling for a Sustainable Water Future." May the distilled insights from these pages inspire transformative actions in your respective domains, fostering a future where recycling plays a pivotal role in securing water resources.

Thanks & Regards,

Simran Arora

Editorial Incharge

EverythingAboutWater Magazine

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NATIONAL W

DROPLETS

Kirloskar Brothers Limited has contributed to the Majestic Shri Ram Mandir in Ayodhya with Over 100 Pumps

Kirloskar Brothers Limited (KBL), a renowned Indian pump manufacturing company, is proud to announce a contribution of over 100 pumps, playing a crucial role in the temple's water management system and fire safety infrastructure.

The pumps provided by KBL encompass an energy-efficient range, including monobloc pumps, self-priming pumps and pressure-boosting pumps. These pumps will ensure efficient water supply throughout the sprawling temple complex, catering to the needs of devotees and maintaining a serene ambience.

Furthermore, KBL has equipped the temple with its state-of-the-art firefighting pumps. These Factory Mutual (FM) approved & Underwriters Laboratories (UL) listed firefighting pumps ensure the safety of the temple and devotees. KBL's commitment to quality and reliability guarantees the effectiveness of these pumps in safeguarding the iconic structures, globally. These energy-efficient pumps are designed in India and Made in India.

Mr. Sanjay Kirloskar, Chairman and Managing Director of Kirloskar Brothers Limited, said: "We are deeply honoured to be associated with the construction of the Shri Ram Mandir, a project of immense spiritual and cultural significance. As a 100% Indian-owned company, we believe in contributing to the development of our nation, and this initiative aligns perfectly with our values. Our pumps will not only facilitate smooth water management but also act as silent guardians, protecting the sanctity of the temple."

KBL's involvement in the Shri Ram Mandir is a testament to the company's unwavering dedication to preserving India's rich cultural



Tamil Nadu: Jal Shakti Abhiyan Improves Groundwater in Six Revenue Blocks in Dharmapuri

The ambitious Jal Shakti Abhiyan that aims to promote the conservation of water in water-stressed blocks in the country has proved to be a success in the dry Dharmapuri district of Tamil Nadu. The district administration has spent over Rs 77.03 crores under the central government programme in improving water storage, reusing water sources and watershed development. The efforts have paid off well as per early indicators as the groundwater levels in six firkas (revenue blocks) across Dharmapuri district have improved.

Though the rivers Cauvery and Thenpennai flow through Dharmapuri, the elevated terrain of the district is not conducive for effective water storage or ground water recharge. This, coupled with the exploitation of groundwater, explains the frequent water shortages for domestic and agrarian purposes in the backward region.

The situation is slowly improving as the District Rural Development Agency (DRDA) is spearheading the Jal Shakti Abhiyan by constructing check dams, soak pits, wells and other sources to improve rainwater harvesting in the district.

In a study conducted by the DRDA, it was found that in nine short months, ground water levels in six firkas have improved. In each of these firkas, groundwater levels have improved by 10 feet.

"Under Jal Shakti Abhiyan Scheme the first part of the project included the identification of all existing water bodies suitable for water harvesting schemes with the help of Geographic Information System (GIS). Through this we identified the inventory of all water bodies and provided data for effective planning and monitoring. In the initial inventory we identified that Dharmapuri had 1,400 water bodies," said Collector K. Santhi.

Following this, a scientific study was conducted on water conservation, with the help of remote sensing images from the National Remote Sensing Centre (NRSC) and GIS mapping

ATER NEWS

technology. Through this, we planned Water Harvesting Structures (WHS) and made note of areas for planning future WHS.

However, apart from WHS, we also set up soak pits across rural and urban areas, dug community wells and conducted afforestation drives across the district. Further, through various NGOs and government bodies we have also been pushing on the need for water harvesting. In the nine months, between March and November of 2023, we have completed various projects which have directly improved groundwater levels in over six firkas across the district,” she said.

Balaji, a DRDA engineer, commented on the project, “In the 23 firkas across Dharmapuri water resources have been severely over–exploited or critical, meaning, there is an increase in the vulnerability of drinking water supplies due to the scarcity of water.”

In 2020, water resources were over–exploited in 15 firkas, critical in four firkas, semi–critical in two firkas and safe in only two firkas. However, in a study conducted in 2023, there has been a significant improvement on an average by 10 feet in nine months. As per arecent study, of the 23 firkas, water resources were found over–exploited only in 12 firkas, whereas those in the critical, semi–critical and safe categories were three each.

“Through the various projects, the water levels have improved in six firkas in one year. However, in the upcoming years the benefits from the project will increase manyfold in all the 23 firkas,” added Balaji.

Parasuram from Adilam village said, “Well irrigation is the only way for farmers to undertake cultivation in our village. However, over the years slowly well irrigation is also seemingly reduced and summers are usually harsh for farmers. However, last year, a cement check dam was constructed in our village and it has improved the situation. Apart from the wells now we have another source to pursue cultivation. So, this type of scheme has been helpful to us.”

Another farmer, R. Narayanasamy from Ariyakulam village, said, “The check dam set up by the administration in our village last year has directly benefited us. Our situation was such that when even borewells had been failing it was difficult to pursue farming with no other water sources. Now cultivation is slowly improving,” he said.



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DROPLETS

TERI Launches Policy Briefs at WSDS2024 for Sustainable, Climate–resilient Practices



TERI launched a policy brief at WSDS2024 on ‘Benchmarking Industrial Water Use Efficiency in India: Opportunities for Water–Intensive Industries’. With support from the National Water Mission, Ministry of Jal Shakti, Government of India, the institute conducted a comprehensive assessment of water–intensive industries in India. The assessment identified opportunities, technologies, best practices, and policy interventions for reducing water consumption. These interventions, along with the wastewater recycle and reuse opportunities formed the basis for identification of potential benchmarks in water–intensive industries.

The event was graced by Dr. Vibha Dhawan, Director General, TERI, Mr. Anshuman, Director, TERI and Mr. Mannu Ji Upadhyay, Director, Bureau of Water Use Efficiency, National Water Mission, Ministry of Jal Shakti, Department of Water Resources, RD & GR, Govt. of India, with a special video message by Hon'ble Minister Shri Gajendra Singh Shekhawat, Ministry of Jal Shakti.



For J&K Swachh Mission, Centre Okays Rs. 365 Cr. Plan

The Department of Drinking Water and Sanitation, Union Ministry of Jal Shakti, today approved the Annual Implementation Plan 2024–25 for J&K under the Swachh Bharat Mission (SBM) in a meeting convened with the Department of Rural Development and Panchayati Raj, J&K. Chaired by Vini Mahajan, Secretary, Department of Drinking Water and Sanitation, the meeting witnessed the participation of Joint Secretary Jitendra Srivastava and other senior officials of the Union Government, a spokesperson said. Shahid Iqbal Choudhary, Secretary, Rural Development Department and Panchayati Raj, J&K, made a detailed presentation before the panel along with Anoo Malhotra, Director General, Rural Sanitation, J&K.

“The annual plan outlay, projected at Rs. 365.42 crores, envisages the creation of assets in rural areas for waste management, supporting the communities to operate and maintain the assets, coverage of tourist destinations, religious places and educational institutions.

The major thrust of the plan will be the establishment of plastic waste management units, providing electricity supply, connectivity, waste collection support and detailed policy for use of shredded plastic in infrastructure projects, particularly the road sector,” the spokesperson said.

“The department projected the construction of 2,000 community sanitary complexes, covering the priority destinations and uncovered panchayats. Assets for solid waste management, water management, construction of biogas plants, sludge treatment plants, waste management facilities and community awareness are among the major initiatives approved under the SBM annual implementation plan. Efforts on the sustainability of sanitation systems will be made under the AIP,” the statement said.

“The Swachh Bharat Mission’s Director has proposed the construction of 21,000 IHHL units apart from coverage of all PMAY housing unit beneficiaries. Collection, storage and segregation centres, vehicles for collection and transportation of waste, individual and community compost pits, segregation bins and safety material for sanitation workers are also included in the approved plan. Focus will also be placed on capacity building of village level committees and field staff,” the statement reads.

Signing of Memorandum of Understanding (MoU) on Modified Parbati–Kalisindh–Chambal–ERCP (PKC–ERCP) Link Project amongst States of Madhya Pradesh & Rajasthan and Govt. of India



It is another feather in the cap for Government of India in water management sector in the country, especially for the interlinking of rivers (ILR) program and also a momentous occasion for the people of Rajasthan and Madhya Pradesh (MP), as an MoU was signed by both these states with Ministry of Jal Shakti (MoJS), Govt. of India (Gol) today at New Delhi for implementation of the “Modified PKC–ERCP” (integration of original PKC with Eastern Rajasthan Canal Project of Rajasthan), which is the second project under the national perspective plan of interlinking of rivers (ILR) program of Government of India.

The MoU was signed today on 28.01.2024 by Dr. Rajesh Kumar Rajora, ACS, WRD, Govt. of MP, Sh. Abhay Kumar, ACS, WRD, Govt. of Rajasthan and Smt. Debashree Mukherjee, Secretary, DoWR, RD&GR, MoJS, Gol on broad planning of the Parbati–Kalisindh–Chambal (PKC) link duly integrated with Eastern Rajasthan Canal Project (ERCP) and preparation of its DPR. The Union Minister of Jal Shakti, Sh. Gajendra Singh Shekhawat, Sh. Mohan Yadav, Hon’ble Chief Minister of Madhya Pradesh and Sh. Bhajan Lal Sharma, Hon’ble Chief Minister of Rajasthan graced the occasion. Sh. Shriram Vedire, Chairman of the Task Force on Interlinking of Rivers and other officials of MoJS and states of Madhya Pradesh and Rajasthan were present on the occasion.

Led by Shri Gajendra Singh Shekhawat, Union Minister of Jal Shakti, intense consensus building exercise was done by the Jal Shakti ministry during the past few years to build a consensus amongst both the states of Rajasthan and Madhya Pradesh to implement this project. Achievement of consensus amongst both the states is a demonstration of inter–state cooperation under the able leadership of Hon’ble Prime Minister of India, thus paving the way for the joint development and inter–basin water transfers in Chambal basin on the lines of Ken–Betwa Link Project. This is a success of cooperative federalism in the country.

The Feasibility Report (FR) of Parbati–Kalisindh–Chambal (PKC) link project under National Perspective Plan (NPP) was prepared and circulated to the concerned State Governments in February–2004. In the year 2019, Rajasthan came up with the proposal of ERCP. With a view to utilize the water resources optimally, the integration of the Parbati–Kalisindh–Chambal (PKC) link of NPP with Eastern Rajasthan Canal Project (ERCP) was discussed in 11th and 12th meetings of the Task Force for Interlinking of Rivers (TFILR) in year 2019. Thereafter, the issue of integration of ERCP with PKC link has been deliberated regularly with states at various platforms. Looking at the importance and utility of the Modified PKC link project, Special Committee for Interlinking of Rivers (SCILR), in its 20th meeting held on 13.12.2022 in New Delhi has approved the “Modified PKC–ERCP” link as the part of the National Perspective Plan of Interlinking of rivers in the country and also declared it as one of the priority link projects in the country.

This link project proposes to provide drinking and industrial water in 13 districts of eastern Rajasthan, Malwa and Chambal regions of Madhya Pradesh apart from providing irrigation in 2.8 lakh ha. area (or more) each in both the states (total of 5.6 lakh ha or more) including supplementation of enroute tanks in the states. The Modified PKC link project will help in utilizing the available water resources of Chambal basin optimally and economically. The various components of Modified PKC link including areas of benefit shall be firmed up at DPR stage in consultation with both the states.

The preparation of DPR of this Modified PKC–ERCP link is already in progress. Based on the outcome of DPR, a Memorandum of Agreement (MoA) would be finalized amongst the States of Rajasthan, Madhya Pradesh and Union Government, covering the scope of the work of the link Project, sharing of water, exchange of water, sharing of costs & benefits, implementation mechanism and arrangements for management and control of water in Chambal basin etc. to be signed by Hon’ble Chief Ministers of both the States and Hon’ble Minister of Jal Shakti for the implementation of this link. The Hon’ble Union Minister of Jal Shakti, Sh. Gajendra Singh Shekhawat, requested both the states to finalize the DPR of various components by respective states as early as possible so as to initiate the implementation of link project at the earliest.

5th Meeting of Steering Committee of Ken Betwa Link Project Authority and Atal Bhujal Yojana in MP

5th meeting of the Steering Committee of Ken Betwa Link Project Authority was held at Khajuraho, Madhya Pradesh today in the Chairpersonship of Ms. Debashree Mukharjee, Secretary (DOWR, RD&GR). Meeting was attended by the Shri Manish Singh, Principal

Secretary, WRD, MP, Shri Subodh Yadav, JS (A,IC&GW), Collector & DM of Panna and Chhatarpur with the representative from I&WRD, UP, Forest Department of UP MP, Field Director, PTR, NITI Ayog, MOEF&CC, WII, NWDA, CWC, KBLPA.

Chairperson highlighted the importance of project for Bundelkhand region. She stressed for best practices in construction, safeguarding the interest of environment, biodiversity alongwith the community development. Special emphasis for timely land acquisition for Daudhan Dam and Link Canal was highlighted. Directed to timely completion of all the left out DPR’s. Secretary told all the partners to work in unison to have timely and projected benefits in all quarter. Later she chaired the meeting for review of progress of Atal Bhujal Yojna.

Yesterday, Secretary (DOWR, RD&GR) visited the Pipariya Village of Salaiya Gram Panchayat of Raj Nagar Block, District Chhattarpur, MP. She interacted with the villagers regarding ground water awareness under Atal Jal. Mr. Subodh Yadav, Joint Secretary Govt. of India, Mr. Manish Singh Principal Secretary, Govt. of MP, were present along with Mr. Sandeep, Collector Chhattarpur and Project Director, SPMU, Atal Bhujal Yojana, MP. Villagers shared their experiences on ground water management and initiatives taken for adaptation of water saving methods and new initiatives practices.

Later on Secretary (DOWR, RD&GR) along with WRD, Govt of MP, in the presence of NWDA, KBLPA, Collector, Chhatarpur and officials of WRD, MP, CWC and KBLPA visited Daudhan dam site of Ken Betwa Link Project. She discussed with the KBLPA, officials of Govt of M.P, on the planning and execution of Daudhan Dam in a timely manner. Secretary, also interacted with local villagers and asked WRD, MP, Collector’s for effective implementation of R&R for betterment of Project affected Families.

Secretary (DOWR, RD&GR) also visited Panna Tiger Reserve and discussed with the Field Director, Panna Tiger Reserve. She directed to have implementation of Integrated Landscape Management Plan with the coordination of all the stakeholders. All the measures shall be taken in a timely manner.

Digital Mapping Identifies 1,271 Water Sources in Wayanad

As many as 1,271 water sources, including rivulets and streams, have been identified in Wayanad district under two digital mapping campaigns to rejuvenate waterbodies in the district, especially the Kabani river, a major tributary of the Cauvery.

The campaigns titled 'Kabanikkayi Wayanad' and 'Surakshithamakkam Paschimakhatom' were organised by the Haritha Keralam Mission with the support of local bodies and educational institutions. The campaign aims at ensuring the existence of major water sources and mitigating climate change impacts.

When mapping was completed in the 26 civic bodies in the district, the most water sources were identified in Vellamunda grama panchayat, with 85 water sources, and the lowest in Vengappally, with 26 sources.

Those water sources will be conserved with support of the workers under the Mahatma Gandhi National Rural Employment Guarantee Scheme and civic bodies.

Minister Rajeev Chandrasekhar reviews Jal Jeevan Mission in Agartala today

Union Minister of State for Electronics and IT, Skill Development & Entrepreneurship, and Jal Shakti, Shri Rajeev Chandrasekhar, conducted a comprehensive review of the Jal Jeevan Mission in Tripura today, which is rapidly approaching 100% water supply coverage. Presently, the state has achieved an impressive 75.96% tap water supply connections to rural households, showcasing a



During the interaction with corporators and state government authorities involved in the "Har Ghar Jal" initiative, the Minister encouraged them to identify challenges in the districts and expedite the process to ensure that every household has access to water supply connections.

In his review meeting, the Minister stated, "The progress made by Tripura in providing water supply to households is truly commendable. The transformative vision behind this program, driven by Hon'ble Prime Minister Modi ji, empowers every household. It is inspiring to see the transformation in people's lives achieved through this mission

over the past four years in Tripura. Different state governments including the Government of Tripura have played a key role in achieving such a wide coverage. I urge the authorities to persist in their hard work to ensure 100% "Har Ghar Jal." We must also fulfill our commitment to ensuring the supplied water is safe, we must be proactively enhancing the water testing ecosystem. Our support from the center will continue, providing all necessary assistance. While some states, like West Bengal, have not witnessed progress in this regard, your work in Tripura has set an example, inspiring people in West Bengal and in other states. People should ask this question — If every household in Tripura can have safe drinking water, why not us? We should set an example for the entire region."

Since the launch of this mission in 2019, the number of rural households with tap water connections has surged to 564,910 from 24,502, ensuring 75.96% of rural households have tap water supply connections. Among the eight districts, West Tripura, Unakoti, North Tripura, and Gomati have surpassed 75% of their targets, ensuring water supply to over 75% of households. The remaining districts—South Tripura, Khowai, Dhalai, and Sepahijala—are in the range from over 69% to over 73%.

Multiple agencies to be hired for clearing leachate from landfill

Three days after the National Green Tribunal (NGT) directed MCG to submit an action-taken report on the leachate management by February 10, the civic body on Monday decided to empanel multiple agencies for clearing it from Badhwari landfill. These agencies will be responsible to transport leachate produced at Bandhwari to the sewage treatment plants (STPs), ensuring it does not flow into the surrounding areas of the landfill.

"We have already floated a tender to hire multiple agencies so that leachate can be transported from the landfill site daily to the STPs. Once we empanel agencies, we are going to ensure that 50 trips are at least made every day from the landfill to STPs so that leachate does not flow out of the plant at any cost. We earlier had hired one agency but now we want to empanel multiple agencies for the effective management of leachate," said an MCG official. MCG commissioner Narhari Singh Banger had recently directed the private agencies engaged in bioremediation and biomining of legacy waste at Bandhwari to ensure leachate treatment at the site. The agencies were also told to utilise the leachate treatment facility available at the site for the purpose, ensuring that leachate does not flow to the Aravalis.

The MCG officials said that around 400 kiloliters per day (KLD) of leachate is generated at Bandhwari. The civic body recently submitted to the NGT that fresh leachate is treated at the two disk tube and reverse osmosis (DTRs) of the landfill site, each having a capacity of 200 KLD. There is another 150 KLD leachate treatment plant at the

NGT that 400 KLD of leachate is being disposed of in a STP at Behrampur. The NGT recently directed MCG to test the groundwater contamination and health conditions of villagers in five villages surrounding Bandhwari by February 10. The tribunal has asked MCG to constitute a team with representatives of Haryana State Pollution Control Board (HSPCB) to check contamination and health conditions of villagers in Bandhwari, Baliawas, Balola, Gwalpahari and Dera Mandi.

Chennai Metrowater exploring possibilities to supply treated



Chennai Metrowater is exploring possibilities of conveying treated wastewater from Perungudi plant to industries in Chengalpattu district. The water agency is already supplying treated wastewater from its other facilities in Kodungaiyur and Koyambedu. The proposal is under scrutiny following demand raised by various industries during the recent global investors meet in the city. Sources in Chennai Metrowater said the feasibility of supplying tertiary treated water from the Perungudi TTUF (tertiary treatment using ultrafiltration) plant of 10 million litres a day capacity would be studied. Moreover, laying a pipeline for about 40 km to supply reclaimed water to industries in Chengalpattu district would also be considered.

At present, about 23 MLD of secondary treated sewage from Kodungaiyur sewage treatment plant is supplied to industries in Manali, Minjur and Ennore belt. Moreover, two tertiary treatment reserve osmosis plants with 45 MLD capacity each at Koyambedu and Kodungaiyur further treated wastewater that is suitable for industrial purpose.

Currently, nearly 40 MLD of water is conveyed from both the plants as an effort to reduce freshwater demand from industries. Those in Sriperumbudur, Irungattukottai and Oragadam industrial belt are being supplied from Koyambedu plant. While the water agency directly supplied to the companies at a charge of 80 per kilolitre, treated wastewater is being supplied to SIPCOT at a rate of 65 per kl. SIPCOT distributed the water to the companies.

With another TTUF plant in Nesapakkam, Metrowater is looking to reduce stress on freshwater sources and divert it to domestic use. At present, it supplies about 20 MLD of freshwater to industries.

24×7 Canal-based Water Supply Project Picks Up Pace

With the beginning of the new year, the 24×7 canal-based water supply project has picked up pace as soon demo zones will be established in the city to provide residents water round the clock. According to officials, the purpose of creating demo zones is to make preparations to deal with challenges that may arise in the future. It will also help check the actual consumption, they added.

The Sarabha Nagar–Gurdev Nagar area has been selected as the first demo zone. To supply water to these areas, a water storage tank is being built in Leisure Valley, Sarabha Nagar, which is expected to be ready by March. It may take an additional three months to provide water connections to residents. Therefore, the trial may start in the demo zone from June. As per sources, the capacity of the water storage tanks being prepared for the first demo zone is more than 1,800 kilo litres. From this storage tank, water supply will reach around 2,000 households in Sarabha Nagar and Gurdev Nagar.

Some areas of Maharaj Nagar and Ghumar Mandi have been selected for the second demo zone. The storage tank for these is likely to be built in Punjab Agricultural University. The officials of the operation and maintenance cell working on this project said it will take time to set up a water treatment plant in Bilga village for supply of canal water. Providing canal water supply to more than 17 lakh population of the city is also a challenge, they added. Therefore, before streamlining such a big system, demo zones are being created. For now, water will be supplied through tube wells from the water storage tank being built for the purpose. When the water treatment plant in Bilga village is ready, the supply of canal water will begin.

Union Minister For Jal Shakti, Shri Gajendra Singh Shekhawat Inaugurates 14 MLD STP And I&D Network In Baghpat Worth Rs. 77.36 Crores

The Union Minister for Jal Shakti, Shri Gajendra Singh Shekhawat today inaugurated 14 MLD Sewage Treatment Plant (STP) and 2.4 km long Interception & Diversion (I&D) Network in Baghpat, Uttar Pradesh. The centerpiece of the project is the establishment of a cutting-edge Sewage Treatment Plant with a capacity of 14 Million Liters Per Day (MLD) under DBOT mode with 100% central funding under the Namami Gange Programme. The estimated cost of the project is Rs. 77.36 crores. The event was graced by Shri Swatantra Dev Singh, Jal

Shakti Minister of Uttar Pradesh; Shri Satya Pal Singh, Member of Parliament from Baghpat; Shri Jaswant Singh Saini Minister of State for Industrial Development and Parliamentary Affairs; Shri Yogesh Dhama MLA, Baghpat and Shri G. Asok Kumar, Director-General, NMCG.

Union Minister for Jal Shakti, Shri Gajendra Singh Shekhawat, addressing the August gathering asserted that significant strides have been made towards fulfilling Prime Minister, Shri Narendra Modi's commitment to purify the waters of Ganga and Yamuna. He emphasized on the vital role of water as the foundation of life, underscoring that life itself is inconceivable without it. Lauding the leadership of Prime Minister, Shri Narendra Modi, the Union Minister highlighted the comprehensive conservation and promotion work being carried out from Himachal to Bengal through the Namami Gange Mission. Reflecting on a decade of NMCG's endeavors, Shri Shekhawat expressed pride in witnessing successful river conservation efforts. Notably, the rejuvenation has led to the return of aquatic life in the Ganga, with increased numbers of fishes, turtles, and dolphins, affirming the sustained vitality of the river.

Shri Shekhawat took pride in Namami Gange being recognized as one of the top 10 World Restoration Flagships to revive the natural world at the United Nations Biodiversity Conference in Montreal, Canada. He emphasized that the Ganga and Yamuna are not only symbols of faith but also essential sources of sustenance and livelihood. The Ganga River Basin, one of the country's largest, houses 43% of the total population. Shri Shekhawat expressed concern for the endangered existence of rivers due to changing circumstances and urbanization. In response, he highlighted the crucial efforts that are underway, led by Prime Minister Shri Narendra Modi, as vital initiatives in the face of these challenges. He said that in a remarkable achievement, the waters of the Ganga have now reached the standard of potability. Discussing the ongoing challenges regarding the pollution of the Yamuna, he noted that Asia's largest Sewage Treatment Plant (STP) has been successfully established in Okhla, boasting an impressive capacity of 564 MLD. Shri Shekhawat concluded by underscoring the commitment to combat Yamuna's pollution with a firm pledge to ensure 100 percent cleanliness in the Yamuna water of Delhi by the year's end.



DG, NMCG, Shri G. Asok Kumar addressing the gathering highlighted that the newly inaugurated 14 MLD Sewage Treatment Plant (STP) in Baghpat is designed to harness sewage effluent from 4 nalas through a 2.345 km interception line. He mentioned that this intervention aims to redirect household wastewater away from open drains along the roadside, making the discharge into nalas more efficient. Shri Kumar also emphasized the unwavering commitment of NMCG in the extensive cleaning and rejuvenation efforts focused on the tributaries of the Ganga. The project encompasses the strategic interception of four major Nalas in the region, effectively curtailing the discharge of sewage into the sacred waters of the Yamuna River. An Intercepting Sewer Line, utilizing Reinforced Cement Concrete (RCC) NP3 pipes spanning 2.345 kilometers, is installed to ensure efficient sewage interception. The deployment of Ductile Iron (DI) K-9 pipes covering a distance of 600 meters facilitates seamless vertical conveyance through the Rising Main. Additionally, the installation of one Master Pumping Station (MPS) regulates the efficient flow of sewage within the system. Complementing these advancements, the comprehensive initiative includes a robust Operation & Maintenance plan, committed to ensuring the facility's optimal functionality for the next 15 years.

The Baghpat STP, one of the key components of the Government of India's efforts to address Yamuna's pollution concerns, embodies a commitment to environmental stewardship. The Yamuna Action Plan (YAP I, II & III), initiated in 1993, has seen the government providing financial assistance to states along the Yamuna, including Haryana, Delhi, and Uttar Pradesh, to combat the rising pollution levels. Nestled within this broader context, the Baghpat STP stands as a beacon of progress, addressing the pressing need for enhanced sewage treatment and sustainable water management.

The largest tributary of the Ganga River, the Yamuna flows through Uttarakhand, Himachal Pradesh, Haryana, Delhi, and Uttar Pradesh before merging into the Ganga at Prayagraj. The Government of India, in collaboration with NMCG, has recently approved 34 projects, allocating Rs. 5834.71 crore to create 2110.25 MLD STP capacity. These projects are strategically distributed across Himachal Pradesh (01), Haryana (02), Delhi (11), and Uttar Pradesh (20), under the Namami Gange program, aiming to mitigate pollution in the Yamuna and Hindon Rivers. Notably, 15 out of these 34 projects have already been completed, including one in Paonta Sahib, Himachal Pradesh, two in Sonipat and Panipat, Haryana, six in Vrindavan, Etawah, Firozabad, Baghpat, and Mathura (involving both STP & CETP) in Uttar Pradesh, and six in Delhi.

Haryana Achieves 100% Water Connectivity Milestone under Jal Jeevan Mission : Rajeev Chandrasekhar

In a comprehensive assessment of the progress of the Jal Jeevan Mission (JJM), Shri Rajeev Chandrasekhar (Union Minister of State for Skill Development and Entrepreneurship, Electronics and Information

Technology, and Jal Shakti) conducted a thorough review in Raghunathpura and Chanduwas villages of Rewari District, Haryana. Throughout the day, Rajeev Chandrasekhar engaged with the authorities overseeing the District Water and Sanitation Mission, interacted with members of the Village Water & Sanitation Committee, and visited the homes of several residents. The minister highlighted the remarkable success of JJM in Haryana, particularly in model villages like Raghunathpura and Chanduwas, where 100% water connectivity to all households has been achieved.

Acknowledging the impactful collaboration between the Centre and State Governments, Mr. Chandrasekhar expressed how this partnership has transformed lives. He commended the people and authorities of Haryana for demonstrating effective governance, showcasing the synergy of the Centre and State working together as a Double Engine for the community's betterment. During his interactions, the Minister stated, "Hon'ble PM Narendra Modi ji's vision of Har Ghar Jal is deeply impacting the lives of Indians. It was wonderful to meet with people of the villages Raghunathpur & Chanduwas in Rewari today and know about their transformation story.

For 7 decades, women in these villages endured the drudgery of trekking miles to fetch water for their household needs, standing in long queues for hours every day for a mere drop of water. With Haryana achieving its targets in 2022, this longstanding hardship came to an end in just 3 years. Women now spend more time with their families as they get clean drinking water of prescribed quality. Haryana has set an example of how the Centre and State Govt can work as Double Engine to achieve the unprecedented feat of connecting all rural households with water in just 3 years, something that couldn't be achieved over decades. The Minister also inspected the water works management system in the villages, which efficiently facilitates water supply. Several women from these villages expressed gratitude to the Narendra Modi Government for resolving the persistent water problem that plagued their communities for decades. Embodying the motto of Sabka Saath, Sabka Vikas, Sabka Vishwas aur Sabka Prayas, the Jal Jeevan Mission is advancing towards achieving Sustainable Development Goal 6, providing safe and affordable water to all, by delivering safe water through taps to households, schools, anganwadis, and other public institutions in rural areas.

Rural Water Management Training Launched in Ladakh

In Ladakh, in an endeavour to fortify rural water resource management strategies, a pivotal two-day residential training programme was inaugurated in the Union Territory under the aegis of the National Jal Jeevan Mission (JJM) on Best Practices for Rural Water Resource Management. The inauguration of this residential training programme reflects a collective commitment to fostering expertise and sharing

experiences in rural water resource management, promising a brighter and more sustainable future for water access and conservation in Ladakh under JJM. Addressing the media, Executive Councillor Er Kacho Feroz Khan stressed the need for such initiatives to bolster the smooth execution of the JJM Scheme in the region. Despite facing the harshest of terrains and geographical intricacies, Mr. Khan lauded the relentless efforts of the Public Health Engineering (PHE) Department engineers for effectively implementing the scheme on the ground. This implementation has resulted in the maximisation of benefits for a significant portion of the district's populace, he added. Expressing gratitude, Deputy Commissioner Kargil, Shrikant Balasahab Suse, extended appreciation to the All India Institute of Local Self Government (AIIISG) for choosing to conduct the training amidst the challenging winter conditions.

BMC Plans `2,000 Crore State-Of-The-Art Water Treatment Plant In Bhandup By 2024

If all goes according to the plan, the BMC will start constructing a new water treatment plant at the Bhandup complex in 2024. With an estimated cost of Rs 2,000 crore, the project has been undertaken to replace the existing facility, said to be Asia's largest and built-in 1979, given its dilapidated condition. While this plant has a filtration capacity of 1,910 million litres per day (MLD), the new one will be able to treat 2,000 MLD water on a daily basis. A filtration plant purifies the quality of water to make it suitable for potable use like irrigation and drinking.

Tender to open this week

The civic body has already floated a tender for the project, and the last date to submit bids is December 28. "The existing treatment plant is 45 years old and has been fully utilised. The new facility will be ready in the next four years. We have sorted all the technical queries raised by the prospective bidders. The tender will be opened by this week while the work is expected to start at the beginning of 2024," said a civic official. Additional Municipal Commissioner (Projects) P Velrasu said that the old plant will continue to function until the new one comes up. In its 2023-24 budget, the BMC made a provision of Rs350 crore for the project. According to civic sources, its estimated cost of Rs2,000 crore includes 15 years of operational and maintenance costs.

A new filtration plant was commissioned

The BMC daily supplies 3,900 MLD of water to the city, which is purified at the Bhandup complex and Pise. Water supply to the major part of the city comes through the Bhandup plant. With the rise in demand for water supply, a new filtration plant with a capacity of 900 MLD was commissioned in 2014.

GLOBAL W

DROPLETS

**Navigating a Renewable Carbon Future
with the Program of the CO₂-Based Fuels
and Chemicals Conference 2024**

With a current capacity of over 1.3 million tonnes for CO₂-based products and steadily growing demand, smart Carbon Capture and Utilisation (CCU) technologies are helping to establish CO₂ as a renewable carbon feedstock. Innovative technologies and materials are crucial to meet the increasing demand for fossil-free carbon, e.g. derived from CO₂ or biomass, especially in the chemical and fuel sector. Having established itself as a cornerstone in the evolution of this dynamic field, the CO₂-Based Fuels and Chemicals Conference has become a meeting ground, fostering connections and showcasing the latest advancements in CO₂ capture and utilisation.

For the 12th time the conference program presents a comprehensive overview of the status quo, delving into pivotal topics such as CCU, carbon capture technologies, biogenic CO₂ sources and green hydrogen production, Power-to-X for fuels, CO₂-based chemicals, materials, polymers, mineralisation, advanced technologies, advanced research for CCU, and the fascinating realm of artificial photosynthesis. A dedicated session on innovation, strategy and policy will delve into the crucial discussion of framework conditions necessary to stimulate incentives and investments within this rapidly expanding sector, offering valuable insights and future perspectives.

The CO₂-Based Fuels and Chemicals Conference 2024 will take place on 17–18 April 2024 in Cologne, Germany and online.



VA Tech Wabag Secures \$33.5 Million Contract for Industrial Wastewater Treatment Plant in Saudi Arabia

AVA Tech WABAG, a water technology firm listed on the Bombay Stock Exchange, has secured a \$33.5 million order from SEPCO III Electric Power Construction Corporation. The order includes the engineering and procurement (EP) of a 20 MLD industrial wastewater treatment plant at the Ras Tanura refinery complex in Saudi Arabia.

Wabag will serve as the process and technology contractor for the treatment plant, which is being constructed by SEPCO III and developed by Miahona for its off-taker Saudi Aramco, as per the company's disclosure to the stock exchange. The project includes design, engineering, procurement, supply, and supervision of installation and commissioning for the plant to treat complex effluents

Welspun Enterprises Bags Rs. 4,128 Crore Water Treatment Plant Contract

Welspun Enterprises Ltd. has emerged as the lowest bidder for the development of a 2,000 million-litre per-day water treatment plant from the Brihanmumbai Municipal Corp. It won the bid for the design-build-operate contract for the development of a water treatment plant at a Bhandup complex, the company said in an exchange filing on Wednesday.

The total contract value, excluding Goods and Services Tax, is Rs. 4,128 crores and it will be designed and constructed within a period of 48 months. In another exchange filing, the company said that the National Company Law Tribunal has sanctioned the scheme of amalgamation of its wholly owned subsidiaries—Welspun Infraconstruct Pvt., Welspun-Kaveri Infraprojects JV Pvt., Corbello Trading Pvt. and RGY Roads Pvt.—with the company. Shares of Welspun Enterprises closed 1.39% lower at Rs 546.35 apiece on the BSE, as compared with a 0.05% decline in the benchmark BSE Sensex.

Brazil to Bolster Water & Waste Regulator Amid Strong Sector Growth

The Brazilian government kicked off a process to hire 40 employees to reinforce the country's water and waste sector regulator Agência Nacional de Águas e Saneamento

ATER NEWS

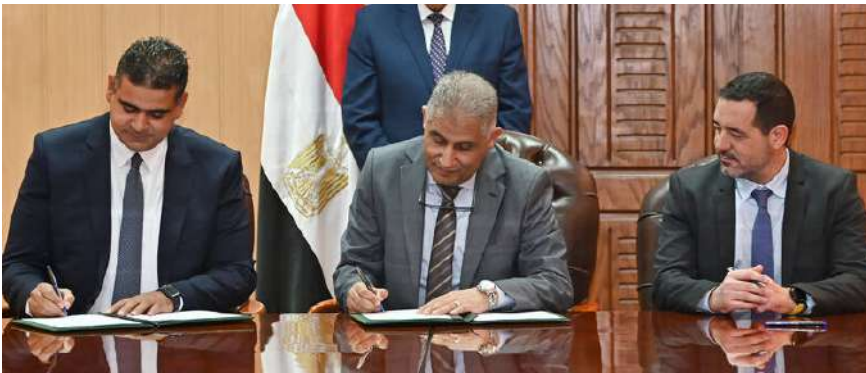
The agency will hold nationwide tests on April 28 to select the candidates that will be contracted, ANA said in a statement. The reinforcement of ANA comes amid a growing number of new players in the sector, which is the result of regulations approved in mid-2020 that facilitated the entry of private firms into a sector previously dominated by state-owned companies. The current regulations require that cities reach full water and sewage coverage by 2033 or risk losing access to federal funding. ANA is the agency responsible for assessing whether the targets are being met.

EGYPT: Rubicon Water Technology Needed to Optimise Water Management

During a trip to Egypt, Bruce Rodgerson, CEO of Rubicon Water, based in Melbourne, Australia, visited Hani Sewilam, Egypt's Minister of Water Resources and Irrigation. During their discussions, the supplier of innovative gravity-fed irrigation canal systems enquired about the water situation in the land of the pharaohs, before confirming its willingness to support Egypt's policy of rationalising water resources. A memorandum of understanding was signed between Hani Sewilam, Bruce Rodgerson, and Tamer Nafea, Managing Director of the Egyptian company Elsewedy Watanya, for industrial and engineering projects. Indeed, the Australian company has developed advanced technology to control water supply so that farms are reliably supplied when needed, and without spillage, to precisely synchronise the application of water to crops, and to apply the optimum amount of water to crops. This, thanks to sensors and control & monitoring software.

Hani Sewilam plans to use this technology to optimise the efficiency of 50,000 water installations in the North African country. This will be part of a project to rehabilitate and maintain these installations. Egypt is in dire need of such a system, as it has been facing persistent drought for several years, with negative impacts including water stress.

Although significant progress remains to be made, Rubicon Water was keen to commend Egypt's commitment to ensuring the optimal use of its water resources. "I was impressed by the Nile Delta's iconic irrigation system and the scale of irrigation developments in the 'new delta' at El-Dabaa. The country's rich agricultural heritage and ambitious commitment to modernisation are inspiring," says Bruce Rodgerson, CEO of Rubicon Water, founded in 1995. The supplier's expertise could also enable the country to improve the sustainability of irrigated agriculture, which is crucial to both food security and Egypt's



DROPLETS

Saudi Arabia to host largest-ever UN conference on land and drought

The Kingdom of Saudi Arabia and the United Nations Convention to Combat Desertification (UNCCD) signed an agreement paving the way for the 16th session of the Convention's Conference of the Parties (COP16) in Riyadh from 2–13 December 2024.

The Riyadh COP16 will be the largest-ever meeting of UNCCD's 197 Parties, the first to be held in the Middle East region and the largest multilateral conference ever hosted by Saudi Arabia. 2024 also marks the 30th anniversary of the UNCCD, one of the three major environmental treaties known as the Rio Conventions, alongside climate change and biodiversity. At the signing ceremony in Riyadh today, Eng. Abdulrahman Abdulmohsen AlFadley, Saudi Minister of Environment, Water and Agriculture and COP16 President, said: "The hosting of the conference (COP16) in the Kingdom of Saudi Arabia reflects the commitment of the wise leadership to environmental protection at the national, regional, and international levels. Additionally, Saudi Arabia launched several groundbreaking environmental projects, such as the Saudi Green Initiative and the Middle East Green Initiative."

The Riyadh COP16 will focus on mobilizing governments, businesses and communities worldwide to accelerate action on land restoration and drought resilience as a cornerstone of food, water and energy security.

The two-week event will feature a high-level segment, as well as associated events including the Gender Caucus and the Business for Land Forum. Taking place in the most water-scarce region and one that is severely affected by desertification and land degradation, the Riyadh COP16 will showcase efforts underway in Saudi Arabia, the Middle East region and beyond towards a green transition based on sustainable land stewardship.



HCL Group and UpLink Announce Winners of Zero Water Waste Challenge, part of the Aquapreneur Innovation Initiative

Davos–Klosters, Switzerland, 17 January 2024: HCL Group, a global conglomerate and UpLink, the open innovation platform of the World Economic Forum, today announced the top 10 water–focused entrepreneurs who will receive a financial award from a total pool of 1.9 million CHF as part of the Zero Water Waste Challenge. HCL Group committed a \$15 million investment in total to drive freshwater sector innovation for five years until 2027. In less than a year, HCL Group’s commitment saw a 10x return on its investment as the first cohort of ‘Aquapreneurs’ collectively raised \$54.5 million after joining the UpLink Innovation Ecosystem.

The Zero Water Waste Challenge is the second out of five innovation challenges, under HCL Group and UpLink’s Aquapreneur Innovation Initiative. The focus of this year’s challenge was capturing and protecting freshwater supply, water reuse and recycling of materials, and saving water in agriculture. Top 10 water–focused entrepreneurs or “Aquapreneurs” were selected from a pool of 192 global applicants. Out of these, most of the applications were from Africa (16%), Asia (18%) and Europe (13%). These Innovators come from eight different countries and are bringing cutting edge innovative solutions in areas such as greywater reuse, rainwater capture, advanced filtration, precision agriculture, and data analytics and AI.

Announcing the winners, Roshni Nadar Malhotra, Chairperson of HCLTech said, “In light of the current global climate change crisis and increasing scarcity of freshwater resources, the urgent need for innovative solutions to manage our freshwater supplies cannot be overlooked. These innovations reshape our approach to water, optimising its use and conservation. HCL stands committed to supporting these innovations for a positive global impact. Congratulations to the winners of the Aquapreneur Innovation Initiative 2024.”

Climate change, pollution and overuse pose a grave threat to the planet’s freshwater supplies”, said Olivier Schwab, Managing Director of the World Economic Forum. “UpLink and HCL are building an innovation ecosystem around early–stage, water–focused entrepreneurs that will provide them with the resources, expertise and vital funding they need to thrive. The solutions created by these ‘Aquapreneurs’ will play a crucial role in bringing about the transformative change required to shape a sustainable, water–resilient future for all.”

Two of the top 10 innovators were selected to present their solutions at the World Economic Forum’s Annual Meeting in Davos in 2023:

- “We are thrilled and humbled to be recognised as a Zero Water Waste challenge winner,” said Karina Peña, CEO and Co-founder of FieldFactors, “joining this cohort will allow us to bring our technology to the global stage, increasing community resilience to the impacts of climate change.” FieldFactors is a water technology start-up providing circular solutions for urban water management and climate adaptation. Specialising in climate change adaptation, the company designs and implements integrated solutions to combat urban flooding, drought, and heat stress, fostering biodiversity with green space.
- “Being named an Aquapreneur is validation for our vision to eliminate urban water pollution” said Asim R. Bhalerao, CEO of Fluid Analytics, “we look forward to working with HCL and UpLink, World Economic Forum to bring our vision to life globally.” Fluid Analytics Inc. is a water analytics company committed to addressing urban water pollution. With unique mathematical and machine-learning models trained on diverse datasets, Fluid Analytics Inc. has successfully deployed solutions monitoring over 1.5 billion litres of urban water pollution and enabling the treatment and reuse of 800 million litres daily.

The other entrepreneurs that were awarded prize money from HCL Group and support from UpLink are:

- Juan Carls Escobar, CEO and Co-Founder and Rina Martinez, Co-Founder of AQUAKIT SRL, (Bolivia) – A greywater treatment technology that enables the recycling of household greywater for non-potable uses and reduces wastewater emissions.
- Amira Cheniour, Co-Founder and CEO and Taher Mestri, Co-founder, Chief Technology Officer of SEABEX SAS (France) – An AI-powered precision irrigation solution that uses a digital twin to help farmers produce more food with less water.
- Gokul Krishna Govindu, CEO of Smart Terra (India) – An AI-powered analytics software designed to analyse data and reduce water losses in city-scale and built environment networks.
- Trupti Jain co-founder of Naireeta Services Private Limited (India) – A community-based rainwater harvesting technology that filters, injects and stores rainwater for use in dry seasons.
- Mulundu Sichone CEO at PYDRO (Germany) – A cost-effective self-powered smart flow meter for water pipes,

time, helping building managers to eliminate leaks and related damages.

- Greg Newbloom, CEO and founder of Membrion (United States) – A ceramic desalination technology that removes metals, minerals and salts from harsh industrial wastewater – enabling the water to be recycled in a cost-effective and energy efficient manner.
- Jaime de la Cruz Gonzales, CEO of Kran Nanobubble, (Chile) – A nanobubble technology solution optimising water efficiency in agriculture, water treatment, and aquaculture.

In addition to the financial reward, winners will receive exclusive access to events, projects, and communities led by the World Economic Forum and partners.

Cambridge Waste Water Treatment Plant: Anglian Water vows 'no repeat' of tree deaths

There will not be a repeat of the A14 tree deaths at the proposed Cambridge sewage works, Anglian Water has said. Concerns were raised that the trees that were planned to be planted on top of an embankment at a site near Horningsea would not survive without long-term watering. The water company said the plans would be a "very different situation" to one which saw many of the 8,60,000 trees planted by National Highways die. If approved, the existing sewage works north of Cambridge would be replaced. Anglian Water submitted a Development Consent Order (DCO) application to request permission to build the new Cambridge Waste Water Treatment Plant on land north of the A14, known as Honey Hill.

The project has come forward to free up the land that the existing plant sits on, to be redeveloped into around 8,000 homes as part of the North East Cambridge development. At a DCO hearing last week, planning examiners highlighted concerns that had been raised about the proposals. Many trees died soon after they were planted alongside the nearby 12 mile (19 km.) section of the A14 in Cambridgeshire in 2020 – with dry weather conditions blamed.

Alex Hudson, one of the examiners, said, "Numerous concerns around the likely success of planting on the bund have been raised, primarily due to the dryness of the area and the potential need for watering in perpetuity. If constant watering is needed, how does this represent a sustainable design solution?"

Jo Morrison, representing Anglian Water, said detailed plans had been prepared for the tree planting and to look after them as they establish. She said they planned to make sure the soil was of good enough quality to make a "good growing medium" on the embankment.

Ms. Morrison added that if any trees did die, then they would be replaced, potentially with a species more likely to survive. However, Ian Gilder, from the Save Honey Hill campaign group, said he had been planting trees in the area for 30 years and said he had seen the impact of drier seasons.

He said: "I think it is pretty clear that without sustained watering, or opportunity to intervene in dry conditions that it is very unlikely that those trees will thrive."

Puducherry makes it mandatory for government offices to use treated sewage water for bathrooms, gardening

Keen on saving 17 million litres per day (MLD) of treated sewage water from draining into the sea, the Puducherry government has made it mandatory for all government offices in Puducherry to use treated water for toilet flushing and watering gardens, among other non-potable purposes.



The Public Works Department (PWD) has laid pipelines from its Sewage Treatment Plant (STP) in Dubrayapet for use of the ultra-filtered water for gardening in Bharathi Park and the Government Botanical Garden, located in the Boulevard. The notification for reuse of Secondary Treated Effluent Water (STEW) for government offices will be formally released by Lt. Governor Tamilisai Soundararajan and Chief Minister N. Rangasamy on Wednesday, December 20, 2023.

According to PWD Secretary D. Manikandan, "The decision has been taken to ensure that no drinking quality water is used for non-potable purposes. Owing to over-exploitation of groundwater, the water level has depleted to a great extent in Puducherry. To overcome the shortage of water for different purposes and to avoid over extraction, the Government has decided to reuse water up to a certain quantity, after proper treatment, for non-potable purposes."

"An ultra filtration unit has already been installed at the 17 MLD STP in Dubrayapet and the treated water confirms to the standards prescribed by the Central Public Health and Environmental Engineering Organisation (CPHEEO). The treated water is chlorinated and the Biological Oxygen Demand (BOD) was found to be 3 mg/litre as against the permissible 6 mg/litre," he said.

Initially, the PWD has decided to use about 50,000 litres per day of treated sewage water for horticulture in the Bharathi Park, the Government Botanical Garden and government offices located near Dubrayapet. By using treated effluent, around 50,000 litres of groundwater per day will also be saved, making this an environmentally sound practice. There are no issues like quality or smell as the water is thoroughly chlorinated and meets all parameters, Mr. Manikandan said.

All government offices have been directed to utilise the ultra filtered water from Dubrayapet STP to the maximum extent possible and to recommend all stakeholders under their control for efficient use of treated sewage so as to conserve water. The executive engineer of the public health division of PWD has been appointed as the nodal officer for this purpose, an official said. The PWD is also coming up with a waste water management policy, aimed not only at treatment of water but also its utilisation. As part of the policy, the PWD would be closing all open drains and shifting to underground drainage in the city.

WHO calls for technical experts for support and guidance on global monitoring of wastewater

The World Health Organization (WHO) is seeking expressions of interest from individual consultants for technical support and guidance on global monitoring of wastewater. The deadline for applications is 20 February 2024. The selected consultant will work under the supervision of the WHO/UNICEF (United Nations Children's Fund) Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) team lead and will work closely with UN-Habitat as the co-custodian agency for SDG target 6.3.1, as well as with UNICEF as a co-custodian for SDG target 6.2.1.

The consultant will engage in the work of the Department of Health, Environmental and Climate Change, within the Water, Sanitation, Hygiene and Health Unit (WSH), on multiple activities related to the global database on domestic wastewater maintained by WHO.

New study sheds new light on forests' role in climate and water cycle

The research, involving scientists from 11 institutions across five countries, including Sweden, the UK, Finland, Germany, and Brazil, highlights the intricate relationship between forests, particularly their emission of organic gases, and the formation of reflective clouds that could influence global temperatures.

Comparing boreal and tropical forests

The unique aspect of this study is its focus on both boreal and tropical forests, which constitute 27% and 45% of the Earth's forested area, respectively. These ecosystems differ in their emissions and cloud formation processes, leading to varying impacts on the forest-cloud-climate feedback loop. "This study, utilizing long-term data from diverse forest environments in Finland and Brazil, marks the first time observational evidence has been presented for these interactions in tropical rainforests," says lead author Sara Blichner, postdoctoral scientist at the Department of Environmental Sciences at Stockholm University.

Underrepresentation of forests in climate models

The study emphasizes the need for improved climate models to accurately represent these complex interactions. "Our findings suggest that current models may underestimate the impact of forests on cloud formation and climate, especially in tropical regions, which are crucial due to high amount of solar radiation these areas receive at these latitudes," Blichner explains.

However, Blichner stresses that while the study highlights areas for improvement in climate modeling, it does not undermine the overall reliability of these models. "Climate models are highly trustworthy in representing the main processes of climate change. Our research aims to refine these models, reducing uncertainties in future climate



Natural particles and global warming

The research also points out that as human-made particle emissions decrease due to air quality policies, the natural particles from forests become increasingly significant. These feedbacks are more potent in cleaner air environments and could play an important role in moderating global warming.

This collaborative study underscores the need for continued research and improvement in climate modeling to better predict future climate scenarios. Additionally, the findings highlight that these types of effects must be considered when assessing forest conservation as a key strategy in climate change mitigation.

About forest emissions and climate regulation

Forests release substantial amounts of organic gases, particularly noticeable as the distinctive scent of a pine forest on a warm day. These gases, once released into the atmosphere, contribute to particle formation. Clouds are composed of minuscule water droplets and each of these droplets nucleate around a particle in the air. An increase in atmospheric particles results in clouds with more droplets, enhancing their reflectivity of sunlight and leading to cooler surface temperatures. As climate change raises temperatures, forests are anticipated to emit more of these gases, thereby creating more particles and potentially more reflective clouds.

The Black Mermaid Foundation: Creating More Diverse Oceans

Earth is known as the “Blue planet”. With 71% of its surface being covered in water and more than one-third of the world’s population living within 100km of the coast, the ocean is vital to many people’s lives. However, this is not always reflected in the diversity of people that fight for its protection.

Climate change is threatening our marine environments and the multitude of benefits they provide us. This change is happening worldwide— from the icy waters at the poles to the tropical equatorial waters— people and marine species are having to adapt to the altering conditions. As a global issue, everyone deserves an equal chance to get involved and to be heard in the marine conservation conversation. We must have diverse voices and perspectives to overcome our biggest challenges. Zandile Ndhlovu is a South African freediver, marine conservationist and founder of The Black Mermaid Foundation. She is working to diversify our ocean spaces and create a new generation of ocean guardians by educating coastal communities.

Zandile advocates for diversity and inclusion through storytelling and teaches children the importance of ocean conservation in the fight against climate change. Her passion in life is sharing the wonders of the ocean and inspiring others to love and protect our natural environment.

Where It All Began

Zandile created The Black Mermaid Foundation from her experiences as a black freediver and instructor. She was the first Black African

Instructor in South Africa and, since then, has used her voice to help diversify the ocean conservation space. Zandile shares her love of the ocean and passion for freediving to inspire, motivate and challenge people from all different backgrounds.

She explained why she felt there was a need to change how things were done:

“I had been diving for a few years and was always the only black person who was a guest on the boat. Once I qualified as a freediving instructor, I knew I wanted to create change. My aim now is to enable access to ocean spaces in a way that allows us, as black people, to expand our narrative around the water and change how black people and water are viewed socially. I also want to build a connection for communities to not only enjoy the water recreationally but to protect it and raise a generation of ocean guardians.”

The Ocean Classroom

The Black Mermaid Foundation prioritises getting outside and learning in the ocean. The best way to learn is to be hands-on and appreciate the sea and its weird and wonderful marine life first-hand. “Our organisation takes children between the ages of 10 and 15 on ocean excursions. We teach them about the marine environment and the main challenges our oceans are facing, such as pollution, overfishing and warming waters. We kit up in snorkelling gear and go exploring in the water! It’s an incredible opportunity— providing practical and memorable experiences to these children which truly impact their lives.”

The Importance of Diversity And Inclusion In Ocean Conservation

“If we are to see a change in the current trajectory of our oceans, we need all hands on deck, and we need everyone making a change and actively showing up to be good guardians! We cannot simply enjoy the water but must become active voices for her protection.” We need diversity, equality and inclusion to achieve our big ocean conservation goals and the work being done by Zandile and the Black Mermaid Foundation is doing just that. It allows people from different backgrounds to believe that they, too, can be a part of protecting our ocean environments and that the sea is something worth saving, not to be afraid of. We need a world in which people of all ages, ethnicities and walks of life can feel connected to our precious environments and act to create conservation solutions.

Metro Water Recovery’s work leads to healthier South Platte River

Aquatic diversity in the South Platte River continues to improve with the help of wastewater treatment upgrades and environmental work,

Quality Report. The water Metro recovers, treats and releases to the South Platte River accounts for 85% of the river's flow for more than three-quarters of the year. After a decades-long habitat improvement project — among other innovations and initiatives — native fish and aquatic macroinvertebrates are thriving in the South Platte. Metro has been monitoring the South Platte River from Denver to Platteville for more than 50 years, providing reliable data to support regulatory policies and plant upgrades with the mission of protecting the region's health and environment.

"When effluent quality is improved, there is often a corresponding and significant positive response in the biological health of the downstream aquatic communities," said Jordan Parman, senior water quality scientist for Metro. Total phosphorus and nitrogen concentrations in the South Platte River downstream of Metro's outfalls continue to decrease, showing the effectiveness of treatment plant upgrades over the past four decades. Enhanced biological nutrient removal is having a noticeable positive impact on the waterways and reservoirs downstream.

Encouraging aquatic life improvements in the river are thanks in large part to drastic reductions of in-stream ammonia concentrations. Since its completion a decade ago, a \$211 million secondary treatment project decreased ammonia concentrations in the South Platte River downstream from the Robert W. Hite Treatment Facility (RWHTF) outfalls from an average of 4.9 mg/L in 2013 to 0.5 mg/L in 2022.

"Correspondingly, the macroinvertebrate community composition immediately downstream of the RWHTF outfalls shifted from tolerant taxa like midges and aquatic worms to a more diverse community including sensitive taxa such as mayflies and caddisflies," Parman said.

A blue heron enjoys the waters of the South Platte River near Metro Water Recovery's treatment facility. Metro successfully switched our largest treatment plant from a chlorine-based disinfection system to one using peracetic acid addition. The change was driven by several factors, including a desire to eliminate the generation of disinfection by-products in the final effluent and river. "Recognizing that salinity is quickly becoming an issue of concern throughout the South Platte Basin, Metro is dedicated to limiting chemical usage wherever possible in the treatment process in order to limit the amount of salts reaching the river via effluent discharge," Parman said.

Metro continues to pursue innovative technologies to improve effluent quality and the overall health of the South Platte River, including the

partnership at the National Western Complex to build one of the largest sewer heat recovery systems in North America. "Metro staff will continue to assess the physical, chemical and biological condition of the South Platte River into the future, just as we have since 1972 as stewards of one of Colorado's most precious resources," Parman said.

Gender parity in water accelerated with UK-US agreement

British Water will sign a memorandum of understanding (MoU) with the WaterRising Institute of the USA at the trade association's upcoming International Reception on Monday 19 February in London. The MoU is an agreement to partner on the WaterWoman Project, which aims to accelerate gender parity in water management, addressing the urgent need for a gender-inclusive, water-positive approach to solving the water crisis. Gender diversity in the water sector is crucial for improved business performance, representation of the customer base, and a greater combination of skills across the workforce. However, according to a recent report from global consultancy McKinsey, in the UK just 17% of the energy and utilities workforce are women — around two-thirds less than in the overall UK workforce.

The WaterWoman Project is a call to action for the adoption of Women's Empowerment Principles, along with a transparency and accountability framework for monitoring progress on gender equality indicators, to advance gender equality in global water utilities. "We are thrilled that British Water is engaging its members in this initiative and contributing to the urgent acceleration of gendered water workforce development," said Alicia Douglas, founder & chief executive officer of WaterRising Institute, who will be signing the MoU in person, on behalf of the WaterWomen Project.

In the lead-up to this partnership, British Water was actively involved in the WaterWoman Project's Youth & Gender Hub at the UN 2023 Water Conference in New York. "At British Water, we firmly believe in the power of collaboration and advocacy to drive positive change. Our Women on Water campaign stands as a testament to our commitment to advancing gender parity in the UK's water industry," said Lila Thompson, chief executive of British Water.

Robbie Moore MP is keynote speaker at the International Reception. Moore was appointed Parliamentary Under Secretary of State for the Department for Environment, Food & Rural Affairs on 13 November 2023. "Since 2013, the International Reception has been held with three objectives — to help grow UK exports; to raise the international profile of the UK Water Industry and its ecosystem, which British Water represents; and to encourage the sharing of best practices," added Thompson. The reception will provide a platform for those involved in the global water market to meet international operators, consultants, contractors, technology suppliers, research institutions, government



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PUMPING STATION: CRUCIAL FOR WATER SUPPLY

Anil Sethi, Chairman, Pump Academy Private Limited

Water is a fundamental need to human existence, required by all forms of life to survive, and all commerce to thrive. Seeing the water consumption patterns across segments, it is evident that there would be a huge scarcity of fresh water in the future. In Indian context, for a global population of almost 18%, India has less than 4% of the world's freshwater resources making the situation grimmer and needs urgent attention to conserve water.

According to the United Nations, water use has been increasing globally by roughly 1% per year over the last 40 years and is expected to grow at a similar rate through to 2050, driven by a combination of population growth, socio-economic development and changing consumption patterns. While the water use is increasing, the availability is on constant decline over the years and making water scarcity a global problem that affects different regions and populations in different ways. Around 1.2 billion people live in areas of physical water scarcity. This means that there is not enough water to meet the demand. Another 1.6 billion people face economic water shortage. This means that they lack the infrastructure to access the available water. There are 4 billion people, or half of the world's population, experience severe water scarcity for at least one month each year. This means that they have to cope with insufficient water supply during certain periods. Around 1.4 million people die annually and 74 million will have their lives shortened by diseases related to lack of safe drinking water facilities.

Water security is in a crisis situation in India that needs to have strategic approach to mitigate.

According to the Niti Aayog, over 600 million Indians are facing extreme water stress and by 2030, water demand could be twice the existing supply which could further lead to severe water scarcity for so many millions of other people, leading to huge economic burden and a ~6% loss to the country's GDP.

To ensure sustainable water security, it is essential to build resilient water infrastructure, tap into groundwater resources, mitigate the impacts of climate change, and invest in technology and digital interventions. Economic water scarcity, distinct from physical scarcity, arises when there is enough water to fulfill human and environmental needs, however, limited access results from inadequate water infrastructure or inefficient water resource management. Apart from storage facilities, water treatment plants, and pipeline networks, pumping systems are integral components of a well-functioning water supply infrastructure. Their proper maintenance and incorporation of innovative technologies are vital to meeting the ever-increasing water needs for people and industries.



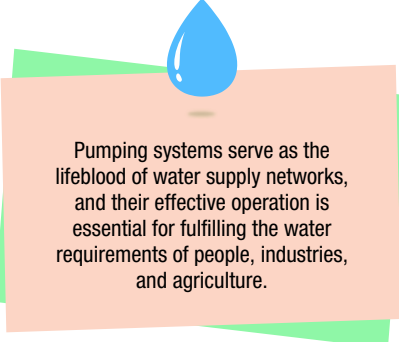
SIGNIFICANCE OF PUMPING STATION

Pumping stations are the heartbeat of water supply networks, and their proper functioning is paramount for meeting water demands for people, industries, and agriculture. Being an integral element in the water supply chain, pumping stations are strategically located water infrastructure designed to lift water from lower to higher elevations, overcoming natural geographical variations and ensuring a constant flow of water supply to designated areas. Their primary function is to maintain adequate pressure in water distribution systems, enabling water to reach every corner of a city or region. These stations are the unsung heroes that make it possible for us to turn on our taps and receive a reliable supply of clean water. Continuous focus and maintenance efforts are essential to uphold the reliability, efficiency, effectiveness, and durability of these pivotal components within the water infrastructure.

Pumping systems play a crucial role in lifting and transporting water from its source to storage facilities and distribution networks. Regular inspection, preventive maintenance, and timely repairs are imperative to optimize the performance, reduce energy consumption, and extend their lifespan. Proactive measures, such as implementing advanced monitoring technologies and automation, contribute to the efficient operation of pumping systems.

From quenching our thirst and helping in production to nourishing our crops, water pumping system play an important role ensuring a steady and reliable supply of water. The indispensable role of water pumping stations in meeting the demands of growing

populations and ensuring access to this precious resource across sectors are supreme. Some of the significant role it plays could be attributed to the following:



Pumping systems serve as the lifeblood of water supply networks, and their effective operation is essential for fulfilling the water requirements of people, industries, and agriculture.

Overcoming Geographical Challenges

One of the primary reasons water pumping stations are essential lies in its ability to overcome geographical challenges. Natural variations in elevation can create obstacles in distributing water effectively, especially in hilly or uneven terrains. Pumping stations lift water from lower to higher elevations, allowing it to flow seamlessly across cities, towns, and rural areas, reaching even the most remote locations.

Meeting Growing Demand

As population is growing with expanding urban areas to new territories beyond traditional city limits, the demand for water escalates. Water pumping stations play a pivotal role in meeting this growing demand by maintaining consistent water pressure in distribution systems and ensuring that water reaches every household, school, hospital, and commercial establishment, industries and other faraway places fostering social growth and development.

Optimizing Water Distribution

Pumping stations optimize water distribution by controlling the flow of water across a network. It manages pressure in pipelines, preventing problems like low water pressure or uneven distribution. This precise control guarantees the efficient delivery of water to consumers, irrespective of their location within the serviced area. To optimize the distribution network, genetic algorithms should combine with effective utilization of reservoirs for scheduling and activating the pumping systems. The aim is to minimize electricity costs while ensuring uninterrupted service provision.



Adapting to Changing Conditions

The dynamic nature of water consumption patterns requires adaptive water infrastructure. Water pumping stations are designed to respond swiftly to changes, adjusting water flow rates and pressure levels accordingly. This adaptability is crucial for managing fluctuations in water usage, such as during peak hours or emergency situations. Pumping stations supports to cater the increased demand during summer months or drought periods and reduce output during winter seasons when water demand reduces. Incorporating the latest technologies like IIoT, AI and Smart Sensors allows pumping stations to adapt and integrate innovations for real-time monitoring and predictive maintenance for optimal efficiency.

Promoting Agricultural Growth

Agriculture is the most important sector in India, as the country being an agrarian nation. It contributes to 15% of India's GDP and is the leading user of fresh water. It is a sector heavily reliant on water, benefits significantly from water pumping stations. These stations supply water for irrigation, enabling farmers to cultivate crops efficiently. The efficient pumping not only has an impact on food production but also on the economic prosperity of regions dependent on agriculture.

Ensuring Reliability in Water Provisioning

Ensuring reliability in water provisioning is a crucial task that involves determining the best operational rules for activating pumping systems and efficient use of reservoirs and water pumping stations play a central role in achieving this. By ensuring a consistent and dependable water supply, these stations contribute to public health, hygiene, and overall quality of life. Access to clean water is essential for drinking, sanitation, and industrial processes leading to better health for people and economy.

IPUMPNET: REVOLUTIONARY TRANSFORMATION OF PUMPING STATION

In the sphere of pump optimization, iPUMPNET stands out as revolutionary digital solutions that harness state-of-the-art technology to elevate the efficiency, reliability, and overall performance of pumping systems. With its groundbreaking approach and advanced features, iPUMPNET is positioned to revolutionize how water utilities and industries oversee and enhance their pumping operations. This innovative system, introduced by Pump Academy Private Limited, employs advanced technology of Artificial Intelligence (AI) and Industrial Internet of Things (IIoT) to facilitate various aspects of pumping system management.

It offers the following benefits to water utilities in their day-to-day operations:

- **Efficient Monitoring:** iPUMPNET provides real-time monitoring of pumping stations and related equipment, allowing utilities to keep a close eye on their performance.
- **Predictive Analytics:** The platform employs predictive analytics to anticipate potential issues or inefficiencies, enabling proactive maintenance and preventing costly breakdowns.
- **Energy Optimization:** iPUMPNET helps water utilities optimize energy usage in pumping operations, leading to reduced operational costs and a more sustainable approach to water management. It is estimated that almost 5 GW of energy could be saved per annum if iPUMPNET is implemented across all water pumping stations in India.
- **Data-Driven Insights:** The platform gathers and analyzes data, providing valuable insights that can inform decision-making and drive operational improvements.

- **Remote Control and Automation:** iPUMPNET allows for remote control and automation of pumping station operations, reducing the need for physical intervention and enhancing operational efficiency.
- **Compliance Management:** The platform assists water utilities in adhering to regulatory requirements by providing tools for monitoring and reporting on compliance-related metrics.
- **Fault Detection and Diagnostics:** iPUMPNET is equipped with features that swiftly detect faults or anomalies, allowing for prompt troubleshooting and resolution.
- **Resource Optimization:** By optimizing resource allocation, iPUMPNET helps water utilities make the most of their assets and personnel, ensuring optimal performance.
- **Improved Customer Service:** With better control and insights into pump operations, water utilities can provide more reliable and efficient services to their customers.
- **Resilience and Adversity Preparedness:** The platform aids in adversity preparedness of pumps by providing early warnings and facilitating quick responses in emergency situations.
- **Environmental Stewardship:** Through improved operational efficiency and energy optimization, iPUMPNET contributes to reduced environmental impact, significantly reducing the carbon footprints of pumping stations. It is estimated to save almost 3.06 million tonnes of carbon emission annually, if implemented across all water pumping stations in India, aligning with sustainable



iPUMPNET improves operational efficiency of pumping station by 35%, reduce energy consumption by 25%, reduce the life cycle cost (LCC) of by 45%, and extend the lifespan of pumping systems by 50%.



CONCLUSION

Water pumping stations are not just structures with pipes, valves and pumps; they are the lifelines that sustain the water supply system. As we navigate an era of growing populations, increasing water scarcity, environmental challenges, and amplifying water demands, the role of pumping stations becomes even more prominent. Recognizing their significance is imperative as we strive for sustainable and resilient water supply systems that cater to the needs of present and future generations.



About the Author



Anil Sethi
Chairman
Pump Academy Private Limited

Mr. Anil Sethi, Chairman of Pump Academy Private Limited, brings profound expertise to the water sector. His vision in establishing the company was to provide innovative solutions to water utilities, aspiring to revolutionize pumping stations into technologically advanced, automated, and responsive entities with robust processes.

Widely recognized for his outstanding contributions to nation-building initiatives, he has received numerous awards that celebrate his achievements in the industry.



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TRANSFORMING WATER SUSTAINABILITY WITH DANFOSS' KOYAMBEDU WASTEWATER TREATMENT PLANT

Mr Mandar Vajjanapurkar – Head of Drives Sales, Marketing & Services, Danfoss India Region

INTRODUCTION

With regard to the pursuit of a sustainable and water-resilient future, the Koyambedu Tertiary Treatment Reverse Osmosis (TRRO) plant emerges as an emblem of innovation and efficiency. Crafted by the skilled hands of VA Tech WABAG Ltd in Chennai, India, this wastewater treatment facility signifies a monumental shift in municipal water recycling, ushering in new benchmarks for water resilience and sustainability. This detailed case study meticulously unravels the transformative journey of the Koyambedu Wastewater Treatment Plant, accentuating its integration of advanced technologies and unwavering commitment to energy efficiency. The focal point revolves around recycling, serving as the linchpin in the plant's blueprint for crafting a sustainable water future. Beyond its local impact, the plant's adoption of cutting-edge technologies and energy-efficient solutions positions it as a guiding beacon for municipalities worldwide, inspiring a paradigm shift in redefining water management practices.

BACKGROUND:

Water and wastewater treatment processes play a pivotal role in the global energy landscape,



constituting a substantial share of total electricity consumption. Recognizing the imperative for energy-efficient solutions in the water sector, the Koyambedu Tertiary Treatment Reverse Osmosis (TRRO) plant emerged as a trailblazer in wastewater treatment in India. Conceived as one of the nation's most sophisticated facilities, the plant's design embodies a strategic integration of cutting-edge technologies.

At its core, the Koyambedu TRRO plant leverages advanced pre-treatment methodologies, incorporating dual media rapid gravity filters to optimize the removal of impurities. The adoption of state-of-the-art ultrafiltration systems further refines the treatment process, ensuring a high-quality output. A key highlight is the plant's utilization of a 3-stage reverse osmosis system, a sophisticated technique

known for its efficacy in water purification. The cumulative effect of these innovations culminates in an exceptional overall recovery rate of 80%, underscoring the plant's commitment to achieving optimal efficiency and sustainability in wastewater treatment.



KEY OBJECTIVES AND CHALLENGES:

The central focus of the Koyambedu Wastewater Treatment Plant was the augmentation of energy efficiency within its operational framework, with a particular emphasis on mitigating the energy-intensive aeration process. This critical step in wastewater treatment, aimed at removing dissolved organic matter and nutrients, accounted for half of the total treatment cost, necessitating an innovative solution for optimization. The Koyambedu wastewater treatment plant grappled with formidable challenges, primarily stemming from the intrinsic nature of energy-intensive processes integral to wastewater treatment. A pivotal process in this regard was aeration, indispensable for the removal of dissolved organic matter and nutrients. Notably, aeration emerged as the chief energy-consuming process, constituting half of the total wastewater treatment costs. This underscored the pressing need for a targeted solution to optimize and enhance the energy efficiency of the aeration process.

Compounding this challenge was the plant's substantial demand for pumping, contributing significantly to the already elevated energy consumption levels. The cumulative effect posed a dual challenge: mitigating the costs associated with aeration while addressing the high energy demand inherent in the extensive pumping requirements. This multifaceted energy consumption landscape highlighted the urgency of deploying innovative and tailored strategies to curtail operational expenses and

enhance overall efficiency.

Furthermore, the geographical context of Chennai, marked by extreme temperatures and humidity, introduced an additional layer of complexity. The consequential high heat dissipation from the motor panel room exerted an increased load on the control room cooling system. In response, the plant necessitated a larger HVAC system to manage the heightened thermal load, inadvertently escalating energy consumption and, consequently, amplifying operational costs. This intricate interplay of factors, from aeration challenges to the thermal dynamics of the plant's location, underscored the imperative for a holistic and adaptive solution to navigate the demanding operational landscape of the Koyambedu wastewater treatment facility.

DANFOSS' ROLE AND SOLUTIONS:

In tackling the energy-intensive challenges of wastewater treatment, Koyambedu strategically partnered with Danfoss, opting for their specialized drives tailored for water and wastewater applications. The implementation of VLT® AQUA Drive FC 202 units, boasting an IP42 protection rating and covering a substantial total drive capacity of 6 MW, marked a transformative step in enhancing energy efficiency. These drives played a pivotal role in achieving optimal energy-efficient speed control for pumps, precisely adjusting the voltage to match the prevailing load conditions and consequently reducing energy consumption.

A revolutionary aspect of Danfoss's solution lies in the incorporation of intelligent heat management within the VLT® drives. This innovative feature successfully eliminated 85% of heat losses through rear heat sinks, introducing a groundbreaking back-channel cooling system. This system efficiently transferred heat to the cooling air, alleviating the burden on the control room cooling system. The strategic separation of the back-channel from the electronics area not only contributed to longer equipment life but also elevated reliability by minimizing the ingress of airborne contaminants. Danfoss's holistic solution at Koyambedu exemplifies a paradigm shift towards sustainable and energy-efficient wastewater treatment practices.

OUTCOMES AND ACHIEVEMENTS:

The integration of Danfoss's innovative solutions at the Koyambedu Wastewater Treatment Plant yielded



an impressive 22% reduction in energy consumption, resulting in substantial savings of over 700,000 USD (59 million INR) over 15 years of operation. This achievement was made possible through the implementation of the back-channel cooling system, allowing the plant to opt for a more efficient 30-tonne air conditioning unit instead of an 80-tonne unit. This decision not only significantly curtailed capital expenditures (CAPEX) but also led to notable reductions in operational expenses.

Beyond the realm of energy savings, the Koyambedu plant plays a pivotal role in water resilience and sustainability. With a remarkable throughput of up to 45 million liters per day, the facility annually saves over 16 billion liters of fresh water. This substantial contribution underscores the plant's commitment to addressing water scarcity challenges. By embracing advanced technologies and prioritizing energy-efficient solutions, the Koyambedu Wastewater Treatment Plant emerges as a noteworthy model for municipal water recycling in India, showcasing the potential for transformative impacts on both energy efficiency and water conservation.

RECYCLING FOR A SUSTAINABLE WATER FUTURE:

The Koyambedu Wastewater Treatment study serves as a prime illustration of the profound transformation achievable through recycling for a sustainable water future. Through the strategic integration of cutting-edge reverse osmosis technology and advanced treatment processes, the facility not only tackles immediate water challenges but also actively contributes to the principles of the circular economy. The implementation of a multi-stage treatment scheme, incorporating crucial elements like ultrafiltration and ozonation, stands as a testament to the plant's commitment to delivering treated water that meets rigorous quality standards, thereby

opening new avenues for effective water reuse.

A pivotal aspect of the Koyambedu project is its adoption of the DBO (Design, Build, Operate) model, which includes a substantial 15-year Operation and Maintenance period. This emphasizes a steadfast dedication to ensuring long-term sustainability, aligning with the broader goals of environmental stewardship. Noteworthy is the ultra-low specific power requirement of 1.88 kWh/m³, reflecting the project's commitment to operational efficiency, cost reduction, and a minimized environmental footprint. Such considerations underscore the holistic approach taken by the project to balance the dual objectives of economic viability and sustainable water management.

The remarkable outcome of the Koyambedu initiative is its pivotal role in positioning Chennai as a trailblazer – the first city in India to successfully reuse more than 20% of its treated water. This accomplishment not only signifies a major stride towards water sustainability but also translates into the liberation of a staggering 16 million m³ of freshwater annually. The Koyambedu Wastewater Treatment Plant stands as a beacon of innovation and commitment, showcasing how forward-thinking projects can revolutionize water management paradigms for a more sustainable and resilient future.

The collaborative efforts between Danfoss and the Koyambedu Wastewater Treatment Plant stand as an inspiring case study in the pursuit of a sustainable and water-resilient future. This partnership, focused on overcoming energy challenges and integrating forward-thinking solutions, showcases a transformative approach to wastewater treatment. The Koyambedu plant, through its commitment to innovation and embracing cutting-edge technologies, has become a beacon of possibility in the realm of recycling for water sustainability.

The key highlight of this collaboration lies in addressing the energy-intensive aspects of wastewater treatment, a critical consideration in the broader context of resource conservation. Danfoss's contribution to the implementation of innovative cooling solutions, particularly the pioneering back-channel cooling system, reflects a commitment to energy efficiency and operational optimization. The success story of the Koyambedu plant extends beyond immediate gains, offering valuable insights for future initiatives in water management.

The study serves as a benchmark, underscoring the transformative potential of technology and efficient water management practices in shaping a more sustainable and resilient world. It provides a roadmap for other endeavors seeking to navigate the intersection of environmental stewardship and technological innovation.

About the Author



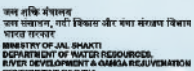
Mr. Mandar Vaijanapurkar
Head of Drives Sales,
Marketing & Services, Danfoss India Region

Mr. Mandar Vaijanapurkar is an experienced business manager in the mechanical and industrial engineering industry. With a strong background in product management, business strategy, key account management, and business development, he has proven himself as a skilled sales professional.

Mr. Mandar has been an integral part of Danfoss India close to two decades, specializing in the sales and marketing division for Danfoss Drives. With his expertise and dedication, he has played a crucial role in driving the success of the company in the India region.



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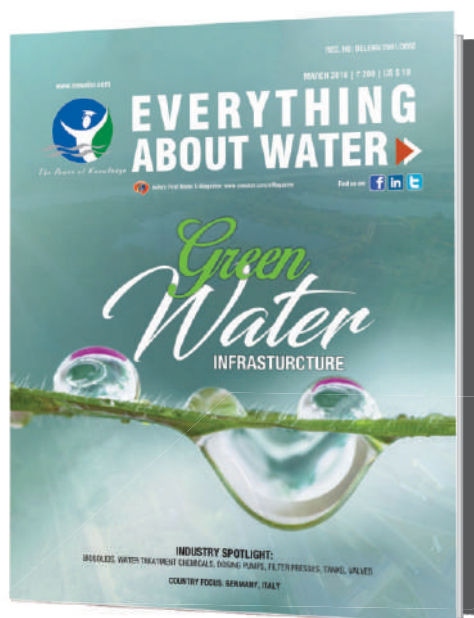


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SECURE FUTURE WATER AVAILABILITY BY USING TREATED WASTE WATER TODAY

Dr Mayur J. Kapadia, Trainer, Writer, Editor & Former AGM, Quality Control Dept, GNFC Ltd, Bharuch, Gujarat.

AN UNCERTAIN FUTURE FOR WATER AVAILABILITY

Freshwater is an essential natural resource for all because it is fundamental to our existence. Its availability must be sustained for current and future generations. The usage statistics indicate that only agriculture accounts for roughly three-quarters of global freshwater withdrawals. Water leakages have been contributing to 60% of distributed water loss. In the midst of climate change, water utilities are challenged to provide clean and safe drinking water. Additionally, the increasing and urbanizing population are putting a greater demand on water availability. By 2025, absolute water scarcity will be a daily reality for an estimated 1.8 billion people.



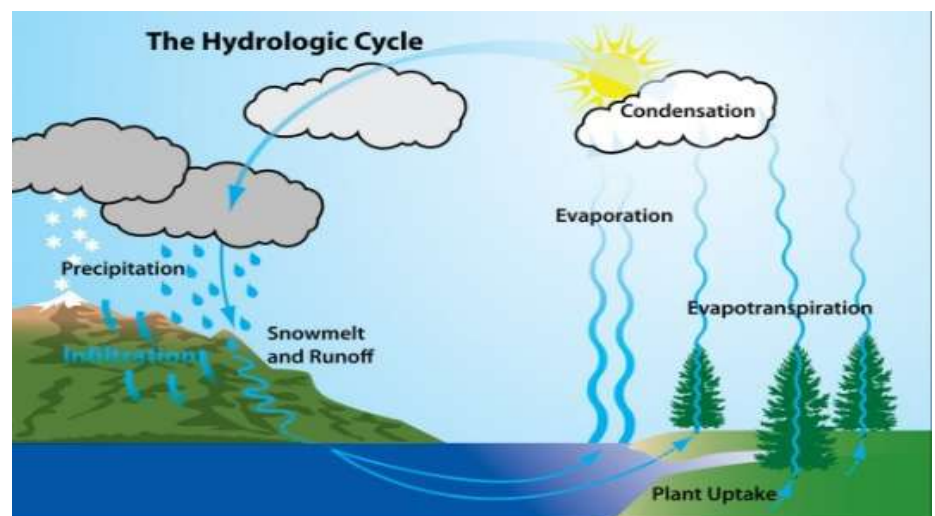
India is home to 16% of the global population but has only 4% of global fresh waters, while discharge of untreated wastewater has resulted in contamination of 75 % of all surface water bodies in India. In a world where vital resources are increasingly scarce, nations cannot afford to flush them down the drain and waste

many valuable resources with drained water. Waste water is rich in carbon and nutrients and – if collected and treated properly – it could provide new water, fertiliser, and energy. But more than 80% of all waste water still currently flows into natural ecosystems, polluting the environment and taking valuable nutrients and other recoverable materials with it.

To tackle this enormous challenge, it will require a move away from today's linear 'take – make – use – discharge' approach towards water use and move towards more circular water management initiatives that follows 'take – make – use – reuse / recycle / restore' approach.

HYDROLOGICAL CYCLE

The water cycle or the hydrological cycle existing in nature is a biogeochemical cycle wherein the water continuously moves above and below the surface of the Earth. The mass of water on Earth remains fairly constant over time but the partitioning of the water into the major reservoirs of ice, fresh water, saline water and atmospheric water is variable depending on a wide range of climatic variables. Nature purifies the water through various physical processes like evaporation, transpiration, condensation, precipitation, infiltration. This cycle is evidence that water can be recycled again and again. However,



anthropogenic activities over the last hundred years have disrupted the circulation of the earth's water stock. The greenhouse gas effect of climate change has disrupted the hydrological cycle through elevated moisture, evaporation and temperature, leading to melting of snow, rising of sea levels and an uneven distribution of rainfall patterns. It is an endeavour of all concerned to drive back towards nature's own water cycle through various steps and measures that interfere with the water consumption and disposal patterns of the mankind.

BUILDING RESILIENCE

With increasing human population and activity, the demand for water resources has increased by nearly 8 times. Reliance on natural water supplies is increasingly unpredictable, therefore water management needs sustainable solutions and strategies.

In many parts of the world, recycling water has become a common practice in aiding the fight towards water security. Singapore is a country that is leading the world in water recycling technology and securing water resources for its communities. Recycling water is the process of treating municipal wastewater, sewer network, greywater and stormwater to replenish freshwater resources, thereby closing the water cycle system on a local scale and ensuring the sustainable availability of freshwater to households, businesses and industries.

Wastewater treatment technology is capable of providing hygienic water that is often of a superior quality to existing water standards. Additionally, recycled water is relatively economical with low costs and low energy consumption, whilst providing a climate-resilient water supply system. However, despite its benefits, the population is generally hesitant to adopt this alternative water supply into their households. The studies have found that more than 50 % of the population is resistant to use recycled water for food preparation and drinking.

TAKING ADAPTIVE MEASURES

Depending upon the water collection and distribution system, different approaches need to be followed to enhance reuse of the treated waste water. Discussed here are some of the approaches that could be followed for treating the waste water and recycling

the outflow.

Decentralized waste water treatment plants

While waste–water systems in large cities are often effective, they are also very expensive to construct and costly to maintain and operate. Instead of that, decentralised waste–water treatment plants should be constructed in the affected communities. Unlike large waste–water treatment plants, the water is treated directly where it is produced instead of being confined in the sewer system. In rural areas, this setup can provide ready access to clean water and reduce environmental pollution.

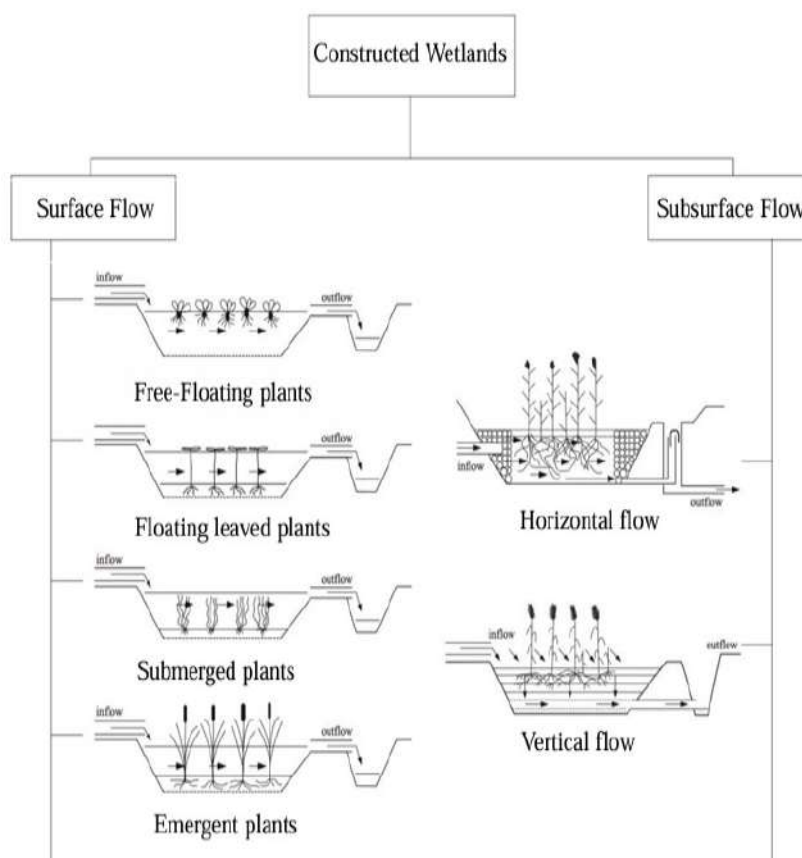
Due to relatively small size and low carbon footprints, the negative impact of small plants on the environment gets reduced than the traditional plants. Moreover, each site can be tailor–made to suit local climatic conditions, aesthetic requirements, water quality demands, and intended use of the treated water.

Constructed Wetland Environment

Wetland is a unique and distinct ecosystem that is flooded by water, either permanently or seasonally, where oxygen–free processes prevail. The primary distinctive factor is the occurrence of adaptive vegetation of aquatic plants characteristic to the unique hydric soil. The modified form of wetland, used for waste water treatment, is termed “Constructed Wetland”, which is a complex and integrated system of water, plants, animals, microorganisms, and the environment.

The surface of a constructed wetland is aesthetically pleasing and provides refuge for local wildlife. Beneath the surface is a wetland that treats waste water and produces energy. The energy produced saves families from having to resort to using firewood collected from the forests, while the outflow of this wetland can be used safely for crop irrigation or other purposes.

This is not a dream scenario and is already in practice on a small scale worldwide. Wetlands play a number of functions, including water purification, water storage, processing and recycling of carbon and other



micro and macro nutrients, stabilization of shorelines, and support of plants and animals. While wetlands are generally reliable and self-adjusting systems; an understanding of how natural wetlands are structured and how they function greatly increases the likelihood of successfully constructing a wetland treatment system.

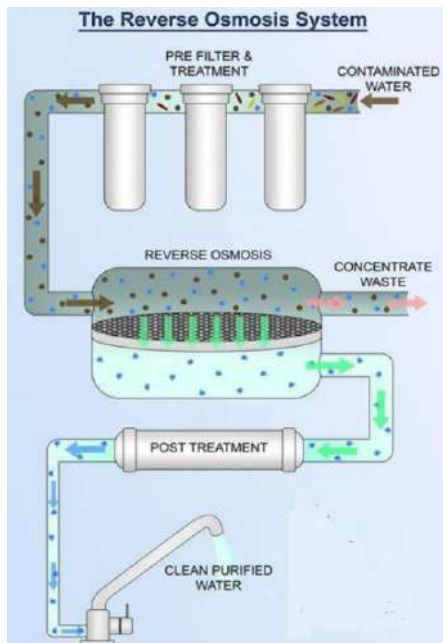
Cascading

Cascading is a sequence of consecutive uses of water for different purposes. Water (whether untreated or treated) should be used again and again in multiple stages of industrial and domestic processes. For instance, steam used for energy production can be used as condensate, then for cooling, again for cleaning, and subsequently for flushing toilets. Once treated, the same water can be used for irrigation as well.

To achieve Cascading, multiple solutions involving different strategies are integrated and combined. Cascading works best under proximity, when consecutive uses are located close to one another and with technologies working in synergy. In an ideal situation, water is cascaded infinitely, as in the natural water cycle of the Earth.

Physical / Chemical / Biological treatment

Particles or chemical / biological contaminants are



removed, or concentrations are lowered to acceptable levels by appropriate treatments for recycling the used water. This is accomplished by encompassing a single treatment (e.g. debris removal) or several simultaneous or sequential chemical, physical and biological treatments from among coagulation, flocculation, sedimentation, etc. Post treatment, the quality of water is enhanced and thereby value of the best suited approach for coastal communities or islands. It can not only augment the water supply but also provide greater water security. RO and Desalination plants deliver autonomous, resilient, modular, and electrified systems that reduce costs, improve performance, and enhance the resilience of nontraditional water reuse systems. Water is raised, which contributes to the upcycling of water.

Desalination & Reverse Osmosis

Desalination is a process to remove salt in general and other constituents from waste water by either Thermal process (Evaporation), Membrane Desalination, or Hybrid technologies. These processes have made their own niche in circular water practices. Desalination & Reverse Osmosis are

CONCLUSION

Water scarcity has reached to a threshold level with excessive pressure on human wellbeing. There is no longer any good reason to waste any type of water. Collecting and exploiting waste water is both technically feasible and financially justifiable. If properly managed, the water we have already used can be stopped to be an environmental hazard and it could become an affordable and sustainable source of energy, nutrients, and other recoverable materials. All the stakeholders – consumers, government authorities, local water bodies, industries, small and medium enterprises, water and wastewater treatment plant authorities – need to play a crucial role in recycling maximum possible waste water into productive use to finally achieve future water sustainability.



About the Author



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Dr Mayur J. Kapadia, MSc, PhD, is an Educator, Trainer, Editor and Technical Content Creator. He served M/s GNFC Ltd in capacity of Add Gen Mgr & Lab Head for its Bharuch & Dahej (Gujarat) locations. He possesses professional industrial experience of 40 years in the fields of Quality Control of Chemicals / Fertilizers / FMCG products, New Laboratory Set up, Cooling Water Management, ISI certification, and many other areas. He has to his credit technical suggestion awards, nearly 30 publications in journals / magazines and >20 presentations in conferences. He has been conducting full day training programs on Quality Control, NABL, Instrumental Analysis, ISI certification, Cooling Water Management, etc for industry professionals.

He is an active member in technical committee of Bureau of Indian Standards (BIS), which has conferred upon him a 'Certification of Appreciation' for his immense contribution towards establishing and improvising various Indian Standards. He also has been rendering technical services to various organizations for quality improvement, process trouble-shooting and analytical aspects.

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SAFEGUARDING WATER IN URBAN AND INDUSTRIAL SETTINGS RECYCLING FOR SUSTAINABILITY

Rajul Parikh co– founder of ALFAA UV



In an era marked by escalating apprehensions surrounding water scarcity and the imperative for environmental sustainability, the spotlight has unequivocally shifted towards the pivotal role of water recycling, particularly in urban and industrial domains. The deployment of robust water recycling strategies is emerging as a linchpin in the global quest for a sustainable water future.

India, with its burgeoning population of over 1.3 billion people and significant livestock population, faces a critical imbalance between water demand and supply. Despite receiving ample rainfall during the monsoon

limited storage capacity, resulting in only a fraction of rainfall contributing to water reserves.

With a per capita water availability of 1545 m³ per year, India is categorized as a water–stressed country according to international norms. Projections indicate a further decline in per capita water availability to 1401 m³ by 2025 and 1191 m³ by 2050, signalling water scarcity.

India's total annual utilizable freshwater resources amount to 1123 BCM, comprising surface water and groundwater reserves. However, the bulk of this water is utilized for irrigation purposes, accounting for

of total water usage, followed by domestic and industrial sectors.

In terms of wastewater urban India generates approximately 72,368 MLD of sewage daily, but only about 28% of it undergoes treatment, and of which a fraction is reused. Untreated wastewater, which forms the bulk, is discharged into groundwater, rivers, and lakes, causing pollution, spreading diseases, and harming wildlife. In addition, industries release an estimated 300–400 megatons of waste, adding to the already polluted surface and ground



The 2021 National Inventory of Sewage Treatment Plants highlights a significant gap between the escalating sewage generation and the capacity to treat it. Despite a three–fold increase in urban population since 1971, the capacity of sewage treatment plants (STPs) has only grown from 2,758 to 23,277 MLD. The Central Pollution Control Board's report also indicates that much of the water supplied for domestic use is discharged as toxic wastewater, remaining largely unused.

A new report by the Council on Energy, Environment, and Water (CEEW) suggests that 80% of urban India's wastewater holds potential for treatment and reuse for non-potable purposes like irrigation. This approach could alleviate pressure on water bodies, reduce pollution levels, and enhance water security, particularly in the face of climate crisis-induced weather events that may compromise the reliability of water bodies.

This article aims to delve into the multifaceted landscape of water recycling, exploring its significance, challenges, and the transformative potential it holds for achieving a sustainable water future.

URBAN WATER SYSTEMS RECYCLING: FOSTERING SUSTAINABILITY

Urban water systems play a pivotal role in our daily lives, and exploring successful recycling practices within them is key to sustainable water management. Investigating innovative technologies employed for wastewater treatment and reuse sheds light on their contribution to water conservation. These practices not only mitigate water scarcity but also underscore the potential for sustainable urban living.

Current methods used to treat wastewater involve physical, chemical, and biological processes to remove contaminants and pathogens. The primary treatment stage focuses on removing large solids, while secondary treatment targets dissolved organic matter. Treated wastewater undergoing primary and secondary treatment stages, leave behind certain critical contaminants. Incorporating advanced technologies and tertiary treatment processes like filtration and UV disinfection are crucial for achieving higher water quality standards and promoting sustainable urban water management.

QUALITY ASSURANCE IN RECYCLED WATER: THE CORNERSTONE OF SUSTAINABLE PRACTICES

Quality assurance stands as the linchpin in the triumph of recycled water initiatives, forming the bedrock for guaranteeing the safety, reliability, and widespread acceptance of recycled water in diverse urban and industrial landscapes. In this pivotal segment, we delve into several crucial aspects that collectively contribute to the establishment and steadfast maintenance of the highest standards of

water quality in recycled water applications. As we navigate this intricate landscape, it becomes evident that integrating chemical free and green technologies such as UV for wastewater recycling, play a pivotal role in fortifying the sustainability of these initiatives.

UV IN TERTIARY TREATMENT

As a tertiary treatment in recycled water initiatives, UV (Ultraviolet) radiation, particularly at the 254nm wavelength, stands as a crucial step in ensuring the highest standards of water quality. Serving as a disinfection method, UV light at this wavelength effectively neutralizes microorganisms by disrupting their DNA structures.

In addition, and in keeping with the digital era, UV technology facilitates real-time monitoring, enabling an instantaneous assessment of water quality parameters in the recycled water.

Further, adhering to local and international water quality regulations is fundamental, and UV technology aids in achieving compliance by providing an effective and chemical-free disinfection method.



Several large cities around the world have implemented UV technology as part of their recycled water initiatives to ensure water quality assurance. Some examples include:

- 1. Singapore:** The NEWater initiative in Singapore incorporates UV disinfection as one of the key treatment processes in producing high-quality reclaimed water for various non-potable uses.
- 2. Los Angeles, United States:** The Los Angeles Department of Water and Power (LADWP) utilizes UV disinfection systems in its water recycling facilities to treat reclaimed water before distribution for irrigation and industrial purposes.
- 3. London, United Kingdom:** The Thames Water Utilities Ltd. operates wastewater treatment plants equipped with UV disinfection systems to treat

sewage effluent and produce recycled water. UV technology is employed to ensure the safety of recycled water discharged into water bodies, contributing to environmental protection and public health.

ADAPTABLE APPLICATION OF UV IN URBAN AND INDUSTRIAL SETTINGS:

Urban Water Recycling:

UV technology plays a vital role in wastewater treatment plants, both centralized and decentralized, when utilized for disinfection purposes. In centralized facilities, UV systems are integrated post-secondary treatment to neutralize pathogens before treated wastewater is discharged into the closest water body or reused wide long distribution pipelines. Similarly, in decentralized setups, UV units are employed to achieve disinfection, ensuring water safety and supporting sustainable wastewater management practices at the point of treatment and use, thus reducing both infrastructure and distribution costs.

Industrial Water Recycling:

The integration of UV technology in industrial processes enhances water quality, supporting industries in reducing their water and ecological footprint through water conservation and effective pathogen control. Recycled water in industries is used for cooling towers, boiler feedwater, equipment cleaning, landscaping, and certain manufacturing processes.

CHALLENGES AND FUTURE PERSPECTIVES IN WATER RECYCLING: NAVIGATING THE PATH FORWARD

Currently, challenges in establishing widespread water recycling practices include:

- 1. Public Perception:** Misconceptions about recycled water safety and reluctance to accept its use is a sizable challenge. Comprehensive campaigns to raise awareness about the safety and benefits of recycled water is one way to address this challenge.
- 2. Infrastructure:** Insufficient infrastructure for collecting, treating, and distributing recycled water is another challenge. Here, besides government financed schemes, self-sustaining public private partnership programs to build more waste water

treatment capacities is the way forward.

3. Policy Framework: Inadequate regulatory frameworks and policies may hinder the implementation of water recycling initiatives. Strengthening existing regulatory frameworks with better implementation, and providing monetary incentives may serve as a stick and carrot approach.



About the Author



Rajul Parikh
Co- Founder of ALFAA UV

Rajul Parikh is a co- founder of ALFAA UV, India's leading manufacturer & exporter of UV water, air & surface disinfection systems and is passionate about people, and the environment.

As a co-founder, has contributed towards making Alfaa a market leader in UV technology and India's first ISO 9001 certified water purification company. Has played a key role in the development and implementation of marketing strategy, HR strategy and brand communication at Alfaa UV.

CONCLUSION

Paving the Way for a Sustainable Tomorrow

As we navigate the complexities of water scarcity and environmental responsibility, quality assurance emerges as a non-negotiable factor in the success of water recycling initiatives. By prioritizing the quality of recycled water in urban and industrial applications, we lay a solid foundation for a sustainable water future—a future where every drop is not just recycled but is a testament to our commitment to environmental stewardship and responsible water management.

In the realm of water sustainability, Alfaa UV emerges as a beacon of innovation and commitment. With a focused approach on advanced technologies, particularly UV for wastewater recycling, Alfaa UV plays a pivotal role in elevating the standards of water quality and contributing to the resilience of recycled water initiatives, both in urban and industrial settings. Alfaa UV's cutting-edge solutions, seamlessly integrated with a vision for a sustainable future, exemplify the fusion of technology and environmental responsibility.



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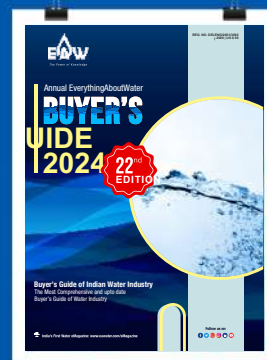
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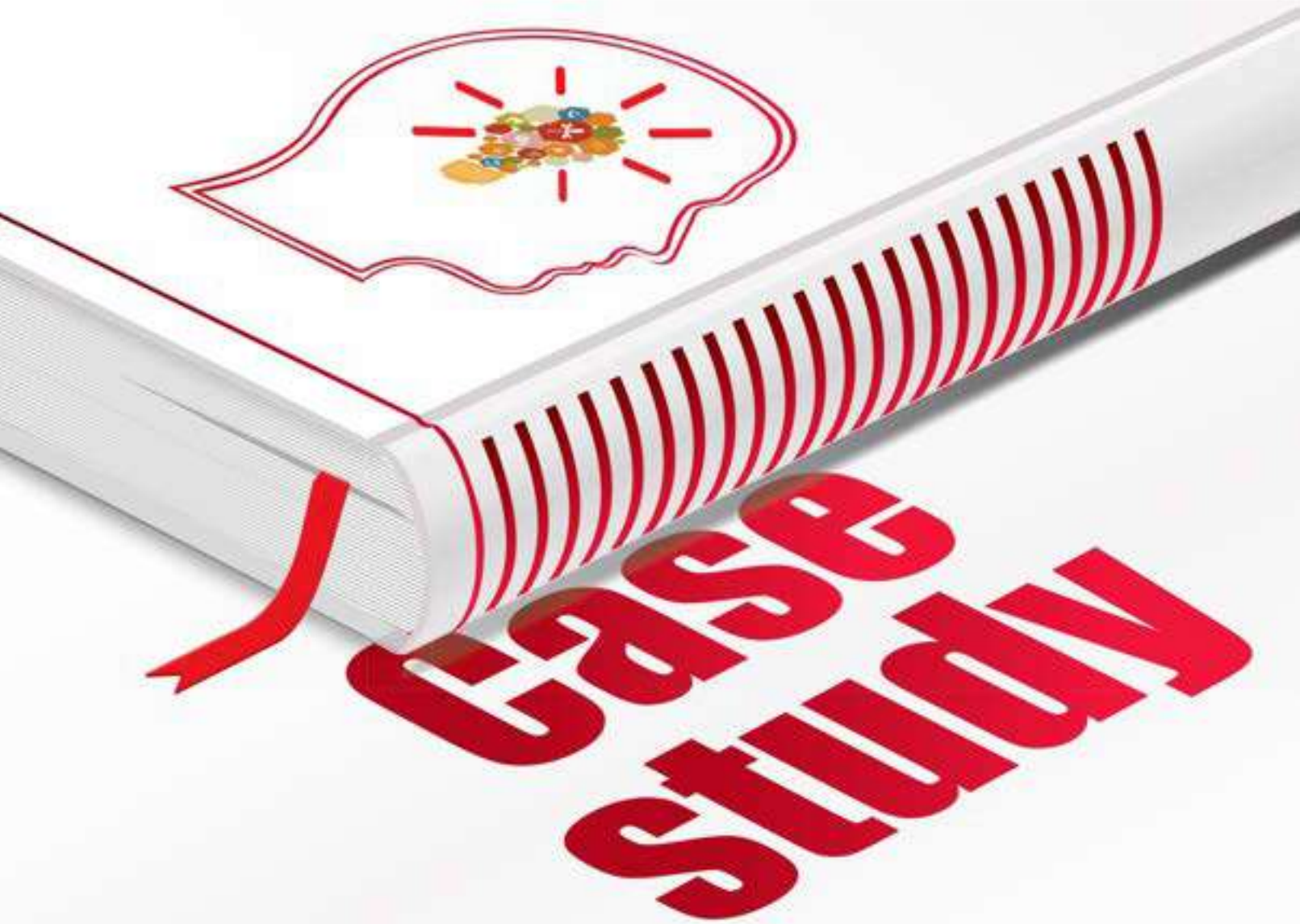
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OVIVO'S ADVANCE OXIDATION DITCH – FIRST STP IN INDIA

Mrs. Dharni Lahewala, Manager, Process Aeration Group

INTRODUCTION TO DITCHES

Oxidation ditches are the advanced and modified version of Activated Sludge Process. It is a complete mix process which tends to operate in an extended aeration mode. Oxidation ditches are operated at long hydraulic and solid retention times to get good removal of carbon and nutrients. The two processes, namely, Nitrification and denitrification, occur in the two different zones of the Ovivo's advanced oxidation ditch. The process of Nitrification occurs with the help of the Autotrophic bacteria in the aerobic zone of the Oxidation Ditch which helps in converting the ammonia–nitrogen to nitrate–nitrogen. The nitrate–nitrogen then gets converted to the nitrogen gas in the anoxic zone of the Oxidation Ditch basin with the help of facultative bacteria. This process of converting

Nitrates to Nitrogen gas is called denitrification process. The ditches are equipped with primary treatment upstreams and secondary clarifiers at the downstream side for complete removal of BOD and TSS.



Fig.2–Ovivo's advanced Oxidation Ditch Site Image

ADVANTAGES OF OVIVO'S ADVANCED OXIDATION DITCHES OVER OTHER BNR OPTIONS

Ovivo's advanced Oxidation Ditch treatment is very successful and proven Secondary Wastewater treatment technology. Once the ditch is commissioned and working as shown in Figure.1 and 2, it requires minimum manpower to operate it (an unmanned operation). The Ovivo's Advanced Oxidation ditches can handle varied flow ranges and it has proven to be a very effective technology for those areas generating low flow conditions as well as for any isolated regions where labor availability is also less. Oxidation ditches require more land area as compared to the area required to construct SBR and MBR or other treatment plants. On comparison with the other treatment technologies, it has been found out that the ditches generally utilize less energy as compared to other technologies and so are energy efficient and the treatment objectives can be achieved with low capital and maintenance costs.

Ovivo's Advanced Oxidation ditches are equipped with mechanical surface aerators. These are vertical shaft aerators with an upper impeller and a lower turbine. The upper impeller helps in maintaining the effective velocity of the wastewater throughout the basin and helps to transfer oxygen from the atmosphere to the wastewater whereas the lower turbine prevents sludge settling and also helps in maintaining the floor velocity.

There are two different types of mechanical aerators installed in the basin. One of its types is known as the LSC aerator with Draft Tube as shown in Figure 3. It has the upper impeller known as Hubert impeller. The impeller and the draft tube has certain inches of clearance in between. The draft tube is mounted on



Fig.1-Ovivo's advanced Oxidation Ditch Google earth Image

the floor and is the non-rotating part of the aerator which is fixed horizontally with the partition wall within the basin. The draft tube aerators are used when the depth of the basin is more than it is specified, depending on the diameter of the aerator impellers. For 215 HP aerators, the standard allowable max depth is around 19ft. The depth of the Ovivo's Advanced Oxidation Ditch plant is 22 ft, so the draft tube aerator has been installed at one end of the basin.

Type	Transfer rate, kg O ₂ /kW.h	Transfer rate, lb O ₂ /hp. h
Low-speed surface aerators	1.5–2.1	2.5–3.4
Low-speed surface aerators with Draft Tube	1.2–2.8	20–4.6
high-speed surface aerators	1.1–1.4	1.8–2.3
Submerged turbine with draft tube	1.2–2.0	20–3.3
Submerged turbine aerators	1.1–2.1	1.8–3.5
Submersed turbine aerators with spargers	1.2–2.0	2.0–3.3
Horizontal Rotor	1.5–2.1	15–3.6.

Table 2. Oxygen transfer capabilities for various types of mechanical aerators (source: Metcalf & Eddy)

Integrated fixed film activated sludge system (IFAS)	Ovivo Advanced Oxidation Ditch (OAOD)	Membrane Bioreactor basin (MBR)
Media required for treatment	No media required	Membranes required for treatment.
MLSS upto 6000mg/L	MLSS upto 4000 mg/L	MLSS upto 10,000 mg/L
Less space requirement	Land requirement is more	Less space requirement
Media are required to be compensated after certain period of time	No replacement of any component required	Membranes are required to be changed after certain period of time
Least instrumentaion	Least instrumentaion	More instrumentaion as compared to OD & IFAS
Low manpower requirement for maintenance	Low manpower requirement for operation and maintenance	High manpower requirement for maintenance
Good treatment efficiency	Efficient BNR process	Highest reusable water quality/efficient BNR process

Table 1. comparison between various wastewater treatment technologies:

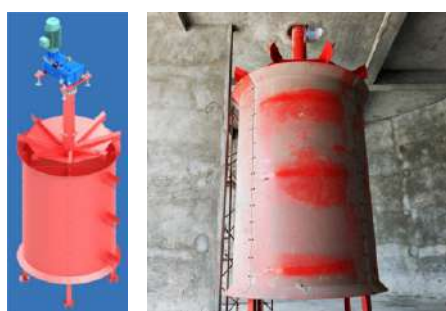


Fig.3—LSC aerator w/Draft Tube

The other type of aerator installed in the ditch is known as the Excell® aerator II with dual Impeller which is shown in Figure 4. Its upper impeller is known as the Astrumaer impeller, and it has the lower turbine for mixing. It is located at the far end of the basin. The lower turbine helps in dewatering the basin, if the basin is required to go under maintenance, to a depth of three feet above the basin floor.

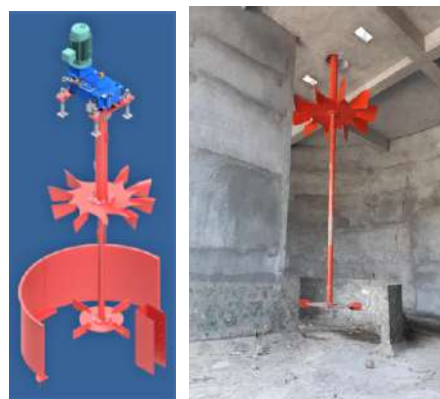


Fig.4 – Excell Aerator II

Ovivo's advanced oxidation ditches are monitored and controlled by the Oculus™ control System. It helps in monitoring and controlling the BNR operations occurring in the basin and in optimizing the power usage of the plant. The DO probes, ORP probes and NO₃ probes in the basin work in co-ordination

each other to maintain the anaerobic, anoxic and aerobic conditions in the basin. The level sensors help in maintaining the effluent weir level in the basin. The Oculus system receives signals from all the installed probes in the basin which helps in controlling the power input to the aerators and also helps in better functioning of the EliminatIR gate. The EliminatIR gate helps in maintaining the NO₃ levels in the Anoxic zone with the help of the readings obtained through the ORP probe.

STP DESIGN BASIS

Design Basis		
Total Flow (MLD)	102.6	
Total peak flow (MLD)	277.6	
	Inf. Data	Eff. Data
BOD (mg/L)	225	5
TSS (mg/L)	300	15
TKN (mg/L)	55	≤10
TP (mg/L)	6	-

Table 3. Design Basis

There was sufficient land area available at the Sewage Treatment Plant site for the construction of Ovivo's advanced Oxidation Ditch treatment process. As per the incoming flow and the influent parameters available, four oxidation ditches were constructed on the site. Each oxidation ditch is constructed to treat the incoming flow of 25.65 MLD. The total occupied footprint including all the four ditches is 338 ft X 273 ft with 22 ft of SWD. The plant design data (influent and effluent details) is presented in Table.3. Ovivo India Private Limited Provided the key equipments for the construction of the STP including surface aerators, mechanical gates and controls with a detailed process design. The plant was commissioned in 2020.

Each oxidation ditch is equipped with two (2) nos. of 215 HP aerators. These aerators are VFD controlled. The Excell aerator II in the basins are operated completely with the electricity generated through the

gas driven turbines. The LSC Aerator with the draft tube is operated partially with electricity generated through the gas driven turbines. The gas is produced by the anaerobic digesters installed on the site.

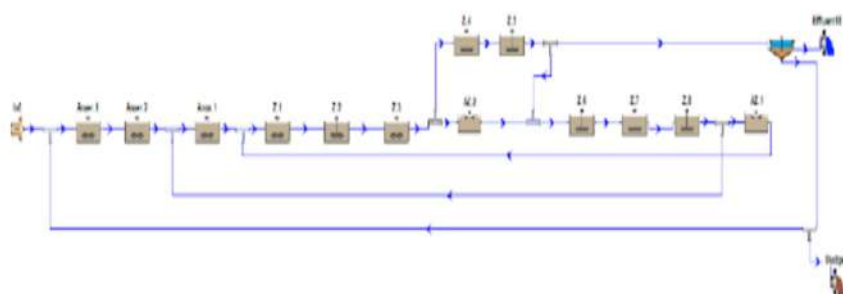
NITRIFICATION/DENITRIFICATION IN OVIVO'S ADVANCED OXIDATION DITCH

The process of Nitrification occurs in the oxidation ditch where there is sufficient oxygen available. The nitrogen enters the wastewater treatment plant in the form of ammonia. As ammonia is very harmful and toxic, it is required to be removed from the wastewater before it enters the water bodies. Ammonia ($\text{NH}_3\text{-N}$) entering the plant gets converted to Nitrates ($\text{NO}_3\text{-N}$) with the help of the DO available in the basin. This process of converting the ammonia to nitrates is facilitated by a specific type of bacteria called Nitrosomonas and Nitrobacter in a two-stage process. These NO_3 generated enters the anoxic basin where the process of denitrification occurs with the help of facultative bacteria. These NO_3 generated gets converted to N_2 gas which is released into the atmosphere. The facultative bacteria also require oxygen to carry out the process. These bacteria can utilize the oxygen from the NO_3 generated in the basin to oxidize the organic substrate coming into the plant. This helps in decreasing the overall power requirement of the plant.

BIOWIN SIMULATION:

BIOWIN is a very well-known and trusted software in the wastewater industry which is used to validate the traditional design methods of wastewater treatment plant designing. Ovivo India has used this simulation tool to simulate the Ovivo's three-stage advanced oxidation Ditch process and to confirm the results guaranteed by the design sheets. BIOWIN can be used to simulate the simple Oxidation Ditches to complex 5 Stage Oxidation Ditches. The Ovivo's advanced Oxidation Ditch is modelled by dividing the basin into specific zones as shown in the figure below. The influent values, wastewater temperature, SRT value, DO, MLSS and the aerator HP value are required to run the model.

The below image shows the Ovivo's Oxidation Ditch fragmented into various zones and the influent values used in the model along with the effluent results obtained after simulation.



Influent Details:

	Flow	6.70 mgd
	COD - Total	458.00 mg/L
	N - Total Kjeldahl Nitrogen	35.00 mgN/L
	P - Total P	6.00 mgP/L
	ISS Total	75.00 mg/L
	S - Total S	10.00 mg/L
	Volatile suspended solids	225.00 mg/L
	Total suspended solids	300.00 mg/L
	BOD - Total Carbonaceous	225.00 mg/L
	pH	7.30

Effluent Details:

	Flow	6.51 mgd
	N - Ammonia	0.62 mgN/L
	N - Nitrate	2.40 mgN/L
	N - Nitrite	0.17 mgN/L
	N - Filtered TKN	1.79 mgN/L
	N - Total N	4.95 mgN/L
	P - Soluble phosphate	0.45 mgP/L
	P - Total P	0.74 mgP/L
	Total suspended solids	11.78 mg/L
	COD - Total	35.47 mg/L
	BOD - Total Carbonaceous	3.79 mg/L
	pH	7.46

SUMMARY:

The Ovivo's advanced oxidation ditches costs significantly lower in operation and maintenance cost, as compared to the other treatment technologies. The oxidation ditches are very robust in operation and a very reliable solution to handle shock loads. The STP plant is running successfully generating the required permissible effluent limits from 2020.

About the Author



Mrs. Dharni Lahewala
Manager
Process Aeration Group

Mrs. Dharni Lahewala, Manager, Process Aeration Group has been working with OVIVO India Pvt Ltd since past 10 years. She is B.E. (Civil) and has completed her post-graduation in M. Tech (Env.).

At present she leads the Process Aeration Group for USA business support which works on designing of Advanced Oxidation Ditch plants in USA. Ovivo is a global provider of equipment, technology and systems producing among the purest water and treating some of the most challenging wastewater in the industry

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OVERCOMING WASTEWATER TREATMENT CHALLENGES IN A AGRO BASED PAPER MILL

Sanjay Bahl, CEO at Superweld Ecosolutions

Let's talk about something we've all heard about but might not pay much attention to – managing our wastewater. It's not just about getting rid of liquid waste; it's a big deal for our health, the environment, and making sure we use resources wisely. Wastewater management is like a superhero job that goes beyond just tossing away liquid waste.

Why does it matter in India and worldwide? Well, it's crucial for keeping our communities safe, protecting our environment, and making sure our planet stays happy. When we don't handle our wastewater properly, it can make our water sources dirty and spread diseases – definitely not something we want.

There are various hurdles faced in wastewater treatment, let's understand those through a case study about overcoming this hurdle in an Agro-based Paper Mill. Wastewater treatment is an integral element of conscientious industrial practices, particularly in sectors characterised by elevated organic loads, such as paper manufacturing.



Before delving into real-life case studies and exploring how Superweld successfully addressed challenges, let's first comprehend the significant hurdles faced by the industry. Understanding these challenges is crucial as neglecting them could have serious consequences:

COMMON CHALLENGES FACED BY THE PAPER MILL INDUSTRY:

Paper mills are crucial in our world, but one important thing they often forget is treating their wastewater properly. There are big problems here, from owners not knowing enough to the sewage treatment plants having bad infrastructure. Let's talk about these issues and why it's so important to make things better, and then we'll share some practical solutions too with a real life example!

Obliviousness of Management:

Management of paper mills may underestimate the significance of efficient wastewater treatment. This ignorance can lead to inadequate investments, improper maintenance, and a lack of awareness about the environmental impact of untreated wastewater.

Inadequate Infrastructure of ETPS:

Effluent Treatment Plants in many paper mills often suffer from poor infrastructure. Outdated equipment, insufficient capacity, and a lack of modern technologies hinder the plants from effectively

treating the diverse pollutants present in paper mill effluents.

Complex Composition of Wastewater:

Wastewater from paper mills is uniquely challenging due to the complex composition. It contains various pollutants such as lignin, cellulose fibres, and chemicals used in the papermaking process. Conventional treatment methods may struggle to handle such a diverse and complex mix.

Regulatory Compliance:

Stringent environmental regulations demand paper mills to meet specific standards in wastewater discharge. Non-compliance not only poses legal risks but also harms the reputation of the mills.

THE IGNORED CONSEQUENCES:

Environmental Impact:

Discharging untreated wastewater into water bodies can lead to severe environmental consequences. The release of harmful chemicals and pollutants can disrupt aquatic ecosystems, harm aquatic life, and compromise the overall health of receiving water bodies.

Public Health Risks:

Untreated wastewater may contain pathogens and toxins harmful to human health. If not properly managed, it can contaminate local water sources, posing risks to nearby communities and ecosystems.

Operational Inefficiencies:

Inadequate wastewater treatment can result in operational inefficiencies within the paper mill. The accumulation of pollutants in water recycling systems may lead to equipment corrosion, increased downtime, and higher maintenance costs.

Now that we've looked at the potential problems in the paper mill industry and how not treating wastewater properly can seriously harm the environment, let's back up our points with a real-life example. In a case where unexpected issues were causing trouble, and potential solutions were being overlooked, Superweld Ecosolutions stepped in. They successfully revived the wastewater treatment at a paper mill, providing a long-lasting solution that, when implemented correctly, brought tremendous relief.

CASE BACKGROUND:

Located in Uttar Pradesh, the paper mill under discussion is a well-established entity in the paper manufacturing sector. Demonstrating a dedicated commitment to sustainability, this mill specialises in the production of food-grade paper utilising bagasse and agricultural waste. This exemplifies the capacity of agro-based industries to play a significant role in promoting environmentally friendly practices.

ORIGINAL CONDITIONS: UNVEILING THE WASTEWATER TREATMENT CHALLENGES OF THE MILL

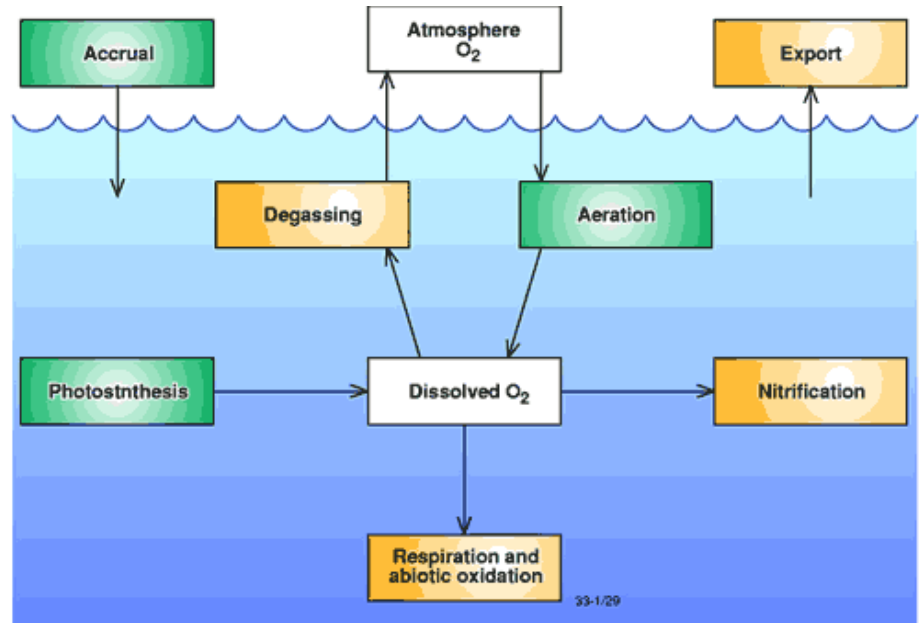
Despite its notable standing, the paper mill encountered substantial obstacles within its Effluent Treatment Plant (ETP), responsible for treating and purifying the wastewater generated during the paper manufacturing process. The original conditions had numerous challenges:

Low Dissolved Oxygen and Odour Issues:

The aeration tank, a pivotal element of the ETP, displayed diminished levels of dissolved oxygen ranging from 0.6 to 0.9 ppm. This not only indicated ineffective treatment but also resulted in the unwelcome generation of odours, presenting both environmental and operational concerns.

Poor Settleability and Sludge Bulking:

The sludge within the system exhibited poor settleability, accompanied by indications of bulking.



This compromised the efficient separation of solids from the wastewater, consequently impacting the overall efficacy of the treatment process.

Bleach Effluent pH Disturbances:

A distinct challenge arose from the bleach effluent, characterised by a disruptive pH level of 3. This highly acidic environment posed a detriment to microbial growth, presenting a recurring obstacle that necessitated an immediate and effective resolution.

LET'S TALK ABOUT THE SOLUTION:

Enter Superweld, a leader in wastewater management solutions. Recognizing the unique needs of the Paper Mill, Superweld implemented an all-in-one approach to revolutionise wastewater management carefully considering the problems and infrastructure of the STP.

The Superweld team, being the real experts in Microbial Treatment Dynamics, did some smart things to implement a series of interventions to orchestrate a microbial makeover and elevate the ETP's performance.

1. Regular Dosing of SUPER 24 and OXYSUPER: Nourishing the Microbial Ecosystem

Super 24 and OxySuper, specialized microbial products, were central to the intervention strategy.

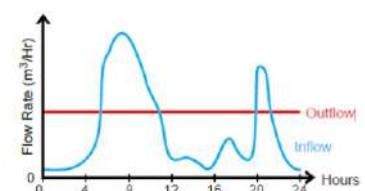
Consistent dosing of these formulations supplied the microbial ecosystem within the ETP with essential nutrients and oxygen. This addressed the challenge of low dissolved oxygen levels while fortifying the

2. Mixing of OMYA OPTICAL to the Bleach Effluent:

The disruptive pH level of 3 in the bleach effluent posed a significant hindrance to microbial growth. Superweld's experts introduced OMYA OPTICAL, a pH-stabilising agent, to the bleach effluent. This precise adjustment aimed to establish an environment conducive to microbial activity, fostering a balanced and efficient treatment process.

3. Adjustment of Water Flow and Operations: Fine-Tuning for Optimal Performance

Guided by Superweld's Expert Wastewater Services Team, meticulous adjustments were made to the water flow and operational parameters within the ETP. This fine-tuning process ensured the optimal operation of the entire system, creating conditions conducive to enhanced microbial activity and overall treatment efficiency.



So, what was the outcome? Let's get into it!

RESULTS: A RESILIENT MICROBIAL DYNAMICS AND ENHANCED TREATMENT EFFICIENCY

The application of Superweld's microbial makeover produced noteworthy results within a relatively brief period. The key outcomes encompassed:

1. Improved Dissolved Oxygen Levels:

The consistent application of SUPER 24 and OXYSUPER played a pivotal role in raising dissolved oxygen levels within the aeration tank. This not only tackled odorous emissions but also fostered an environment conducive to the growth of aerobic microorganisms essential for effective wastewater

treatment. "Despite the initial problems with the plant's setup, the introduced products performed admirably, resolving issues effectively. Sanjay Bahl, CEO at Superweld Ecosolutions.

2. Enhanced Settleability and Sludge Management:

The microbial makeover yielded a substantial improvement in sludge settleability, effectively addressing bulking issues. This improvement facilitated a more efficient separation of solids from the wastewater, contributing to an overall enhancement in ETP performance and the streamlined management of sludge.

3. Bleach Effluent pH Harmonisation:

The introduction of OMYA OPTICAL successfully harmonised the pH of the bleach effluent. This adjustment created a stable and favourable environment for microbial growth, effectively resolving the recurrent disturbance caused by the highly acidic conditions.

CONCLUSION

In simple terms, teaming up with Superweld for a microbial makeover was a game-changer for the paper mill. It highlighted how understanding and using tiny living things can make a huge difference in cleaning wastewater. They tackled issues like oxygen levels, managing sludge, and balancing pH. The results showed that using these microbial strategies can really boost how well the Effluent Treatment Plant works, making it more efficient overall.

If you encounter similar wastewater treatment challenges, don't hesitate to reach out to Superweld Ecosolutions – your trusted partner in turning wastewater problems into success stories.

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About the Author



Sanjay Bahl
CEO at Superweld Ecosolutions

Sanjay helps businesses 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, companies improve their biological wastewater treatment, he strongly believes Indian biotechnology is among the best in the world. Along with his passion for transforming the course of companies, he likes to read about the latest technologies and does social work in his free time.




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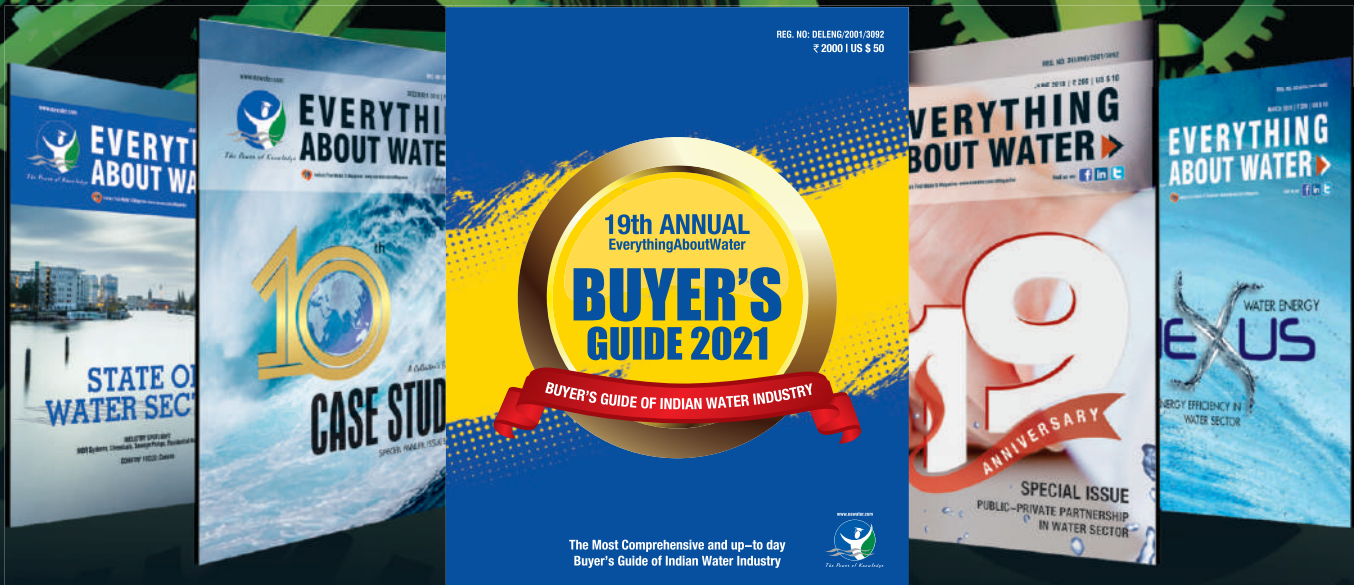
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A SYSTEMATIC REVIEW ON WATER QUALITY PARAMETERS: THE-ORY AND APPLICATIONS WITH RECENT DEVELOPMENTS

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Bhubaneswar, Odisha, India.

ABSTRACT:

Water is the furthestmost significant component in the terrestrial foundation and regulating the climate. It is one of the chemicals that affects life the most significantly. Typically, the characteristics of water's physical, biological, chemical, and constitution are utilised to define it. Groundwater resources are being depleted and are becoming significantly and diversely contaminated as a result of rapid economic development and the unrestrained use of chemical pesticides and fertilisers in agriculture. In-place sewage systems, landfill leachate, wastewater treatment plant effluent, leaking sewers, hydraulic fracturing, gas stations, or excessive fertiliser use in agriculture are the usual causes of ground water adulteration. Pollution can also be brought on by natural contaminants like fluoride and arsenic. Use of tainted groundwater exposes the entire public to illness or injury. Poor water quality can lead to a range of negative effects, including subpar goods, low earnings and serious risks to human health. This document provides detailed information on underground water quality characteristics, including pH, temperature, biological oxygen demand, dissolved oxygen, alkalinity, chemical oxygen demand, nitrite, hardness, ammonia, nitrate, sulphate and phosphate.

KEYWORDS:

Biochemical Oxygen Demand (BOD), Alkalinity, Eutrophication, Heavy metal.

INTRODUCTION

The lack of access to clean water is a global issue that affects all countries. The strong human desire to improve living standards has inevitably resulted in water pollution, with cumulative efforts and activities establishing as heavy industrial development and incessant urbanization, leading to progressive pollution of aquatic system [1–4]. When it comes to drinking, irrigation of crops, waste disposal, transportation, recreation, irrigation of crops, and industrial production, humans are utterly dependent on renewable resources of freshwater. The quality and quantity of water that can be used to placate human necessities are already threatened in many parts of the biosphere due to rising water usage, growing population, climate change and a rising water usage, the gap between freshwater availability and demand will worsen over the next century. About 80% contamination of Indian water resources, according to estimates by WHO, is caused by inhabited refuse. Water system management issues could have a substantial impact on the supply of drinking water [5–6]. Industrial waste is the main basis of water contamination. When wastewater from various industries is disposed of in the water without being properly treated [2]. Water's biological, physical and chemical properties have been changed in

that they are no longer useful for the intended application [7].

A change in the underlying sediments' and aquifer's chemical make-up also affects the variation in water quality. Surface sources like canals, lakes, dams, and rivers provide around one-third of the world's drinking water needs. Water is used in some way or another by an organism's chemical and physiological processes. In numerous aspects of existence, water is crucial. In order to research numerous physicochemical water characteristics including B.O.D. (biochemical oxygen demand), WQI (water quality index), D.O. (dissolved oxygen), Eutrophication, heavy metal, alkalinity, etc., water samples from rivers and lakes provide an appropriate platform. Many scientists have occasionally studied the physicochemical properties of water bodies. The physicochemical features will also aid in the continuation of eco-biological impact research, the detection of pollution sources and the beginning of remedial action procedures for polluted water bodies [8–10]. Numerous scholars in India have studied the physicochemical and biological properties of reservoirs and rivers. Since a variety of physical and chemical elements can combine to affect primary production levels, which in turn affect total biomass and trophic structure across the aquatic food web, water quality must be taken into account when evaluating wetland habitat.

In the current review work, certain parameters for evaluating the quality of water have been presented together with earlier research on the subject by academics and scientists.

ANALYSIS OF WATER QUALITY

Before using water for drinking, residential, industrial or agricultural purposes, it must first be tested. Different biological, physical and chemical factors must be used to test water. The only factors considered when selecting water testing parameters are the envisioned use of the water and the level to which its purity and quality are required. [11–14]. Different kinds of microbiological, dissolving, suspended, floating, and bacteriological pollutants are present in water. Physical tests should be conducted to evaluate the substance's odor, colour, temperature, pH, TDS, turbidity and further physical characteristics. Chemical tests should be conducted to evaluate the substance's COD, BOD, alkalinity, hardness, DO and other characteristics [15]. Water must be verified for heavy metal trace, organic and metal contaminants like pesticide scum in order to obtain more and more pure, high-quality water. It goes without saying that potable water must satisfy all of the required parameters during tests and contain the necessary amount of minerals [16–17]. Only in wealthy nations are all these requirements properly checked because there are very few organic and heavy metal pesticide contaminants in water, necessitating extremely analytical equipment and skilled labor. To monitor the water quality, a variety of physical–chemical parameters must be used.

TEMPERATURE MEASUREMENT

Using a digital thermometer, the temperature is determined by dipping the thermometer in the sample and recording the result [18]. Temperature is the degree of heat or cold in an aquatic organism's body, whether it is in water or on land. Despite having cold blood, fish experience body temperature changes in response to their environment. These changes have an impact on the fish's physiology and metabolism as well as its production. The micro biota's rate of metabolic activity as well as their rate of respiration both increase with temperature because of the rise in oxygen demand. It also results in increased ammonia levels in water and decreased oxygen solubility. However, with prolonged ice cover, chemicals such as carbon dioxide, methane and hydrogen sulfide can build up to dangerous levels and affect the health of fish. (Fig. 1 and 2).

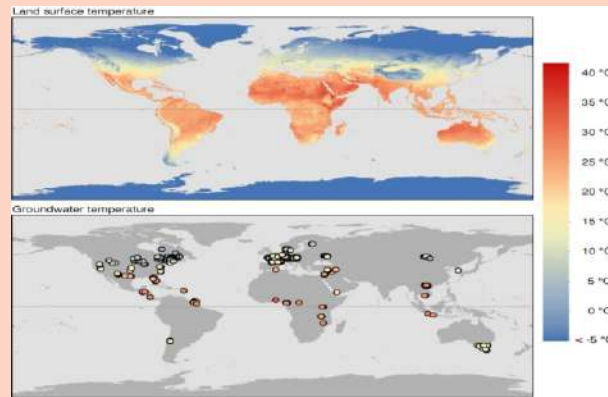


Fig. 1
Global map of temperature of shallow groundwater and land surface (LST). LST is calculated using the daily MODIS products MOD11A1 and MYD11A1 averaged over a 10-year period (01/2005–12/2014). With regard to seasonal fluctuations in cloud cover, the bias in favor of cloud-free days was rectified. The same time frame saw the collection of (multi)annual mean GWTs at depths of up to 60 m [19].

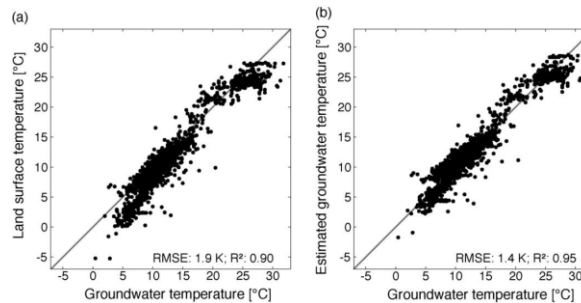


Fig. 2
Relationship between (a) and temperature of land surface (LST) and groundwater temperature (GWT) and (b) estimated and measured GWT. The equality line is shown in dark grey [19]

pH MEASUREMENT

The pH of water is a significant factor in determining its acceptability for a variety of uses, bathing, cooking, including drinking, agriculture and washing, among others. According to the BIS, water's pH should not overlie on either side of range 6.50–8.50. With a pH of 7, pure water is considered to be neutral. Acidic water is that which has a pH below 7.0, and basic or alkaline water is that which has a pH over 7.0 [20].

DO MEASUREMENT

Determining the amount of dissolved oxygen in a river is crucial since aquatic life there depends on it and needs at least 4ppm of DO to survive [8, 18, 21]. DO tests are carried out to confirm this. The Digital Dissolve Oxygen Meter is used to measure the DO test at the location of the sample collection. When measuring DO on-site, the results are correct, but if DO is measured later, the results will alter due to changes in the atmosphere and temperature [10, 14].

BOD MEASUREMENT

The BOD is a measurement of how much total

the biodegradation of organic materials, such as sewage or food particles. Rural ponds may have an excessive amount of phosphate, cow waste, and domestic sewage from non-point sources, which all contribute to a high organic load and a higher BOD level [22].

COD MEASUREMENT

Chemical oxygen demand, which is typically combined with biological oxygen demand, is a measure of the amount of organics in water (BOD). The COD is a measurement of the amount of organic matter in a sample that can be oxidized by a potent chemical oxidant. [23–26]. The COD is frequently employed as a gauge of the organic and inorganic materials' susceptibility to oxidation in water bodies, industrial plant effluents and sewage discharges [27]. As a result, the COD is an accurate indicator for determining the degree of water pollution (Fig. 3). As organic and inorganic matter concentrations rise, so does the COD of water [28–29]. According to Garg [30], the COD concentration in Ramsagar reservoir ranged from 3.600 to 17.400 mg/l.

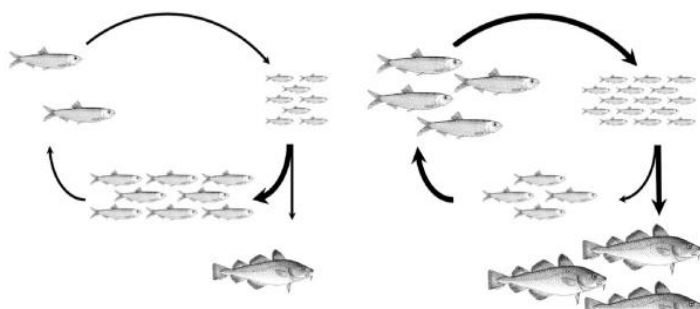


Fig. 3

Distribution of the stage of population of sprat in the two possible community conditions that give birth to the COD Allee effect. Right: Staffing of big size classes of sprat is strong with the presence of COD and high predation, especially on minor sprat, as a result of decreased intra-specific competition. Left: In absence of COD and low predation, individuals amass in the trivial-adult stage (stunted population). As a result, the remaining sprats grow quickly and produce a lot of progenies (arrows), which (mainly young) cod can eat. Even though cod target all sprat size classes, only the flow of biomass illustrating predation on young sprat is depicted because this interaction is what ultimately results in the other community states [31]

CARBON-DI-OXIDE MEASUREMENT

Unrestricted carbon dioxide, an exceedingly soluble gas in water generated by animal respiration, serves as nature's primary source of carbon. It can exist in water as dissolved or bound bicarbonate or carbonates in coral reef habitats, the earth's crust, and limestone. The pH of any system, especially those with inadequate buffering, is reduced when carbon dioxide is dissolved in water. This pH decrease can be harmful to aquatic life [32].

ALKALINITY MEASUREMENT

Alkalinity, a measurement of the inclusive concentration of bases in pond water that includes dissolved calcium, magnesium, and other compounds as well as, bicarbonates, hydroxides, borates, phosphates, and carbonates, is the volume of water to engross variations in pH. Alkalinity is primarily increased by lime leaching from cement ponds or calcareous rocks, photosynthesis, sulfate reduction, and denitrification and it is primarily decreased or consumed by sulfide, respiration, and nitrification [33], as well as to a lesser extent by evaporation and decomposing organic matter. However, in case of insufficient alkalinity, even minor bit of acid might source a large pH change.

NITRITE-N (NO₂-N) MEASUREMENT

An intermediate in the transformation of NH₄⁺ or NH₃ into NO₃, nitrite, that is a by-product of oxidized NH₃ or NH₄⁺. Nitrification, which is carried out by the system's naturally occurring highly chemotrophic bacteria, aerobic, gram-negative, completes this process. Due to the rapid nature of the dialogue, large nitrite amounts are not frequently seen.

The "brown blood illness" is a condition where high amounts of the substance do, however, result in hypoxia brought on by the hemoglobin in fish blood becoming inactive [34]. Boyd [35] asserts that less than 0.3 mg/l of nitrite is the ideal level for aquaculture. The concentration of nitrite at cage stations was greater than the standard permitted value due to the influence from fish waste and more feed, according to research [36–42] that found the concentration of nitrite-N lied in the range of 0.001–0.28 mg/l in cage culture systems. It has been discovered that a higher less dissolved oxygen, more ammonia and pH can make it more poisonous.

NITRATE-N (NO₃-N) DETERMINATION

Nitrate is created via the process of nitrification, which is the oxidation of NO₂ to NO₃ by aerobic bacteria. Denitrification of nitrate that aquatic plants cannot directly absorb occurs in anaerobic sediments [43]. According to Boyd [35], the ideal nitrate content for aquaculture is between 0.2 to 10 mg/l. Sewage and other pollutants high in nitrates can also contaminate surface water. Drinking water with higher nitrate content is harmful [44]. The Environmental Protection Agency (EPA) has determined that 10.00 mg/l of nitrate is the maximum contamination level (MCL) for water to be used for drinking purpose [45]. The concentration of nitrate in receiving waters is significantly impacted by runoff from farming operations and waste disposal sites. The usage of fertilizers on farms may have contributed to receiving streams' elevated nitrate levels through leaching and surface runoff during heavy rains. [29].

AMMONIA (NH₃) DETERMINATION

Ammonia is a consequence of the protein metabolism

that fish harvest, as well as the breakdown of bacterial of biological waste like dead planktons, food scraps and manure. Both ionized or unionized and ammonia are referred to as "total ammonia," yet only the unionized form (NH₃) is extremely toxic [31].

TSS MEASUREMENT

Total suspended solids, also known as non-filterable solids, are those solids that are retained by a filter with 1-micron holes. By running a known volume of sewage sample through a glass fiber filter equipment and weighing the dry residue that remains, their amount may be calculated [46].

TOTAL DISSOLVED SOLIDS (TDS) MEASUREMENT

Total dissolved solids, also known as filterable solids, are those solids that are not retained by a filter with 1-micron holes. By running a known amount of sewage sample through a glass fibre filter equipment and weighing the dry residue that remains after boiling the filtrate sewage, their quantity may be calculated.

MEASUREMENT OF TURBIDITY

As soon as you can after the sample is taken, determine the turbidity. Before examination, gently stir all samples to achieve a representative measurement. If sample preservation is not possible, start the analysis right away. If storage is necessary, refrigerate or cool to 4°C to reduce the amount of microbial degradation of solids. For the best outcomes, test the turbidity right away without changing the pH or temperature of the original sample. A digital turbidity meter is used to measure turbidity. This was calibrated using a standard NTU [46].

HEAVY METALS MEASUREMENT

Each sample of acid-digested water weighed 100 cm³ and was placed in a beaker. The beaker was then placed in a 70°C oven to condense the water to 50 cm³. Using an atomic absorption spectrometer, the concentrations of Co, Cu, Cr, Cd, Zn, Pb and Ni in each sample of water were measured (AAS: AAS: LABINDIA: AA-7000) Prior to analysis, AAS required phase of acid digestion, which was accomplished by exposing the samples to concentrated HNO₃ [29]. Samples are digested using the methods endorsed by the American Public Health Association (APHA). The suggestions in the instruction manual were used to determine the instrument settings (IO).

INDEX OF WATER QUALITY (WQI) MEASUREMENT

The WQI is premeditated in three steps. Each criterion

intended for consumption. Nitrate has been given a maximum weight of 5 due to its significant role in determining the water quality [48]. The relative weight is computed using Eq. 1 in the second step.

$$(1) \quad W_i = \frac{w_i}{\sum_{i=1}^n w_i}$$

Where n is the number of parameters, relative weight is denoted by W_i and w_i represents the weight of each parameter. The parameter's calculated W_i values are provided in Table 1.

In the third stage, by dividing each parameter's concentration in each water sample by the relevant standard, according to the BIS specifications, and multiplying the result by 100, a quality rating scale (q_i) is obtained for each parameter (Eq.2)

$$(2) \quad q_i = \left(\frac{C_i - C_{io}}{S_i - C_{io}} \right) \times 100$$

Where S_i is the BIS-recommended standard for Indian drinking water in mg/l for each chemical parameter and C_i is the concentration of each chemical parameter in every single water sample in mg/l. The parameter's optimal value in clear water is C_{io} . With pH, q_i is equal to $(C_i - 7)/(S_i - 7)100$ and C_{io} is equal to 7. For the remaining parameters, the optimal value is 0.

Table 1. Chemical parameters and their relative

Chemical indicators	Weight	Indian Standard	Relative Weight (W)
Magnesium	2.00	30.00	0.091
Total hardness	2.00	300.00	0.091
Calcium	2.00	75.00	0.091
TDS	4.00	500.00	0.182
Chloride	3.00	250.00	0.136
pH	4.00	6.50 – 8.50	0.182
Nitrate	5.00	45.00	0.227

Each parameter's sub index (SI_i), which is utilized to calculate the WQI in accordance with Equations 3 and 4, is first determined in order to calculate the WQI.

$$(3) \quad SI_i = W_i \times q_i$$

$$(4) \quad WQI = \sum_{i=1}^n SI_i$$

The i^{th} parameter's subindex is SI_i . The estimated WQI values are classified into five categories in Table 2.

Table 2. Classification of water quality based on WQI value [49]

Water Quality Index	Water Quality Index
>300.00	Unsuitable
200.00–300.00	Very Poor
100.00–200.00	Poor
50.00–100.00	Good
<50.00	Excellent

The five categories range from "good water" to "unfit for drinking water", according to the computed WQI values (Table 2). The WQI has an inter-seasonal range of 28 to 267, with 24% of water-bodies rated outstanding in the pre- and post-monsoon seasons and 18% rated excellent during the monsoon season. Approximately 62%, 58% and 60% of water bodies are in good quality during the monsoon, pre-monsoon and post-monsoon seasons, respectively in pre-monsoon, monsoon and post-monsoon seasons, respectively. 14%, 16% and 12% of water bodies were found to be poor water bodies in the respective seasons. The remaining 6%, 2% and 4% of water bodies were very poor water bodies in aforesaid seasons. 16% and 48% of water bodies are in excellent and good water bodies throughout the monsoon and post-monsoon seasons. Limits for the physicochemical properties of lake water in India are shown in Table 3.

Table 3. Physical and chemical features of Indian lake water [50]

Sr.	Parameter	BIS Specification
1	PH	6.50–8.50
2	Color	5 Hazena max
3	Appearance	Clear
4	Turbidity	5 NTU max
5	Alkalinity	200 mg/L max
6	EC	Lacking mention
7	Chloride	250 mg/L max
8	Fluoride	1 mg/L max
9	Sulfate	200 mg/L max
10	Phosphate	Lacking mention
11	Ca H	75 mg/L Max
12	T H	300 mg/L Max

13	TDS	500 mg/L Max
14	Mg H	30 mg/L
15	FRC	0.25 mg/L
16	Silica	Lacking mention
17	COD	Lacking mention
18	Hydrazine	Lacking mention
19	DO	Lacking mention
20	BOD	Lacking mention
21	NO ₃	50 g/L
22	So ₃	Lacking mention

PHYSICOCHEMICAL REVIEW OF SOME WATER SAMPLES FROM INDIA

The study of physical-chemical parameters is crucial to obtaining a precise understanding of the water quality, and it allows us to compare the results of various chemical and physical parameter values with reference values (Table 3). Here is a brief summary of some previous research studies. Pulp and paper sector effluents are one of India's most polluting industries, according to Tripathi [51]. Small and large pulp and paper mills use several procedures that produce effluents with drastically varying physical-chemical characteristics due to their disparate production capacities and raw material sources. To diminish the impact of various pollutants on the environment, before being released into the drainage channel, such contaminated effluents must undergo sufficient treatment. Based on the findings presented here, it can be stated that the effluent emitted from both paper industries is extremely contaminated and exceeds the limits set by Indian regulatory agency norms. Furthermore, it is claimed that the pollutants produced at various stages of the paper manufacturing process can be reduced either by replacement of some current bleaching and pulping techniques with ECF (Elemental Chlorine Free bleaching), bio-pulping, TCF (Total Chlorine Free bleaching), bio-bleaching, and ozone bleaching, or by treating the effluent with physical, biological or chemical methods. This monitoring research of pulp and paper mill effluent collected from wood-based and agro-based sources resulted in the creation of a data bank that may be used to successfully anticipate their toxicity and implement appropriate management. Agarwal's [52] research shows that the water in the Bihar River can perform as a good habitat, provides educational data, and aids in understanding water features. The pH value suggests that the alkaline water in May have resulted from the high temperature, which suggests that CO₂ is soluble in the water. The Bihar River's Baba Ghat's water quality metrics, including alkalinity, total hardness, chloride ion, pH, BOD, COD are all well within the acceptable range, according to the analysis.

Consequently, appropriate methods should be developed. According to research by Vyas [53], the majority of fresh water bodies world-wide are becoming contaminated by human waste, industrial waste, sewage, agricultural waste, and religious practices like idol immersion. The Central Pollution Control Board [54] has created a thorough set of regulations regarding the act of immersing idols in oceans, lakes and rivers (Guidelines for Idol Immersion, CPCB, 2006). These regulations outline and define the function of state pollution control boards in evaluating the water quality of aquatic bodies and categorizing them according to specific physiochemical parameters. If these recommendations are followed and put into practices, the quality of the river's water after idol immersion could significantly improve. Tamot [55] asserts that the most crucial metric for determining the water quality is DO, which was discovered to be Nil at seven places despite being necessary for all aquatic creatures' metabolism.

Ganai and Parveen [56] came to the conclusion that water temperature and water chemistry are the primary influences on phytoplankton dispersal, chloride, transparency, dissolved oxygen, alkalinity, TDS and CO₂. Hardness and Conductivity, on the other hand, have less of an impact on the distribution of phytoplankton groups. Rani Lake water displays low high COD, BOD, DO, hardness, turbidity, alkalinity, chloride, TDS, nitrate and phosphate during 2008 and 2009, according to Mishra [57]. These parameters' values were discovered to be over the allowable limit (IS: 10500). A higher pH number implies that the water is slightly alkaline. The results unambiguously show that sewage discharge and other anthropogenic activities have caused this lake to become contaminated and entropic in character. The amount of oxygen utilized during aerobic processes of organic material degradation brought on by microorganisms is measured by biological oxygen demand. Therefore, the BOD provides details on the proportion of an organic substance in a sample of

converted biologically. As a result, it is necessary to take into account how susceptible certain materials are to oxygen oxidation. The pre-during, and post-immersion activities yielded the ranges of 1.4–35, 4–55, and 3.3–38 mg/L. At Site-7, the immersion period produced the highest BOD value (Majnu Ka Tila). Analysis was also done on the COD, which is frequently used to estimate indirectly how many organic chemicals are present in water. COD is a helpful indicator of water quality because the majority of its applications estimate the volume of organic contaminants present in wastewater or surface water (such as lakes and rivers). As indicated by a number of researchers [58–61], the value of COD in conjugation with BOD is beneficial in determining the hazardous circumstances and existence of physiologically resistant organic compounds.

CONCLUSION AND RECOMMENDATIONS

The water quality of rivers and lakes has declined as a result of all the aforementioned effects. It provides a hint for municipal authorities to create effective management plans. The main factors influencing temperature variation are atmospheric temperature and weather. The industrial effluents that were released may have contributed to the pH decrease in Indian water bodies. This outcome is consistent with prior scientists' reports. The decrease in water volume due to rapid evaporation at high temperatures, high loadings of organic compounds, chlorides, detergent and other pollutants are all responsible for the increase in hardness. Low levels of DO as a result of wastewater discharge from enterprises that were discharging some biological wastes that demanded a lot of oxygen. An important factor that is frequently used to estimate the pollutant load of waste water is biological oxygen demand. The purpose of the BOD test is to quantify the quantity of carbonaceous matter that is biochemically oxidized. Values of BOD were caused by a faster rate of organic matter decomposition with turbidity, at a higher temperature and slower water current. A test called chemical oxygen demand is used to gauge how polluting household and industrial waste. This provides important information regarding the possibility for pollution from home sewage and industrial effluents. Many aquatic zones in India have high COD value, which shows that industrial effluents released by industrial units are mostly to blame for the pollution there. Therefore, it is crucial to check the water's purity using the several criteria listed above before utilizing it.

About the Author



Mr. Abhijeet Das works as a Research Scholar in the Department of Civil Engineering at C.V. Raman Global University (CGU), Bhubaneswar, Odisha, India. He has teaching experience of about 8 years and Research experience too, and his area of specialization is Water Resource Engineering.

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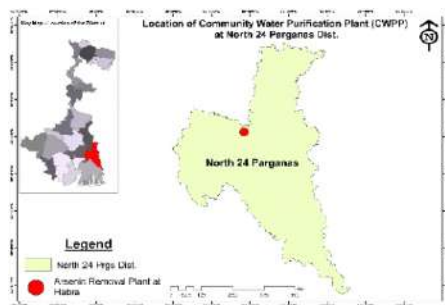
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PROVIDING ARSENIC FREE WATER FOR LAST 20 YEARS AT THE COMMUNITY LEVEL

Dr. Debasri Mukherjee; Er. Sohini Tarafdar; Dr. M.N. Roy; Soumyadeep Das; Er. Srikanta Sau

BACKGROUND:

Arsenic contamination in ground water and related health hazards are serious concerns throughout the world. As per Central Ground Water Board report several large aquifers, in various parts of the world, have been identified with problems of high arsenic concentration in ground water. Arsenic contamination in ground water of West Bengal in the range of 0.001–3.20 mg/l, occurs in isolated patches, spreading over 79 blocks in the eight districts of the state. The districts of Murshidabad, Nadia, North 24 Parganas, and South 24–Parganas are located to the east of river Bhagirathi/ Hooghly and Haora, Hooghly, and Bardhaman to the west of the same river, and Malda to the north of river Ganga. The eastern part of Bhagirathi/ Hooghly River is much more affected than the rest. The people staying in such areas are in the risk zone of getting affected by arsenic poisoning in the event of a greater number of ground water structures are tested to yield high arsenic water in due course of time.



The most common health effects include skin lesions, skin, lung, bladder, and kidney cancers, cardiovascular diseases, and neurological disorders. The government of West Bengal, Public Health Engineering Department has taken several measures to address the arsenic contamination problem. These initiatives include the installation of Community Water Treatment Plants (CWTP), drilling of deep tube wells, public awareness campaigns, and medical interventions for affected individuals. In West Bengal, the need for a CWTP for supplying safe water after removing arsenic arises due to the widespread contamination of groundwater sources with high levels of arsenic. It is often more efficient and cost-effective to treat water in larger quantities, reducing per-unit costs of purification. This approach helps in providing affordable access to safe drinking water for communities that may not have the means to install and maintain individual treatment systems.

PROBLEM STATEMENT:

In the year 1990, Dr. Sadhan Sen, a local doctor, diagnosed some patients as suffering from Arsenicosis. Those patients were then sent to the School of Tropical Medicine and SSKM Hospital Kolkata for treatment. In due time Prof. Dipankar Chakravorty of Jadavpur University visited the area with a foreign team and assessed arsenicosis among 30 individuals, and thereafter, in the assessed report, 30 out of 30 individuals were found suffering from the disease. After these events, water quality was assessed and arsenic contamination was found beyond the safe limit. At that time Prof. Anirban Gupta from Indian Institute of Engineering Science and Technology (IIST) West Bengal organized some awareness programs regarding arsenic contamination. He organized awareness generation camps on the effects of consumption of arsenic contaminated water for a long period. Subsequently, in 2002, IIST initiated a project for installing a CWTP for addressing the problem with financial support from 'Water for People' and the plant was installed in 2004. The plant is situated in Ward No. 3 of Ashoknagar–Kalyangarh Municipality under Habra I block of North 24 Parganas district in West Bengal.

ENSURE SAFE DRINKING WATER AT THE COMMUNITY LEVEL:

The water purification plant is managed by a 15-members committee. The committee was formed in 2004 with members of the Ward. There are four

women on the committee. The councilor is also a member of this committee. Gradually, as the project rolled out at the community level, NGO 'SATHEE' (Shibpur Association for Technological, Humanitarian and Environmental Endeavors) hold the hand with the people supported the project in collaboration with IEST. Importantly, SAATHI is responsible for all kind of operation and maintenance (O&M) whenever the community requires.



TECHNOLOGY USED FOR ARSENIC REMOVAL:

The technology adopted for the removal of arsenic from water is adsorption, where a reagent, activated alumina is used as it has a very good adsorptive surface and is effective for arsenic removal. When water passes through a packed column of activated alumina, the impurities, including arsenic, present in the water are adsorbed on the surfaces of the activated alumina grains. It is an effective method that offers several advantages over other methods. It is a simple removal system that can be developed at community levels, also it requires no addition of chemicals. The lifespan of activated alumina media is long, often several years, depending on the specific conditions and arsenic concentrations in the water, resulting in cost savings. Activated alumina also remove fluoride, sulphate, and chromate.

OPERATION OF THE PLANT:

Every two months, the alumina grains are taken out of the cylindrical column, washed, and refilled. Activated alumina is completely replaced at 1.5–2–years intervals after reviewing the test results. The replacement costs around Rs 50,000–60,000, which is a major maintenance expenditure. Aeration of raw

water in the overhead tank is also done to oxidize the iron present in the raw water, which gets deposited at the bottom of the tank. Tanks are cleaned in an interval of two months. Backwashing is carried out daily, and the backwashed water reaches the underground through a filter medium.

THE BRIGHT SIDE OF THIS PILOTING: SYSTEMATIC SERVICE DELIVERY:

There are nearly 400 families that are dependent on the water from the plant. Each family has a membership card, and the cardholder is entitled to receive 20 litres of arsenic free drinking water per day. Daily capacity of the plant is 8,000 liter and the current production is around 6,000 liter per day, although it varies with the seasons.

MAINTENANCE OF THE PLANT:

The committee is responsible for operation and maintenance (O&M). There is one pump operator engaged at the plant. They are very active in delivering service to consumers. The committee members got proper training on running the purification plant efficiently while managing the operation and maintenance of the plant. Initially, a manual was provided to the committee by IEST, and practical training, i.e., "hands-on instructions." Water is tested regularly to check the level of arsenic. The committee members have attended many training sessions conducted by IEST Shibpur and different NGOs. In last year (2022), they have attended a total of four training programs, which were conducted by Barasat Municipality and IEST, Shibpur. They systematically maintain all the records of meeting resolutions, balance sheets, including procurement and service costs, membership card distribution, and such other things.

LESSONS LEARNT:

The causes behind success of the programmes were analysed and the following factors were found to have helped to sustain the functioning of the CWTP:

- Right technology selection and involvement of IEST, an institute of repute.
- Facilitation by the NGO "SAATHI" helped to develop the management system.
- Proper training of the committee members.
- People became aware of the threat from drinking arsenic contaminated water and were willing to purchase purified water at the rate they themselves decided.
- Community ownership in management of the plant was good.
- Transparency of maintaining accounts and sharing with the people facilitates community participation. Also, the rate is also affordable.
- Assistance of Water For People made it possible to develop the CWTP which proves that the NGOs can play important role in piloting new technology in future.

About the Author



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Dr. Debasri Mukherjee is a Senior Research Officer in SIGMA Foundation a 'Not for Profit Organization' based in Kolkata, India. Before this She was a Research Officer (WQMS) from the day of inception of the Water and Sanitation Support Organization (WSSO), Public Health Engineering Department, Govt. of West Bengal for eight years. Prior to that she was with UNICEF Kolkata office for one year.

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Dr. M.N. Roy did his M.Tech in electronics from Calcutta University and served the Government of India as a member of the Indian Engineering Services for around 2 years. Thereafter he joined the Indian Administrative Services in 1980. He studied Sustainable Development at the University of Birmingham in 1996. Thereafter, he did his Ph.D from the Tata Institute of Social Sciences, Mumbai and the research topic was Women's Empowerment. Subsequently he headed several departments of the Government of West Bengal including the Department of Panchayats and Rural Development and the Department of Health & Family Welfare and retired as Additional Chief Secretary of the Government of West Bengal.



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Soumyadeep Das did his MBA in Environment Management from IISWBM (University of Calcutta). Has a total experience of more than 4.5 years in the field of Environment like Solid Waste Management, Climate Resilience, Biodiversity Conservation, Environmental Law and Policy, Water and Sanitation, and Project Planning and Management. He has been associated with various prestigious organizations like AmbiRisk Research and Management Consulting India Pvt. Ltd, Dhanbad Integrated MSW Ltd, Banka Biolo Ltd. and SIGMA Foundation. He has also experience in handling project under World Bank WBEDGMP.



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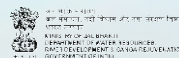
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CONNECTING AGRICULTURE WITH WASTEWATER MANAGEMENT; A REAL WATER CONSERVATION SLUDGE FREE EFFLUENT TREATMENT METHOD

Abdul Aala Khurram, Technical Director Water Care Services Pakistan

THE DRIVING FORCE BEHIND THE PROJECT

In the majority of the world's arid and semi-arid countries, including Pakistan, Iran, and India, water scarcity is thought to be one of the main barriers to sustainable agriculture. Water scarcity areas are facing challenges from increasing water demands, especially from the agricultural sector, and increased strain on fresh water resources in water-scarce areas. Therefore, using lower-quality or nonconventional water resources has been proposed as a way to meet agricultural water needs. Both benefits and drawbacks might be associated with the usage of wastewater in agriculture. However, its application in agriculture has the potential to seriously harm people. Nonetheless, wastewater can be beneficially reused if it is adequately treated, which can be achieved by converting wastewater into purified water that can be returned to the environment when it is no longer required or appropriate.

RATIONALE REVISITED

By using treated wastewater for agricultural purposes, WCSP had taken step forward to combat water scarcity. Due to the limited water supply and the steadily increasing demand, the team decided to preserve water by using safe technologies to treat waste water. A wastewater treatment method known as biological wastewater treatment effectively treats all types of wastewater by harnessing the power of nature. WCSP team planned to employ Facultative microbes technology, an effluent treatment plant based on biological treatment (awarded the US Green Patent A for Environmentally Innovative Technology) to reduce pollution load of drain wastewater.

This innovative technique can handle any type of organic waste from homes, industries, or municipalities. It may even be used successfully in natural waterways including bays, rivers and lakes.

- ✓ To fight scarcity and water ecosystem degradation, recycled water is reused
- ✓ To provide an eco-friendly solution for treatment that produces no sludge

- ✓ To promote a chemical free technology with no odor
- ✓ To promote a solution to treat wastewater which will ultimately use for agriculture and irrigation at their premises
- ✓ To enhance water reuse and improvement in agriculture and irrigation by treated wastewater
- ✓ To encourage solar energy use, by operating the plant on solar energy only

FROM CONCEPT TO PROJECT: BRIDGING THE GAP BETWEEN IDEA AND EXECUTION

There was a beverage unit, the effluent wastewater generated from the beverage facility exhibited elevated levels of biological oxygen demand (BOD), chemical oxygen demand (COD), total suspended particles (TSS), and additional nutrients, including Nitrogen & Phosphorus. A treatment unit with the capacity to handle 25 m³ of wastewater per hour is provided to them by the Water Care Service Pakistan (WCSP) team.

EQUIPMENT ARCHITECTURE

The treatment unit consist of 4 tanks Equalization tank, Anoxic Tank and 2 anaerobic tanks. The pH dosing is done in equalization tank then it passes through anoxic tank. After that the Facultative microbes technology is provided in aerobic tank I. The aero—lifts are provided in both aerobic tanks. The water when passes through these tanks has acceptable limits of COD and TDS for used in agriculture.

OPERATIONAL DESCRIPTION OF UNIT

Below is a brief explanation of the setup of the BioCleaner treatment plant that is currently in place at the site: A motor drives the pump that transfers drain waste to an equalization tank. Acid–base dosing is used in the equalization tank to keep the pH between 6.5 and 8. The partially treated wastewater is moved into an anoxic tank. The At this point, the aerobic tank returns 2% to the anoxic tank, allowing microbial activity to occur as well. Anaerobic treatment removes of the incoming of the Total Suspended Solids (TSS), 30–40% Biochemical Oxygen Demand (BOD₅), and 30–50% of the Chemical Oxygen Demand (COD). An aerobic tank receives the effluent from the anoxic tank. Where, microorganisms are thoroughly mixed with the organics in the wastewater so that they grow by using the organics as food in the presence of oxygen.

To keep them from getting polluted, the bacteria are kept in porous ceramic pellets. These pellets are then kept in a tube known as a "bio–tube." Aeration is carried out with the help of blowers. Back pressure causes the grids to aerate and release tiny bubbles, which makes the surrounding water denser and the water inside it less dense. Due to this, the water moves to an area with lower density, which lifts the water and the microorganisms together and allows them to disperse over the surface water and clean it. The resulting supernatant will exit the aerobic zone and enter the second aerobic tank, where it will be released as treated wastewater.

ANTICIPATING OUTCOMES

The opportunity to select an effluent treatment method free of sludge is offered by Water Care Services. This approach uses the least amount of operating energy from solar system. The 20 m³ of water that is removed every hour for horticulture is no longer extracted; instead, treated water is utilized. Over the course of a year, 17,520 m³ of water are conserved at beverages unit and utilized for gardening. By switching to solar energy from other electrical sources, we are able to avoid consuming 20.24 tones of carbon credits. 38500 kg of oxygen are produced by the grass at site that is irrigated with treated water.

An annual production of 42,705 kg of oxygen is recorded by 30 mature trees that are irrigated with purified water. A fully grown tree has the capacity to absorb 21 kg of CO₂. 7,665 kg of carbon dioxide was absorbed by 30 trees.

Green Solar energy, replenish able source is used to run a plant, so zero fossil fuel zero carbon. BOD and COD of waste water was reduced to 6mg/L and 26mg/L respectively. The fresher water is saved and conserved, the more it will be available for next generation.

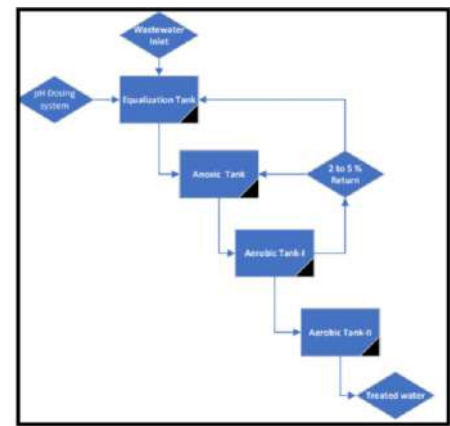


Figure. Process flow diagram

Parameter	Units	Influent Results	Acceptable Limits	Effluent Results
pH	-	10.4	06–09	7.26
TSS	mg/L	80	200	10
BOD	mg/L	467	80	06
COD	mg/L	800	150	26

Table 1. Analysis results



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.

WATER MANAGEMENT DURING WINTER SEASON FOR CROP DIVERSIFICATION IN FALLOW CANAL COMMAND AREA

Mridusmita Debnath, Land and Water Management Division, ICAR–Research Complex for Eastern Region, Patna

Agriculture plays a crucial role in the economic development of India. Adopting various technical measures since past few decades, India has been able to harness, in the long way, its land and water resources to a greater extent for agricultural purposes and has become one of the world's largest exporters of food grains. However, growth of population as well as economic development in India has given rise to the demand for larger production of food crops thereby challenging food security. On the otherhand increasing urbanization and industrialization in developing India pose a great threat to land and fresh water available for agricultural productivity in near future. This result in raising the productivity per unit of land and water with by developing various technologies and techniques. Apart from this, during the dry season, the water is almost negligible or at very low level to carry out agricultural operations.

The case study evaluates the optimal crop area planning for irrigation inorder to stabilize agricultural productivity in the face of changing climate using linear programming method. The command area falls on the rainshadow region of central Brahmaputra valley. The command area covers two districts of Assam; Nagaon and Karbianglong.



Fig. 1 Picture depicting the fallow land of command area after rice harvest

The irrigation water to the command area is supplied by Jamuna river, which is a sub tributary to the Brahmaputra river. The command area undergoes rice–fallow cropping system. After kharif season due to lack of proper irrigation facilities farmers keep their fields fallow. Apart from this, lack of production of food crops to meet the per capita demand of the people of the command area is affecting food security to a major extent. Therefore, the planning of crop area is primarily based on food demand during the dry fallow period.

DATA REQUIREMENT

The daily nutritive requirement comprises mainly carbohydrates, protein and fats which is in the form of

cereals, pulses and oilseeds and per capita requirement are 420g, 82.66g and 32.67g respectively (Borthakur et al., 2016).

For the command area except rice, all other food crops have self sufficiency ratio less than 100%. The water requirement of crops was acquired from the crop coefficient values of the crops and the pan evaporation data. Crop coefficient (Kc) value for rice, wheat, lentil, mustard and maize are respectively 1.10, 0.61, 0.68, 0.592 and 0.86 (Water Management Division, 1971). The corresponding crop water requirement is ETp multiplied by Kc. Moreover, as the effective rainfall is insignificant, the crop water requirement is the irrigation water requirement. Irrigation efficiency was assumed to be 0.35 as

northeastern states have irrigation efficiency 30 to 35%. Net return of the farmers from various crops is obtained by deducting the cost of cultivation of these crops from the gross benefit received by selling the crops. Since the market price is not static and depends on the amount of production of crops in that year, minimum support price (MSP) for crops, provided by the government is considered as the gross benefit received. The cost of cultivation includes cost for fertilizer, seed, pesticides, labour, machine and other miscellaneous cost. The required fertilizer for the crops is shown in Table 2.2. MSP and cost of cultivation was collected from government office report. The minimum area allocated for various crops was based on the self sufficiency of the population of the command area. Since with the demographic growth and industrialization amount of land suitable for cultivation is a limited constraint, it is very much necessary to increase the productivity per unit of land. Water is also a major constraint as the available fresh water is decreasing day by day. Linear programming (LP) technique is used for area allocation for finding the optimal cropping pattern during rabi season as per the available natural resources in the command area. The programming consists of two parts (1) objective function for maximizing net benefit for the farmers (2) Linear constraints.

1. Objective function: The LP model aims to maximise the net benefit of the farmers by determining the optimal cropping pattern for rabi season thereby making command area self sufficient in food crops.

Maximize TNB=

Where,

TNB= Total net benefit

MSP_i= Minimum support price for ith crop

$$\sum_{i=1}^n [MSP_i * Y_i - CC_i] X_i$$

X_i= land for ith crop

Y_i= Yield of ith crop

2. Constraints:

(a) Total available land: the sum of land allocated for different rabi crops must be less than or equal to the cultivable command area during the rabi season.

$$\sum_{i=1}^n X_i \leq TCA$$

Where TCA= Total Cultivable command area

(b) Area of each crop: minimum land area is to be kept for meeting the self sufficiency of cereals, pulses and oilseeds keeping in view the very less amount of available agricultural land.

$$X_i \geq A_{ss}$$

Where Ass= Area required for self sufficiency

(c) Total water available: water requirement of various crops should be less than or equal to the available water for irrigation from the river.

$$\sum_{i=1}^n IR_i X_i \leq TWA_{irr}$$

Where IR_i= Irrigation requirement for ith crop

TWA_{irr}= Total water available for irrigation

RESULTS OF LP MODEL

The linear programming model for determining the optimal cropping pattern during the rabi season was solved by using Microsoft Excel Solver. It was found that the allocated areas for the crops were not obtained and the solution was found to be infeasible for the rabi crops. However, the existing yield of other rabi crops except rice, was not enough for meeting per capita demand even after complete removal of rice cultivation in rabi season. As the command area covers mostly the Nagaon district, the yield of various crops are shown in Table 1.

Crops	Average yield of India (kg/ha)	Yield of Nagaon district (kg/ha)
Summer rice	2367.46	2605.57
Lentil	814.66	432.86
Mustard	1251.41	624.57
Maize	2667.13	1509
Wheat	2495.38	1030.14

Table 1: Yield statistics of Nagaon district and India (Directorate of Economics and Statistics, Department of Agriculture & Cooperation, Government of India)

To test the capability of the model, sensitivity analysis was performed. Various alternative yield were suggested on the basis of yield of other crop producing states. Since rice has already achieved self sufficiency, another method of solving the optimization problem was by removing the rice and also increasing the yield of other rabi crops by 50%, 75% and 100% than the existing production. The allocated area for the rabi crops is presented graphically in Fig. 2. The total net benefit achieved due to increase in yield is as shown in Table 2.

Land area of all other crops except mustard decreases with increase in yield as shown in Fig. 2 and also the allocated land is equal to the amount of land as required for self-sufficiency of the region. For mustard, the allocated area increases with increase in yield as the crop water requirement is less for mustard crop. Table 2 shows the utilized amount of land and water resources.

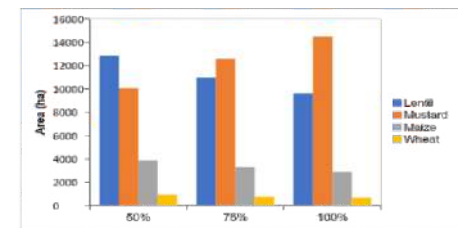


Fig. 2: Allocated area for the rabi crops

Yield increase	Total Net Benefit (Million Rs)
50%	583
75%	778.2
100%	967

Table 2 Increase in yield and corresponding net benefit

REQUIREMENT

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CONCLUSION

Based on the analysis of the results obtained, following conclusions can be drawn for the study area:

1. Rice cultivation is completely removed as the land suitable for cultivation is in limited amount.
2. Also, there should be increase in productivity of rabi crops per unit of land which can be achieved by encouraging farmers to adopt improved technologies in farming practices as well as providing proper financial assistance.
3. Profit can be maximized only after increasing yield per unit area than the existing area.

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- Studies on irrigation water pricing and influencing factors.
- Indian Institute of Technology Guwahati ...
- Supervisor: Prof. Arup K. Sarma, Co-Supervisor: Prof. Chandan Mahanta
- Title of Ph D Dissertation: Optimal Crop Planning in A Canal Command Area with Due Emphasis on Nutrient Balance and Climate Change.
- Indian Institute of Technology Kharagpur (2012-2014)
- Supervisor: Prof. Ashok Mishra
- Title of M. Tech. Dissertation: Impacts of Climate Change and Demographic growth on Water Resources in the Kesinga Sub catchment of Mahanadi

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TURNING THE TIDE: NAVIGATING TOWARDS A SUSTAINABLE WATER FUTURE THROUGH RECYCLING

By Simran Arora, Editorial Incharge, Earth Water Foundation



Water is the “Elixir of Life” and it is indispensable for the sustenance of ecosystems. However, the availability of water is becoming precarious due to climate change, population growth and unsustainable consumption patterns. In this context, water recycling emerges as a crucial solution to alleviate pressure from freshwater resources and ensure sustainable management of water.

UNDERSTANDING WATER RECYCLING

Water Recycling is typically the process of treating wastewater to remove impurities, making it suitable for various non-potable purposes.

The Process of Water Recycling

1. **Collection and Preliminary Treatment:** collection of wastewater from and removing solid particles through sedimentation.
2. **Primary Treatment:** suspended solid organic matter is further removed by the process of sedimentation and flotation.
3. **Secondary Treatment:** the biological processes of activated sludge, trickling filters and biological ponds.
4. **Tertiary Treatment and Distribution:** advanced treatment processes like filtration, disinfection and oxidation further distributed for beneficial uses after quality checks.

Water Recycling can be Grouped as:

1. **Non-Potable Water Recycling:** The Greywater Recycling, where the source of wastewater is from domestic activities. Along with Industrial Water Recycling which involves treating wastewater generated by industries.
2. **Potable Water Recycling:** Direct Potable Reuse (DPR) where water is treated to a level suitable for direct drinking purposes. Indirect Potable Reuse (IPR) is where treated wastewater is treated to a high standard and discharged in environmental buffers like aquifers, rivers etc.
3. **Agricultural Water Recycling:** Wastewater generated from agricultural activities is treated to remove impurities and reusing it for irrigation purposes.
4. **Stormwater Recycling:** This involves capturing surface runoff and recycling it to make it suitable for non-potable reuse for toilet flushes, groundwater recharge etc.

Technologies Used in Water Recycling

The technologies used in water recycling with their successful examples of implementation are as follows:

- **Advanced Oxidation Processes (AOPs):** It includes ozonation and UV/H₂O₂ treatment, which are effective in degrading organic

pollutants. Example: The Orange County Groundwater Replenishment System (GWRS) in California.

- **Membrane Filtration:** Membrane filtration technologies, such as reverse osmosis (RO) and ultrafiltration (UF), are widely used in water recycling. Example: Singapore's NEWater program involves RO.
- **Electrocoagulation:** Electrocoagulation involves the use of electric current to destabilise and remove suspended solids and pathogens from water. Example: textile dyeing industry of India.
- **Natural Treatment Systems:** Utilises natural processes like biofiltration to treat wastewater and enhance water quality. Example: The Riverbank Filtration Project in Germany utilises SAT

POLICIES AND ACTS FORMULATED BY THE GOVERNMENT

The following acts and policies reflect the national government's commitment to water recycling to foster sustainable water management.

- **Jal Jeevan Mission (JJM):** This was launched in 2019, with an aim to supply piped water to rural households by 2024. This mission aims to

encouraging water recycle and reuse of wastewater at the community level.

- **Atal Bhujal Yojana (ABHY):** This was launched in 2018 with an aim to address the reducing groundwater levels across the length and breadth of the Indian subcontinent. The scheme promotes the adoption of water conservation measures, including rainwater harvesting, groundwater recharge, and the recycling of treated wastewater for agricultural and other non-potable uses.
- **National Mission for Clean Ganga (NMCG):** This was launched in 2014 to rejuvenate and recharge River Ganga and its allied tributaries through various initiatives. It included recycling, water treatment. Efforts are being taken to establish robust sewage treatment plants (STP's) along the basins of Ganga and promote the use and reuse of treated wastewater for irrigation and other non-potable purposes.
- **National Water Policy:** The National Water Policy presses on the need to use water efficiently along with water conservation and management. It specially emphasises on water recycling and reuse. It encourages the adoption of decentralised wastewater treatment systems and recycling treated wastewater for non-potable purposes such as irrigation, industrial and groundwater recharge.
- **National River Conservation Plan:** The NRCP, initiated in 1995 aimed to clean up and rejuvenate polluted rivers across the country. Alongside pollution control measures, the plan also emphasised the importance of recycling wastewater before discharging it into rivers.
- **National Water Mission:** Launched as part of the National Action Plan on Climate Change in 2008, the National Water Mission aimed to improve water use efficiency, promote water recycling, and increase the water supply through conservation measures
- **Central Ground Water Authority (CGWA) Regulations:** It introduced regulations to control and regulate groundwater extraction to prevent depletion. These regulations encouraged industries and commercial establishments to adopt water recycling and reuse technologies to

Other acts that promote water recycling in numerous countries and foster concerted efforts to conserve water resources are the Water Pollution Control Act (Clean Water Act in the U.S.) and Water Framework Directive (WFD) in the European Union.

SUCCESSFUL WATER RECYCLING PROJECTS

The two case—studies enumerated below are successful examples of water recycling projects carried out in the world fostering best practices which can be adopted by other countries.

Singapore's NEWater Program

Singapore's NEWater program is a successful example of water recycling on a large scale. This was implemented in response to Singapore's problem of acute scarcity of water for a growing population. This program treats wastewater by advanced purification processes such as microfiltration, reverse osmosis and ultraviolet disinfection to achieve safe drinking standards.

NEWater is then used for various non—potable applications including industrial processes and for indirect potable use by discharging treated water into reservoirs. Since its inception in 2002, it has significantly enhanced Singapore's water security making it less dependent on imported water.

Orange County Water District's Groundwater Replenishment System (GWRS), USA

This pioneering water recycling project in California has transformed wastewater into a valuable resource for recharging groundwater. The GWRS treats municipal wastewater using advanced purification technologies including microfiltration, reverse osmosis and oxidation to produce purified water of near—distilled quality.

The purified water is then injected into groundwater basins where it further undergoes filtration to make it suitable for potable use. The GWRS has reduced the dependence of Orange County on water supplies and has increased water reliability with its capacity to produce 100 million gallons of recycled water per day.

CHALLENGES AND SOLUTIONS WITH A FUTURE OUTLOOK

The common challenges of water recycling are enumerated below:

1. **Technological and Infrastructure Constraints:** Development of advanced and robust infrastructure entails burden on resource—deficit regions.
2. **Public Perception and Acceptance:** prevailing negative perceptions owing to the safety and cleanliness of recycled water hinders acceptance.
3. **Regulatory Frameworks and Standards:** inadequate regulatory frameworks and standards of water quality and reuse practices pose challenges.

Innovative Solutions

1. **Decentralised and Modular Systems:** this allows onsite treatment units and community—scale facilities that offer flexibility especially in water stressed areas where infrastructure is poor.
2. **Water—Energy Nexus Optimization:** integration of renewable energy resources with water recycling facilities for a sustainable outlook.
3. **Advanced Treatment Technologies:** continuous research and development in advanced treatment technologies like membrane filtration, electrocoagulation, nanotechnology.

A Way Forward

Water recycling is critical for combating water scarcity, pollution, and maintaining sustainable water management. To ensure a water—secure future, both governments and the public must prioritise water recycling projects, invest in cutting—edge technology, and raise awareness. It's time to work together to protect this valuable resource for current and future generations.

REVIEWS ON UNION BUDGET 2024



Dr Mayur J. Kapadia
Trainer, Writer, Editor & Former
AGM, Quality Control Dept,
GNFC Ltd, Bharuch, Gujarat

The Finance Minister Nirmala Sitharaman, while presenting an interim budget or a “vote-of-account” in a record creating shortest speech of 58 minutes, abstained from any populist measures, but offered a vision for ‘Viksit Bharat 2047’ through fiscal prudence, discipline and reduced fiscal deficit. ‘Vote-of-account’ is generally believed to be a non-eventful one, but several specific measures of budget 2024 make it an eventful budget.

1. **Fiscal consolidation** : FM revised the fiscal deficit down to 5.8 % of GDP from previous target of 5.9 % of GDP. The target for FY25 and FY26 have been set at 5.1 and 4.5 % of GDP.
2. **Capex** : Increase in capital expenditure outlay by 11.1% to Rs 11.11 lakh crore, equivalent to 3.4% of GDP, will help boost increased investment to stimulate private capital expenditure. This surge will not only drive economic growth but also create increased employment opportunities.
3. **EV push** : The expansion and strengthening of e-vehicle ecosystem clubbed with greater adoption of e-buses for public transport networks will increase opportunities for small vendors for manufacturing, installation and maintenance of EV charging networks.
4. **Rail** : The conversion of 40,000 more rail bogies into Vande Bharat coaches will further create job opportunities while reducing travel time as well as increasing tourism across the country.
5. **Solar ambition** : Through rooftop solarization, 1 crore households will be enabled to obtain up to 300 units free electricity every month, which will help households to save monthly up to Rs 15,000–18,000.
6. **Nari Shakti** : 30 crore Mudra Yojana loans for women entrepreneurs, allotment of >70% houses to rural women under PM Awas Yojana, Improved nutrition delivery, Early childhood care etc will ensure increased women contribution towards enhanced economic activities.
7. **Tourism** : Encouraged to states to develop iconic tourist centres, provision of long-term interest free loans, projects for port connectivity, tourism infrastructure, and amenities will enhance tourism.

While promising government support for farmers, young, women and poor; the FM intends to continue on the path of fiscal consolidation with continued capital expenditure and other social welfare services. The slew of measures for targeted sectors implies that budget 2024 is not a non-eventful, but it will pave way towards turning the dream of Viksit Bharat into a reality by 2047.



**Ravichandran
Purushothaman**
President, Danfoss India

We commend the government's continued visionary approach towards green and sustainable economic growth as outlined in the interim Budget. The measures introduced for developing green energy capacity in the country – viability gap funding for offshore wind energy, boost for electrification and promotion of compressed biogas – demonstrate the nation's focus towards building a cleaner energy ecosystem. These initiatives will also stimulate innovation and growth within the renewable energy sector.

The budget's focus on agriculture and food processing, along with investments in efficient supply chains, align with Danfoss's commitment to sustainable solutions for Cold Chain sector. The emphasis on urbanization, especially Metro Rail and NaMo Bharat, creating more residential infrastructure powered by solar, etc. resonates with our ambition to contribute to India's green transition with our energy efficient technologies.

Furthermore, the emphasis on technology, research and innovation, including the establishment of a corpus for tech-driven advancements, will accelerate new 'India for India' solutions in the field of engineering and technology.

At Danfoss, we look forward to actively participating in these transformative initiatives, contributing our 9 decades plus expertise to drive sustainable development and innovation in India.



Anil Sethi
Chairman,
Pump Academy Private Limited

The Finance Minister's Budget 2024 presentation has laid the foundation for fostering India's growth trajectory, in an effort to solidifying India's growing credibility in the global economy. This Interim Budget for 2024 is focused on reforms and stimulating investments, aligning with the vision of a 'Viksit Bharat' by 2047, marking the 100th year of independence and aspiring to attain a \$30 trillion economy.

According to the International Monetary Fund (IMF), India is projected to secure the position of the third—largest economy by 2027. The IMF also estimates that India's contribution to global growth will increase by 200 basis points within the next five years. This underscores the growing global confidence in India's economic strength.

From uplifting the underprivileged to energizing the nation's infrastructure development, the Government has outlined its vision to drive India's progress towards a developed economy. This underscores the country's capacity to pursue a high—growth trajectory, with a significant capital expenditure of INR 11.1 trillion towards infrastructure development, reflecting a 50% increase from FY23. The planned outlay on infrastructure is set at 3.4% of GDP, which includes new railway corridors and improving air connectivity, internal waterways, urban metro and rail networks, renewable energy, water and sanitation infrastructure.

Key highlights of Interim Budget 2024

- Under the interim budget 2024-25, the Ministry of Jal Shakti (MoJS) has received an allocation of INR 984.18 billion. The allocation is 1.93 per cent higher than the revised estimate of INR 965.48 billion for 2023-24. Of the total allocation, an outlay of INR 699.26 billion has been made for the Jal Jeevan Mission/ National Rural Drinking Water Mission while INR 71.92 billion has been earmarked under the Swachh Bharat Mission (Gramin).
- Under the interim budget 2024-25, the Ministry of Housing and Urban Affairs has received an allocation of INR 775.23 billion. The allocation is 11.91 per cent higher than the revised estimate of INR 692.70 billion for 2023-24. Of the total allocation, the outlay for Swachh Bharat Mission (Urban) is INR 50 billion, around 96.08 per cent higher than the revised estimate of INR 25.50 billion for 2023-24.
- An allocation of INR 104 billion has been earmarked for the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) for infrastructure development to provide assured supply of water and sewerage connection, developing greenery in cities, and to reduce pollution by to public transport system.
- An allocation of INR 104 billion has been assigned for the Smart Cities Mission to promote cities that provide core infrastructure, clean and sustainable environment, and decent quality of life.
- Allocation to Interlinking of Rivers increased to INR 35 billion from INR 14 billion in 2023-24.
- Total budgetary allocation for Information Technology increased to INR 214 billion in as compared with INR 144 billion in 2023-23.
- Allocation for the establishment of new technology centres (TCs) with allocation of INR 4.5 billion as compared with INR 0.2 billion last year.

There has been a thrust to enhance productivity and develop technology, enhanced focus on women empowerment in the budget underscores India's commitment to inclusive and sustainable development with the theme of 'Sabka Sath, Sabka Vikas, and Sabka



Jitender Thirwani,
COO SmarterHomes

In recent years, India has shown a proactive stance in the fight against climate change. The government's commitment to addressing climate issues and promoting sustainability is evident in the initiatives outlined in the interim budget. The government's allocation of 70,163 crore for the Jal Jeevan Mission (JJM) in the budget 2024–25 is a great step towards ensuring clean water to millions of households.

This is a reflection of the government's recognition of the critical importance of water security in the country. This not only helps address the challenges posed by water scarcity but it also improves the quality of life of millions.



Subhash Sethi,
Chairman,
SPML Infra Limited

Infrastructure development is a fundamental driver of economic progress, forming the backbone of a nation's growth. Robust infrastructure facilitates increased productivity, efficiency, and connectivity, thereby fostering favourable environment for economy to thrive. By investing in and enhancing essential physical structures, such as road, rail, air and water transportation, energy, communication, sanitation, water facilities etc. can create an environment conducive to economic advancement. Improved infrastructure not only facilitates smoother business operations but also attracts investments, fosters innovation, and boosts overall GDP.

The Interim Budget 2024, presented by Union Finance Minister prioritizes key sectors such as infrastructure, agriculture, green growth, railways, youth, and women empowerment. The allocation for capital expenditure in 2024–25, dedicated to infrastructure development sees an 11.1 percent increase, reaching Rs.11,11,111 crore, equivalent to 3.4 percent of the GDP.

The Hon'ble Prime Minister hailed the Interim Budget saying, "This budget is a reflection of the aspirations of Young India" and highlighted two significant decisions taken in the budget: a fund of Rs. 1 lakh crore announced for research and innovation, and extension of tax exemptions for the Startups. It is a very significant move to foster innovation and provide support to entrepreneurs.

The Budget 2024–25 has allocated a marginally enhanced outlay of Rs.2.78 lakh crore for the roads & highways sector. This indicates the government's focus on the road sector and enables the completion targets for the projects under the Bharatmala and National Infrastructure Pipeline.

The FM has allocated Rs.2.55 lakh crore for railways to implement three major economic railway corridor programs, energy, mineral, and cement corridors, port connectivity corridors, and high traffic density corridors aimed at enhancing logistics efficiency and reducing costs.

As part of the green growth and promotion of renewable energy, the rooftop solar program aims to provide 300 units of free electricity every month to 10 million households in the country. The constant focus on green growth, especially in the promotion of electric transport and the development of charging infrastructure, continues to steer India towards a sustainable and environmentally conscious development path.

The initiative to build 20 million houses under the PM Awas Yojana and the progress of the Pradhan Mantri Awas Yojana (Grameen) with an additional 20 million homes planned to be built over the next five years, is particularly noteworthy.

The Ministry of Jal Shakti has been allocated Rs.98,418 crore. Within this, the Jal Jeevan Mission scheme is granted Rs.69,926 crore, while Swachh Bharat Mission Rural projects has received Rs.7,192 crore. Additionally, Rs.10,400 crore is allocated for the continuation of projects under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT). These funds will be utilized for developing rural and urban water supply and sewerage infrastructure, promoting green spaces in urban areas, and mitigating pollution through improvements to the public transport system.

In the interim budget for 2024–25, Rs.5000 crore has been allocated to sustain Swachh Bharat Mission (Urban) projects, aiming to enhance the cleanliness of cities. Additionally, an allocation of Rs.10,400 crore has been earmarked for the Smart Cities Mission, focusing on the development of cities with core infrastructure, a sustainable environment, and an improved quality of life.

The government's initiatives to enhance port connectivity, alleviate congestion in busy rail corridors, and revamp metro rail systems represent positive strides in infrastructure development. Emphasis on a green economy, bolstering the electric vehicle ecosystem, promoting domestic tourism, and establishing multi-modal logistics corridors will help India propel towards the vision of a developed nation, Viksit Bharat, by 2047.

SPML Infra Limited views this budget as a forward looking and funding for the future through infrastructure development. The budgetary allocations and business-friendly measures are anticipated to not only enhance the standard of living for millions but also generate abundant opportunities for economic and social development.



Abdul Rahman Mohammed,
CEO, Sahara Industry

Adequate quantity of safe quality water is a fundamental human right, yet it is not assured; it requires active efforts to procure, store, use and manage. Access to clean water is essential for sustaining life, promoting health, and ensuring well-being of nations. Therefore, it is our collective responsibility to work towards guaranteeing this basic human need, implementing sustainable water management practices, optimizing resources and fostering equitable access to this vital resource. As water is vital for human survival, similarly, it is essential for all economic activities leading to nation's economic growth and existence.

The water treatment industry in India is in a phase of substantial growth, with a Compound Annual Growth Rate (CAGR) of 9.10%, projected to reach USD 5.6 billion (Rs. 46,480 crore) by 2030. This growth is attributed to various government initiatives, including the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), National Mission for Clean Ganga (NMCG), Jal Jeevan Mission (JJM), and Community Drinking Water Schemes, which collectively contribute to the expansion of the Indian water and wastewater treatment market. The interim budget for 2024, with a focus on development and the ambitious goal of achieving a \$30 trillion economy by 2047 (the centenary year of India's independence), has set the agenda for a "Viksit Bharat" (Developed India).

The substantial allotment of Rs. 11,11,111 crore for infrastructure development represents an 11.1 per cent increase compared to the previous year. This allocation, amounting to 3.4 per cent of the GDP, underscores the government's targeted strategy to construct resilient infrastructure encompassing railways, metro rail, roads, airports, waterways, urban development, as well as water and sanitation.

Under the interim budget 2024–25, the Ministry of Jal Shakti (MoJS) has received an allocation of Rs. 98,418 crore. Out of this, the share of the Jal Jeevan Mission, which aims to provide safe and adequate drinking water by 2024 to all households in rural India, is Rs. 69,926 crore. Out of the 19.26 crore rural households in the country, 14.22 crore have already been provided tap water connection under the mission till now.

The Department of Water Resources, River Development and Ganga Rejuvenation has been allocated Rs. 21,028 crore for 2024–25, a 7.74 per cent increase from 2023–24. It was Rs. 19,516 crore in the last year's budget.

The National Ganga Plan, which comes under the department for implementing schemes and projects for the Ganga River and its tributaries, has been allocated Rs. 3,500 crore. The Central Water Commission has been allocated Rs. 391 crore, the Central Water and Power Research Station Rs. 75 crore and the Central Ground Water Board Rs. 310 crore. The Pradhan Mantri Krishi Sinchai Yojna has been allocated Rs. 11,391 crore for 2024–25, a 29.7 per cent increase from last year.

The Rural Development Ministry's budget to Rs. 1.77 lakh crore for 2024–25 is increased by around 12 per cent from last year's Rs. 1.57 lakh crore. The Swachh Bharat Mission (Rural) got Rs. 7,192 crore for 2024–25. The same amount was allocated to it in 2023–24 as well. The substantial allocation for water supply projects across various schemes is highly appreciated, and at Sahara Industry, we eagerly anticipate contributing to the efforts to ensure clean and safe water for both drinking and industrial purposes. Leveraging our extensive experience and an innovative, technologically advanced NDF certified product range, Sahara Industry, along with its parent organization Anu Advance Composite Products Pvt. Ltd., is poised to lead in delivering advanced water and wastewater treatment solutions in adherence to international standards. We are pleased that the Government of India is demonstrating a strong commitment to the water sector by allocating a substantial budget for its development.



Mr. Jash Panchamia
Partner, Suraksha Group

We applaud the Government's focus on the development of affordable housing in the interim Union Budget 2024. As families grow, we anticipate an increase in the demand for housing by building two crore new houses in the next five years. The revolutionary scheme empowers the middle class, which resides in rented houses, slums, and unauthorized colonies, to buy or build their own homes. This also emphasises on the fact that the Government's focus has been in providing a respectable lifestyle to the economically weaker section of the society. In addition to building affordable housing, it is also commendable that our Hon'ble Finance Minister focused on providing free electricity to one crore families.

The development of real state will also further boost employment especially for the youth of the country. This will significantly create an upward trajectory for the country's economy. A compact budget reflects the commitment to inclusive growth, sustainable living, and fostering opportunities for the next generation.



Naser Azeez Mohammed
Managing Director,
Aquality Water Solutions Pvt. Ltd.

The World Economic Outlook report from the International Monetary Fund (IMF) anticipates an improvement in global economic growth in 2024, reaching 3.1%. The IMF also projected that India will attain the position of the third-largest economy by 2027. India has showcased resilience throughout 2023, overcoming challenging global economic conditions. The initial advance estimate indicates a projected gross domestic product (GDP) growth of 7.3% for the financial year Fy24.

In FY25, India's economic growth will consistently be driven by government revenue expenditure, with the funds allocated under the budget for 2024 dedicated to infrastructure development, ultimately resulting in improved output. The budget proposal to create a fund of Rs. 1 trillion for extending long-term interest-free loans to the private sector in emerging sectors is a commendable initiative. This aims to stimulate research, innovation, and technological development. The move is particularly beneficial for start-ups and MSMEs, enabling them to harness technological innovation to build resilient systems and achieve improved outcomes with limited resources.

The Interim Budget 2024, as presented by the Finance Minister, establishes the groundwork for a prosperous and advanced India, fostering comprehensive development supported by modern infrastructure. The projection of the fiscal deficit for FY25 at 5.1% of GDP is indeed encouraging, providing a significant boost to the Indian economy. This fiscal discipline is likely to capture the interest of foreign investors, attracting substantial foreign direct investment in various sectors, further boosting the economic growth.

The water sector, being a growth harbinger for various industries, has witnessed commendable attention from the government. The strategic push towards establishing a robust water infrastructure is not only vital for addressing immediate concerns but also contributes significantly to the overall development of other sectors. This foresighted approach aligns with the government's commitment to fostering sustainable growth and ensuring the well-being of the nation.

Under the interim budget for 2024–25, the Ministry of Jal Shakti (MoJS) has been allocated Rs. 984.18 billion, indicating a 1.93% increase from the revised estimate of Rs. 965.48 billion in the fiscal year 2023–24. Within this allocation, a substantial outlay of Rs. 699.26 billion has been directed towards the Jal Jeevan Mission/National Rural Drinking Water Mission, emphasizing the government's commitment to providing clean and accessible drinking water to all citizens.

The allocation for the Swachh Bharat Mission, encompassing both rural and urban areas, has witnessed a commendable 28% increase, reaching Rs. 121.92 billion. This notable rise in funds underscores a dedicated emphasis on enhancing sanitation facilities in both urban centres and the rural heartland of the country. The increased financial commitment reflects a concerted effort to address and improve sanitation infrastructure across the country.

The developing water and wastewater treatment sector emerges as a pivotal player, showcasing significant growth potential. The heightened focus by the government to provide clean drinking water and increased sanitation facilities will be escalating development of water and wastewater treatment infrastructure, collectively fostering a more sustainable and hygienic living environment across the country.

We, at Aquality Water Solutions Pvt. Ltd., perceive the allocation of funds for water and sanitation in the budget as crucial and integral to our commitment to promoting sustainable water management practices. We recognize the significance of financial allocation to ensure the availability and sustainability of clean water and sanitation services. It is our steadfast belief that adequate budgetary provisions contribute directly to the enhancement of water quality, accessibility, and overall environmental well-being.

We stress the significance of addressing the urgent challenges associated with water quality through innovative treatment facilities. One notable solution involves harnessing renewable resources, such as the implementation of a solar-powered water filtration system. This approach not only emphasizes our commitment to sustainable practices but also serves as a proactive step towards effectively addressing water quality concerns and ensuring access to clean and safe water for security establishments and communities inhabited in remote locations.



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HOW TO EVALUATE AND SELECT AN OZONE GENERATOR

PART-I



Awareness of ozone and its applications in India have increased. With more stringent rules with respect to the environment, Consultants have begun to look to alternate technologies and have found ozone providing solutions to many of their problems. As this technology is relatively new, it becomes very important for Consultants and prospective users to be aware of the intricacies associated with this technology. We will have a series of five parts Ozone page content to try and cover all the valid points one must consider while going in for an ozone system.

Ozone is an effective technology as long as it is applied well. For a successful Ozone application, four vital aspects are to be borne in mind. They have to be understood, analyzed and then the decision can be taken. The three aspects to be considered are:

- The Ozone generation technology – Ozone can be generated from air through UV technology or Corona discharge technology, but also directly from water using electrolytic membranes. The selection of technology will greatly affect the success of the application. The Ozone generation technology also determines the Ozone concentration produced by the Ozone generator.
- The running costs of an Ozone generator- The running costs of an Ozone generator depends on the choice of feed gas, the type of cooling and hardware design which also affects the maintenance costs over time.
- Safety Aspects – Never neglect this aspect. Though ozone is a safe gas when handled well, the equipment uses high power, and needs to have interlocks for protection. The life span of the equipment and maintenance requirement depends upon this factor. Operational safety should also be ensured. In most cases, clients and consultants are often in the dark as to how they go about evaluating ozone systems and the criteria to select the equipment for their applications. The article will attempt to simplify the process of selections so that the user and the consultant make an informed decision to arrive at the selection.

CONSIDERING THE OZONE TECHNOLOGY

Ozone can be produced in over a 100 ways. There are more than 700 patented ways of ozone production. But commercially four most popular methods are being used.

1. The UV method of ozone production
2. The plate types corona Ozone production
3. The tube types corona Ozone production
4. Electrolytic (PEM) water based Ozone production

THE UV METHOD OF OZONE GENERATION

To understand this we need to define the role of Ozone.

The role of Ozone

The main purpose of Ozonation is of dual nature. Ozone is expected to perform both Oxidation and disinfection. (Oxidation to remove organics and inorganic contaminants and disinfection to kill bacteria etc). Irrespective of the amount of ozone generated per hour, a minimum concentration of at least 1% is required for both oxidation and disinfection. UV ozone generators cannot generate Ozone at this concentration to perform simultaneous oxidation and disinfection. Ozone concentration greatly affects mixing efficiency.

The concentration of Ozone

Corona discharge Ozone Generators can produce Ozone at a concentration ranging from 1 to 16% w/w compared to 0.1 to 0.001% w/w by UV ozone. This as mentioned is 10 to 1000 times less when compared to CD ozone generators. The amount of air required for UV Ozone generators is 10 times more than that required for CD units with consequent low Ozone concentrations.

The solubility of Ozone in water is only partial and is governed by Henry's Law (the solubility of the gas in water is directly proportional to its partial pressure in the gas phase). Consideration of Henry's Law leads to the obvious conclusion that the higher the Ozone concentration the greater will be the solubility of ozone in water. The more ozone is dissolved in water the more effective it is as a disinfectant. It is therefore very clear that Ozone generated through UV radiation, not much of Ozone is available in the water for both Oxidation and disinfection.

ISSUED IN PUBLIC INTEREST BY
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COLOMBIA'S LIQUID RAINBOW:

Nature's Chromatic Masterpiece



Nestled deep within the lush, tropical landscapes of Colombia lies a hidden gem that defies the imagination – the awe-inspiring Caño Cristales, affectionately known as the "Liquid Rainbow." This enchanting river, often hailed as the most beautiful in the world, unveils a mesmerizing display of colors that seems to be straight out of a painter's dream.

Picture yourself stepping into a realm where nature takes on the role of an artist, meticulously crafting a masterpiece that dances with vibrant hues. Caño Cristales, located in the remote Serranía de la Macarena National Park, transforms into a breathtaking palette of reds, blues, yellows, greens, and blacks during the short-lived spectacle that occurs between July and November.

The river's unique kaleidoscope of colors is a result of a rare phenomenon involving a combination of factors. The aquatic plants on the riverbed, *Macarenia clavigera*, undergo a spectacular transformation as they turn a brilliant red, contrasting with the vibrant green moss and the golden sands beneath the crystal-clear water. The interplay of sunlight, water chemistry, and the surrounding environment creates a symphony of colors that captivates all who are fortunate enough to witness it.

As you embark on a journey along the Liquid Rainbow, you'll find yourself immersed in a surreal world where every step reveals a new dimension of beauty.

The rhythmic flow of the river and the gentle rustle of leaves in the surrounding Amazonian rainforest create a harmonious melody, making this experience not just a visual feast but a multisensory extravaganza.

Local legends and indigenous communities add an extra layer of mystique to this natural wonder. They believe that the river is a sacred place, guarded by spirits that protect the vibrant ecosystem. As you navigate through this magical waterway, you can't help but feel a profound connection to the ancient tales and the rich cultural heritage that envelops the region.

For adventure seekers, Caño Cristales offers more

Daredevils can partake in thrilling activities like hiking through the lush trails, swimming in natural pools, and even exploring the nearby caves that add an adventurous twist to the journey.

In conclusion, Colombia's Liquid Rainbow stands as a testament to the unparalleled beauty that Mother Nature can conjure. Its fleeting brilliance serves as a reminder of the delicate balance within our ecosystems and the importance of preserving such natural wonders for generations to come. You can hence, embark on a journey to witness the kaleidoscopic magic of Caño Cristales – a living testament to the artistry of our planet.



T E N D E R

Providing Street Lighting On Roads Leading To Sewage Treatment Plant Bio And Nano Technology Department And Sports Complex In The Premises Of Gju S And T At Hisar

Category	Scientific Equipments tenders		
Location	Haryana, Hisar		
Bid Open Date	11 Feb 2024	Tender Value	11.09 Lac
Doc Collection Date	11 Feb 2024	FTID	240113448050

Installation Of Arsenic Free Water Treatment Plant Near Indarapar At Bahadurpuru

Category	Chemical tenders		
Location	West Bengal, Krishnagar		
Bid Open Date	27 Feb 2024	Tender Value	93.70 Lac
Doc Collection Date	23 Feb 2024	FTID	240214443740

Providing Generators For Sewage Water Treatment Plant Pumping Stations At Onden

Category	Construction, Infrastructure, Civil Work tenders		
Location	Kerala, Kannur		
Bid Open Date	23 Feb 2024	Tender Value	92 Lac
Doc Collection Date	21 Feb 2024	FTID	240214459940

Cleaning Of Weeds From Facultative Ponds No.1 I/C Cleaning Of Grass And Surface Dressing Work At Kotra Sewage Treatment Plant Campus, Bhopal

Category	Manpower, Security Guard Supply tenders		
Location	Madhya Pradesh, Huzur		
Bid Open Date	29 Feb 2024	Tender Value	14.20 Lac
Doc Collection Date	25 Feb 2024	FTID	2401134239230

Supply Of Poly Aluminium Chloride For Treatment Of Water At Various, Water Treatment Plant Of Municipal Corporation Of Jabalpur.

Category	Construction, Infrastructure, Civil Work tenders		
Location	Madhya Pradesh, Jabalpur		
Bid Open Date	26 Feb 2024	Tender Value	9.70 Lac
Doc Collection Date	24 Feb 2024	FTID	240214478100

Supply Of Sewer Treated Water For Use Of Non Domestic Purpose Through Tankers From Sewerage Treatment Plant To Demanded Place On Premium Sharing Basis. Package-3. Second Call

Category	Transportation, Courier, Cargo Services tenders		
Location	Madhya Pradesh, Indore		
Bid Open Date	27 Feb 2024	Tender Value	12.54 Lac
Doc Collection Date	23 Feb 2024	FTID	240214478260

T E N D E R

Renovation And Painting Of Old Water Treatment Plant 6.80 MI At Lambaline Section Under Phed Apwd, Prothrapur.
Sw Renovation Of Internal Electrical Installation.

Category	Electrical and Electrical Equipment tenders		
Location	Andaman & Nicobar, Port Blair		
Bid Open Date	4 Mar 2024	Tender Value	3.68 Lac
Doc Collection Date	14 Feb 2024	FTID	240214481850

Construction/Laying Of Transmission Line From 33/11 Kv Civil Line Sub– Station To Sewage Treatment Plant, Main Pumping Station At Bisundarpur In District–Mirzapur Under Namami Gange Programme

Category	Scientific Equipments tenders		
Location	Uttar Pradesh, Mirzapur		
Bid Open Date	20 Feb 2024	Tender Value	1.70 Lac
Doc Collection Date	20 Feb 2024	FTID	2402144359020



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EVENT CALENDAR



January 2024

Water India Expo

17 – 19 Jan 2024

Pragati Maidan, New Delhi, India

Water & Wastewater Equipment, Treatment & Transport

24 – 27 Jan 2024

Indiana Convention Center, Indianapolis, USA

www.wvetshow.com/en/home.html

WWT Wastewater Conference and Exhibition

25 – 26 Jan 2024

The National Conference Centre, Solihull, UK

www.10times.com/wwt-wastewater

Nevada Water Resources Association Annual Conference Week

9 Jan – 01 Feb 2024

Tuscany Suites & Casino, Las Vegas, USA

www.nvwra.org/2024-symposium

Local Water Management Crossroads

31 Jan – 01 Feb 2024

Parc Expo Rennes, Rennes, France

www.10times.com/carrefour-des-gestions-locales-de-leau

InterAqua

31 Jan – 02 Feb 2024

Tokyo Big Sight, Koto, Japan

www.interaqua.jp/eng/

Smart Energy India Expo

17 – 19 Jan 2024

Pragati Maidan, New Delhi, India

www.smartenergyindiaexpo.com

Utah Green Conference & Trade Show

22 – 24 Jan 2024

Mountain America Expo Center, Sandy, USA

www.10times.com/utah-green-trade-show

February 2024

Annual Water Expo

06 – 08 Feb 2024

Delta Hotels by Marriott Fargo, Fargo, USA

www.10times.com/water-system-expo-fargo

Mountain States Ground Water Expo

08 – 09 Feb 2024

Aquarius Casino Resort, Laughlin, USA

www.mountainstatesgroundwater.com

AquaFarm

14 – 15 Feb 2024

Pordenone Fiere, Pordenone, Italy

www.aquafarm.show/en/aquafarm-program

World Water Tech Innovation Summit

20 – 21 Feb 2024

Hilton London Bankside, London, UK

www.worldwatertechinnovation.com

E-World Energy & Water Exhibition

20 – 22 Feb 2024

MESSE ESSEN GmbH, Essen, Germany

www.e-world-essen.com/en

Pacific Water Conference

20 – 22 Feb 2024

Hawaii Convention Center, Honolulu, USA

www.hiawwa.org/2024-pacific-water-conference

UF Water Institute Symposium

20 – 21 Feb 2024

J. Wayne Reitz Union, Gainesville, USA

www.conference.ifas.ufl.edu/waterinstitute

Water Today's Water Expo

28 Feb – 01 Mar 2024

Chennai Trade Centre, Chennai, India

www.waterepo.biz

Water Garden Expo

28 Feb – 01 Mar 2024

Grand Casino Hotel & Resort, Shawnee, USA

www.wgexpo.com

WAPTAG Water Exp

29 Feb – 02 Mar 2024

Mahatma Mandir Exhibition Hall,

Gandhinagar, India

March 2024

Roorkee Water Conclave

03 – 06 Mar 2024

Indian Institute of Technology Roorkee,

Roorkee, India

www.iitr.ac.in/rwc

New England Water Well Expo

07 – 09 Mar 2024

Best Western Royal Plaza Hotel & Trade

Center, Marlborough, USA

www.newwassociation.org

WaterReuse Research Conference

10 – 13 Mar 2024

Hilton Denver City Center, Denver, USA

www.watereuse.org/event/2024-watereuse-symposium

Water Policy Conference

18 – 20 Mar 2024

Washington Hilton, Washington DC, USA

www.10times.com/e12k-rr53-h02x

Rural Water Conference

18 – 21 Mar 2024

Penn Stater Conference Center Hotel, State

College, USA

www.prwa.com/annual-conference

Aqua Netherlands

19 – 21 Mar 2024

Evenementenhal Gorinchem, Gorinchem,

Netherlands

www.aquanederland.nl/en/

KRWA Conference & Exhibition

26 – 28 Mar 2024

Century II Performing Arts & Convention

Center, Wichita, USA

www.krwa.net/TRAINING/Conference

April 2024

Florida Water Resource Conference

02 – 05 Apr 2024

Gaylord Palms Resort & Convention Center,

Kissimmee, USA

<https://www.fwrc.org/>

Texas Water

09 – 12 Apr 2024

Fort Worth Convention Center, Fort Worth,

USA

www.txwater.org

AZ Water Conference & Exhibition

10 – 12 Apr 2024

Phoenix Convention Center, Phoenix, USA

www.azwater.org/group/annualconference

Water Expo & Forum

16 – 18 Apr 2024

Abu Dhabi National Exhibition Centre –

ADNEC, Abu Dhabi, UAE

www.worldfutureenergysummit.com/en-gb/water.html#/

IE Expo China

18 – 20 Apr 2024

Shanghai New International Expo Centre

(SNIEC), Shanghai, China

www.ie-expo.com

Asia Water

23 – 25 Apr 2024

Kuala Lumpur Convention Centre, Kuala

Lumpur, Malaysia

<https://www.asiawater.org/>

SDARWS Rural Water Expo

24 – 25 Apr 2024

Best Western Ramkota Hotel, Rapid City, USA

<https://www.sdarws.com/>

EVENT CALENDAR



International Green Energy Expo

24 – 26 Apr 2024

EXCO, Daegu, South Korea

<https://www.greenenergyexpo.co.kr/eng/>

Water Expo Bangladesh

25 – 27 Apr 2024

International Convention City Bashundhara (ICCB), Dhaka, Bangladesh

<https://www.limraexpo.com/water/index.php>

Green Vision Summit & Expo

30 Apr – 02 May 2024

MFCC – Malta Fairs & Conventions Centre, Malta

May 2024

Maryland Rural Water Association Conference

06 – 09 May 2024

Roland E. Powell Convention Center, Ocean, USA

<https://10times.com/mrwa-ocean>

Power of Water Canada Technical Conference & Trade Show

08 – 10 May 2024

Niagara-on-the-Lake, Canada

<https://www.owa.ca/conference/>

IFAT Munich

13 – 17 May 2024

Exhibition Munich, Munich, Germany

<https://ifat.de/en/trade-fair/>

Renewable Energy Show

16 – 18 May 2024

International Convention City Bashundhara (ICCB), Dhaka, Bangladesh

<https://10times.com/renewable-energy-show>

Water Management Show

16 – 18 May 2024

International Convention City Bashundhara (ICCB), Dhaka, Bangladesh

<https://10times.com/water-management-show>

West Africa Water Expo

21 – 23 May 2024

Landmark Centre, Lagos, Nigeria

<https://elanexpo.net/waweexpo/>

June 2024

SIEE Pollutec

02 – 05 Jun 2024

Add Safex – Foire d'Alger, Mohammadia, Algeria

https://sieepollutec.com/?page_id=90&lang=en

International Exhibition on Environmental Technology & Green Energy

03 – 05 Jun 2024

COEX Convention Center, Seoul, South Korea

<https://www.envex.or.kr/eng/main/index.asp>

Watertech Africa

05 – 07 Jun 2024

Kenyatta International Convention Centre, Nairobi, Kenya

<https://www.expogr.com/watertech/>

GreenTech Amsterdam

11 – 13 Jun 2024

RAI Amsterdam, Amsterdam, Netherlands

<https://www.greentech.nl/>

China (Guangzhou) International High-end Drinking Water Industry Expo

14 – 16 Jun 2024

China Import and Export Fair (Canton Fair Complex), Guangzhou, China

<http://www.ihe-china.com/cn/Invitation/40.IWE/>

Singapore International Water Week

16 – 20 Jun 2024

Singapore

<https://www.siwww.com.sg/>

Egypt Infrastructure & Water Expo

25 – 27 Jun 2024

Egypt International Exhibition Center, Cairo, Egypt

<https://www.egyptinfrastructureexpo.com/>

July 2024

European Wastewater Management Conference & Exhibition

02–03 July 2024

The Point at Emirates Old Trafford, Manchester, UK/Online

wwwmconference.com/

Thai Water Expo 2024

03 – 05 Jul 2024

Queen Sirikit National Convention Center, Bangkok, Thailand

www.thai-water.com

12th Annual International Forum on Water

15–18 July 2024

Athens, Greece

www.atiner.gr/water

Water and Aqueous Solutions Gordon Research Conference

20 – 21 Jul 2024

Holderness School, Holderness, USA

<https://www.grc.org/water-and-aqueous-solutions-conference/2024/>

August 2024

The Water Expo 2024

20 – 22 Aug 2024

Miami Airport Convention Center, Miami, USA

www.thewaterexpo.com/

AgriTech India 2024

22 – 24 Aug 2024

BIEC Bengaluru International Exhibition Centre, Bengaluru, India

agritechindia.com

September 2024

19th EverythingAboutWater Expo 2024

10–12 September 2024

Yashbhoomi, IICC, Dwarka, New Delhi

www.eawaterexpo.com

EcwaTech 2024

10 – 12 Sep 2024

Crocus Expo, Moscow, Russia

www.en.ecwatech.ru

CamWater 2024

11 – 13 Sep 2024

Diamond Island Convention and Exhibition Center, Phnom Penh, Cambodia

www.camwaterexpo.com

Taiwan International Water Week 2024

11 – 13 Sep 2024

Taipei World Trade Center, Taipei, Taiwan

www.taiwanintwaterweek.com

Water & Wastewater Management Expo 2024

11 – 12 Sep 2024

The Emergency Services Show, Birmingham, UK

www.ess-expo.co.uk

Indo Water Expo & Forum 2024

18 – 20 September 2024

Grand City Mall & Convex Surabaya, Surabaya, Indonesia

indowater.com/

Water and Wastewater Fair 2024

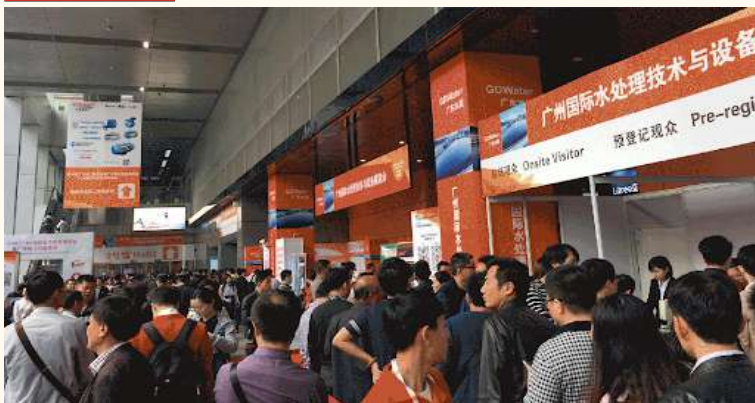
24 – 26 Sep 2024

Elmia, Jönköping, Sweden

www.elmia.se/en/va-massan/

BAYWATCH

WATERTECH



Date: 05–07 March 2024

Venue: Guangzhou Poly World Trade Expo Center

Website: www.watertechgd.com

Guangdong International Water Treatment Technology and Equipment is co-sponsored by China Membrane Industry Association, China Instrument Industry Association, Shanghai Herui Exhibition Service (Group) Co., Ltd., and Informa Markets, co-organized by Shanghai Hexiang Exhibition Co., Ltd., and hosted by Qingdao Adea Desalination Center. The exhibition (referred to as: Guangdong Water Exhibition) has been successfully held for seven times and is a major event in the spring water treatment industry in South China.

With an exhibition area of 36,000 square meters, it is expected to bring together 800+ high-quality exhibitors across the three major fields of municipal, industrial and civil use, displaying more than 20,000 products and attracting 20,000 professional visitors to visit various new technologies, new products and new activities.



Date: 19–21 March 2024

Venue: Evenementenhal Gorinchem

Website: www.aquanederland.nl/en/

In the scenic Netherlands, Aqua Nederland isn't just an event; it's a water odyssey. Imagine a tapestry of unity woven through the Dutch waterways – a collective effort embracing circularity, steering the energy transition ship, adapting to the changing climate, and ensuring the safety of every drop.

Aqua Nederland is no ordinary gathering. It's the heartbeat of water innovation, bringing together the entire water ecosystem, from wastewater to drinking water, process water to urban water & sewage management.

This event is an innovation hub where ideas flow freely, showcasing cutting-edge solutions and fostering a community that sparks innovation at every turn. It's not just about supply and demand; it's about creating a space where ideas flourish.

BAYWATCH



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जल संसाधन, नदी विकास और बंधुता मंत्रालय
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RIVER DEVELOPMENT & GANGA REJUVENATION
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Where the Water Community Comes Together

The 19th EverythingAboutWater Expo 2024 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.

Date: 10 – 12 September 2024

Venue: IICC, New Delhi

Website: [//www.eawaterexpo.com](http://www.eawaterexpo.com)

India is currently on a trajectory towards severe water stress, with projections indicating a critical situation by 2025. 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 19th Everything About Water Expo 2024, 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.

In the expansive field of residential, commercial, industrial, and small community water treatment, the Water Quality Association (WQA) takes the lead as a prominent voice. With a robust network comprising over 2,500 manufacturers, suppliers, and dealers worldwide, WQA is more than an organization; it's a driving force for excellence in the water treatment industry.

WQA's impact is diverse, spanning across residential, commercial, industrial, and small community water systems. It caters to the varied needs of different sectors, ensuring that water treatment standards are met across the board.



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for water quality excellence

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PRE-CONVENTION PROGRAMS: MARCH 4
MARCH 5-7, 2024 | ORLANDO, FLORIDA

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Date: 05–07 March 2024

Venue: Orlando, FL

Website: convention.wqa.org

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114	Daftech Engineers Pvt. Ltd.	05	+91 98141 27804	mail@daftechindia.com	www.daftechindia.com
115	EverythingAboutWater eMagazine	25	+91 85889 11033	enquiry@eawater.com	www.eawater.com
116	EverythingAboutWater Expo 2024	Back Cover, 55	+91 85889 11033	enquiry@eawater.com	www.eawater.com
117	EverythingAboutWater eMagazine	29	+91 85889 11033	enquiry@eawaterexpo.com	www.eawaterexpo.com
118	EverythingAboutWater Magazine	33	+91 85889 11033	enquiry@eawater.com	www.eawater.com
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NEW DELHI, INDIA

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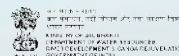
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