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Sector-34A, Chandigarh-160022.
Ph: +91 172-5275055, 4012755

WORKS:
Plot No.286, HSIIDC Industrial Estate -I,
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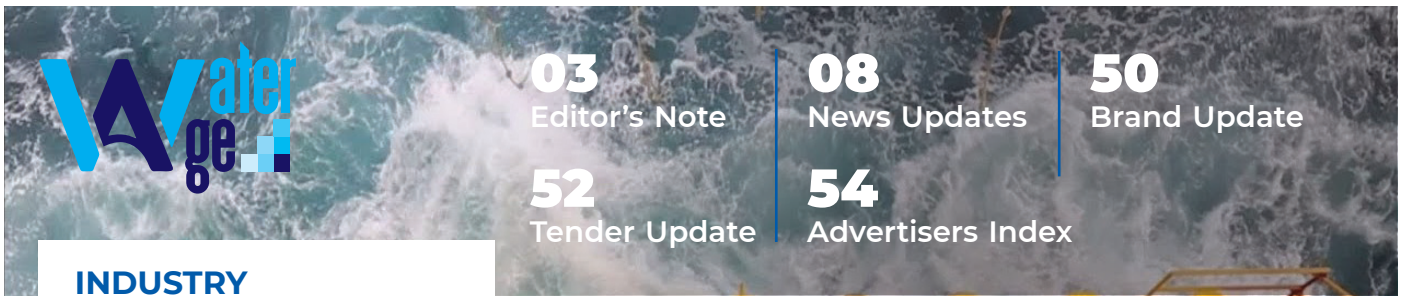

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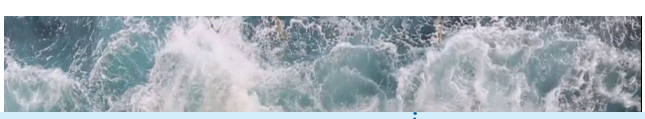

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EDITOR–IN–CHIEF	:	Renu Tomar
ASSISTANT EDITOR	:	Manisha Singh
DESIGN & GRAPHICS	:	Virender Kumar
MARKETING & OPERATION	:	Poonam Singh

PRINTER
Fine Art: D–7 /3, Okhla Industrial Area, Phase 2, New Delhi 110 020

PRINTED AT
Fine Art:
D–7 /3, Okhla Industrial Area, Phase 2, New Delhi 110 020

PUBLISHER
WaterAge
Initiative of SHUDH JAL FOUNDATION
605, Bhikaji Cama Bhawan, Bhikaji Cama Place, New Delhi – 110 066

EDITOR
Renu Tomar
#4048, B 5 & 6, Vasant Kunj, New Delhi – 110 070

For editorial contributions / press releases, write to: **editor@waterage.in**
For advertising enquiries, write to: **info@waterage.in**
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Published by **WaterAge** (Initiative of SHUDH JAL FOUNDATION) :
605, Bhikaji Cama Bhawan, Bhikaji Cama Place, New Delhi – 110 066, **E–mail: enquiry@waterage.in**

R E N U T O M A R

(Editor-in-Chief)

WATER AND WASTEWATER TREATMENT IN INDIA

It's a basic human right to have access to clean, safe water. But in India, managing wastewater and providing access to clean water continue to be major problems. More than 600 million Indians experience moderate to severe water stress, according to research by NITI Aayog. A significant portion of the nation's wastewater - about 80% is released into waterways without being treated, which adds to water pollution.

Several programs, including the Namami Gange Programme and the Swachh Bharat Mission, have been launched by the Indian government to address these issues. Although these programs have been slowly put into action, the capacity and upkeep of the current facilities are inadequate.

The public and private sectors must make investments in enhancing the water distribution network and infrastructure to address this challenge. Public education on the value of water conservation and efficient wastewater disposal should also be a top priority. It is possible to ensure the successful management of water resources and wastewater treatment by providing local bodies with sufficient budget and technology.

It is important for everyone to work together to solve the societal issue of water shortage and wastewater management, which transcends issues involving the public or private sectors. To promote and advocate for sustainable water management practices, communities, civil society, and the media all have a critical role to play.
In addition, there is still a big problem with people not wanting to pay for water and sewage services. The government can encourage the establishment of fair and reasonable water rates that are based on the concepts of cost recovery and cross-subsidies. This strategy can guarantee that the weak and disadvantaged groups in society have access to services for managing wastewater and providing clean water.

To resolve the water and wastewater treatment issue in India, a multifaceted strategy including the public and corporate sectors, as well as communities, civil organizations, and the media, is necessary. It is now necessary for all interested parties to work together and implement sustainable water management strategies to guarantee that future generations will have access to clean and safe water. The theme of this edition is Water & Wastewater treatment. Industry experts have provided us with indepth articles focusing on the solutions and technologies to treat wastewater and make safe and clean water available to all. Happy reading...

If you want to submit articles, case studies, news, and product launched, please send us to editor@waterage.in.

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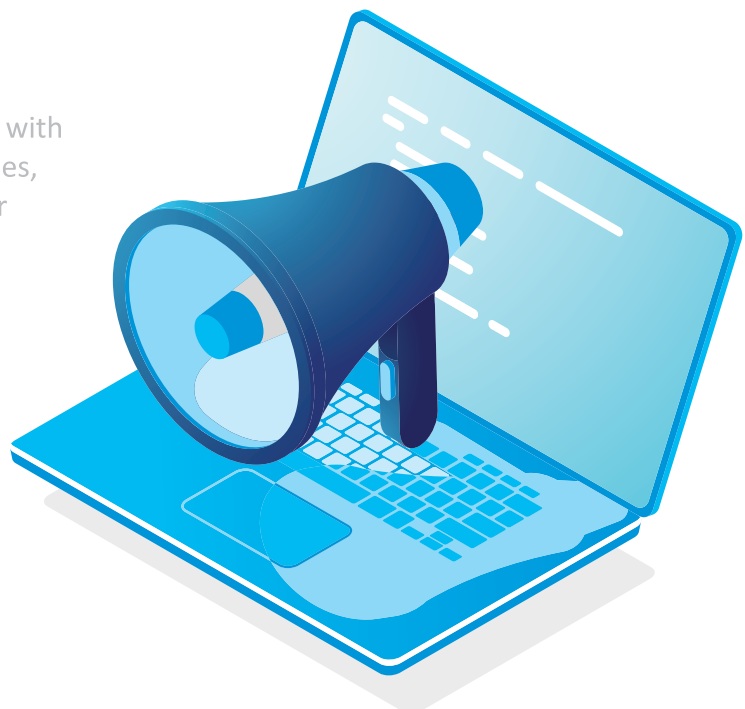

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PMC to exclude Uruli Devachi and Fursungi from sewage project

The Municipal Corporation of Pune (PMC) has decided to exclude Uruli Devachi and Fursungi from a sewage project that aims to process wastewater from 11 villages near Manjari. The project, which has a capacity of 93 million litres per day (MLD), was estimated to cost Rs 350 crores.

According to the PMC, the decision to exclude the two villages will require a redesign of the project, as the maximum wastewater from these villages is only 60 MLD. The project was originally approved in 2017, when the limits of the Pune Municipal Corporation were expanded to include the 11 villages, including Uruli–Devachi and Fursungi. The administration at the time had decided to collect and process 100% of the wastewater from these villages, leading to the approval of the 93 MLD capacity project.

Work on the project began last year after being approved by the Municipal Corporation. However, a meeting with Chief Minister Eknath Shinde in December 2022 resulted in the exclusion of the two villages. The government subsequently asked the Municipal Corporation for feedback on the exclusion, and objections and suggestions were received last week. As a result, the PMC has decided not to carry out sewage project work in these villages.

It is unclear why the decision was made to exclude Uruli Devachi and Fursungi from the project or what objections and suggestions were received by the Municipal Corporation. The decision to exclude the villages may have an impact on the overall scope and cost of the project, which is expected to process wastewater from the old municipal limits as well as the 11 villages.

The sewage project in the Pune area is facing challenges and uncertainties, and it remains to be seen how the Municipal Corporation will proceed in light of these developments. The redesign of the project may require additional funding and resources, and it may also impact the timeline for completion. The PMC has not yet provided any details on the revised plan for the project or the expected timeline for completion.

Delhi government extends free sewer connection scheme

The Delhi government has extended its free sewer connection scheme in an effort to reduce pollution in the Yamuna River. Water minister Saurabh Bhardwaj announced on Monday that the scheme will now provide free sewer connections in the unauthorised colonies of Sangam Vihar and Ghalibpur, with Rs 7 crore set aside for this purpose.

According to Bhardwaj, the Arvind Kejriwal–led government has already connected 527 new unauthorised colonies to the sewer network since coming to power eight years ago, expanding the sewer network by 2,371 kilometres. The latest initiative is expected to further strengthen the government's commitment to improve the living conditions of the people in Delhi. The Yamuna river, which runs through the city, has been severely affected by pollution, with unauthorised colonies and jhuggi–jhopri clusters contributing to the issue. The poor quality of treated wastewater discharged from sewage treatment plants and common effluent treatment plants has also added to the problem.

According to reports, twenty–two drains carrying domestic wastewater and industrial effluent fall into the Yamuna between Wazirabad and Okhla. Although the 22–km stretch is less than two percent of the river's length, it accounts for around 80 percent of the pollution in the river.

The extension of the free sewer connection scheme is expected to help tackle this issue by providing better access to sewage facilities for those living in unauthorized colonies, reducing the amount of untreated wastewater that is discharged into the river.

The Delhi government's efforts to improve the city's sewer network are part of a wider plan to address pollution in the Yamuna River. The government has already taken several steps to clean up the river, including setting up sewage treatment plants and introducing measures to control industrial pollution.

However, more needs to be done to tackle the issue. In addition to improving the sewer network, the government will also need to address

the root causes of pollution, such as unauthorized settlements and poor waste management practices.

Overall, the extension of the free sewer connection scheme is a positive step towards reducing pollution in the Yamuna River. If successful, it could help improve the living conditions of millions of people in Delhi and have a positive impact on the environment.

National Mission for Clean Ganga approves projects worth Rs. 638 crore

The Executive Committee of the National Mission for Clean Ganga (NMCG) approved eight projects worth Rs. 638 crore in its 48th meeting, held under the chairmanship of Director General, NMCG, Shri G. Asok Kumar. The committee approved four projects worth Rs. 407.39 crore to clean the Hindon River, a tributary of River Yamuna, as part of the Hindon Rejuvenation Plan. The four projects in Shamli district include construction of sewage treatment plants, septage co–treatment facilities, interception and diversion works in Babri, Bantikhera villages, Banat town, Shamli town, and Thanabhawan town to prevent the flow of polluted water into Krishni River.

The committee also approved one project worth Rs. 2.12 crore for the development of Akhand Param Dham ghat in Haridwar, Uttarakhand, and one project for the development of seven ghats in Prayagraj, Uttar Pradesh, to prepare for the Mahakumbh in 2025. The ghats will have amenities such as change rooms, universal access ramps, floodlights, and kiosks.

In addition, two sewerage management projects were approved in the meeting, one each in Bihar and Madhya Pradesh. The Bihar project will construct three sewage treatment plants to prevent the flow of polluted water into River Kiul, a tributary of Ganga, at an estimated cost of Rs. 77.39 crore. The Madhya Pradesh project will construct a sewage treatment plant and a Common Effluent Treatment Plant to prevent the flow of polluted water into River Kshipra, a sub–tributary of Yamuna, at an estimated cost of Rs. 92.78 crore.

During the meeting, DG, NMCG, Shri G. Asok Kumar urged officials from the States to use solar power to run the Nirmal Jal Kendras and to use grills to separate and dispose of solid waste from drains flowing into the rivers. He also emphasized the responsibility of the State Governments to maintain the assets created under the Namami Gange Programme and asked them to communicate their Standard Operating Procedures for cleaning existing ghats to NMCG.

The meeting was attended by senior officials from the concerned states and officials from the Department of Water Resources, River Development, and Ganga Rejuvenation, Ministry of Jal Shakti. The approved projects are a step towards achieving the goal of the Namami Gange Programme to clean and rejuvenate the Ganga river and its tributaries.

Okhla Sewage Treatment Plant to become operational in June, set to benefit over 40 lakh people

Delhi's Okhla sewage treatment plant, Asia's largest, is scheduled to become operational in June this year, according to Somnath Bharti, Vice Chairman of the Delhi Jal Board. The plant's four phases are being upgraded and rehabilitated to meet the prescribed standards for biological oxygen demand (BOD) and total soluble solids (TSS) in the treated wastewater. The upgraded plant will be capable of treating 56.4 crore litres of wastewater daily from South Delhi, the New Delhi Municipal Council (NDMC) area, and other parts of the capital, benefiting around 40 lakh people.

The government invested Rs 1,161.17 crore in the project, which began in June 2019 under the third phase of the Yamuna Action Plan. The plant will also include artificial lakes, with 15 to 20 million gallons per day (MGD) of treated water being reused in them. Bharti stated that this initiative will help to reduce pollution in the Yamuna River.

The Yamuna, a tributary of the Ganges, is one of India's most polluted rivers, with high levels of toxic chemicals, untreated sewage, and industrial waste. The untreated wastewater from unauthorised colonies and jhuggi–jhopri clusters, as well as the poor quality of treated wastewater discharged from sewage treatment plants and common effluent treatment plants, is the primary cause of pollution in the river. Between Wazirabad and Okhla, 22 drains carrying domestic wastewater and industrial effluent empty into the Yamuna. Although this 22–km

stretch is less than two per cent of the river length, it is responsible for about 80 per cent of the pollution in the river.

The upgrade of the Okhla sewage treatment plant is an essential step towards cleaning up the Yamuna River. The new plant will ensure that the wastewater discharged into the river is of a significantly higher quality than what was previously discharged. This will significantly reduce the pollution levels in the river, resulting in cleaner water and a healthier environment for those living in and around Delhi.

In conclusion, the Okhla sewage treatment plant's upgrade is a significant milestone in the ongoing efforts to clean up the Yamuna River. With a capacity to treat 56.4 crore litres of wastewater daily, the plant will benefit over 40 lakh people in South Delhi, the NDMC area, and other parts of the capital. The use of artificial lakes and the reusing of treated water will help reduce pollution in the Yamuna River, which is essential for the health and well–being of those living in the region.

HP and French Development Agency Sign MoU for Water and Sanitation Improvement in Five Towns

The state government of Himachal Pradesh has signed a Memorandum of Understanding (MoU) worth Rs. 817.12 crore with the French Development Agency (AFD) to enhance water and sanitation services in five towns. The MoU was signed in the presence of Chief Minister Thakur Sukhvinder Singh Sukhu and Deputy Chief Minister Mukesh Agnihotri.

Under the agreement, the project aims to improve sewerage facilities in five towns, including Manali, Bilaspur, Palampur, Nahan, and Karsog, and enhance the drinking water supply in Manali and Palampur. The French Development Agency will provide the necessary technical and financial assistance to ensure the success of the project.

Speaking about the project, Chief Minister Thakur Sukhvinder Singh Sukhu stated that the objective is to ensure better living conditions for the residents of these towns by providing them with access to clean drinking water and improved sanitation facilities. He added that the project aligns with the government's efforts to achieve the Sustainable Development Goals (SDGs) set by the United Nations.

The Deputy Chief Minister, Mukesh Agnihotri, emphasized the significance of the MoU and praised the French Development Agency's involvement in the project. He expressed his confidence that the project would yield successful outcomes and contribute towards the overall development of the state.

The project's implementation will involve the construction of new drinking water supply systems and the upgrading of existing sewerage systems in the five towns. The MoU also includes provisions for capacity building and technical assistance to the state government's Jal Shakti Vibhag.

The signing of the MoU is a significant step towards ensuring access to clean drinking water and improved sanitation facilities for the residents of Himachal Pradesh. With the French Development Agency's support, the state government is set to achieve its objective of enhancing the quality of life for its citizens and contributing towards the SDGs.

NGT Directs Chief Secretary of Uttar Pradesh to Take Remedial Action on Pollution of River Yamuna in Mathura and Agra

The National Green Tribunal (NGT) has ordered the Chief Secretary of Uttar Pradesh to ensure remedial action to curb pollution in the Yamuna River in the cities of Mathura and Agra. The directive was issued in response to two applications filed with the NGT, which alleged the discharge of untreated sewage into the river by local authorities and commercial establishments.

A bench consisting of Chairperson Justice A K Goel, judicial member Justice Sudhir Agarwal, and expert members A Senthil Vel and Afroz Ahmad observed that the state pollution control board had filed separate reports, acknowledging the pollution of the Yamuna River in Mathura and the discharge of 131 million litres per day of untreated sewage into it. The authorities in Agra had also failed to take necessary remedial action, the reports said.

The bench further noted that there were "huge gaps and deficiencies in sewage management" in Agra and untapped drains and discharge of untreated sewage into the river in Mathura. The tribunal said that Mathura is a heritage city of great significance, visited by a large number of people, and urged senior–level officers to take urgent measures to address the issue, given that there are huge funds allocated for this purpose.

The NGT instructed the Chief Secretary to convene a meeting with the concerned officers within a month to ensure remedial action in the two cities. For Mathura, the meeting must consider intercepting untapped drains and diverting them to sewage treatment plants (STPs) within two months. The tribunal also directed that treated sewage from each STP must be used for irrigation and agriculture, and only during non–utilisation periods, should it be discharged into the river. Additionally, the performance of six STPs must be evaluated and improved, and the chlorination method studied for treating industrial effluents.

Regarding Agra, the NGT observed that out of the 286 MLD of sewage flowing into the drains, only 58.25 MLD was tapped, and there was no information available about the wastewater in the sewage network. The tribunal noted that the installed capacity of nine STPs was 220.75 MLD, but the utilisation capacity remained at 175 MLD. The meeting must, therefore, take steps to address these issues.

The NGT's directives come at a time when India is grappling with severe water pollution problems, particularly in its major rivers, including the Yamuna. Environmental activists have long criticized the government's lack of effective action to address this issue, leading to severe health hazards for the citizens living in these regions.

MoHUA and RITES sign MoU for sustainable waste management

MoHUA and RITES Limited have signed a Memorandum of Understanding (MoU) to accelerate Solid Waste and Used Water Management in towns with less than 1 lakh population under Swachh Bharat Mission–Urban 2.0. The Technical Support Unit (TSU) of RITES will provide technical assistance for a period of 3 years, with areas of engagement focusing on process standardization and engineering design of waste management facilities under SWM, and standards & specification in the field of sewage and faecal sludge management and reuse, engineering design and process of wastewater treatment units under UWM.

The MoU aims to strengthen the thrust on sustainable solid waste management with the overall vision of creating garbage–free cities. The assistance provided by RITES will enable states / ULBs to implement the mission initiatives efficiently providing safe and sustainable sanitation access universally, through safe containment, collection and transportation, treatment, and reuse for greater public health impact.

Speaking on the occasion, Mr. Manoj Joshi, Secretary, MoHUA, emphasized the significance of this partnership and said that it will help to accelerate the pace of solid waste and used water management in smaller towns. He also expressed his confidence in RITES' technical expertise and their ability to provide innovative solutions to urban sanitation challenges.

Ms. Roopa Mishra, JS, MoHUA, spoke about the importance of achieving universal sanitation coverage and highlighted the need for sustainable solid waste management practices to achieve this goal. She expressed her appreciation for RITES' commitment to supporting the SBM–U mission and the potential impact of this partnership in improving public health outcomes.

Mr. Rahul Mithal, CMD, RITES, highlighted the company's experience in providing technical assistance for urban infrastructure projects, including solid waste and used water management. He emphasized the importance of sustainable and innovative solutions to address urban sanitation challenges and reiterated RITES' commitment to supporting the SBM–U mission.

Overall, this MoU between MoHUA and RITES is a significant step towards achieving universal sanitation coverage and improving public health outcomes in smaller towns through sustainable and innovative solid waste and used water management practices.

Pune Municipal Corporation launches project to recycle muddy water to prevent wastage

The Pune Municipal Corporation (PMC) in India has launched a project to recycle muddy water from water treatment plants, helping to satisfy the daily needs of around 80,000 people and preventing the wastage of water. The PMC has been drawing water from four dams in recent years, but the city has experienced water scarcity in the summer months, prompting the corporation to take measures to reduce losses due to leakages and misuse of potable water.

The new project involves the installation of a small capacity water treatment plant to treat muddy water discharged from a large treatment plant with a capacity of 300 MLD in Parvati. Around four per cent of the water from the plant is lost during cleaning of the filter bed and released into the nearby canal. However, the small unit will recycle 12 MLD of water, equivalent to the water needs of around 80,000 residents. The cost of the project is INR 2.5 crore, but it is a permanent solution to stop the wastage of water at the Parvati water treatment plant, and similar units will be set up at other large water treatment plants with discharge of muddy water.

The PMC has set up large–capacity water treatment plants at Parvati, Vadgaon Budhruk, Pune Cantonment, Warje, and Holkar Bridge, where the water from dams is treated before being supplied through a network of pipelines. The treatment process involves using alum and separating water from mud. The filter bed is cleaned twice daily, and the sludge is removed and the muddy water is released in the nearby canal. However, with the new project, the muddy water will be cleaned and made potable.

The project has been welcomed by civic activist Vaishali Patkar of Bhujal Abhiyan, who said that every drop of water counts, and efforts to recycle the muddy water discharged in the canal were a good initiative. She added that the city's population was increasing, and there was a need to ensure their water demand was met efficiently. The PMC also has the task of stopping water leakage through its supply network.

The state water resources department has also planned to build a tunnel to carry water for irrigation purposes instead of an open canal to avoid loss due to evaporation. This is part of wider efforts to conserve water resources in the region and tackle water scarcity.

H2O Innovation secures eight new water treatment projects worth $8.4M

H2O Innovation, a water treatment solutions provider, has announced that its Water Technologies & Services (WTS) business line has secured eight new water and wastewater treatment projects. These projects include six industrial projects, which have added $8.4 million to the company's backlog, increasing it to $56.0 million.

One of the projects involves the design of a 1.5 million gallons per day (MGD) ceramic ultrafiltration (UF) system for the Fort Berthold Indian Reservation in North Dakota. The system features a high–water recovery rate of over 97%, making it energy–efficient and capable of generating high–quality water for the community. Another project is for an electric vehicle manufacturer that requires a treatment system consisting of multimedia filters, degasifiers, and reverse osmosis (RO) systems. This system will produce 150 gallons per minute (GPM) of make–up water for cooling towers, and the project is expected to be completed by the end of 2023.

H2O Innovation has also been awarded a project for a seawater reverse osmosis (SWRO) system with a capacity of 1.0 MGD for a resort in Latin America. The system will provide a reliable and energy–efficient source of desalinated water for the resort. The fourth project involves an 18 MGD UF system for the West End Water Treatment Plant in the City of Billings, Montana. The UF system will comprise of seven trains and will treat surface water for the city's drinking water supply. The water treatment plant is expected to be operational by 2025.

Additionally, H2O Innovation has secured four new industrial projects, one of which involves a four–month extension for a UF rental. The other contracts include the delivery of systems for a client that specializes in biofuel production and a RO system for a client in the US automotive industry.

Frédéric Dugré, President and CEO of H2O Innovation, expressed his

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pleasure at securing contracts with new and recurring clients for water and wastewater projects. He stated that the company's ability to deliver high–quality systems and build strong relationships with clients is reflected in the contracts secured. H2O Innovation is committed to creating value for its clients and helping them achieve their objectives, he added.

Hydromo unveils Kratos and showcases solar & water solutions at CREDAI meeting

The Confederation of Real Estate Developers Association of India (CREDAI) Vijayawada recently held its monthly general body meeting on April 28, 2023, at Hotel Novotel in Vijayawada. The event was sponsored by Hydromo, a leading provider of water treatment, wastewater management, and solar solutions in India, which is committed to supporting the real estate industry in areas of water treatment, waste management, and solar solutions.

The event had a turnout of close to 170 people, with around 140 people from the builder fraternity and 60 members from the Builders Association of India joining the CREDAI chapter. The event was the first to be held under the Presidentship of Dasari Rambabu, who recently took over the post.

During the event, Rambabu welcomed the members and spoke about the importance of connecting with other developers, sharing best practices, and exploring new ideas for driving growth and success in the industry. The General Secretary V Sridhar reviewed and confirmed the minutes of the last general body meeting, announced and introduced the newly formed sub–committees, and T Vamsi Krishna put forth the Treasurer's report for the month.

Hydromo showcased its new–age products suitable for builders through a presentation. Hydromo's builders kit includes a Commercial RO plant, pressure pumps, solar street lights, solar fencing, and solar power. Jay Krishna Chadalawada, founder and CMD of Hydromo, was felicitated on the occasion and expressed his pride in supporting the real estate industry. He committed to bringing advanced and customized solutions of global standards for the builders and construction fraternity.

Deputy General Manager of SBI, K Ranga Rajan, soft–launched Hydromo's latest product, Kratos, the first modular electric motor–generator with solid–state technology. Dr. Anuja Charpe, assistant professor, VR Siddhartha Engineering College, gave a presentation on the importance of water and its quality during construction activities. She highlighted how the quality of water affects the strength and durability of concrete.

The Director of Hydromo Growth and Strategy, Nandita Kanwar, announced the grand success of the event and emphasized Hydromo's commitment to bringing new product suits to serve growing builder requirements in the future.

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E-mail: triveni_anand@yahoo.com, triveniconstructions.mohali@gmail.com,

Abhinav Sharma
Head of Marketing, Conscient Initiatives

WATER PURIFICATION WITHOUT THE WASTE:

HOW ELECTRO–DEIONIZATION TECHNOLOGY IS SAVING WATER

Water saving is a critical issue in the current times, especially in light of the United Nations Sustainable Development Goal (SDG) 6, which aims to ensure the availability and sustainable management of water and sanitation for all. According to the United Nation, 2.2 billion people lack access to safe drinking water and by 2025, half of the world's population will be living in water–stressed areas.

Clean and safe drinking water is a fundamental

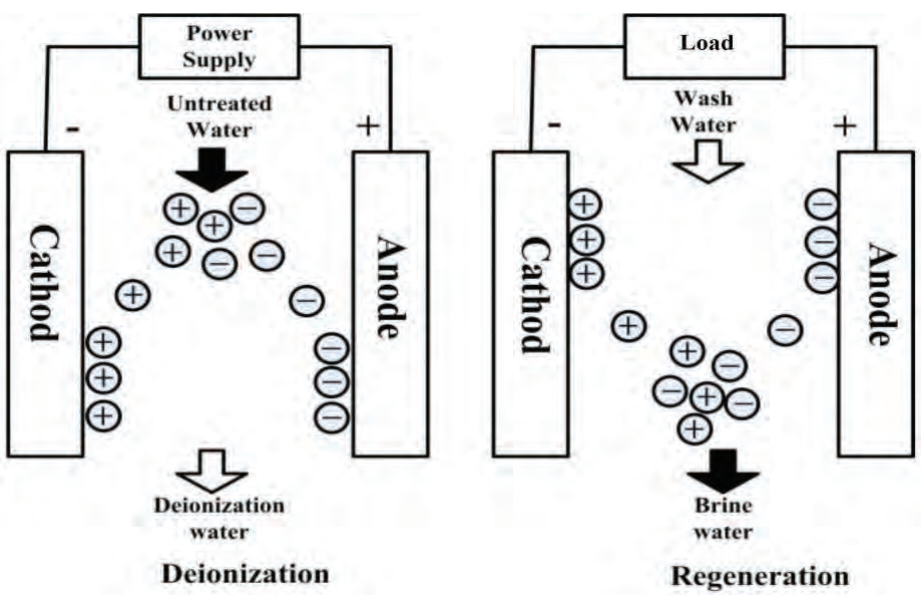


Figure 1

human right, yet millions of people around the world lack access to this basic necessity. Water scarcity, pollution, and climate change are some of the major challenges that make access to clean water even more difficult. In this context, water purification technologies play a crucial role in ensuring access to clean water for all.

In India, the National Green Tribunal (NGT) has put a soft ban on the use of Reverse Osmosis (RO) purifiers in areas where the Total Dissolved Solids (TDS) in the water are below 500 mg/liter. The ban was imposed due to concerns over the high–water wastage associated with RO purifiers. Water scarcity is a significant concern, with several regions facing acute water shortages, particularly during the summer months. The overuse and mismanagement of water resources have led to the depletion of groundwater levels and deteriorating water quality.

Climate change and rapid urbanization are exacerbating water stress in India. A study published in the Journal of Hydrology 2020 found that climate change has already reduced India's freshwater availability by 6% and urbanization is expected to further reduce it by 15–20% by 2050.

Reverse Osmosis (RO) purifiers are one of

The EDI process involves the use of porous carbon to remove impurities from water.

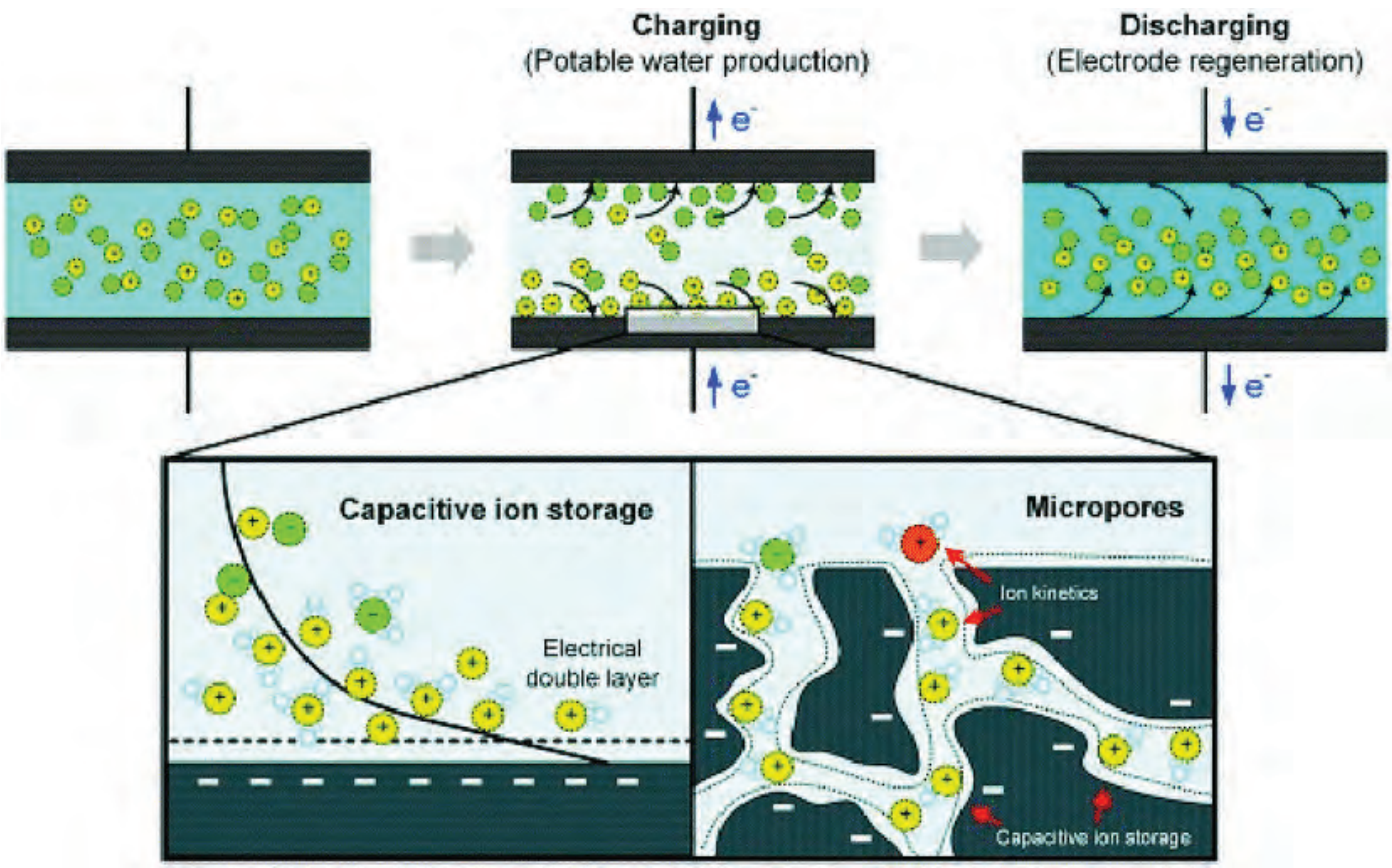


Figure 2

During the desorption cycle, the electrical potential is removed from the electrodes, and the accumulated ions are released from the surface of the electrodes

Figure 3

the most commonly used water purification technologies. However, RO purifiers have a significant drawback in terms of their water usage and efficiency. RO purifiers use a high–pressure pump to force water through a semi–permeable membrane, which removes impurities and contaminants. While this process effectively purifies the water, it also wastes a considerable amount of water during the process. The rejected water is discharged as wastewater, often at a ratio of 3:1 or higher. This can lead to a significant amount of water wastage, particularly in areas where water scarcity is a pressing issue or where the quality of water is comparatively better than groundwater.

In contrast, Electro Deionization (EDI) technology is an emerging and more efficient and sustainable option for water purification. EDI technology uses a low–voltage electrical current to remove impurities and contaminants from water without the need for high–pressure pumps or membranes. This process consumes significantly less water for purification than RO purifiers, making it an ideal solution for areas where water scarcity is a major concern.

The EDI process involves the use of porous carbon to remove impurities from water. These electrodes are made up of three layers majorly that are a basic layer of graphite along with a layer of high surface area porous carbon material further coated with anionic or cationic exchange films/membrane sheets that hold onto ions of opposite charge.

These electrodes are placed parallelly separated by a porous material & separator which allows water to flow through it. When a voltage is applied to the electrodes, one electrode becomes positively charged, while the other becomes negatively charged. This creates an electric field that attracts positively charged ions, such as sodium, calcium, and magnesium, to the negatively charged electrode, and negatively charged ions, such as chloride, nitrate, and sulfate, to the positively charged electrode.

Figure 4

As the ions accumulate on the surface of the electrodes, they form a layer called an electric double layer. The thickness of this layer determines the capacitance of the system, which is the ability to store electric charge. By controlling the applied voltage, the thickness of the electric double layer can be adjusted, which in turn controls the number of ions that are removed from the water. This gives the technology flexibility to adjust the desired amount of ions removal from water.

When the voltage is turned off, the accumulated ions are released from the electrodes and flushed with minimum water which regenerates the electrodes to again be ready for use. The process is repeated until the desired level of purity is achieved.

These cyclic processes are known as adsorption and desorption cycles.

During the adsorption cycle, the ions in the feed water are attracted to the oppositely charged electrodes, and they accumulate on the surface of the electrodes.

During the desorption cycle, the electrical potential is removed from the electrodes, and the accumulated ions are released from the surface of the electrodes. This process is achieved by reversing the polarity of the electrodes or using a short–circuiting technique. The released ions are then flushed out of the system with a small volume of water.

The adsorption and desorption cycles are repeated multiple times to achieve the desired level of purification. The number of cycles required depends on the initial water quality, the desired water quality, and the specific electro–deionization system used.

EDI technology has several advantages over other water purification technologies. For one, it is energy–efficient and has a low carbon footprint. Moreover, the high water footprint of EDI technology means that it is an effective solution for water–scarce regions. EDI technology can save up to 90% of the water that would otherwise be wasted by RO purifiers, making it a more sustainable option for water purification.

Another advantage of EDI technology is that it produces high–quality water with low levels of impurities and keeps intact the minerals in their natural form instead of mixing the raw water stream to manage the

Image Ref 5: (Team Members)
Left to Right: Ms. Chandrika Maheshwari (Co–Founder), Mr. Dinesh Chawla (Inventor), Ms. Kanupriya Maheshwari (Co–Founder)

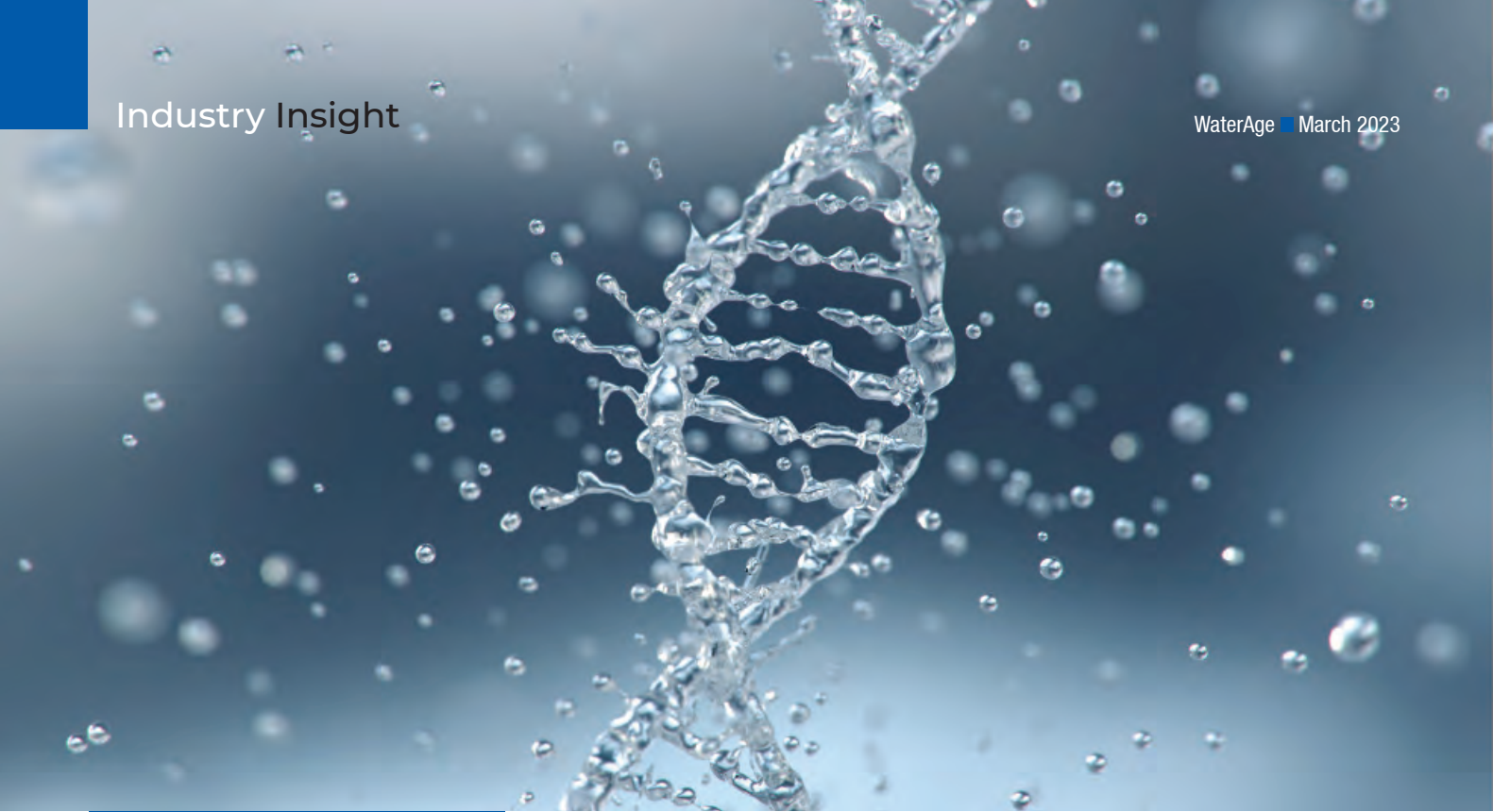
TDS. Unlike other water purification technologies that use chemicals or require regular maintenance and replacement of parts, EDI technology is a clean and easy–to–maintain solution.

In conclusion, Water resources are the basis for human survival and development. However, human beings face severe challenges of water pollution and freshwater shortage. With the critical advantages of low energy consumption, high efficiency, low

cost, green and pollution–free, and renewable electrodes, electro–deionization is becoming an up–and–coming water treatment technology.

With the increasing demand for clean water and the need for sustainable solutions, EDI technology has the potential to play a crucial role in addressing the growing demand for clean water while conserving this precious resource for future generations.

Overall, the heavy water wastage associated with traditional water purification technologies such as RO is a major concern in India, given the growing demand for water and the need for sustainable solutions to manage water resources. Conscient Initiatives, Delhi is one of the organizations that is developing and implementing this technology on Indian groundwater and making a move towards the sustainable management of water.



WATER: THE DNA OF LIFE

Tariq Siddiqui
Chief Strategist, TS Advisory Services

About the author:
He is the Chief Strategist of TS Advisory Services which works on the philosophy to evolve, adapt, and innovate as success means choosing to change for the better. He is responsible for evaluating, defining and developing measurable marketing and communication strategies for water companies. A doctorate in media, he has over 26–years of experience working with different sectors including water and wastewater.

Ever thought about how water is being used or we say misused by us for decades. In ancient India, water was treated as sacred as it is purified as well as the purifier, the real and spiritually conceived source of life. The Harappan civilization (~3000–1500 BC) epitomizes the level of development of water sciences in ancient India that includes construction of sophisticated hydraulic structures, water supply system, wastewater disposal systems based on centralized and decentralized concepts, and methods for wastewater treatment. The Mauryan Empire (322–185 BC) is credited as the first "hydraulic civilization" and is characterized by the construction of dams with spillways, reservoirs, and channels; they also had an understanding of water balance, development of water pricing systems, measurement of rainfall, and knowledge of the various hydrological processes.

In the first century B.C., Sringaverapura near Allahabad had sophisticated water harvesting system channelling the flood water of the river Ganga. During the reign of Chandragupta Maurya, dams, lakes and irrigation systems were extensively built. The kings and queens were aware of the importance of water for their populace and always giving importance to it. Bhopal Lake was built in the 11th century, was one of the largest artificial lakes of its time. In the 14th century, the tank in Hauz Khas, Delhi was constructed to provide water to Siri Fort area. Some of the ancient hydraulic structures for water storage and supply could still be found in some places.

In contrast to our ancestors, modern day water use practices are mostly unsustainable without concerning the challenges of scarcity and pollution. There is high demand of clean water from people, industries and agriculture and all of them consuming trillions of litres of clean water every day while discharging an equal amount of wastewater.

www.tsas.org.in www.linkedin.com/in/tariq–siddiqui–a9288915/

Irrigation consumes more than 80% of total water in India with water use efficiency as low as 30%. Improving irrigation water use will help ease the pressure on water stress.

The Conundrum

Most of the fresh water consumption in the country is for the irrigation; it is above 80% of total water use of the country. If we consider the water use efficiency of irrigation projects, it is very low and only about 30–40% making India the world's largest user of groundwater. It is absolutely important to introduce new methods and technologies for agriculture production such as drip irrigation, rainwater harvesting, cloud based micro irrigation, and sprinkler etc. along with technology support to increase water use efficiency as much as possible. With water resources decreasing fast, it has become crucial to educate farmers to use water wisely and implement sustainable methods in farming.

Clean Water Matters

India needs a maximum of 3,000 billion cubic meters (BCM) of water a year while it receives 4,000 billion cubic meters of rains. The country captures only 6 per cent of its annual rainfall, which is amongst the lowest in the world. According to the Central Water Commission, water levels in 91 major Indian reservoirs are at 25% of its total capacity which is 2% less than the average storage in a decade. Urban centres in China has worked extensively on rain water harvesting projects and in Beijing only, it has increased rapidly to reach 57.20%. The total water storage capacity of India is 181.6 million acre foot (maf) spread across 5202 dams and reservoirs. Compare this with China's 672.72 maf in 98,000 dams and reservoirs.

It is predicted that India will have to face severe water deficit of around 50% by 2030 according to Asian Development Bank report. It has already started afflicting large number of population. Niti Aayog has reported in

By awarding water projects to the lowest bidder, innovative technology solutions that could be beneficial and sustainable is getting compromised at the early stage of project implementation.

Drinking water: A precious resource

2019 that around 600 million people in the country are facing severe to extreme water scarcity. If that is not enough challenge to counter, Central Ground Water Board has reported that over 900 million people are having arsenic affects in India by drinking contaminated water. The availability of water is also a grave concern and it is predicted that 21 major cities across India, including Delhi, Bengaluru, and Chennai are on the verge of running out of groundwater.

Wastewater disposed into river

The country which generates more than 73,000 MLD of municipal sewage per day in urban settlements, is expected to increase the load to over 87,000–97,000 MLD by 2025. But around 70% of wastewater directly goes back into water bodies without any treatment. The situation is little better with industrial wastewater where about 60% – 70% is receiving some kind of treatment before disposal.

The water infrastructure is huge and mostly buried underground. India is facing a huge challenge of dilapidated state of its legacy water infrastructure, losing almost 50% of treated water to leaking pipes as NRW and water utilities tend to ignore the issue until disaster strikes. Then there is another challenge while planning and tendering for new infrastructure development; the contracts are awarded mainly based on (lowest) costs, giving little consideration to environmental, technological or societal impacts, supply chain nature and location, or life cycle analysis, sustainability and resiliency of the solutions proposed. This results into innovative technology solutions getting shelved from the list at the early planning stage, resulting in status quo project delivery on old and rundown system. The format impels water utilities and municipalities missing out on the incredible new technologies which not only provide long–term and sustainable benefits in addressing the current and emerging challenges but also proves to be more cost–effective in the end.

What we need to do is re–evaluate the way the water infrastructure development projects are awarded and money spent. It requires an out–of–box thinking and problem solving conditions and getting more for the investment made because the water utilities does not have the funding capacity to meet all infrastructure renewal and rehabilitation needs if we continue to use the traditional approach of granting the project and building it.

The Solution

In 2015, the United Nations announced clean water and sanitation accessibility to all people in the world as the sixth Sustainable Development Goal (SDG). After eight years, we are constantly reminded of its importance and slow progress towards achieving the goal by member nations. And it has got more significance with the pandemic created big havoc globally and highlighted the importance of washing hands and maintaining cleanliness.

Smart solutions powered by modern day technological intervention like artificial intelligence (AI), internet of thing (IoT), machine learning (ML), automation etc. helps in smart water management by not only analysing the data for probability of failure in aging infrastructure, but doing a host of intelligent operation and maintenance task thereby identifying areas that need improvement and repair. The intelligence demonstrated by vast water infrastructure through these technologies support the efforts of water utilities in improving life and efficiency of the asset through timely intervention. AI also offers the potential to enhance service delivery, optimize investments, and reduce costs. Automation and robotics help to fine tune work processes for greater efficiency. Robotic lab analysers can test two to three times more samples than human operators and

allow analysis to be carried out round the clock. This helps to keep a strict check on various parameters concerning quality of water.

Big data and analytics techniques help in harnessing the data coming from different sources and provide early indications in areas like quality, abnormal consumption, reliable fault detection, and optimized customer interactions. The processed data can also be used to address particular challenges in the water industry including detection of leaks, costs of energy–intensive pumping stations, reducing risk and resources while other areas such as health and safety, energy efficiency and even CO2 emissions can also be predicted. Adopting smart water infrastructure like smart metering, smart leak detection techniques would help in reducing non–revenue water with real–time monitoring to ensure a sizeable reduction in transmission and distribution losses thus resulting in better management of revenue and resources.

Electronic instruments like pressure and acoustic sensors, telemetry units and control systems connected wirelessly with cloud–based monitoring system generate real time information on leaks with accurate location details so that they can be detected in the distribution network quickly and precisely. Drones on the other hand can be used for efficient execution and monitoring. Smart end–to–end water networks offer the opportunity to improve productivity and efficiency while enhancing customer service.

Way Ahead

Water management is a significantly challenging task. It requires totally integrated approach with the goal being to maximize performance, efficiency, lifespan and safety through remote monitoring, pre–emptive maintenance and reducing losses. For a country which is facing acute water scarcity and higher contamination challenges, need to rapidly adopt sustainable way of water management practices while implementing systematic approach towards wastewater treatment with complete reuse facilities. Best practices in irrigation and industries may expeditiously be implemented with innovative technology and adequate financial resources.

Exceptional circumstances may be prompted with unique out–of–the–box problem–solving mindset and ensuring that innovative solutions make it to the table and are seen and heard and given the right amount of attention during the bidding process for any water infrastructure development project. Project development and management methods known for decades must be re–evaluated to see if it fits the modern day requirement with long term perspective and evaluate the innovative solutions available that could solve the current and emerging challenges rapidly and economically.

> Smart water management technology and intelligent solutions must be implemented to ensure we have water, the DNA of life, to survive and thrive.

Water_The DNA of Life

Jitendra Katre

Jitendra Katre has been working in the development sector for various firms for 10 years. He has years of experience in both the government and private sectors and has led several highly esteemed Projects in different Bilateral organizations. Jitendra holds a Bachelor's degree in Civil Engineering from the University of RTMNU and is skilled in team building, strategic planning, project management, DPR preparation, Proposal Writing, Infrastructure planning, technical monitoring, and evaluation. In his career performed a variety of Tasks including the design and implementation of Water supply Projects, Water Resource Developments projects, the Implementation of a holistic WASH approach in Ashramsalas, wastewater management, and Faecal Sludge management projects in various geographic areas. Jitendra has a magnetic presence in the workplace and uses her positive attitude and energy to encourage others to work tirelessly toward success.

IMPROVING RURAL WASTEWATER MANAGEMENT IN INDIA

About

Improved sanitation and hygiene through efficient wastewater treatment are crucial for rural communities' long–term growth. Wastewater management is an important approach to protecting water resources and it is defined as the collection, treatment, and reuse of wastewater. In wastewater collection networks as one of the important infrastructures, undesirable performance can lead to different problems. The goal of wastewater management is to clean and protect water. This means that water must be clean enough so that it can be used by people for drinking and washing, and by the industry for commercial purposes. It also must be clean enough to release into oceans, lakes, and rivers after it has been used.

Introduction

The majority of wastewater, which includes sewage and non–potable water that flows back into the environment, is untreated. Untreated wastewater is typically released into nearby environments and bodies of water in rural areas. This has detrimental consequences on the environment and human health by contaminating surface and subsurface water.

The amount of wastewater that is disposed of has also increased because the water supply for home use in rural regions has significantly improved over time. Therefore, it is necessary to implement efficient wastewater management systems in rural regions to reduce the issue of contamination. Managing sewage and water used for non–potable uses is the goal of wastewater management programs in rural regions. In addition to preserving the water table and water supplies, the goal is to prevent pollution and environmental harm. In addition to improving cleanliness and sanitation, this would ensure a steady and clean supply of safe

drinking water for the general public.

One of the largest sources of wastewater is that which comes from homes and small Industries. Wastewaters from homes contain human waste, food, soaps, and detergents. They also contain pathogens, which are organisms that can cause diseases. Industrial wastewaters contain toxic (poisonous) pollutants, which can endanger human health and harm other organisms. These include pesticides, polychlorinated biphenyls (PCBs,) and heavy metals like lead, mercury, and nickel. These metals are generally toxic to plant and animal life. The goal of Wastewater treatment is to remove all of these pollutants from the wastewater so that it can be returned to natural waters.

Current Scenario of Wastewater in Rural Areas

In India especially in rural areas, waste is a severe threat to public health concern and cleanliness. Though, the form of liquid waste generated in rural areas is a major problem to the overall sustainability of the ecological balance. E.g. it is estimated that rural people in India are generating liquid waste (Wastewater) of the order of 15,000 to 18,000 million liters per day respectively.

As a result, the absence of proper disposal of liquid waste (wastewater from the hand pump, Kitchen, Urinals, and bathroom) they are leading to vector–borne diseases such as diarrhea, Malaria, Polio, Dengue, Cholera, Typhoid, and other water–borne infections

Anaerobic Treatment using Anaerobic Bioreactor (ABR) and Anaerobic Filter (AF) is recommended for high–strength wastewater such as black water or sewage. Only well–settled wastewater which does not contain solids and fat, oil, or grease can be treated using AF. Hence, ABR is placed before AF.

such as schistosomiasis. Close to 88% of the total disease load is due to lack of clean water and sanitation and improper solid and liquid waste management–which intensifies their occurrence, e.g.:

- 5 of the 10 top killer diseases of children aged 1–14 in rural areas are related to water and sanitation
- Almost 1500 children die every day from diarrhoeal diseases

Presence Issues in Rural Wastewater Management

With the rising population and fast industrialization, wastewater management has become a major concern. Rural India has reached a tipping point due to outdated or non–existent infrastructure. The situation is escalating and adding to the difficulties of a helpless rural population with little or no access to potable water. With much of it coming from contaminated subsurface sources due to over–exploitation or pollution, wastewater management is critical. India has the most people who do not have access to safe drinking water. Even an abundance of water in some areas does not guarantee access to safe, dependable, and clean drinking water.

Why Manage/Treat Wastewater in Rural India

Wastewater treatment is interconnected with the water chain and thus affects the environment. Water used by rural homes gets converted to sewage or gets contaminated with chemicals and other pollutants. It must be treated before it is released back into the environment. While nature can process and cope with a small amount of wastewater, imagine the huge volume produced every day before being released back into the environment.

Health and the environment are two major reasons to have an urgent focus on this oft–neglected area: health. A contaminated water chain can have disastrous effects on human health, agriculture, marine life, wildlife, and our food chain, to name a few. According to the 2015 report of the Central Pollution Control Board, India has the current capacity to treat approximately only about 30 percent of its wastewater, most of it in urban India. An urgent need for community participation along with government and private initiatives are the needs of the hour. Rural growth, prosperous existence, and development will be driven by the methods we use to manage wastewater in times to come.

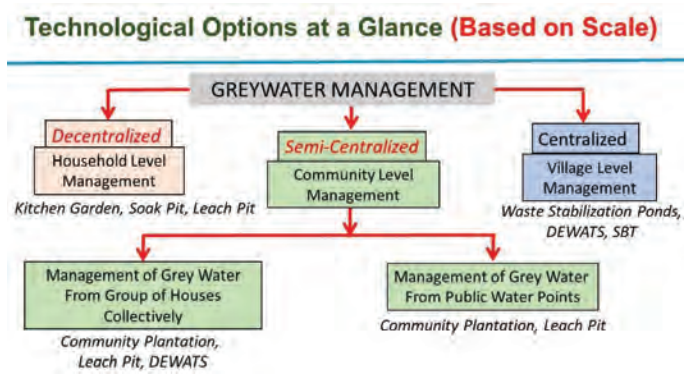
Wastewater management is important to achieve public health outcomes in rural areas. Safely managed greywater can help achieve a reduction in vector–borne diseases and exposure to water–borne and water–washed diseases. If greywater is managed properly, it can also reduce freshwater demand burdens to a considerable extent.

Water 'wasted' as a result of various human activities at home, in businesses, or in industries is called liquid waste or wastewater. In rural areas, wastewater is broadly classified as domestic (black water and greywater) and commercial (black water and greywater) emanating from small–scale industries, hotels, slaughterhouses, laundries, etc.

With the revised norms for the supply of 55 liters per capita per day (LPCD) under the Jal Jeevan Mission (JJM), the availability and use of fresh water in rural areas are increasing. The increased use of freshwater will also entail the challenge of increased generation of wastewater, which requires effective management.

Methods for Improving Wastewater Management

There are different methods of Wastewater Management in Rural Areas



A few wastewater management/treatment methods are described below.

- Soak pits
- Leach pits
- DWWTs (Decentralized wastewater Treatment Systems)

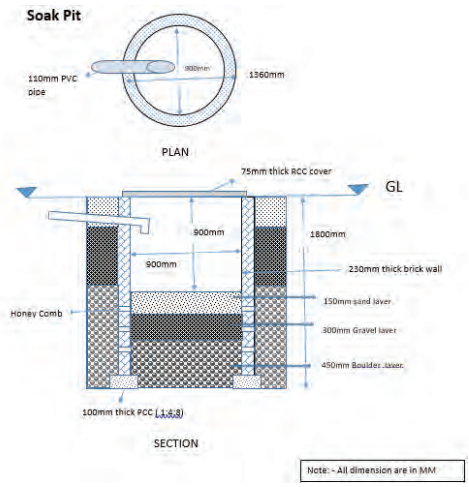
Soak Pit

If there is no intention or no need to reuse wastewater, collected stormwater, or greywater, soak pits can offer a cost–efficient opportunity for a partial treatment of waste– grey– or stormwater from a primary treatment and a relatively safe way of discharging it to the environment and therewith recharging groundwater bodies. As the wastewater (greywater or blackwater after primary treatment) percolates through the soil from the soak pit, small particles are filtered out by the soil matrix and organics are digested by microorganisms. The wastewater effluent is absorbed by soil particles and moves both horizontally and vertically through the soil pores. Sub–soil layers should therefore be water–permeable in order to avoid fast saturation. Thus, soak pits are best suited for soil with good absorptive properties; clay, hard packed or rocky soil is not appropriate. Soak pits are used the same way as leach fields, but require less space as well as less operation and maintenance. But they generally can also receive less influent and the groundwater pollution may be higher than with leach fields.

Design Standards

The soak pit, consisting basically of a simple pit (generally approximately 1 m^3), should be between 1.5 and 4 ft deep, but as a rule of thumb, never less than 2 m above the groundwater table. It should be located at a safe distance from a drinking water source (ideally more than 10 m). The soak pit should be kept away from high–traffic areas so that the soil above and around it is not compacted. It can be left empty and lined with a porous material to provide support and prevent collapse, or left unlined and filled with coarse rocks and gravel.

The rocks and gravel will prevent the walls from collapsing, but will still



provide adequate space for the wastewater. In both cases, a layer of sand and fine gravel should be spread across the bottom to help disperse the flow. To allow for future access, a removable (preferably concrete) lid should be used to seal the pit until it needs to be maintained.

Leach Pit

This is a brick–lined pit constructed in the courtyard of a house at a convenient place. The grey water from the house (kitchen wastewater, bathing water, washing water, etc.) should be directed to this pit. It is essential to pass the water through a nhani trap or P trap to avoid entry of mosquitoes and exit of foul odor. The pit is suitably covered with flagstones or Reinforced Concrete Cement (RCC) cover of the required dimensions.

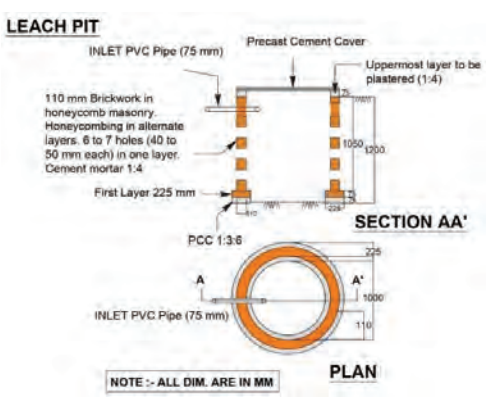
Design Standards/Considerations

- **Shape:** preferably circular (cylindrical). Reduces cost, makes it durable.
- **Bottom of the pit:** not to be cemented or concreted to facilitate seepage of water;
- **Construction:** The first layer should be 225 mm (9" brickwork). All other layers above in 110 mm (4.5" brickwork) These layers should have honeycomb masonry in alternate layers to facilitate seepage of water;
- **Inlet pipe:** 63 to 75–millimeter (mm) diameter PVC (Polyvinyl Chloride) or SWR (Soil, Waste, and Rain) pipe: to be connected to the pit keeping 200–225 mm freeboard;
- **Volume:** Effective volume (volume up to pipe level) should be kept equivalent to double the daily discharge of grey water from the house. Generally, it should be 0.82 cum (28 cft). The volume can be increased if the wastewater generation is higher.

Decentralised Wastewater Treatment Systems (DWWATs)

A decentralized Wastewater Treatment System (DEWATS) is a simplified method for managing wastewater at a community or village level. Unlike wastewater treatment technology which is always designed with the objective of achieving discharge standards of treated wastewater, DEWATS is an approach that is not dependent on automated control and maintenance. Treatment units that do not need electricity for the treatment of the wastewater are considered to be part of the DEWATS family. Since these units do not rely on electricity, they cannot be switched off intentionally.

DEWATS provides treatment for wastewater flows from 1 – 500 cubic meters per day (m^3/d) and is applicable for domestic as well as industrial wastewater. Unlike mechanized wastewater treatment technologies, DEWATS guarantees permanent and continuous operation. However, there is a possibility of variations in effluent quality might occur temporarily.



Treatment Stages and Systems

A DEWATS comprises various stages of treatment. At each treatment stage, different options of treatment units with different treatment mechanisms can be chosen.

The above units are meant to be combined depending upon the characteristics of wastewater influent and required effluent quality.

Anaerobic Settler (AS), also known as biogas settler is used for high–strength wastewater (wastewater mixed with animal waste and/or organic agricultural waste). The intention here is to recover biogas from the anaerobic digestion process.

Anaerobic Treatment using Anaerobic Bioreactor (ABR) and Anaerobic Filter (AF) is recommended for high–strength wastewater such as black water or sewage. Only well–settled wastewater which does not contain solids and fat, oil, or grease can be treated using AF. Hence, ABR is placed before AF.

Aerobic treatment using Constructed Wetlands (CW) is recommended for low–strength wastewater such as greywater or secondary treated sewage. Similar to an anaerobic filter, a constructed wetland also demands well–settled wastewater. This increases the life of the wetland and does not give rise to odor nuisance. Hence, pretreatment is recommended using ABR or AF before treating the water with CW.

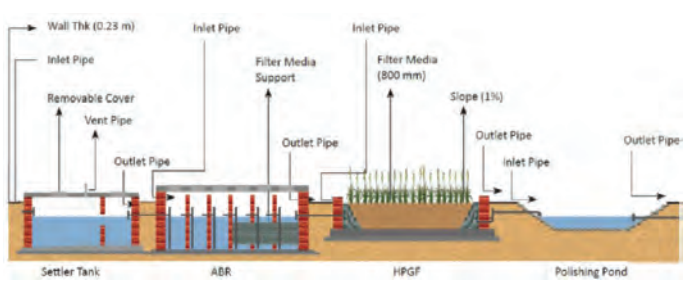
A constructed wetlands can be a horizontal flow constructed wetland (HFCW) or a vertical flow constructed wetland (VFCW)

All these technologies have been explained in detail in subsequent sections. The table below gives a summary of various possible systems having a combination of these technologies.

Treatment Stage					
Preliminary treatment	**Primary treatment**	**Secondary treatment**	**Tertiary treatment**	**Post Treatment**	**End products**
Screening	Anaerobic settler	Anaerobic bioreactor + Anaerobic filter	Constructed wetland (horizontal or vertical flow)	pond is sufficient, if the water is to be disposed of or to be used for land application (agriculture). However, safe reuse practices as recommended by	Treated water, Digested Sludge
Screening	Anaerobic settler	Vertical flow constructed wetland	Horizontal flow constructed wetland		Treated water, Digested Sludge
Screening	Anaerobic Pond	Facultative Pond	Maturation Pond		Treated water, Digested Sludge
Oil and grease trap		Anaerobic filter	Constructed wetland (horizontal or vertical flow)	WHO need to be followed for using treated wastewater in agriculture. To meet the current standards of CPCB, post–treatment using Chlorination, Sanf, and Activated Charcoal Filter and/or UV is recommended.	Treated water
Oil and grease trap		Facultative Pond	Maturation Pond		Treated water
Screening	Anaerobic settler	Anaerobic bioreactor + Anaerobic filter	Anaerobic filter		Treated water, Digested Sludge
Screening	Anaerobic settler	Vertical flow constructed wetland	Horizontal flow constructed wetland		Treated water, Digested Sludge
Screening	Anaerobic Pond	Facultative Pond	Maturation Pond		Treated water, Digested Sludge
Screening		Anaerobic bioreactor + Anaerobic filter	Constructed wetland (horizontal or vertical flow)		Treated water, Digested Sludge
Screening	Anaerobic Pond	Facultative Pond	Maturation Pond		Treated water, Digested Sludge
Screening	Anaerobic settler	Anaerobic filter	Constructed wetland (horizontal or vertical flow)		Treated water, Digested Sludge, Biogas
Screening	Anaerobic Pond	Facultative Pond	Maturation Pond		Treated water, Digested Sludge

The above units are meant to be combined depending upon the characteristics of wastewater influent and required effluent quality.

Hybrid systems i.e. combination of the primary on–site treatment and secondary/tertiary off–site treatment are also possible. However, in this case, there would be a requirement for an appropriate collection and conveyance system for the partially treated wastewater.



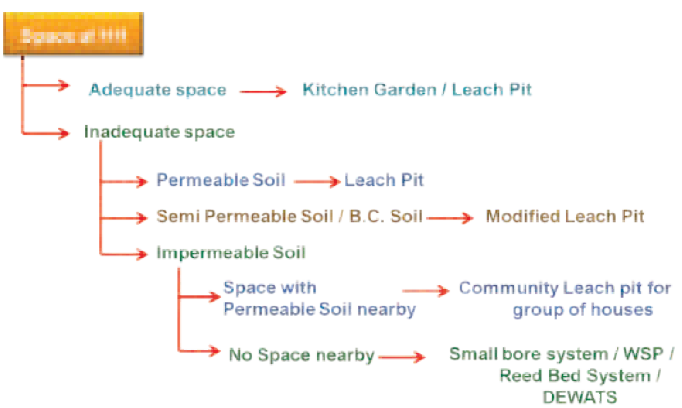
Sample Layout

Selection of technology in different soil structures

Soil conditions of the villages play an important role in the selection of technology. The following algorithms will help select the right technology in different soil structures & conditions, especially in difficult terrains.

General Area

Level of Treatment	Primary Treatment	Secondary Treatment		Tertiary Treatment	Advanced Treatment (Optional)
Component	Settler	Anaerobic Baffled Reactor	Anaerobic Filter	Horizontal/Vertical Planted gravel Filter	Polishing Pond
Process	Sedimentation & separation of physical impurities	Anaerobic digestion of organic impurities	Anaerobic digestion of organic impurities	Degradation of organic impurities with the help of plants	Aerobic decomposition & elimination of pathogens
Area required per KLD	0.5 m²/KLD	1 m²/KLD	1 m²/KLD	6.5 m²/KLD	25 m²/KLD



Semi/ Fully water logged area

(B) For Areas with Seasonal High water table (only in the rainy season)

These areas also follow the above algorithm (A). However, the selection of decentralized treatment technologies should be done logically. If the water–logging conditions are found to prevail for a longer portion of the year it should be treated as permanent water–logged condition and algorithm (C) should be followed

(C) For Areas with permanent high water table / Water logged areas

Hard strata/ Rocky area

(D) For Areas with hard strata (rocky strata)

Objectives of Wastewater Management

- To protect public health (prevent the spreading of water–borne diseases)
- To prevent deterioration of (non–sealed) roads and footpaths
- To avoid damage to buildings and surrounding areas from inundation, waterlogging, and freezing
- To avoid the creation of bad odors, stagnant water, and breeding sites for mosquitoes
- To prevent contamination of groundwater and drinking water reservoirs
- To use greywater after treatment as a resource for urban agriculture, irrigation, aquifer recharge, and landscaping

Conclusion

Wastewater management is crucial for sustaining the environment's quality, protecting natural resources, and avoiding water pollution, according to Study. The economy, public health, and environment may all be significantly impacted. For the preservation of sustainable development and the preservation of our natural resources, proper wastewater treatment is crucial. Effective wastewater management can decrease the number of dangerous pollutants that enter our water systems and enhance the general quality of our water by decreasing potential sources of contamination. Additionally, effective management can lower the price of energy use as well as the expense of treating sewage and industrial waste. Effective waste management can also support or grow the number of jobs related to running and maintaining treatment facilities.

REFERENCES

- Swachh Bharat Mission (Grameen) Phase–II Operational Guidelines Operational Jal Shakti, Government of India
- Greywater Management in Rural India, Ministry of Drinking Water and Sanitation
- Toolkit– Greywater Management
- Solid Liquid Waste Management in Rural Areas

TREATING WASTEWATER TO REMOVE SILICA AND CALCIUM CARBONATE

Dattaram D. Rane

Dattaram D. Rane is a highly motivated Chemical Engineer with over 10 years of experience in executing and managing WTP & WWTP EPC projects. With hands–on experience in executing international projects, he has developed a strong global network and a deep understanding of diverse cultures. He worked as a "Technical Advisor" for many reputed clients in various countries such as Thailand, Philippines, Azerbaijan, Nigeria, Maldives, U.A.E, Saudi Arabia, Bangladesh, and Kenya and successfully completed each agenda within the deadline. He takes responsibility for leading and executing the project through all phases such as project planning, execution, and closeout, consistent with established project delivery processes to meet the scope, schedule, and other specified requirements stated in the contract.

How to achieve product water quality as per Government standards when feed water contains high contamination for silica and calcium carbonate at the same time? These situations happen rarely and are found in coastal areas of the world.

There are two elements that we want to remove from feed water,

- Silica
- Calcium carbonate

For Silica & Calcium carbonate removal we have the following options:

Silica & calcium carbonate is a common impurity found in the feed water, and they can cause scaling and other issues in boilers and other industrial equipment. To remove them from feed water, you can try the following methods:

- Ion exchange: This involves passing the feed water through a resin bed that selectively removes silica ions. The resin bed needs to be periodically regenerated with chemicals to maintain its effectiveness.
- Reverse osmosis: This is a membrane–based filtration process that uses pressure to force water through a semi–permeable membrane, which removes impurities including silica.
- Coagulation and sedimentation: This involves adding a coagulant chemical to the feed water, which causes the silica to clump together and settle out. The water is then passed through a sedimentation tank to remove the silica particles.
- Lime softening: This involves adding lime to the feed water, which causes the silica to precipitate out. The water is then passed through a sedimentation tank to remove the silica particles.
- The most appropriate method for removing silica and calcium carbonate from feed water will depend on the specific circumstances, such as the amount of silica present and the quality of the feed water.

Consider the Following feed water quality for study

DATE ANALYSIS STARTED	09th March 2023
SAMPLING METHOD	
MARKINGS	

TESTS	TEST METHOD	RESULTS	UNITS	KS EAS 12: 2018: NATURAL POTABLE WATER SPECIFICATION
PHYSICAL TESTS				
*pH value	APHA 4500-H+	7.63	@ 25.0°C	5.5 Min – 9.5 Max
Total dissolved solids	APHA 2540 C	**6990**	mg/L	1000 Max
Colour	APHA 2120B	1	TCU	50 Max
*Total Suspended Solids	APHA 2540D	**26.40**	--	Not Detected
Salinity	POTENTIOMETRIC	7.47	ppt	--
*Conductivity,	APHA 2510 B	**13980**	µS/cm	2500 Max
Turbidity	APHA 2130B	4.84	NTU	25 Max
CHEMICAL TESTS				
*Iron as Fe	APHA 3111B	**0.69**	mg/L	0.3 Max
*Manganese as Mn	APHA 3111B	<0.01	mg/L	0.1 Max
*Copper as Cu	APHA 3111B	<0.01	mg/L	1.0 Max
Fluoride as F	PQA/LIM/061	0.59	mg/L	1.5 Max
Ammonia as NH_3	APHA 4500-NH_4G	Nil	mg/L	0.5 Max
Ammonical Nitrogen as NH_3	APHA 4500-NH_4 B	Nil	mg/L	--
Ammonium	APHA 4500-NH_4	Nil	mg/L	--
Nitrate as NO_3	APHA 4500-NO_3	6.20	mg/L	45 Max
Nitrite as NO_2	APHA 4500-NO_2	<0.03	mg/L	0.9 Max
*Potassium as K	APHA 3111B	**143.90**	mg/L	50 Max
*Phosphates as PO_4	APHA 4500-PE	<0.01	mg/l	2.2 Max
Reactive Silica as SiO_2	APHA 4500-SiO_2 C	200	mg/l	--
*Calcium as Ca	APHA 3111B	47.44	mg/L	150 Max
*Magnesium as Mg	APHA 3111 B	**539.47**	mg/L	100 Max
Calcium Hardness	KS05-459-02	987	mg/L	--
Magnesium Hardness	KS05-459-02	1353	mg/L	--
*Total hardness as $CaCO_3$	KS05-459-2	**2340**	mg/L	600 Max
Aluminium as Al	APHA 3111D	<0.02	mg/L	0.2 Max
Molybdenum as Mo	APHA 3111D	<0.01	mg/L	0.07 Max
Sulphates as SO_4	APHA 4500-SO_4 B	**439.67**	mg/L	400 Max
*Chlorides as Cl^-	KS 05-459-5	**3055.01**	mg/L	250 Max
*Total alkalinity as $CaCO_3$	KS05-459-2	150	mg/L	--
P-Alkalinity as $CaCO_3$	KS05-459-2	6	mg/L	--
Bicarbonates as HCO_3	KS05-459-5	109.8	mg/L	--
Carbonates as CO_3	KS05-459-5	6	mg/L	--
Barium as Ba	APHA 3111D	<0.01	mg/L	0.7 Max
*Sodium as Na	APHA 3111B	**3577.56**	mg/L	200 Max

**********End of test results**********

Comment: Based on the above tests only, the water does not conform to the referenced specifications due to high total dissolved solids, conductivity, Iron, potassium, magnesium, total hardness, sulphates, chlorides, sodium and presence of suspended matter.

Mombasa Lab
14th March, 2023

Chemist

E. Wambugha – *Analyst*

Authorized Signatory

E. Sakha – *Asst. Lab Manager.*

*Indicates test(s) covered under the KENAS accreditation schedule.
A statement(s) of conformity is made without taking account of measurement uncertainty. 'conform/comply' – Results are within limits while 'does not conform/comply' –Results exceed limits.

Unless otherwise stated the results shown in this test report refer only to sample(s) tested and such sample(s) are retained for 90 days only (if non-perishable).
NB: This report relates to submitted sample(s) only. The source and markings are as provided by the customer.

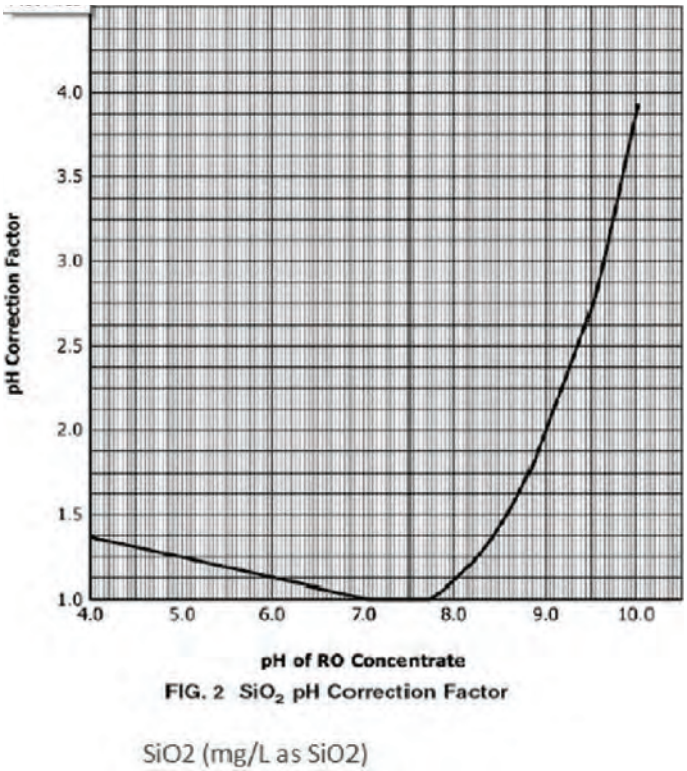


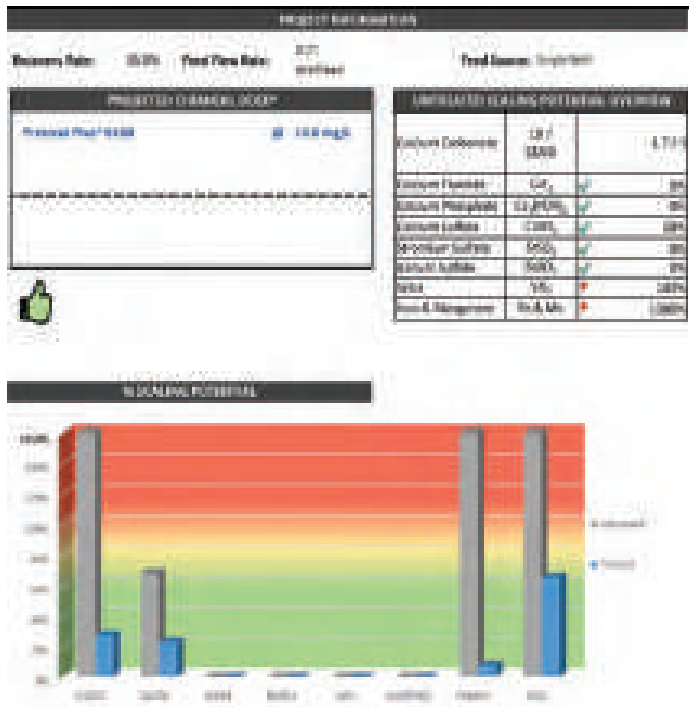
FIG. 2 SiO_2 pH Correction Factor

There is an interesting balance that happens when there is both high silica and high calcium carbonate scaling potential.

Typically, calcium carbonate can reach a higher saturation limit at a lower pH, almost the opposite occurs with silica. It is more soluble at higher pHs.

So, it is always the choice of trying to balance the antiscalant with any pH adjustment, either higher or lower.

Antiscalant dosing @16.1 mg/L without any pH adjustment



Antiscalant dosing @12.6 mg/L without any pH adjustment

When I consider consultants adding acid to make the pH 6, it usually tells me they think the CaCO3 is more difficult to handle so they bring down the pH.

I can look and readily see that CaCO3 isn't the most difficult to treat scale but it's the silica which is at 200 mg/L.

So, normally, one might want to leave the pH where it is to reduce acid costs or even raise the pH by adding caustic to help control the silica.

Attached are the 3 projections.

- With acid to lower the pH
- No acid
- With Caustic to increase the pH

When I compared the acid and no acid projections, I expected the no acid saturation limit for silica to be lower because typically, silica is more soluble at a higher pH.

But it was not the case! You can see from the chart below the silica saturation chart. The silica can be much more saturated at more extreme (high) pH levels but also is more saturated closer to a pH of 6.

So, anywhere in the 7–7.8 pH range(concentrate) it is more likely to come out of the solution.

So, it is a choice of treatment selection, if we intend to dose acid both for

PROJECT INFORMATION

Recovery Rate: 35.0% **Feed Flow Rate:** 3.71 m3/hour **Feed Source:** Single Well

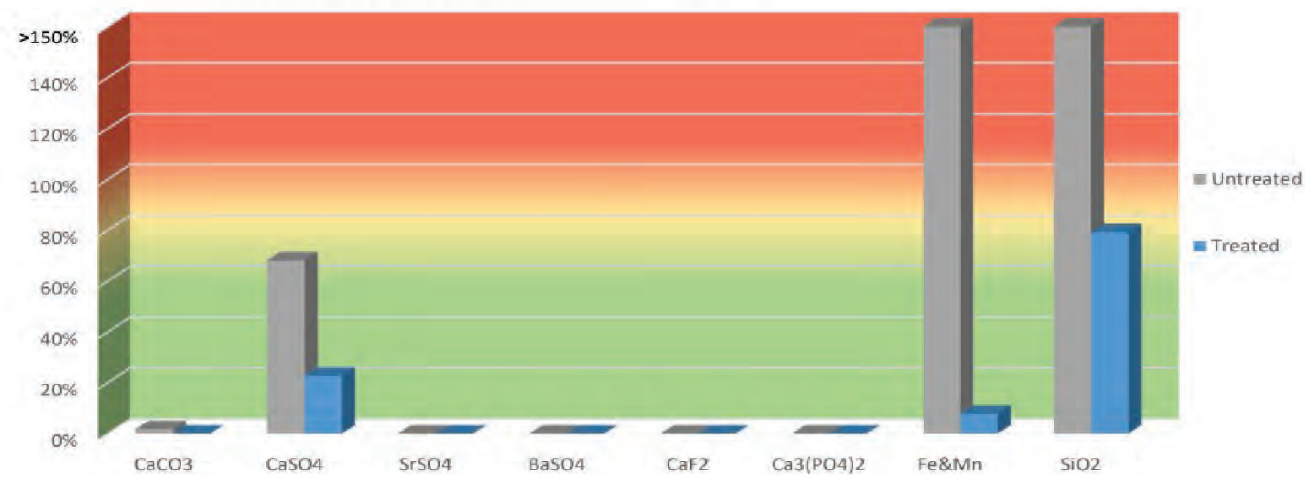
PROJECTED CHEMICAL DOSE*

Pretreat Plus® 0100	@ 13.3 mg/L
Acid: 100% Hydrochloric Acid (HCl)	@ 59.94 mg/L

UNTREATED SCALING POTENTIAL OVERVIEW

Calcium Carbonate	LSI / S&DSI		-1.1 / -1.8
Calcium Fluoride	CaF_2	✓	0%
Calcium Phosphate	$Ca_3(PO4)_2$	✓	0%
Calcium Sulfate	$CaSO_4$	✓	68%
Strontium Sulfate	$SrSO_4$	✓	0%
Barium Sulfate	$BaSO_4$	✓	0%
Silica	SiO_2	⚑	222%
Iron & Manganese	Fe & Mn	⚑	1380%

% SCALING POTENTIAL



Antiscalant dosing @13.3 mg/L with pH adjustment

the $CaCO_3$ inhibition and slight Silica inhibition or not.

Either way, at a small extra added dose of antiscalant and leaving the pH where it helps them eliminate acid and save money altogether.

Since $CaCO_3$ isn't a factor, we could even raise the pH to bring the saturation of silica down as well.

So, we can't really raise the recovery either way because the silica in the concentrate would bump up against our product's abilities.

Additionally, since the silica is 200 mg/L, it is quite likely that a good portion of it is colloidal.

As per our observation & recommendation, the addition of Protec RO should help with that and you can start with 10 mg/L or match the dosage with the PTP 0100 so you can just mix half and half in the antiscalant tank without having to do other calculations.

Or consider 1.5 times the amount of PTP 0100 vs Protec RO.

After choosing the second option, Reactive Silica 200 mg/l will be removed from RO by precipitating it on the RO membrane by maintaining high pH with optimization of antiscalant dosing, but in this case, at the same time will face a calcium carbonate issue.

So, in such a critical situation we mostly consider instead of adjusting the pH we focus on Antiscalant dosing optimization, which we can see in the following images. This data is only for study purposes, there is no intention of any product marketing.

WATER CREDITS IN THE FUTURE OF WATER TECH

Dr. Subramanya Kusnur
Founder Chairman and CEO,
AquaKraft Projects Pvt. Ltd.

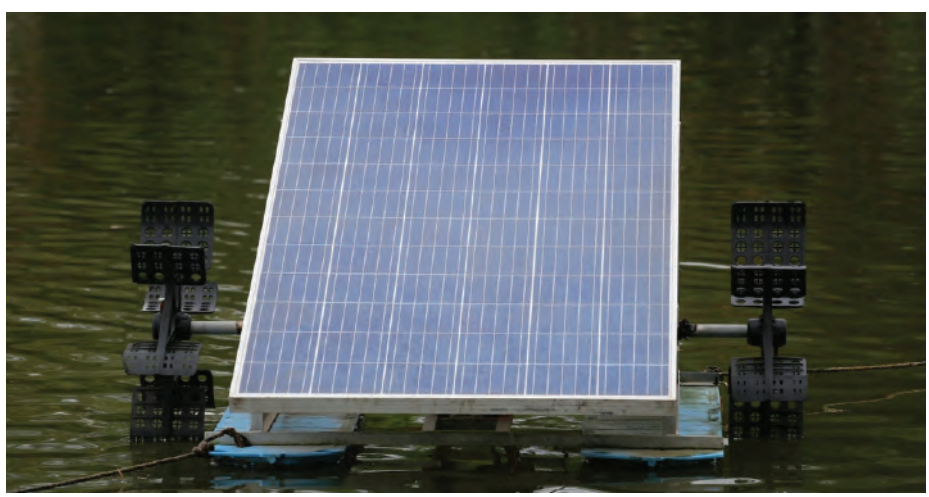
Dr. Subramanya Kusnur is a well-recognized Sustainability & Impact Leader known for his advocacy for clean drinking water & safe sanitation. He is the Founder Chairman and CEO of AquaKraft Projects Pvt. Ltd., an innovation-driven next-generation for-profit social enterprise that creates actionable solutions to drive improvements in areas of sanitation, clean drinking water, health, and hygiene across India. He has been at the forefront of advocating sustainability right since the inception of AquaKraft in 2010. Since then, he has relentlessly worked in the field of Water, promoting Green solutions, and traveled to over 7000 villages to help India achieve its dream of giving the "Right To Water" to every citizen. AquaKraft is the SDG6 member partner of the UN Global Compact Network India & The Economic Times has recognized AquaKraft as "Champions of Sustainable Solutions" in 2019 and "Best Brands 2021".

Water is an essential resource for human survival and economic development, but its availability and quality are under increasing pressure from population growth, climate change, and environmental degradation. As such, the water tech landscape of the future is expected to see rapid growth and innovation, with new technologies and business models emerging to address the challenges of water scarcity, pollution, and inefficient use.

One of the key drivers of innovation in the water tech landscape is the growing recognition of the economic value of water. Water scarcity is already a major issue in many parts of the world, and the demand for water is expected to increase in the coming decades due to population growth, urbanization, and economic development. At the same time, the quality of water resources is under threat from pollution, climate change, and overuse. This has created a need for new technologies and business models that can help to conserve, protect, and enhance the value of water resources.

One of the key concepts that are expected to play an important role in the future of water tech is water credits. Water credits are a mechanism for incentivizing and financing efforts to conserve, protect, and improve the quality and availability of water resources. Water credits are similar to carbon credits and are used to incentivize the reduction of water footprint or the saving of water.

The basic concept of water credits is simple: they are a tradeable unit of water savings generated through process improvements. An entity earns water credits by implementing water–saving or water quality–



improvement projects. Once earned, water credits can be traded on water markets or used to offset water use, pollution, or other impacts. The value of water credits is determined by the supply and demand for water savings or improvement.

Water credits can be issued for a wide range of water–saving or water quality–improvement activities, such as:

- Water conservation and reuse: Water credits can be issued for activities that reduce water use or enable the reuse of water, such as rainwater harvesting, greywater recycling, and wastewater treatment.
- Watershed management: Water credits can be issued for activities that protect and restore the health of watersheds such as pond desilting.
- Water quality improvement: Water credits can be issued for activities that improve the quality of water resources, such as pollution control, sediment management, and aquatic habitat restoration.
- Groundwater recharge: Water credits can be issued for activities that enhance the recharge of groundwater resources, such as infiltration basins, recharge wells, and spreading grounds.

Water credits can play an important role in the future of water tech for several reasons. First, water credits provide a financial incentive for entities to invest in water–saving or water quality–improvement projects. This can help to accelerate the adoption of water–efficient technologies and practices and encourage innovation in water tech.

Second, water credits can help to allocate water resources more efficiently and effectively. Water credits can be traded on water markets, which can help to ensure that water is allocated to its highest–value use. Water markets can also help to incentivize entities to conserve water, by making it more expensive to use water wastefully.

Third, water credits can help to promote collaboration and partnerships between entities that share water resources. By trading water credits, entities can work together to achieve water savings or improvement that might not be possible on their own. Water credits can also help to align the incentives of different stakeholders, such as water users, regulators, and environmental groups, around common goals.

The future of water tech is expected to see the emergence of new technologies and business models that can help to address the challenges of water scarcity, pollution, and inefficient use. Some of the key areas of innovation in water tech include:

- Water efficiency technologies: There is a growing need for technologies that can help to reduce the amount of water used in various industries and sectors, such as agriculture, manufacturing, and buildings. Water efficiency technologies can include smart irrigation systems, leak detection sensors, water–efficient appliances and fixtures, and water recycling systems. These technologies can help to reduce water use, lower operating costs, and improve water management.
- Water quality monitoring and treatment technologies: As water resources come under increasing pressure from pollution, climate change, and overuse, there is a growing need for technologies that can monitor and treat water quality. These technologies can include sensors and data analytics platforms that can detect contaminants in water, as well as treatment systems that can remove pollutants and pathogens

from water. These technologies can help to ensure that water resources are safe and healthy for human use and the environment.

- Innovative financing models: The adoption of new water technologies and practices can require a significant upfront investment, which can be a barrier to adoption for many entities. To overcome this barrier, there is a growing need for innovative financing models that can provide affordable financing for water–saving or water quality–improvement projects. Water credits can be one such financing model, which can help to incentivize and finance water conservation and improvement projects.
- Digital water technologies: The digitization of water management is expected to play an important role in the future of water tech. Digital water technologies can include data analytics platforms that can provide insights into water use and efficiency, as well as automation and control systems that can optimize water management in real–time. These technologies can help to improve water management, reduce costs, and enhance the resilience of water systems.

Water credits can be a key tool in the adoption of these and other water technologies and practices. By incentivizing and financing water–saving and water quality–improvement projects, water credits can help to accelerate the adoption of innovative water technologies, promote collaboration and partnerships between entities, and allocate water resources more efficiently and effectively.

Water credits can also help to drive the transformation of the water tech landscape. As more entities earn and trade water credits, water markets are likely to emerge, which can help to allocate water resources to their highest–value use. Water markets can also provide a transparent and efficient mechanism for pricing water, which can help to promote investment in water–saving and water quality–improvement projects.

However, for water credits to play a meaningful role in the future of water tech, there are several challenges that need to be addressed. These challenges include:

- Standardization: There is a need for standardization of water credit protocols and methodologies, to ensure that water credits are issued and traded in a transparent and consistent manner. This requires collaboration between stakeholders, such as water users, regulators, and environmental groups, to develop and implement standard protocols and methodologies.
- Verification and certification: To ensure the integrity of water credits, there is a need for robust verification and certification processes. This requires independent third–party verification and certification bodies, that can verify and certify the water savings or improvement associated with water credit projects.
- Market development: To enable the trading of water credits, there is a need for the development of water markets. This requires the establishment of market infrastructure, such as trading platforms and market participants, as well as legal and regulatory frameworks that enable water credit trading.
- Public awareness and engagement: To promote the adoption of water credits and the transformation of the water tech landscape, there is a need for public awareness and engagement. This requires outreach and education campaigns that can raise awareness of the benefits of water credits, as well as stakeholder engagement processes that can ensure the participation and support of all stakeholders.

In conclusion, the water tech landscape of the future is expected to see rapid growth and innovation, with new technologies and business models emerging to address the challenges of water scarcity, pollution, and inefficient use. Water credits are expected to play an important role in this transformation.

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SAVE THE PLANET

Anil Sethi, Chairman, Pump Academy Private Limited

If earth could speak for itself, it will certainly tell us that it is starving, suffocating and getting warmer day after day. The natural resources like water, soil, minerals, air, environment and ecological habitats are all declining. Best practices, technological intervention, conservation and care for these resources are paramount so that all living things can benefit from them now and in the future.

The ever increasing pollution and contamination of the soil has far-reaching consequences that can be catastrophic for water, air, habitations, and all living species. The food and water we need to survive is grown and drawn from the surface of the earth. Our lives are intimately tied to the earth's resources and anything that degrades, damages, or destroys it ultimately has an impact on human life and threatens our ability to survive.

The leading resource of the planet earth and source of life to all living being – water; is needed utmost attention for it to be preserved, keep clean and safe for consumption. The social and economic growth of people and nations majorly depends on the availability of water. In India, water is still treated a free commodity and sustainability plans are limited. We have taken water for granted for many years when it was available in abundance. But the scenario has changed entirely from abundance to extreme scarcity in the last few decades and we are now facing a tough challenge in getting clean water to drink at many places in the country. Major cities are facing water stress and staring the 'day zero' scenario. Many of us still do not think that how much of this finite resource we over consume from the earth resources and does not realize that clean water is a very precious commodity.

A pioneering effort has been taken by the Ministry of Jal Shakti that has conducted the first-ever census of water bodies in India across the country. The census provides a comprehensive inventory of India's water resources, including natural and man-made water bodies like ponds, tanks, lakes, and others and to collect data on the encroachment of water bodies. The Census also highlighted disparities between rural and urban areas and varying levels of encroachment and revealed crucial insights into the country's water resources. It reveals that 24,24,540 water bodies have been enumerated in the country, out of which 97.1% (23,55,055) are in rural areas and only 2.9% (69,485) are in urban areas. The survey found that 55.2% of the total water bodies are owned by private entities whereas 44.8% of water bodies are in the domain of public ownership.

The Govt. of India is taking multidimensional approach towards water sector. It is spearheading the ambitious Jal Jeevan Mission program for providing safe and adequate drinking water to every household in the country, eliminating open defecation in rural areas, rejuvenation of river Ganga and its tributaries, improving the safety and operational performance of existing dams and water bodies etc. While it is also involved in assessment, development and regulation of the country's water resources through technical guidance, scrutiny, clearance and monitoring. The earth's most precious resource need focused attention and such efforts in right direction will certainly help in mitigating the scarcity challenges for a better water sustainability in the long run.

Technology to Support Sustainability

In this era of new technological innovations and digital interventions, there are potentially huge advantages which have to be evaluated and implemented for water management in India as much as possible. Apart from other smart interventions, an enabling solution for accelerating the transition from traditional pumping system to smart and digitally integrated pumping system for effective water distribution management has become inevitably significant in the current times.

One such technology for water pump optimization is iPUMPNET. It is an advanced technological solutions for making pumping system smart and intelligent ranging from the operational efficiency, reducing energy cost, extending life of pumps, minimizing life cycle cost of pumping system and practically eliminating breakdowns and frequent maintenance requirements with powerful analytics. It also helps in environmental sustainability by significantly reducing carbon footprint of pumping station and reducing risk of accidents thus increasing workers safety.

The cost effective solution once implemented in a pumping station will not only yield good financial returns but the investment on iPUMPNET can easily get the break-even within a year. It will help all water utilities in India to remotely monitor their pump operations and save on time and money while conserving their precious resources to serve their valued customers. It is estimated that around 5 GW of energy can be saved if iPUMPNET is put in use in all pumping stations across all water utilities and municipal water supply systems in India. It is a huge benefit not only in terms of saving electricity and cost, but it will reduce thousands of tonnes of carbon emission thus helping the earth to breathe and minimize climate change effects and global warming.

The efforts by the Pump Academy Private Limited by introducing this pioneering solution, iPUMPNET to optimize pumping station operations with the patented IoT enabled innovative system is in line with the vision of our Hon'ble Prime Minister to revitalize a sustainable green world at the 26th United Nations Framework Conference on Climate Change in Glasgow, wherein India is committed to achieve net-zero emissions by 2070. This innovative solution will play an important role in achieving India's commitments to the world which also emphasize this year's theme, 'Invest in our Planet' while making earth a better place to live.

The Earth needs special attention from every one living on the face of it to sustain for now and in future. The efforts of sustainability could be supported by thoughtful intervention of technology and science.

SAVE EARTH:
HARNESS THE SOLAR POWER

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

The earth started recuperating itself three years ago when coronavirus pandemic lockdowns across the globe forced to stop all commercial and other activities. The nature's recovering trail did show us that it could repair the damage inflicted due to excessive pollution, unsustainable use of resources, dumping of industrial and domestic solid and liquid waste, irresponsible chopping of trees, and every possible abuse. The lockdown has turned the skyline clearer, lakes and rivers were visibly purer, melting of glaciers stopped and the endangered flora and fauna started coming back to life. It cleared the air pollution to the extent that Himalayan range which is more than 100 miles away from Punjab was clearly visible with the naked eyes. The table has turned again now with earth's natural resources air, water, soil, and plants etc. started facing the assault of our activities.

Water: Vital Resource on Earth

Water is indeed a vital resource for all human activities, from survival to commercial, industrial and financial. It is essential for supporting life on earth and plays a critical role in producing food and products to even generating energy. The taken for granted approach has inflicted perennial damage to this natural resource and now a large population in the world has started facing the impact of water stress. On Earth Day, we are reminded of the current and emerging challenges and the theme of this year, "Invest in our Planet" has been designed to create awareness related to the environmental problems and calling out all governments, businesses, and citizens around the world of the need to invest to improve the liveability on earth and give our descendants a better and safer future.

We know that agricultural and industrial water consumption places heavy pressure on the world's limited water supply. In fact, these two sectors together consume approximately 90% of total water withdrawals. The World Bank has estimated that water demand is expected to exceed current supply by 40% by 2030 – just seven years away! The current water scarcity is mainly caused by unsustainable use and mismanagement of water resources.

Why should we care?

India, which has recently become the world's most populated country outpacing China, which has been the most populous country since at least 1950 as reported by the Wall Street Journal citing UN's world population projections. With the current population of 1425.77 million, it is an uphill task to provide essential resources including water to all the people when almost 80% of the surface water is polluted and we still dispose almost 70% of wastewater untreated into our water bodies. If we continue with the current practices of treating water ruthlessly, the predictions of the Water Ministry that per capita water availability will

reduce by 36% in 2025 and 60% by the year 2050 from the level of 2001, may become a reality much earlier than predicted.

The total water demand in India is expected to rise by over 70% by 2025; a huge demand-supply gap is expected in the coming years. Rapid urbanization, steady commercial and economic growth, changing life style has intensified the demand of clean water, while also increasing the load of generated sewage. The demand for water in Class I and Class II cities is expected to increase to 110,000-120,000 MLD by 2025 and sewage generation is expected to increase to over 87,000-97,000 MLD by the same year. On the other hand, the industrial demand for water is expected to increase multifold, with a larger share coming from water-intensive sectors such as power, steel, paper and pulp, textile and oil refineries. It is estimated that almost 640 million people in three-quarters of Indian districts are facing severe water-related stress, and the number is increasing.

Water is integral to our survival and livelihood but the last few decades witnessed the unprecedented use that saw surface and ground water quality deteriorating due to human-related activities such as mining, livestock farming, industrial, municipal and agricultural waste disposal, soil erosion and chemical and heavy metal pollution. India, one of the 17 countries facing the highest levels of water stress in the world, has seen extraordinary pressure on water resources in recent years.

To address the emerging challenges, it will be necessary to make significant investments in sustainable water and wastewater infrastructure and adopting innovative technologies to avoid economic losses. If action is not taken now, the situation is likely to deteriorate further by 2050 with demand exceeding supply leading to a likely 6% loss in India's GDP.

Renewable and Sustainable Action

An important aspect that can help India manage its water resources is the use of sustainable technologies such as renewable energy for water treatment. Energy is one of the basic needs of water treatment and supply infrastructure. The consumption of fossil fuels to generate energy has resulted in serious ecological problems with climate change becoming a threat to not just natural habitats but the health of all living creatures. Tackling this challenge with the energy from renewable sources like solar, has led to a focus on renewable energy use for sustainable growth. In addition to being clean energy, solar powered water treatment system require zero conventional energy enabling India to meet its power needs for other sectors without carbon emissions or consuming water to generate more thermal energy.

Aquality Water Solutions Pvt. Ltd. has been leading the initiative to make clean drinking water available to people, security forces and other establishments globally including human habitats in African and Middle Eastern Countries by using the pioneering solution of Solar Powered Water Filtration System. The solar powered system has high speed water filtration unit that can purify water from practically any source, such as hand pumps, swamps, wells, floods, rivers, and even wastewater making it an ideal source of clean water without much investment. The embedded innovative technology utilizes high purification techniques to make water absolutely clean leaving containments behind, resulting in producing high grade water suitable for drinking at any place without the requirements of conventional electricity.

The purification device is compact, around the size of a big box, has low power requirements and no removable parts that need to be maintained or replaced. The best part of the system is, it can even reclaim the wastewater to be used in toilet flush in all Swacch Bharat Mission toilets that has been constructed but not being used properly due to lack of water.

The technological advanced treatment system will not only reduce the logistical challenges of transporting bottled water, but it will also reduce the risk of waterborne diseases affecting millions of people while ensuring constant clean water supply to all far-flung places wherever our security forces are deployed or even at villages where availability of clean water is a challenge due to electricity. Adopting water purification systems at a large scale can help us use fewer resources from the earth depository and reduce the amount of waste generated. It can also help reduce the amount of water that is wasted and reduce the amount of energy required to treat and transport water. In this way, using solar powered water purification systems can be a true tribute to the earth.

Website: www.aquality.co.in, LinkedIn: www.linkedin.com/in/naserazeez/

Earth's Natural Resources:

SAVE TO SURVIVE

Mohammed Abdul Rahman, CEO, Sahara Industry

Earth Day is an annual event celebrated on April 22 every year to raise awareness about earth and the importance of protecting its natural resources. The Earth Day theme is announced every year by earthday.org, which was founded in 1970 by a group of environmental activists who were concerned about the impact of industrial development on the environment. Currently the organization has partners in over 192 countries to drive positive action for our planet.

Earth Day was first celebrated in 1970 in the United States, inspired by the devastating oil spill in Santa Barbara, California, in January-February 1969. An estimated 13.64 million litres of crude oil were spilled into the ocean creating a 35 miles long oil slick along California's coast that killed thousands of birds, fish and sea mammals. That year, at a UNESCO conference, peace activist John McConnell proposed a day to honor the Earth and the concept of peace.

Earth Day is a day of action and a reminder for everyone to reflect on the impact of human activity on the planet. It is also a day to celebrate our beautiful planet and take action to preserve it. The theme for 2023, 'Invest in Our Planet' was conceived to persuade nations, government organizations, industries, and common citizens around the world to invest in our planet to improve the environment and give our children a better and safer future.

Water: The Most Vital Resource

Water is most useful among earth's resources, vital for life and livelihood. Clean water is an essential need for human and all living objects for drinking and sanitation, producing of food and products, industrial and economic activities, and creating and sustaining the ecosystems on which all life depends. However, the accessible freshwater resources found in rivers, lakes, wetlands, aquifers, and other water bodies accounts for less than one per cent of the world's total water. With the limited resources, ever increasing global population, the demand for water is increasing multifold.

The climate change effects and global warming is altering weather patterns causing shortages and droughts in some areas and floods in others. With current consumption rate, this situation will only get worse and it is estimated that two-thirds of the world's population may face severe water scarcity by 2025, in just two years from now. At the same time, human activity and unsustainable practices are affecting freshwater resources in many ways.

Water Pollution

Water pollution can have several

Earth surface with water

50 M³ hr Reverse Osmosis Plant Installed in Logistic Park, Hyderabad

Industrial Water Treatment Plant

adverse effects on earth's surface and surrounding environment while also negatively impacting human health. According to a report by Lancet, over five lakh deaths occurred across India in 2019 due to water pollution. Globally, water pollution is responsible for 1.4 million premature deaths a year. It is also estimated that around 37.7 million Indians are affected annually by water-borne diseases like cholera, acute diarrheal diseases (ADD), typhoid and viral hepatitis etc. Another consequence of water pollution is the loss of valuable species and biodiversity. Water pollution can also have ecological effects on communities. It can lead to destruction of aquatic ecosystems and disruption of food chains.

Consider the situation in India where an estimated 73,000 million litres of municipal wastewater is generated every day in class I and class II cities only and over 70 per cent of it never receives any kind of treatment before disposal into water bodies. Similar situation is with industrial wastewater as well, although a lesser margin of its direct disposal is estimated. Water Aid, working on water, sanitation and hygiene sectors finds that an alarming 80 per cent of India's surface water is polluted. Central Pollution Control Board estimates that 75-80 per cent of water pollution by volume is from domestic sewage, while untreated sewage flowing into water bodies including rivers have almost doubled in the recent years. Wastewater treatment has become essential to not only address the shortage of fresh water but also saving the surface and ground water sources from further contamination.

Sahara Industry has been promoting the integrated water management and established itself as a leading system provider for water and wastewater treatment with application of technology, exceptional quality, best practices and sustainable long-term solutions. With NSF certified products for water treatment, it has contributed immensely by making water safe for drinking, industrial and institutional purposes.

The ISO 9001:2015 certified company; it has employed technologically advanced machineries and manufacturing solutions combined with professional and well-qualified engineering teams to achieve the feat of being an indigenously creator of advanced water and wastewater treatment solutions matching with world standards.

The Earth Day is a call for action to protect the planet by adopting and implementing solutions that will help it restore its natural resources. Clean water is a precious resource and we must act in harmony to use it wisely and protect it from pollution and contamination. At Sahara Industry, we are committed to follow environment friendly practices and together, we can make a difference to protect the earth and its beauties.

FRP Pressure Tanks for Water Treatment

The Smart *Water Revolution* Is Here

Discover how LIQUICLEAR

is paving the way for purely natural water using Innovative LDI Technology

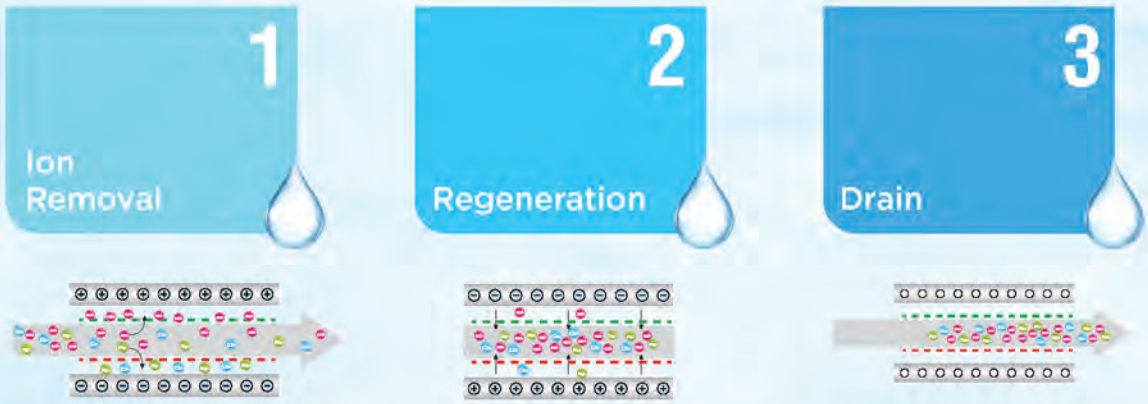
Are you mindful of your water consumption?

Do you know if your water has minerals that are vital for your body? With the blistering heat, you must ensure you drink water that fulfils your body's needs. If any of these questions have left you feeling uncertain, keep reading to learn how you can experience the benefits of mineral-rich water with our state-of-the-art technology.

Liqui De-ionization (LDI):

The Next-Generation Water Purification Technology

Liqui De-ionization (LDI) is an innovative and cutting-edge technology that has been gaining widespread attention for its potential to revolutionize water treatment. LDI works by using a pair of parallel electrodes, typically made of carbon, that are separated by a porous membrane. When an electric field is generated, the ions in the water are attracted to the surface of the electrodes and held there by the electric charge, reducing the concentration of ions in the water, and resulting in deionized water.



The advantages of LDI include low energy consumption, environmental friendliness, the ability to treat brackish water, and its modular design. LDI has the potential to revolutionize the water treatment industry by providing a more sustainable and cost-effective solution for water purification and other water treatment needs.

LDI
Electronic Water Purifier:

Enjoy Mineral-Rich Purified Water with Zero Wastage

LDI Electronic water purifiers

are revolutionizing the way we purify water. The technology uses an electric field to remove ions and impurities from water, resulting in mineral-rich purified water.

Here are some of the advantages of LDI water purifiers:

Energy efficient:

LDI water purifiers use 1/3 of the electricity compared to traditional water purifiers.

Tunable TDS

LDI water purifiers gives the consumer choice to choose what TDS water he or she wants to consume and tune the TDS of output water to their desired needs.

Retains essential minerals:

LDI water purifiers provide mineral-rich and naturally alkaline water, which is a good way to supplement the body with essential minerals and promote overall health and well-being.

High Water Recovery:

LDI water purifiers are effective in removing a wide range of contaminants from water, including dissolved salts, heavy metals, and organic compounds without wasting too much water. LDI conserves around 80-85% of water, which means that if you purify 1 liter of water with LDI, you will get 800-850 ml of water and waste around 100-150 ml only.

Cost effective:

LDI water purifiers do not require any consumables such as replacement filters or membranes, which makes them cost-effective. The only maintenance required is periodic cleaning of the electrodes using a cleaning solution, which is an automatic process and is pocket friendly.

Easy to install and operate

LDI water purifiers are also easy to install and operate as they require minimal plumbing and can be connected to any water source with a standard inlet/outlet.

Overall, LDI water purifiers are a reliable and efficient water purification solution for both residential and commercial applications.

LDISF Electronic Water Softeners:

Say goodbye to hard water naturally, without resin and without salt

LDISF Electronic Water Softeners

offer an advanced and effective solution to treat hard water which has negative impact on household appliances, plumbing systems, and can also lead to certain health problems indirectly. Liqui Deionization (LDI) technology is a breakthrough in water softening and removes hardness in water without resin and without salt.

Here are some advantages of LDISF (Electronic water softeners):

1 **No Salt/Resin required:** Electronic water softeners do not require the use of salt or Resin or any other chemicals to treat hard water. This makes them an environmentally friendly and a hassle-free option where one does not need to change the Salt and Resin regularly.

2 **Reduces TDS too:** Unlike traditional salt-based water softeners which only reduce hardness in water, LDISF also reduces the TDS in water, that too by **50%.**

3 **No regeneration required for hassle-free operation:** LDISF electronic water softener doesn't require any regeneration and provides hassle-free operations.

4 **Fully automatic:** The fully automatic PLC-based electric softeners make water treatment easy and hassle-free.

Overall, LDISF electronic water softeners offer numerous advantages as compared to traditional salt/resin based water softeners. They are a low-maintenance, cost-effective and environment-friendly solution for treating hard water in a home or commercial setting.

Water plays a critical role in sustaining all forms of life, and it is essential for carrying out various bodily functions. Hence, it stands as a fundamental resource for the survival of humans.

It's our responsibility to ensure that we have access to safe and healthy drinking water. LDI technology provides an innovative and advanced solution to an issue we all are facing today i.e. how to 'SAVE WATER'. LDI technology can deliver clean, soft, and mineral-rich water for you and your family. It's time to make the switch to LDI and enjoy the benefits of this next-generation Water Purification and Water Softening technology.

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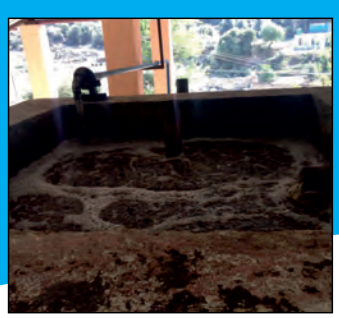

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PUMP ACADEMY PRIVATE LIMITED SIGNED MoU WITH JSS ACADEMY OF TECHNICAL EDUCATION, BENGALURU FOR INDUSTRY-ACADEMIC COLLABORATION

Bengaluru, April 22, 2023: Pump Academy Private Limited (PAPL), a leading provider of pump optimization solutions in India, has signed a Memorandum-of-Understanding (MoU) with JSS Academy of Technical Education (JSSATE), Bengaluru. The MoU aims to establish a strong industry-academic collaboration for knowledge partnership and focused research to create a vibrant ecosystem to foster technology entrepreneurship among students and incubation of start-ups in the field of pumps operations and pumping system management; and Internet of Things (IoT) enabled Industry 4.0 and Industry 5.0 revolution in the country.

The MoU was signed on April 21, 2023, by Mr. Anil Sethi, Chairman of PAPL, and Dr. Bhimasen Soragaon, Principal of JSSATE. The signing ceremony was witnessed by senior officials from PAPL, Dr. H R Mahadevaswamy, Joint Director, TED, JSSMVP, Mysuru, HoDs, Deans and faculties of JSSATE, Bengaluru. The collaboration aims to facilitate research and development for deep learning in design innovation, creative thinking, and adopting artificial intelligence to equip pump machineries with predictive analytics, performance improvement, and enhanced energy efficiency.

The Indian pump industry is a significant contributor to the country's growth and is expected to reach USD 3.3 billion by 2026, growing at a compound annual growth rate (CAGR) of 7% during the period of 2020-2026. Under the MoU, both parties will formulate strategies to incorporate the end user's perspective early on and make the solution more contextually relevant. They will also jointly conduct skill development programs, knowledge exchange through workshops, trainings, seminars, and faculty development programs in a timely manner for developing contemporary solutions for sustainable water pumping systems.

Mr. Anil Sethi, Chairman of PAPL, expressed his happiness over the signing of the MoU and said that the rapid urbanization trends in India, combined with depleting groundwater levels and government initiatives to improve water supply, have led to the rapid growth of the pump industry. He added that the association with a leading engineering and technology institution will certainly help bright minds work together and drive new and innovative ideas for the pump industry. Mr. Sethi further stated that their association with JSSATE would support the students and faculty members with industry visits, internships, skill development, and hands-on experience on project execution, seminars, and other benefits.

The MoU between PAPL and JSSATE will pave the way for exciting new ventures and innovation across the pump industry, bringing together the most up-to-date technological solutions for the benefit of the nation.

For more information,
interested parties can contact Mr. Chandramohan MS
at chandramohan@pumpacademy.in
or visit the company's website at
www.pumpacademy.in

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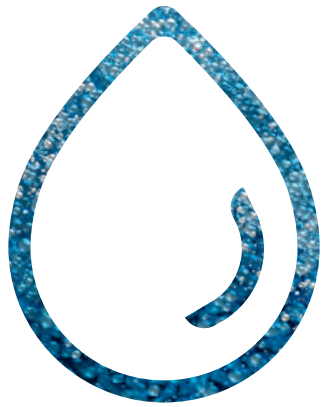

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Chennai Trade Centre, Nandambakkam, Chennai, India
www.renewableenergyexpo.biz

Water & Solid Waste Expo 2023
16–18 February, 2023
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Pragati Maidan, New Delhi
www.watersolidwaste.com

WAPTAG Water Expo 2023
23–25 March, 2023
Venue:
India Expo Center, Greater Noida, India
www.waptag.org

Smart Cities Expo 2023
27–29 March, 2023
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www.waterindia.com

Convergence India Expo 2023
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www.convergenceindia.org/

SRW India Water Expo
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Venue: Chennai Trade Centre, CHENNAI TRADE CENTRE, Ramapuram, Tamil Nadu
www.waptag.org

Water & Plump Skills Expo 2023
18–19 May, 2023
Venue:
Pragati Maidan, New Delhi, India
www.plumbskillsexpo.com

Water Today's Water Expo 2023
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Venue: Chennai Trade Centre, Chennai, India

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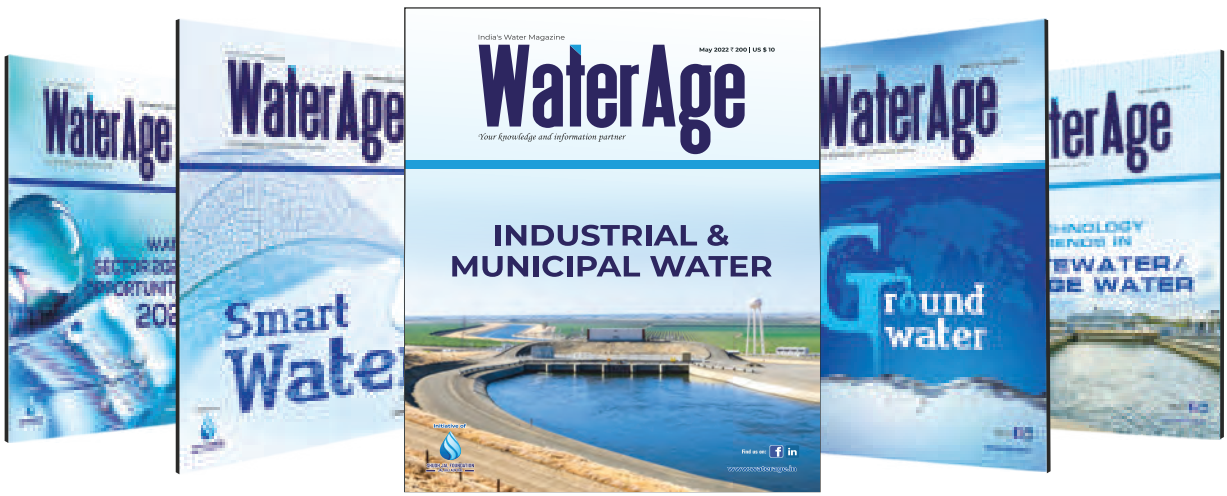

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Buyer/Seller:
Karnataka Co.Operative Milk Producers Federation Limited

Ref. Number: 58710838
Tender Number: KMF/ENGG/TUMUL–MEGA DAIRY/2022–23
Requirement: Design, Supply, Installation, Testing & Commissioning of Steam generation system, including steam header, steam piping, PRS insulation, structural Support & other utilities like Air compressor, water Treatment plant, suitable for 10LLPD expandable to 15LLPD capacity liquid milk processing plant along with 3LLPD capacity condensing plant, 1.5LLPD capacity curd plant on turn key basis for Tumkur Milk Union.
EMD: INR 2,200,000
Closing Date: 12/05/2023
Location: Tumkur – Karnataka – India

Buyer/Seller:
Bhiwandi Nizampur Municipal Corporation

Ref. Number: 58580291
Tender Number: 87/2022–2023
Requirement: Augmentation to bhiwandi nizampur water supply 100 MLD scheme for Construction of jack well, over head pump house, retaining wall, sub station, rcc bridge, raw water and pure water MS rising mains, conventional WTP
Closing Date: 09/05/2023
Location: Bhiwandi – Maharashtra – India

Buyer/Seller:
Haryana State Industrial And Infrastructure Development Corporation Limited

Ref. Number: 58392324
Requirement: Construction of 57 MLD WTP and all contingent works there to in all respect along with 120 months of operation and maintenance at IMT kharkhoda, district sonipat
Closing Date: 03/05/2023
Location: Sonipat – Haryana – India

Buyer/Seller:
Haryana State Industrial Development Corporation Limited

Ref. Number: 58151818
Tender Number : 2023_HBC_264464_1
Requirement: Construction of 57 mld wtp ... planning, design, engineering, procurement, construction, installation, testing, commissioning of 57 mld water treatment plant (wtp) alongwith oand m of 10 years at imt kharkhoda
Tender Detail: Construction of 57 Mld Wtp ... #*. Planning, Design, Engineering, Procurement, Construction, Installation, Testing, Commissioning of 57 Mld Water Treatment Plant (Wtp) Alongwith Oand M of 10 Years at Imt Kharkhoda
Document Fees: INR 50,000
EMD: INR 10,281,000
Closing Date: 03/05/2023
Location: Karnal – Haryana – India
Contact Details: Haryana Board Corporation||hsiidc||kharkhoda||industrial Area kharkhoda

Buyer/Seller:
Madhya Pradesh Power Generation Company Limited

Ref. Number: 58772465
Tender Number: 2023_MPPGC_257602_1
Requirement: Work contract for routine maintenance of system and equipments of wt plant, pt plant and pump house, clarified water and filter water pump house, cw pump house, raw water pump house, dozing system (hp, lp dozing pumps) etc. of 210 mw atps
Document Fees: INR 1,000
EMD: INR 43,000
Tender Estimated Cost: INR 2,151,318
Closing Date: 01/05/2023
Location: Chachai, Madhya Pradesh, India
Contact Details: Madhya Pradesh Power Generating Company Limited||chief Engineer(gen.)–amarkantak Thermal Power Station, Chachai, MPPGCL ATPS Chachai

Corrigendum – 1
Published On: 02/05/2023

Corrigendum Details: Deadline has been changes from May 1 2023 12:00AM to May 8 2023 12:00AM
Corrigendum Document: Available Corrigendum Document For Download
Buyer/Seller: Panchayat Raj Department
Ref. Number: 59437877
Tender Number: 2023_HRY_276380_1
Requirement: Village Jailaf,block– Narnaul, Laying of Rcc Waste Water Pipe Line
Tender Estimated Cost: 409,000
Closing Date: 08/05/2023
Location: Narnaul – Haryana – India
Contact Details: Haryana Government||panchayati Raj Haryana||xen Panchayati Raj Narnaul jailaf

Corrigendum – 1
Published On: 02/05/2023

Corrigendum Details: Deadline has been changes from May 1 2023 12:00AM to May 8 2023 12:00AM
Corrigendum Document: Available Corrigendum Document For Download
Buyer/Seller: Panchayat Raj Department
Ref. Number: 59438550
Tender Number: 2023_HRY_276419_1
Requirement: Village Dohar Khurd, Block– Narnaul, Laying of Waste Water Pipe Line From H/o Lalchand S/o Ramchander to Pond
Tender Estimated Cost: 607,000
Closing Date: 08/05/2023
Location: Narnaul – Haryana – India
Contact Details: Haryana Government||panchayati Raj Haryana||xen Panchayati Raj Narnaul Dohar Khurd

Company	Page No.	Telephone	E–mail	Website
Aadys Components Pvt. Ltd.	1	+91 11 4155 1444	sales@aadys.co.in	www.aadys.co.in
Amikon Blowers & Systems Pvt. Ltd.	5	+91 11 41516313, +91 9311108295, +91 9311108296	amikonblowers@gmail.com, info@amikonblowers.com, sales@amikonblowers.com	
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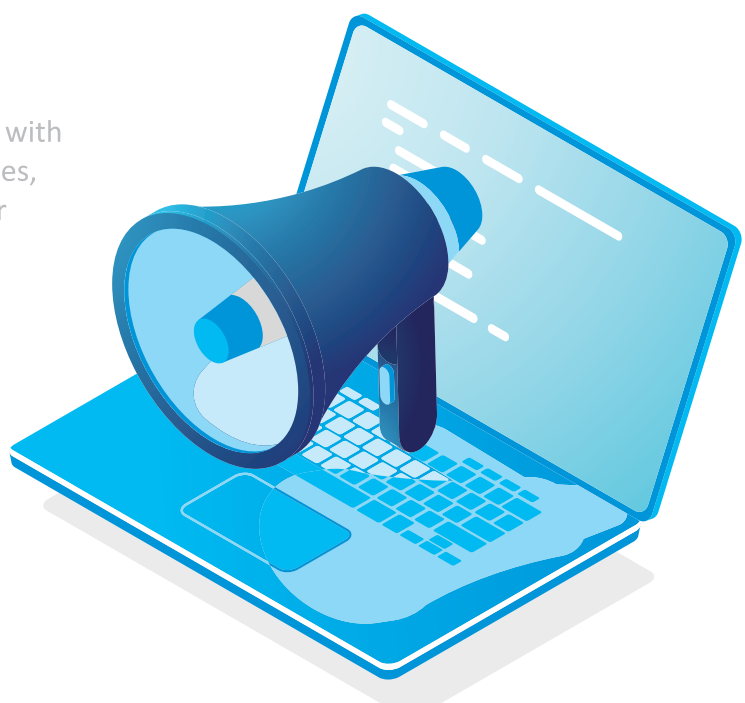

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