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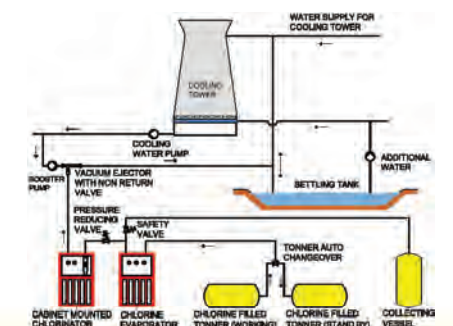
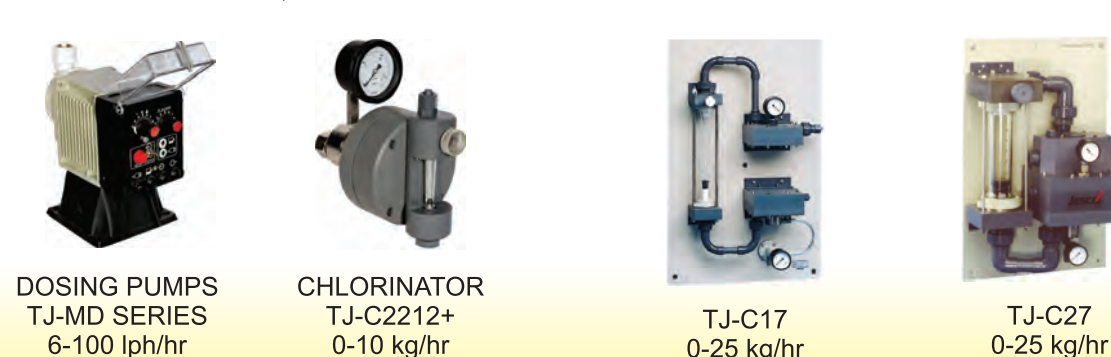
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IN THIS EDITION



REGULARS

- 04** Editorial Stream
- 06** Global Water News
- 74** The Ozone Page – Column
- 75** Subscription Card – Everythingaboutwater
- 76** Tender News
- 78** Advertisers' Index

ADVERTORIAL

- 14** RIDETHE FUTURE OF WATER 4.0 WITH TAIWAN EXCELLENCE
- 18** Interview with Mr. H.C. Gupta, CMD, Roto Pumps.

INDEPTH

- 22** SEWAGE WATER TREATMENT AND WASTE WATER MANAGEMENT
Dr. Anil Kumar Mishra, Bacteriologist, Delhi Jal Board, Govt. Of Nct, Delhi
- 26** NOTE ON SEWAGE WATER TREATMENT AND WASTE WATER MANAGEMENT
By Dushyant Jindal, Co-Founder, Hitech Enviro Solutions
- 30** OPPORTUNITIES TO STRENGTHEN THE EFFICIENCY OF THE INDIAN WASTEWATER MANAGEMENT SECTOR
By Sanjeev Sirsi, Head – Municipal Business – INDO Region, Water Utility, Grundfos India
- 32** SEWAGE WATER TREATMENT AND WASTE WATER MANAGEMENT
By Gowthaman Desingh, Director – Technology, Transwater Systems

- 34** PROMOTING APPROPRIATE LOW COST & LOW MAINTENANCE WASTEWATER TREATMENT SOLUTIONS
By Santwana Sneha, Board Member, FINISH Society
- 40** DECENTRALIZED SEWAGE TREATMENT PLANT
By Arya Water Technologies
- 44** SOLAR POWERED WASTE WATER MANAGEMENT (WWM)
By Dilip Yewalekar and Manisha Kinge, Jain Irrigation Systems Ltd., Jalgaon India
- 48** SUSTAINABLE WATER MANAGEMENT WITH REUSE OF WASTEWATER
By Ms. Janshi.G Murugappa, Organo Water Solutions Private Limited
- 52** MUNICIPAL WATER MANAGEMENT – A PERSPECTIVE
By Subhash Sethi, Chairman, SPML Infra Limited

TECH20

- 58** SPECIALTY SOLUTION FOR EFFICIENT SEPARATION OF OIL FROM PRODUCED WATER
By Amit K., Prabhat R., Pushkar S., Sanjeev G., Hiten M., Water application and product development centre, Grasim Industries Ltd., Bharuch, Gujarat, India
- 62** INITIATIVE TO MODIFY THE EXISTING TREATMENT UNITS WITH NEW ADVANCED TECHNOLOGIES
By Hemalatha A G, Water Management SME, Embassy Services

CASE STUDY

- 66** GROUND WATER EXPLORATION IN HIGH ALTITUDE AREA OF JAMMU & KASHMIR
By S. K JUNEJA, Central Ground Water Board, New Delhi
- 70** FLUORIDE ISSUE IN GROUNDWATER, ITS HEALTH IMPLICATIONS AND WAY FORWARD
By Ranjit Kumar, IVLP Fellow (Water Pricing and Water Economics), USA, Water Expert, KPMG



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FINDING THE BALANCE

The success of water management lies between maintaining a balance of water treatment and waste water management. The availability of water is crucial and will be a deciding factor in future regarding the economic and social development. We cannot deny that in future there may be a threat of world war three around the issue of water availability and water will be a key political agenda in global politics. Increasingly, water is now seen as a strategic resource – one to be used with caution and managed with care. After all, water availability may be what will differentiate the haves and have-nots.

India is a water stressed state and here demand management is better option than augmenting water supply – it is less capita intensive and more environment friendly. Raw water costs

have been increasing in the last few years in many parts of the country. In some areas, the price is as high as 60 rupees per cubic meter. Further, in water scarce areas, industries have no option but to close down their operations if they are using outside water. Similarly, certain cities and municipalities have been dealing with water quantity and quality issues since many years.

One of the solutions to these problems is to have a better co-ordination between water treatment and waste water treatment projects. The Government of India launched the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) with the aim of providing basic civic amenities like water supply, sewerage, urban transport, parks as to improve the quality of life for all especially the poor

and the disadvantaged. The focus of the Mission is on infrastructure creation that has a direct link to provision of better services to the citizens. Launched on June 25, 2015 by Prime Minister Narendra Modi, AMRUT completes its mission period in March 2020. The government's flagship initiative promises 139 lakh water connections by March 2020, 145 lakh sewer connections and storm water drainage projects with a total outlay of INR 776,400 million (including central assistance of INR 359,900 million).

The mission has five thrust areas with the top stated priority being water connections and enhancing water supply capacity. Almost 50% of the total mission outlay has been allocated to water supply sector. Water supply projects worth Rs 338,570 million

have been grounded and INR 38,630 million projects have been completed. In sewerage and septage management, projects worth INR 268,670 million have been grounded and INR 20,530 million have been completed.

Similarly on a micro level, many industries have realized that the waste water within their industry might be the cheapest and reliable source to fulfill their water needs. A natural evolution towards the solution is the concept of Zero Liquid Discharge, where industries completely reuse every drop of processed water and nothing is discharged outside the unit. Reusing water for bulk consumption needs is very important and also to find a balance between water treatment and sewage treatment, and between using and saving water.

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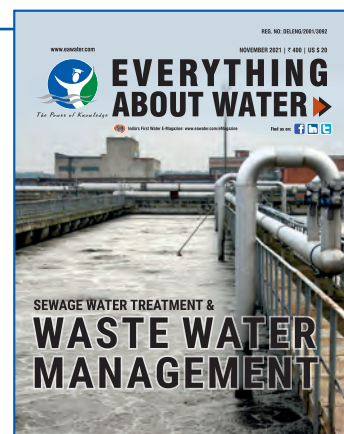
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Snippets

PUROLITE ANNOUNCES PRICE INCREASE FOR ION EXCHANGE, CATALYST, ADSORBENT AND SPECIALTY HIGH-PERFORMANCE RESINS

King of Prussia, Pennsylvania, November, 2021:

Purolite Corporation is implementing a global price increase for its ion exchange, catalyst, adsorbent and specialty high-performance resins in the Core Technologies business (residential, municipal, commercial and industrial). Given recent severe cost increases, Purolite is assessing the impact and will be implementing a global price increase accordingly. The increase is effective January 1, 2022 or as contracts allow.

Since the beginning of 2021, Purolite has experienced increasing raw material, freight and packaging costs. Chemical prices have seen a significant inflationary period. This impacts styrene, DVB, acids, bases, amines and other ethylene-based chemicals. Freight, both domestic and internationally, has increased significantly, especially ocean container rates. Prices of lumber, paper and steel have hit record highs driving up packaging costs.

LANXESS again with leading positions in Dow Jones Sustainability Indices

Mumbai, November, 2021: LANXESS once again convinces in terms of sustainability: The specialty chemicals company placed first in the Dow Jones Sustainability Index (DJSI) Europe in the “Chemicals” category, scoring 87 out of 100 points. In the DJSI World, LANXESS came in second place. The Group achieved particularly good results in the areas of product stewardship, management of water related risks and human rights.

“We want to play an active role in the transformation of the economy and global value chains towards a more sustainable world,” said Hubert Fink, member of the Board of Management of LANXESS AG.

The Dow Jones Sustainability Indices evaluate

Alstom inaugurates new components manufacturing facility in Coimbatore, India



16 November 2021: Alstom, a global leader in sustainable and green mobility solutions, inaugurated its new components manufacturing facility in Coimbatore, in the presence of Emmanuel LENAIN, Ambassador of France to India and Alain SPOHR, Managing Director, Alstom India & South Asia. This is the largest components manufacturing facility in Asia and is dedicated to improving industrial efficiency in manufacturing components for various prestigious national and international projects.

Alstom's industrial presence in Coimbatore has evolved across 3 sites since 1978. This new site is spread over a total area of 15 acres and has an installed capacity of 2.1 million hours, that will offer a higher degree of production diversity & complexity – integration & testing of tractions, auxiliary converters, cubicles, driver desks and Rolling Stock looms. The site will create 10,000 direct & indirect jobs and currently has a gender diversity rate of 20%.

The Coimbatore site currently delivers not just to Alstom's Indian sites but also to major sites across 5 continents – Asia, Australia, Europe, North America and South America. Some of the key countries include – France, Canada, Italy, Belgium, Germany, Netherlands, Saudi Arabia, Vietnam, UAE etc.

Speaking at the inauguration, Alain SPOHR, Managing Director – Alstom India said, “Our presence in Coimbatore dates to the 1970s and since then we've grown multifold. The opening of this facility is a testament of our commitment to the government's flagship ‘Make in India’ & ‘Atmanirbhar Bharat’ initiative. With our enhanced capabilities and a team of talented and dedicated employees, we are proud to be a catalyst in India's manufacturing led growth story. We have been the preferred mobility partner on various Indian projects and are keenly looking forward to becoming a leading supplier of components across Alstom's sites globally.”

Marvelling at Alstom's commitment to India, at the inauguration of the large-scale setup with modern equipment and amenities, Emmanuel LENAIN, Ambassador of France to India, said, “French companies are fully committed to ‘Make in India’ and speeding ahead on the back of strong bilateral relations between the two countries. It is heartening to see India's manufacturing prowess powering global mobility. I salute the efforts and investments made by Alstom over the years in India towards building a strong base of

ATER NEWS

November 2021

sustainable mobility solutions and high localization, while creating a positive impact on the people and communities”

In line with Alstom’s Sustainability Goals for 2025, this site has undertaken several sustainability measures like – targeting 80% of regular activities to be run on green energy, utilize 100% of natural light during daytime, rainwater harvesting, reusing 100% of the sewage treated water, etc. The factory also boasts of a stellar record in safety. Cumulatively, the factory has successfully achieved 10+ years of ‘accident free’ man days.

In line with its commitment to contributing sustainably to communities in need, Alstom is taking up various projects around the factory. With the objective of reaching out to a total of over 100,000 direct beneficiaries, the company has pledged INR 3 crores for various CSR projects in the next 3 years. Some of these activities include – Water conservation, sustainable rural living and youth skilling.

With this stronger industrial & commercial base with the purpose to offer a broad range of components, Alstom is much stronger to address mobility needs of India and the world.

KBL Received Patent for Double Suction Concrete Volute Pumping Assembly

- » It will help the company offer its Concrete Volute Pump with reduced submergence
- » Concrete Volute Pump Offers High Reliability up to 99.95% and Eliminates corrosion



Mumbai, November 2021: Kirloskar Brothers Limited (KBL), a world leader in providing fluid management solutions, successfully received a patent for its Concrete Volute Pumping Assembly. This patent is a significant milestone as it will help the company offer its Concrete Volute Pumps with reduced submergence leading to reduced excavation cost to the customer. The patent will further consolidate KBL as a leader in the designing and manufacturing of Concrete Volute Pumps worldwide.

KBL has designed and constructed CVPs for many large irrigation and powers projects, stormwater applications, including Sardar

Sarovar Narmada Nigam Ltd, Reliance Energy Ltd, National Thermal Power Corporation (NTPC), Nuclear Power Corporation of India (NPCIL), BMA Thailand.

The Concrete Volute Pump was a revolutionary development in the pump industry. Concrete Volute Pumps derive their name as the casting & suction draft tube is concrete, while the rotating parts are metallic. As the casing is constructed in concrete at the site, CVP is the most suitable pumping option from techno-economic consideration for handling large volumes of water. Concrete Volute Pumps guarantee strength and rigidity and virtually eliminate the problems of corrosion and erosion. It also ensures higher & consistent pump efficiencies over a sustained period of operation. Due to the simplicity of construction and ease of maintenance, the reliability achieved is 99.95%.

Droplets Snippets

economically relevant ESG factors once a year. ESG stands for the sustainability dimensions Environment, Social and Governance. The DJSI World lists the best 10 percent of the global companies evaluated per sector, while the DJSI Europe lists the best 20 percent of companies headquartered in Europe.

Sustainable use of water and chemicals

Two years ago, LANXESS published its plan on how to become climate-neutral by 2040. In 2020, the specialty chemicals company also committed to reducing water withdrawals at sites in areas with particularly high water stress by 15 percent by 2023.

In addition, LANXESS has pledged to further improve the sustainability performance of its product portfolio, to eliminate critical substances in products and to develop safe alternatives. The company has also committed not to market any new chemical end products that contain critical substances in a concentration of more than 0.1 percent.

Grundfos India supports flood relief efforts in Chennai

Chennai, November, 2021: With Chennai receiving 491% more rainfall between November 7 & 12, the city once again witnessed flooding in at least 78 locations, including 167 streets that faced severe water stagnation. In lieu of this, Grundfos India, along with its distribution partner, Siddharth Electricals, supported the Chennai Metropolitan Development Authority, Greater Chennai Corporation, Chennai Smart City Limited and residential societies across Chennai with its unique and self-contained Mobile Pumping Station and dewatering pumps.

The Mobile Pumping Station and the dewatering pumps from Grundfos India were operated November 10 – 14 and helped dewater approximately 50 lakh litres during this period. This eased the plight of residents across affected areas such as Chennai MMDA Colony, Adyar and Thiruvannamiyur.

GLOBAL WATER NEWS

November 2021

Concrete Volute Pumps by Kirloskar are widely used for Sea Water applications, applications like Circulating / Condenser Cooling Water for Power Plants, Lift Irrigation, Water Supply, Drainage and Flood Control, Dry Docks and Desalination. High Reliability, Design Simplicity and Superior Operating Performance make Kirloskar Concrete Volute Pumps a trusted choice.

About Kirloskar Brothers Ltd (KBL): KBL was established as Kirloskar Brothers in 1888, from which various group companies emerged later. Kirloskar Brothers Limited was incorporated as a limited liability company on January 15, 1920. A global conglomerate, it provides complete fluid management solutions for large infrastructure projects in the areas of water supply, power plants, building & construction, process industries, irrigation, oil & gas, and marine & defence.

It engineers and manufactures industrial, agricultural, and domestic pumps, valves, and hydro turbines. It is also India's largest centrifugal pump manufacturer with eight manufacturing facilities in India along with other international subsidiaries and operations in the Netherlands, South Africa, Thailand, the United Kingdom, and the United States of America. KBL has over 12,000 channel partners in India and 80 overseas and is supported by the best-in-class PAN-India network of authorised service and refurbishment centres.

All manufacturing plants of KBL have the necessary Quality, Environment, Occupational Health & Safety, and Energy standard certifications under the Integrated Management System (ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, and ISO 50001:2018). The company's Kirloskarvadi plant is a state-of-the-art integrated manufacturing facility, which houses Asia's largest hydraulic research centre with a testing facility of up to 5000 kW and 50,000 m³/hr. KBL is the only pump manufacturing company in India and the 9th in the world to be accredited with the N and NPT certification by the American Society of Mechanical Engineers (ASME).

Industry sustainability leader: GF Piping Systems introduces bio-attributed PVC to its portfolio to reduce CO2 footprint

As a pioneer of pressure piping, GF Piping Systems (GF) announced today the introduction of bio-attributed materials to all of its market-leading polyvinyl chloride (PVC-U) metric pressure pipes, fittings and valves produced in Europe. The sustainable PVC resin, made using tall oil, a waste product from paper production will see up to 90% reduction in the CO₂ emission during production versus conventional PVC while still maintaining the highest quality, durability, and recyclability.

The PVC piping systems from GF, first produced in 1955, have been tried and tested for more than 65 years. Today, they include pipes, fittings, valves, actuators, and measurement and control technology used across industries in over 100 countries for the most demanding applications.

To achieve the biggest impact, the PVC resin used for pipes, fittings and valves is successively adjusted to use up to 20% bio-attributed PVC. The sustainable PVC resins meet the same stringent performance criteria as GF's conventionally produced PVC grades. To verify the correct use, an independent certification body is appointed to audit the production plants and supply chain which processes the bio-attributed PVC-U.

"With the introduction of bio-attributed PVC into our material mix, we are transitioning toward more sustainably sourced products," announces Jens Frisenborg, Head of Business Unit Industry/Utility at GF Piping Systems. "By adding renewable raw material, with identical chemical and mechanical properties, to our valves, fittings and pipes, we provide our customers with unrivaled quality, while also supporting them in achieving their own sustainability goals."

Insensitive, flexible to plan, easy to install, and very reliable: these properties of piping systems are in demand in numerous industrial areas: in drinking water treatment, microelectronics production, in sewage treatment plants, in shipbuilding, and the food industry. PVC piping systems are suitable for use in almost every branch of industry. It is not only their durability that makes them so versatile but also their easy installation. Now with bio-attributed PVC, GF Piping Systems is ensuring they are more sustainably sourced.

Grundfos brings efficient pumping solutions to Nereda® wastewater customers

Company named as Royal HaskoningDHV's Preferred Supplier for pumping solutions



Bjerringbro, Denmark, November, 2021: Today, Grundfos, the world leader in pumps and water solutions announced that it has been selected by Royal HaskoningDHV as 'Preferred Supplier' to its award-winning Nereda wastewater treatment technology. This formal agreement will allow Grundfos to be listed as the Preferred Supplier of pumping solutions for Royal HaskoningDHV's Nereda Wastewater Technology offerings.

Nereda is the sustainable and cost-effective wastewater treatment technology that purifies water using the unique features of aerobic granular biomass. With over 90 projects completed or being delivered across the world, Nereda is a well-established technology for both municipal and industrial use. Through this partnership, Grundfos and Royal HaskoningDHV will be working closely together in bringing the highest quality and the newest innovation to the wastewater industry.

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Commenting on this strategic alliance, Henrik Sonesson, Global Key Account Director – Water Utility, Grundfos, said “Reliability is key when it comes to collecting, transporting and treating wastewater. Our products and solutions for wastewater transport and the wastewater treatment plant build on reliability, modularity and energy–efficiency from optimised pump systems and fully integrated solutions. Based on the successful implementation of Grundfos’ solutions across various Nereda Wastewater Technology plants across South Africa, the UK and the Netherlands, we are happy to be selected as their Preferred Supplier for their projects globally.”

Adding to this, René Noppeney, Global Director of Water Technology Products at Royal HaskoningDHV, said “Our goal is to continually improve the technology and services that Nereda Wastewater Technology provides to our customers. This is made possible through our Preferred Supplier program that establishes collaborations with industry leaders, such as Grundfos. By adding Grundfos to our Preferred Supplier program we are not only providing our customers with the option of reliable and efficient pumping solutions, but aim to promote inter–technology research and development, to enhance our joint offerings on Nereda projects.”

Around 70 per cent of sewage treatment plants in Delhi did not meet norms in last one year: Government data



On an average, 24 out of the 35 sewage treatment plants (STP) in the national capital did not meet the prescribed standards for wastewater over the last one year, according to government data. Delhi generates around 720 million gallons wastewater a day.

The 35 STPs located at 20 locations across Delhi can treat up to 597 MGD of sewage and have been utilising around 90 percent of their capacity. According to the Delhi Pollution Control Committee, biological oxygen demand (BOD), total suspended solids (TSS) and total nitrogen in the treated wastewater should be 10 milligrams per litre or less.

Chemical oxygen demand (COD) should be less than 50 mg per litre, and ammoniacal nitrogen and phosphate should be below five mg per litre and two mg per litre, respectively. Biochemical oxygen demand is the amount of dissolved oxygen used by microorganisms to metabolise organic matter in water.

High BOD levels mean there are a high level of microorganisms in the water, and a high content of organic material that is broken down by the organisms. COD describes the amount of oxygen required to chemically break down pollutants.

The STPs that met the norms the most number of times included Okhla Phase – six, Dr Sen Nursing Home Nalla, Delhi Gate Nalla Phase – one, Delhi Gate Nalla Phase – two, Chilla, Common Wealth Games Village, Nilothi Phase – two and Papankalan Phase – two.

In October last year, teams of the Delhi Pollution Control Authority (DPCC) collected samples from 33 STPs. Of these, 23 were found not complying with the standards. Twenty–three in November and 22 in December did not meet the prescribed standards.

According to government data, 25 STPs in January this year, 26 in February and 24 in March failed to meet the criteria for wastewater. Samples could not be collected for testing in April and May due to the COVID–19 pandemic and the lockdown. The DPCC inspection found that 22 STPs in June, 24 in July, 26 in August and 26 in September did not meet the standards.

An official said many STPs do not have the technology to clean the wastewater to the updated DPCC standards. “The earlier governments did little to clean the Yamuna. The Arvind Kejriwal dispensation has undertaken projects to upgrade these STPs and this will take around three to four years,” he said.

Earlier this year, authorities had informed the National Green Tribunal that the up gradation of STPs in Uttar Pradesh, Haryana and Delhi to “substantially” reduce foaming in the Yamuna will take three to five years depending upon the availability of land and funds etc.

The presence of phosphates and surfactants in untreated sewage from Delhi, Haryana and Uttar Pradesh is a major reason behind frothing in the river.

Officials said the delay in tree cutting permission, COVID–19 lockdown, financial hardships and migration of labor slowed down the construction and up gradation of four major sewage treatment plants (STPs) – Kondli, Rithala, Okhla and Coronation Pillar — in Delhi. These plants will be able to treat 279 MGD wastewater.

The 70–MGD Coronation Pillar STP is to be completed by November 2021, while the deadline for Kondli, Rithala and Okhla STPs is December 2022. The construction of Coronation Pillar STP slowed down mainly due to the delay in handing over the site, appointment of project management consultant, construction ban imposed by Environment Pollution (Prevention and Control) Authority, COVID–19 lockdown and migration of labor etc.

French agency extends funding for drinking water project in Puducherry by two years

The comprehensive drinking water project planned by the Puducherry government at an outlay of Rs 523 crore got a fresh lease of life with the French government development agency agreeing to extend the funding by another two years for implementing the project.

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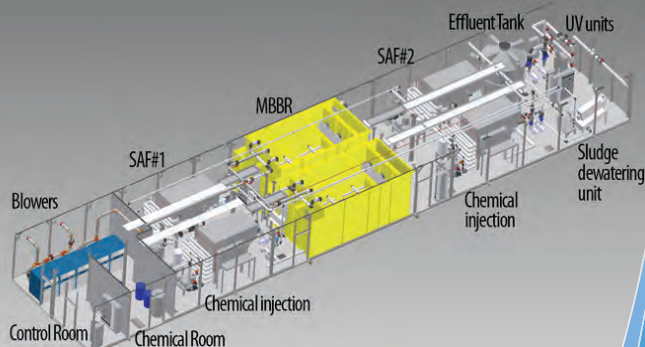
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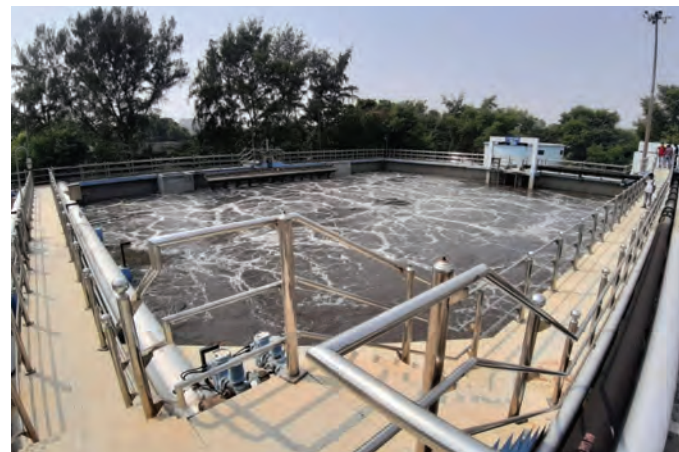


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This was agreed upon after the Puducherry government delegation, led by PWD Minister K Lakshminarayanan, held discussions with the officials of Agence Francaise De Development (AFD), the French agency, led by Bruno Bosle, Country Director for India, a couple of days ago. “They have agreed to extend the agreement after its expiry in June 2022 till June 2024. It is a soft loan to be repaid with 1.5 per cent interest in 15 years,” Lakshminarayanan said.

With more and more bore wells becoming unfit for the supply of drinking water due to high Total Dissolved Salts (TDS), the government is looking forward to sinking fresh bore wells in rural areas, while closing down the bore wells with high levels of TDS, said Lakshminarayanan. In Puducherry urban areas, TDS levels in 100 bore wells, out of 151 bore wells, have high TDS levels between 1,000 and 2,000. Those bore wells need to be immediately closed and replaced with new ones. The daily requirement of water is around 90 million litres (MLD) in the town area alone.

Plans have been drawn up for sinking around 50 fresh bore wells on the riverbeds in rural areas, following the recommendations of the Ground Water Authority. The PWD had selected sites on the beds of Then Penniyar and Malatar rivers, and the Guduviyar tank. “Recharge shafts will be put in each bore well dug to ensure that they get recharged while the water is drawn for supplying. This way, the bore wells will get converted into recharge bore wells,” he said. Pipelines will be laid to bring the water to the town area. Besides, some quantity of surface water from tanks will also be purified through water treatment and supplied for drinking.

A Project Implementation Agency would be established shortly for overseeing the work. The social and environmental impact was assessed and the AFD team was taken to the selected rural areas by the PWD officials for site inspection. A meeting with the MLAs of the areas concerned would be held to explain the purview of the project. This AFD project could not be implemented in the earlier years due to objections raised by the people on the sinking of bore wells.

Besides, more RO plants will be set up to increase the water supply. Desalination plants have also been proposed under AMRUT II, he said, adding that with all these measures taken by the government the drinking water issues would be addressed in Puducherry.

2 new sewage treatment plants to become functional in Noida by February–end 2022

The Noida authority said that its sewage treatment plant (STP) project will be

completed by February 28, 2022, which will be helpful in treating the wastewater across the city. The Noida authority is building a STP with 100 million litres per day (MLD) capacity — its biggest STP so far — and another STP with 80MLD capacity in sectors 168 and 123, with an approximate cost of INR144 crore and INR115.50 crore, respectively.

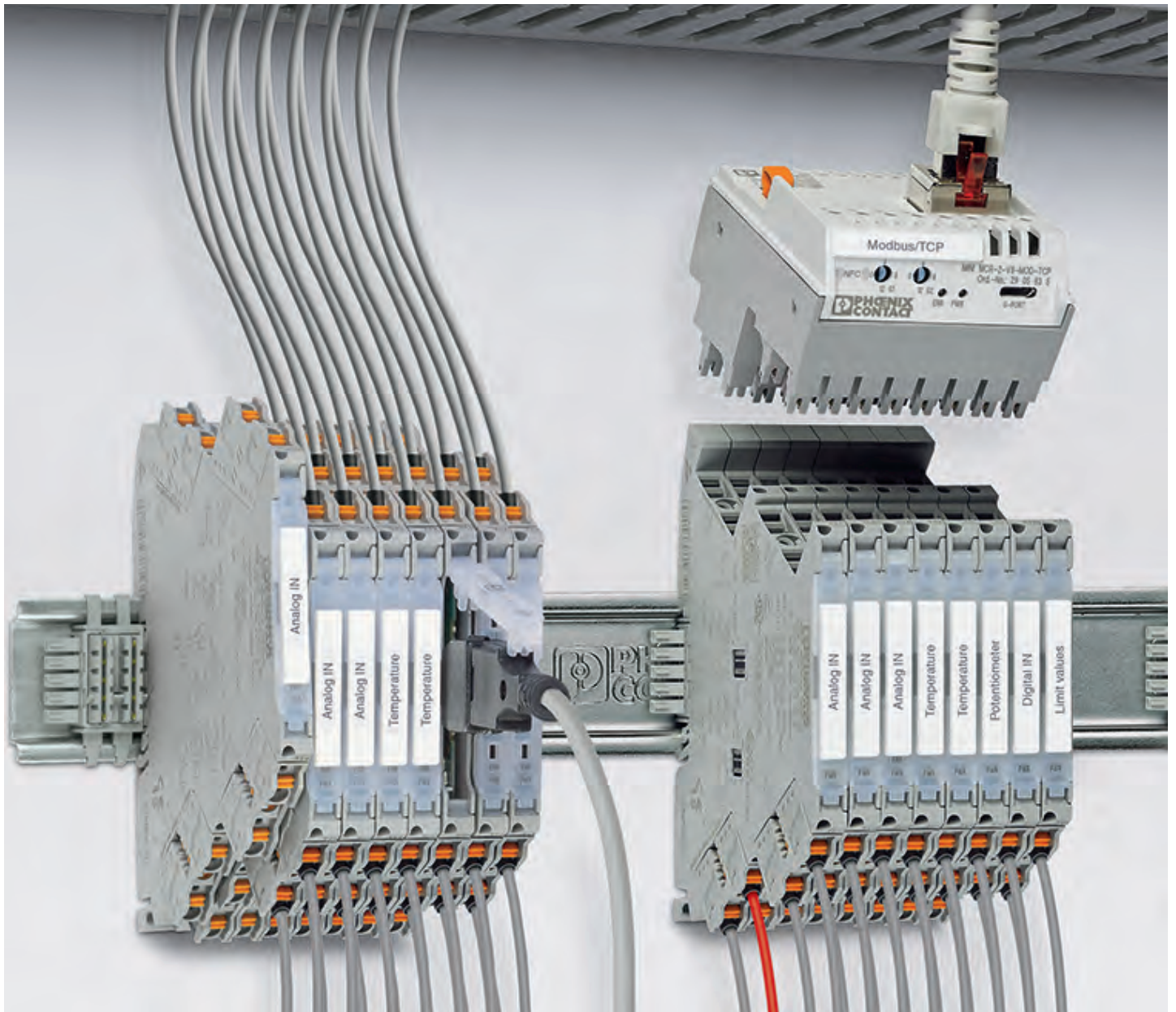
According to the authority officials, only treated clean water will be discharged into Hindon River after the project is completed. The treated water from the two STPs will be used for irrigation and horticulture purposes, thereby saving the groundwater, they added.

“We have expedited the work, and the project will be completed by February–end next year,” said Rajiv Tyagi, chief general manager of the Noida authority. He also said that work progress of all the important infrastructure projects in Noida was reviewed during Diwali.

The authority started working on the two STPs with a total capacity of 180MLD in July 2020, and the deadline for the project was fixed for December–end 2022. There are already STPs of 35MLD and 40MLD capacity in Noida sectors 123 and 168, respectively, but the authority decided to construct two more STPs in these areas as new residential and commercial developments have been taking place there.

At present, Noida has got six STPs — two (34MLD and 25MLD capacity) in Sector 50, two (33MLD and 54MLD) in Sector 54, one (35MLD) in Sector 123, and one (40MLD) in Sector 168.

The Noida authority had hired the WAPCOS Limited to design the water supply and sewerage systems in these areas. WAPCOS Limited — earlier known as Water and Power Consultancy Services Limited — is an Indian multinational government undertaking and consultancy firm wholly owned by the Ministry of Jal Shakti, Government of India. The firm provides consultancy services in the fields of water resources, power and infrastructure. It had been stressing on the need to ready STPs having a capacity of 411MLD by the end of 2021. According to the officials, additional STPs are required in these areas as the Noida authority has earmarked sectors 128, 129, 130, 135, 150 and 151 for group housing projects, and also commercial complexes. They said that more than 50% of the civil work has been achieved at both the sites.



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Ride the Future of Water 4.0 with Taiwan Excellence

>> SPEAKER



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Ms. Claire Chuang
Secretary
KETECH SCIENTIFIC INSTRUMENT CO., LTD.



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Mr. Chester Wu
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Mr. Vu Xuan Tung
Sales Manager
EVER-CLEAR ENVIRONMENTAL ENGINEERING CORP.

Mr. Vu Xuan Tung of Ever-Clear presented FBR-Fenton Solutions in the event

Taiwan Excellence, a campaign to bring the best Taiwanese-made products to the world, held the “Taiwan Excellence Water Treatment Webinar-Toward Water 4.0” on November 10th. At this event, five Taiwan Excellence Award-winning brands showcased their innovative solutions to the audience. These solutions can be classified into two types: advanced technological processes that enhance water treatment quality and equipment with built-in smart technologies that help to improve operational efficiency, ease of

maintenance, and cost-saving. The webinar attracted the online presence of 47 media outlets and 137 buyers.

As 4.0 digitalization and automation are placed at the center of all technology and equipment, Taiwanese leading brands have brought in more integrated, expandable, and customized solutions. Taiwanese suppliers can not only provide high-quality solutions at comprehensive prices but also form



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Ms. Claire Chuang
Secretary
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Ms. Claire Chuang of Ketch shared Chemmit's Online Water Instruments for Liquid Analysis



partnerships with global factory operators to pave the way to the 4.0 future of the water industry.

Featured in the session are several informative presentations, starting with EMS and their smart water management applied with 3G/4G Wireless Data Logger – GTI5 series. This enables managers to access information anytime and anywhere via handheld devices. Chemmit from KETECH demonstrated how they use stabilizers and environmentally friendly reagents to monitor heavy metals in real-time water streams. Meanwhile, the FBR–Fenton solution from EVER–CLEAR is an updated version of their initial Fenton filtering technology. This solution provides a well-rounded solution for recycling textile wastewater for industrial use while avoiding the production of contaminated byproducts. Lastly, HCP PUMP and WALRUS PUMP presented their high-quality pump products that can be applied in solutions to enhance the standard pumping process, foster high technology in design and mechanics, boost performance and efficiency, and address issues

related to maintenance, installation, and monitoring.

With Taiwanese–developed technology, water management solutions can support global customers to improve operational efficiency, ease of maintenance, and cost–saving. These ground–breaking inventions not only adapt to water 4.0 technology revolutions but also provide solutions for addressing growing concerns about environmental externalities to the world. Buyers and viewers who are interested in Taiwan’s latest sustainable products are welcome to visit the Taiwan Excellence Digital Pavilion (<https://world.taiwanexcellence.org/en>) to find more excellent Taiwanese suppliers.

If you missed the “Toward Water 4.0 Webinar,” please click the following link to watch it: <https://youtu.be/plCylxykKAQ>

For more information, please visit Taiwan Excellence’s website: <https://www.taiwanexcellence.org/tw>

About Taiwan Excellence

The symbol of Taiwan Excellence honors Taiwan’s most innovative products that provide tremendous value to users worldwide. All products carrying this symbol have been selected as winners of specific Taiwan Excellence Awards based on outstanding R&D, design, quality, marketing, and Made–in–Taiwan merits. Initiated by the Bureau of Foreign Trade in 1992, Taiwan Excellence has gained recognition in over 102 countries worldwide.

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The Bureau of Foreign Trade (BOFT) under the Ministry of Economic Affairs (MOEA), Republic of China, is responsible for implementing policies and regulations governing foreign trade and economic cooperation. The BOFT’s role and position have been adjusted regularly to meet the needs of the ever changing international economic and trade environments. The BOFT has been guiding and working with the Taiwan External Trade Development Council (TAITRA) on numerous promotional trade projects and activities both internationally and domestically. Having worked closely with TAITRA for many decades, the BOFT continues to commission TAITRA for various critical government projects relating to business, trade, and investment, while promoting Taiwan internationally.

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Founded in 1970 to help promote foreign trade, the Taiwan External Trade Development Council (TAITRA) is the foremost non–profit, semi–governmental trade promotion organization in Taiwan. Jointly sponsored by the government, industry associations, and several commercial organizations, TAITRA assists Taiwanese businesses and manufacturers to reinforce their international competitiveness and to cope with the challenges they face in foreign markets. TAITRA boasts a well–coordinated trade promotion and information network of over 1,300 international marketing specialists stationed throughout its Taipei headquarters and 63 overseas offices worldwide. Together with its sister organizations, the Taiwan Trade Center (TTC) and the Taipei World Trade Center (TWTC), TAITRA has created a wealth of trade opportunities through effective promotion strategies.



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Interview with
Mr. Vinay Kumar Dhar,
Vice President,
Roto Pumps Ltd



Q. As per you what are the key challenges in India in wastewater management?

A. The major challenge we face as a nation is the inadequate number of wastewater treatment plants in the country. The increase in population and the subsequent rise in urbanization has put pressure on the already scarce water resources in the country. As a result of this trend, the existing water treatment plants don't suffice and are thus, overworked above their capacity. In addition to that, there is lack of effective and efficient mechanism to screen the influent waste which increases treatment cost of the sewage and affects the durability of equipment. We should have an optimum budget allocation along with a dedicated financing facility for this industry. Concerns like land allocation and electricity supply for such projects should also be paid more attention to. The absence of adequately trained staff for such projects may further hamper the successful functioning and development of such projects in the country.

Favourite Book/Author:

Good to Great by Jim C Collins

Favourite Movie:

Inception by Christopher Nolan

Favourite Holiday

Destination:

Kashmir J&K

One piece of advice for 'EverythingAboutWater':

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Talking about technicality the most critical parameter is pumping of the significantly highly viscous and solid laden fluids, for instance, the activated sludge, biomass sludge, thickened sludge, Digested sludge, dewatered sludge, sludge cake, etc. Due to their high viscosity and presence of large solids, their transit proves to be a challenge and any leakage of such media can be deleterious to the environment. Keeping in mind the chemical composition of the media, a reliable, robust, and energy-efficient pump is required for the flaw-proof handling of the media. Rest, we need to be vigilant in the ways we treat our environment in terms of pollution and cleanliness.

Q. How is Roto Pumps helping in dealing with these challenges?

A. We at Roto Pumps have developed an entire range of Progressive Cavity Pumps for the effective and efficient handling of all kinds of wastewater applications from the preliminary treatment process to final sludge dewatering. These energy-efficient pumps ensure smooth & non-pulsating flow of media even with varying pressure & viscosities. These pumps are designed

to provide continuous or intermittent transfer duties in innumerable applications for varying viscosities, abrasiveness & even fluids with high solid content across a range of industries not limited to Wastewater, Paper, Chemical, Mining, Marine, Paper, Oil & Gas, etc. We provide different types of shaft sealing to avoid leakage of pumping media.

In addition to that, we also provide on-site pump training to pump operators, for error-proof operations which in the long run contributes to the reduction in their spare consumption & cost.

These pumps are developed for low flow applications that demand high accuracies and repeatability with unique advantages of smooth and non-pulsating flow. These dosing pumps can handle clean and clear liquids.

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The pump is ideal for either intermittent or continuous dosing duties. These dosing pumps can handle minimum flow as low as 0.68 LPH to 500 LPH & ensure proportionate dosing of media.

VISION OF MY COMPANY: Our Vision is to be a leading global fluid engineering solution provider.

NUMBER OF EMPLOYEES: 400

KEY ACHIEVEMENTS OF THE LAST YEAR: We have grown both geographically and financially. Penetrated in new markets i.e. Germany, Malaysia, launched new products – Biomix Pumps, Biomass Pump Range & Roto Kwik Range of Pumps

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Mr. Anurag Gupta: Joint Managing Director

Mr. Arvind Veer Gupta: Dy. Managing Director

Mr. Gulshan Khurana: COO

Mr. Vinay Kumar Dhar: Vice President

These pumps can handle media consistency as large as 50%.

Roto Biomass Pumps

We also have the new Biomass Pump Range that is developed on the Roto Kwik Platform to ensure quick maintenance of installed pumps without removing suction & delivery pipelines which eventually aid in reducing the maintenance cost & improve the pump life cycle.

Some of the distinctive Features & Benefits include—quick maintenance in place pump, easy replacement of the Rotor, Stator & Joint parts without dismantling suction and delivery pipelines, heavy-duty bearing housing directly coupled with geared motor, specially designed double cartridge mechanical seal, heavy-duty cardan universal joint with reinforced boot seal and protector rings and antiblock arrangement at the entry of stator.

Q. What are the future plans of Roto Pumps?

A. With the continuous efforts of our R&D team, we are continuously developing new range of progressive cavity pumps and upgrading the existing pump range to efficiently handle wastewater applications. Our main objective is to invest in our R&D team, so that we can reduce the maintenance cost of the pumps, ensure zero or minimal leakage at the site and improve the pump life cycle.

Q. What steps should the government take for dealing with sewage management effectively?

A. The Government should focus on the initiation and execution waste water management projects as it will ultimately contribute to the overall development and infrastructure of the country. Untreated sewage water poses a threat in terms

Fluids Handled					
Sludge Making			Dosing		Dewatering
Primary Sludge	Thickened Sludge	Stabilized Sludge	Milk Of Lime	Polyelectrolyte	Dewatered Sludge
Secondary Sludge	Digested Sludge	Bio Sludge	Concentrated Flocculent	Polyaluminium Chloride Solution	
Secondary Activated Sludge	Floating Sludge	Settled Sludge	Polymer Solution	Polyacrylamide Flocculent	Sludge Cake
Secondary Excess Sludge	Returned Sludge	Undigested Sludge	Metallic Salts	Alum Flocculent	

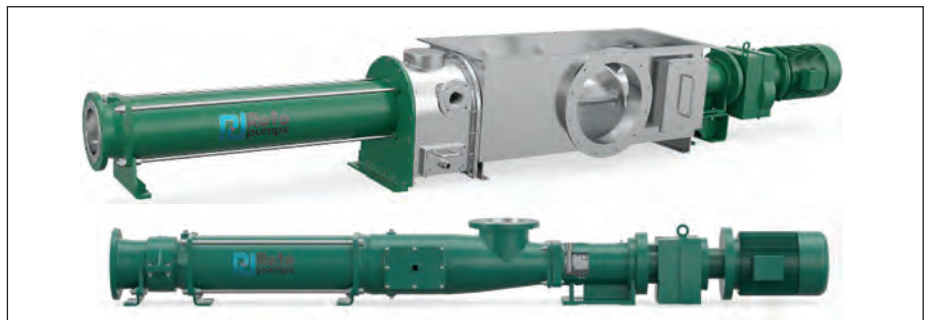
requirement. These pumps are employed to mix and transfer solid bio waste and digestate liquid into the fermentation tank. Customized hoppers are available in round & rectangular shapes up to 3 meters in length.

RotoBiomix pumps can easily handle highly viscous media with a viscosity of up to 3 million cSt and solids handling capacity of up to 40%.

Q. Which are the new technologies that Roto Pumps have adopted in their products?

A. RotoBiomix Pumps

We at Roto Pumps have launched RotoBiomix pumps that have been integrated into the process of renewable energy generation and are constantly upgraded and optimized to meet the customer's



of the toxicity and pollution of the environment that can cause deleterious effects in the long term as everything ultimately enters the food chain directly or indirectly and comes back to us humans. The Government should make stringent laws for the regulation and monitoring of industrial units by ensuring the usage of ETPs of specified standards by them regularly.

Q. In your words how has the last two years of pandemic affected the industry. How long do you think the effect will last?

A. The pandemic has negatively impacted the wastewater industry because of the losses they incurred. Due to shutdown of some industries, our pump business for ETP & STP projects also got impacted. Given the success of the covid vaccination drive in the country, we are hopeful that the economy will recover and bounce back again. The positive effect of this growth will trickle down to the industries across segments creating employment opportunities. The municipal sewage treatment segment was least impacted by corona since it is round the clock business.

PERSONAL QUESTIONS

Q. Please tell us something about yourself and your family.

A. I am from an engineering background and have been associated with Roto Pumps for more than 27 years and I am currently serving as Vice President– Global Marketing.

Q. How and when did you enter the water industry?

A. 27 years ago, I joined Roto Pumps who were already supplying pumps and pumping solutions to the water and wastewater industry.

Q. What was your first Job or Work Profile? Please share its experience and learning with us.

A. After graduating, I joined a construction company. Later, I joined a French consortium involved in construction of hydroelectric power project in J&K.

Q. What has been the most inspiring experience of yours in the water

industry till now?

A. Contributing to the protection of the environment and providing clean and safe water to the nation and generations ahead

Q. Please describe your company in your words. What does it mean to you?

A. Roto pumps is a pioneer in progressive cavity pumps from India. More than 53 years ago, this company worked on the philosophy of make in India (Atmanirbhar Bharat). R&D is deep–rooted in our DNA and apart from manufacturing pumps, Roto also provides fluid engineering solutions. The user perspective continues to inspire us to design and develop innovative products that drive down the life cycle cost of the equipment.

Q. What personal and company milestones you are majorly looking forward to achieve in the next few years?

A. We want to be in the top 5 global fluid engineering solution provider by the year 2030.



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SEWAGE WATER TREATMENT AND WASTE WATER MANAGEMENT

Dr. Anil Kumar Mishra, Bacteriologist, Delhi Jal Board, Govt. Of Nct, Delhi



Due to urbanization, industrialization, increasing population quality and quantity of fresh water reducing drastically in India and worldwide. For fulfillment of this scarcity for water, Proper treatment and management of sewage is utmost important, which are producing from households, factories or other sources. Domestic sewage is the major source of waste water (sewage) which is composed of kitchen and bathroom waste water called "Sullage" or "Gray water" and waste water producing from toilets are known as excreta or "Black water". Now a day, industrial waste is also mixed in our drains resulting its quality also deteriorated. Sewage treatment is also known as waste water treatment and it is one of the most important methods, adopted for better management of sewage, its recycle and disposal in environment for maintaining environmental sanitation. During treatment process in different sewage treatment Plants (STPs) or Waste water treatment plants (WWTP), reducing or removing different type of contaminants (Physical, organic, inorganic Microbiological, biological and other contaminants) present in waste water and after treatment that treated effluent may be utilized for other purpose like irrigation of crops, recharging ground water, domestic purposes other than

drinking and cooking, mixing in rivers, ponds, drains or other natural water bodies without any environmental issues as per national and international guidelines. In nature, anything is not pollutant, everything is useful but if anything is present in wrong quantity, quality, place, time or nature then it is called "Pollutant". Sewage treatment and its proper management is playing important role in environmental sanitation by managing grey water, black water, effluent treatment, solid waste management etc.

Sewage may be treated into Centralized STPs (means sewage is collected from sewerage network of command area into sewage pumping station then pumped into STPs for treatment) and decentralized system (not required major SPS for pumping of sewage as treatment made through on-site small plants). In some cities, storm water also mixed into drains and ultimately reached into STPs for treatment. Population equivalence (PE) is the base value used for considering for the designing capacity of STP in any particular areas for a particular population. It is based on the per person organic matter load. One PE is equal to 60 gram of Biological Oxygen Demand (BOD) or 200 liters of sewage per day. This parameter also differentiates domestic and industrial waste.

On the basis of process control and quality management in STPs, three to four stages occurs. These are:–

- » **Primary treatment:** In this stage suspended solids, Organic matters, oil and grease, floating materials etc. are removed up to maximum extent by physical processes like screening, grit removal, sedimentation, skimming (for removal of oil and grease from sewage) etc.
- » **Secondary Treatment:** In this stage remaining organic matter removed by aerobic and anaerobic biological treatment process.

» **Tertiary treatment:** In this stage removing microbiological loads and other remaining organic and inorganic pollutants through filtration and proper disinfection by Chlorination, Ozonation or by any other agents or technologies.

» **Quaternary or advanced stage Treatment:** In this stage, micro-pollutants such as pharmaceuticals, ingredients of domestic and industrial chemicals, pesticides, algal toxins (Blue green algae like microcystis, oscillatoria, anabaena, lyngbya etc. produce different type of toxins, which are harmful for animals).etc. are removed by using advanced filtration system or by using other advanced and sophisticated technologies. These micro-pollutants generally may not eliminate through commonly used sewage treatment processes (primary, secondary and tertiary treatment).

Purpose of Sewage treatment:

The main objective of sewage treatment is to remove different type of physical, organic, inorganic, microbiological and biological pollutants and produce final treated effluent which must be fit for intended purposes as per national and international norms /guidelines and for maintaining environmental sanitation/ hygiene. Composition of sewage water: Sewage/ Waste Water contain maximum percentage of water but due to mixing of different type of domestic and industrial waste it contains some other pollutants, which are as underneath:–

- » Water
- » Organic contaminants
- » inorganic contaminants
- » Pesticides (Aldrin, DDT, BHC, Atrazine etc.)
- » Heavy Metals (lead, cadmium, mercury etc.)
- » Pathogenic/non pathogenic bacteria, viruses, fungus, algae, protozoans, nematodes & their spores etc.)
- » Poisonous gases (H₂S, CH₄, CO₂) etc.



Major Sewage treatment technologies: In India and worldwide many technologies are available since ancient time for proper treatment of sewage and now a days other new advanced and sophisticated technologies are establishing or arising which treats waste water up to quaternary level (depends on requirements or usability of treated effluents). These technologies are based on biological and non-biological treatment principles (Physical, Chemical, Microbiological, Membrane filtration, Activated Charcoal/ sand filtration etc.). But all the technologies are not suitable universally for all the places and all type of waste water /sewage treatment; as its

depends on quality and quantity of sewage, climatic condition, construction and operating cost, availability of land and energy, sustainability, environmental impacts (odors, vectors attraction, sludge transportation, sanitary risk, water, soil and sub-soil contaminants, surface and ground water contamination, devaluation of nearby locality etc. Most common technologies are:

- » Activated Sludge process (ASP)
- » Up flow Anaerobic sludge blanket (UASB)
- » Waste stabilization ponds (WSP)
- » Moving Bed Bio reactor (MBBR)
- » Sequential Batch Reactor (SBR)

Management of Sewage/ Waste water: In India and worldwide proper sewage or waste water management is challenge and If manage it properly then may save natural resources, economical and health loss, environment, water, soil fertility etc. Properly treated effluents may utilized for different purposes, some important aspects are as underneath:

A. Supplied in household for secondary purposes like gardening, washing, etc:

Every day, we are using hundreds liter of water for our day to day activities like cooking, drinking, washing, bathing cleaning etc. but apprx. 90% of



this water again reached in drains as sewage. If, we separately treat Gray (Kitchen and bathroom) water and Black water (toilet and other water) then this water may be supplied again in households for secondary purpose like washing, bathing cleaning etc.) except drinking and cooking), through separate pipelines (dual pipe supply system). This may save millions liter of treated water which may be supplied to new consumers or consumers may get round the clock water supply.

B. Recharging of underground water aquifers.:

Now a days, we are extracting much quantity of underground water for construction, irrigation, households industrial purposes etc. as compared to rate of percolation; resulting water table decreasing at the rate of 0.5– 2.0 meter per year (quality of underground water also deteriorating drastically). If, we treat waste water as per national and international standards, then this water may be utilized for recharging of aquifers through different water bodies like lakes, ponds

etc; resulting quality and quantity of underground water will also improved and this water may utilized for household and other purposes when sufficient quantity of good quality of surface water will be not available.

C. Irrigation of crops, trees and other plantations:

Farmers using sewage water (untreated/partially treated) for irrigation of herbaceous vegetables, fruits, and other crops. As this water is easily available in metropolitan cities and having sufficient amount of Macronutrients (Ca, N, P, Mg, k etc.) and Micronutrients (Cu, Zn, Mo etc.) which are required for the purpose of growth of the plants but in the other side this sewage water also contains pesticides, heavy metals (Hg, Pb, As etc), bacteria, viruses, spores, and other microorganisms, organic and inorganic pollutants which are very harmful for humans, plants and other animals. As through plants food chain, these organic/inorganic contaminants reaching

in our metabolic pathways and its concentration is increasing day by day in our body or in other plants and animals due to biomagnifications of pesticides and other toxic metals. The cultivation of leafy vegetables using sewage water is a common practice in various part of India and worldwide and using these vegetables with or without cooking, causing different types of health related problems. Due to various climatic factors, irregular and insufficient rain, lacking of water bodies like ponds, lake etc. for storage of rain water also playing pivotal role to encourage farmers to use treated/ partially treated/ untreated sewage as an alternative water resource for irrigation of crops in national and international level. Properly treated sewage (As per guidelines of WHO, CPCB and other national and international standards) is ideal for agriculture for irrigation purpose and is already being widely used throughout the world. Final treated effluent may also used for irrigation purpose of Parks, crops, green belts and other greenery in central and side verges of roads. This

practice may save billion liters of surface as well as underground water every year; resulting we may conserve that water for other purposes.

D. Mixing into natural water bodies like ponds, river, drains etc.:

In present scenario, natural water bodies like river, ponds, lake etc. have been dried or water only available during rainy season and that's quality is also not good as per national and international standards framed for using various purposes. If after proper rejuvenation of those water bodies, we use properly treated effluent for maintaining water level of these water bodies then this water may be available for consumers, drinking purpose of cattle, birds or other animals and other purposes; as due to lack of sufficient water in those water bodies birds and other animals could not get water for drinking purpose and sometimes their survival also affected. These water bodied also help in reduction of gaseous and particulate environmental pollutants; as, water bodies absorb gaseous pollutant and particulate matters through evaporation and other natural process and also disperse these pollutants in natural environment in the form of modified compounds which are less harmful for environment. Some pollutants may be utilized by plants and animals living in natural water bodies for their metabolic activities. But at present, due to lack of these water bodies these pollutants directly reached in our environment causing air pollution (smog or other such types of problems).

E. Supplied to thermal power and other industries etc.:

In present scenario, ground or surface water is being used in thermal power, nuclear power stations or such type of other industries as a coolant or for other purposes; resulting surface or underground reducing. If we use treated effluent for this purpose then that remained water may be utilized for maintaining water table or for other purpose.

F. Treated sludge may be utilized as fertilizers in different type of crops.:

In present scenario, different type of chemical fertilizers are being used for fulfillment of nutritional requirement of crops; as due to all season cropping system and repetition of same

crops, fertility and productivity of land decreasing. Due to excess use of these fertilizers, pH of soil also affected and required for soil treatment by using different type of chemicals. Due to use of these chemicals soil microorganisms and other useful insects are also dying, which protect crops from different type of insects and pests and for prevention of these pests or insects, we are using different type of insecticides or pesticides resulting the concentration of these chemicals increasing in our food chain and in our metabolic activities. For avoiding these conditions, we can use properly treated sludge (by incineration or other physical, chemical and biological process) in annual, biannual and perennial crops and trees. This is economical, cheaper, environmental friendly, helpful for growth of soil microorganisms and also maintains pH and other texture of soil as compared to chemical fertilizers.

G. Maintain environmental sanitization:

Proper sewage treatment and its management also helpful for maintaining environmental sanitation and hygiene; as sewage contains different type of physical, chemical and microbiological contaminants (bacteria, virus, fungi, protozoans, nematodes) etc. and if not managed properly then different type of water born and air born diseases may spread in community. Inadequate sanitation kills people, causes disease, environmental pollution and diminishes welfare—this is the well known but the economic impacts of the poor sanitation have not been counted properly. According to WHO study, one gram of feces may contain approx crores of viruses, lakhs of bacteria, thousands of parasitic eggs and cysts. As per USEPA, Acceptable limit of waterborne illness in a community is 01 case/10,000 consumers. Steps to be taken for proper treatment and management of Sewage:

- » STPs should be upgraded with advanced and sophisticated treatment technologies which should be sustainable, economical, environmental friendly, suitable and fulfill the purpose of treatment.
- » Quality Control laboratories should be established in all the STPs for round the clock monitoring of quality of STPs (Raw sewage till final effluent) as per national/international standards and these laboratories must be

equipped with advanced and sophisticated testing technologies, equipments and qualified manpower.

- » Final treated effluent (After tertiary treatment) directly transmitted till green belt/ crop site through separate pipelines in spite of mixing in drains. Training and awareness must be provided to farmers and other users.
- » Proper guidelines and incentive policy should be framed by the Central, state or local government level for promotion of use of treated final effluent and cured sludge as manure in crops.
- » Strict guidelines may be framed by regulatory organization and must be mandatory for all the STP and other waste water treatment industries or agencies.

In conclusion, sewage treatment and its proper management is a burning issue in India and worldwide. If, we properly manage sewage treatment process control, quality (as per national and international standards/ guidelines) and proper uses of treated effluent, sludge, Biogas and other byproducts of waste water treatment and solid –waste management, we can save energy, maintain environmental hygiene, reduce scarcity of water, improve quality and quantity of underground water, increasing crop production, reduce the use of chemical fertilizers, improved soil texture, improved health and life style of human and other living organisms, save money etc.

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NOTE ON SEWAGE WATER TREATMENT AND WASTE WATER MANAGEMENT

By Dushyant Jindal, Co-Founder, Hitech Enviro Solutions



In the 21st century, clean water and environmentally friendly industrial processes are more critical than ever. According to the World Health Organization (WHO), contaminated drinking water causes 485,000 diarrheal deaths every year.

Fortunately, proper treatment can help commercial and industrial facilities become more environmentally responsible and compliant in their wastewater disposal.

What Is Wastewater?

Wastewater is a complex matrix containing significant concentrations of solids (total solids 350–1200mg/l), dissolved and particulate matter (chemical oxygen demand 250–1000mg/l), microorganisms (up to 109 number/ml), nutrients, heavy metals, and micro-pollutants.

Wastewater is any kind of used water affected by domestic, commercial, or industrial processes.

The used water that flows out of a person's house, a school or an office building is wastewater. So is the water produced during industrial operations like making paper or clothes or manufacturing chemical products.

The composition of most wastewater is about 99.9% water by weight — the remaining 0.1% consists of contaminants like organic matter, inorganic matter and microorganisms that require removal.

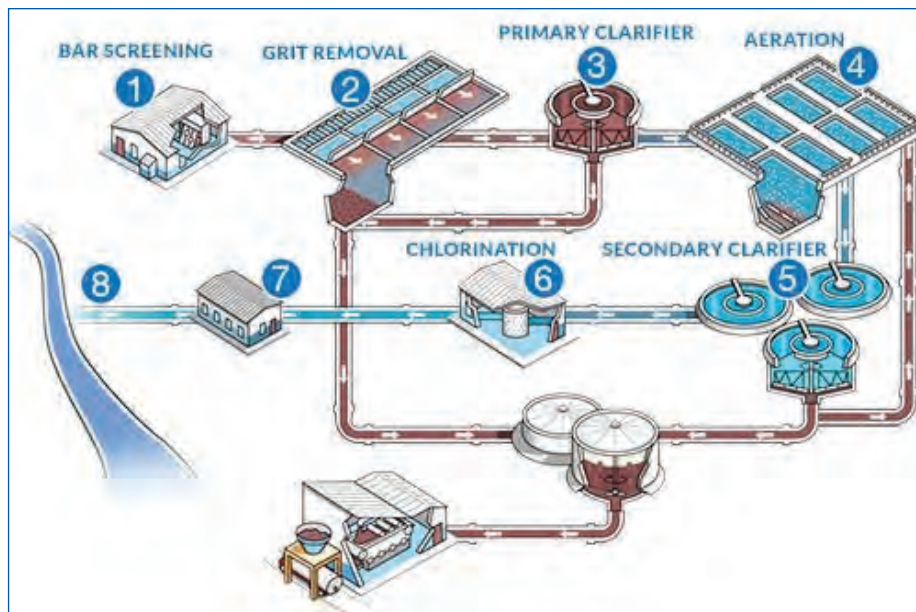
Wastewater management system

Wastewater is any water that requires cleaning after it is used. This includes water that has been used for laundry, bathing, dishwashing, toilets, garbage disposals, and industrial purposes.

Wastewater also includes rainwater that has accumulated pollutants as it runs into oceans, lakes, and rivers. Pollutants are unwanted chemicals or materials that contaminate air, soil, and water.

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 industry for commercial purposes. It also must be clean enough to release into oceans, lakes, and rivers after it has been used.

Wastewater is usually divided into two major groups: point source wastewater and non-point source wastewater. Point source wastewater





includes wastewaters that enter natural waters (such as lakes, rivers, and oceans) from defined locations. The most common point sources are sanitary sewers and storm drains. Non-point source wastewater is wastewater that is not connected to a specific source. This includes runoff (water that drains away) from agriculture and urban (city) areas, and acidic waters from mines. In many ways, point source wastewater is much easier to manage because its source and the pollutants it contains are known. Non-point source wastewater, on the other hand, is both hard to identify and treat.

What Is Wastewater Treatment?

It used to be said that “the solution to pollution is dilution.” When small amounts of sewage are

discharged into a flowing body of water, a natural process of stream self-purification occurs. Densely populated communities generate such large quantities of sewage, however, that dilution alone does not prevent pollution. This makes it necessary to treat or purify wastewater to some degree before disposal.

Wastewater treatment applies special processes to wastewater to remove organic matter and other contaminants. Wastewater treatment programs aim to make the wastewater clean and safe enough to discharge back into the environment without harming nearby residents or the local ecosystem.

Industrial wastewater usually contains a

range of organic and inorganic matters in varying concentrations. Many materials are toxic, mutagenic, carcinogenic or almost nonbiodegradable. This means that the wastewater also contains a range of substances that cannot be easily degraded.

Primary treatment involves the removal of solids, particles and oils in the industrial wastewater stream; therefore, primary treatment usually contains basic physical methods and solid/oil separations such as primary clarifiers, oil separators and screens. Secondary treatment is usually the heart of the treatment unit where suspended and residual organics and compounds are broken down. Secondary treatment usually involves biological (bacterial) degradation of



contaminations and pollutants. Aerated activated sludge treatment has been known as one of the best solutions for secondary treatment. It is simple, cost-effective and high-performing.

Combinations of anaerobic and aerobic treatment processes have been found to be efficient in the removal of many pollutants such as soluble biodegradable organic pollutants. The use of membrane-based technologies in industrial wastewater treatment is increasing. Chemical oxidation techniques to treat wastewater are also on the rise because of tighter treated wastewater limits. Both classical chemical treatment and advanced oxidation processes have been used in modern industrial wastewater units. Tertiary treatment usually includes final filter steps, polishing and finishing stages, e.g., widely used activated carbon filters.

Eight Stages of the Wastewater Process

Stage One — Bar Screening

Removal of large items from the influent to prevent damage to the facility's pumps, valves and other equipment.

The physical process of wastewater treatment

begins with screening out large items that have found their way into the sewer system, and if not removed, can damage pumps and impede water flow. A bar screen is usually used to remove large items from the influent and ultimately taken to a landfill.

Stage Two — Grit Removal

Removal of grit by flowing the influent over/through a grit chamber.

Fine grit that finds its way into the influent needs to be removed to prevent the damage of pumps and equipment downstream (or impact water flow). Too small to be screened out, this grit needs to be removed from the grit chamber. There are several types of grit chambers (horizontal, aerated or vortex) which control the flow of water, allowing the heavier grit to fall to the bottom of the chamber; the water and organic material continue to flow to the next stage in the process. The grit is physically removed from the bottom of the chamber and discarded.

Stage Three — Primary Clarifier

Initial separation of solid organic matter from wastewater.

After grit removal, the influent enters large primary

clarifiers that separate out between 25% and 50% of the solids in the influent. These large clarifiers allow for the heavy solids to sink to the bottom and the cleaner influent to flow. The effectiveness of the primary clarification is a matter of appropriate water flow. If the water flow is too fast, the solids don't have time to sink to the bottom resulting in negative impact on water quality downstream. If the water flow is too slow, it impacts the process up stream.

The solids that fall to the bottom of the clarifier are known as sludge and pumped out regularly to ensure it doesn't impact the process of separation. The sludge is then discarded after any water is removed and commonly used as fertilizer.

Stage Four — Aeration

Air is pumped into the aeration tank/basin to encourage conversion of NH_3 to NO_3 and provide oxygen for bacteria to continue to propagate and grow.

Once converted to NO_3 , the bacteria remove/strip oxygen molecules from the nitrate molecules and the nitrogen (N) is given off as N_2 (nitrogen gas).

At the heart of the wastewater treatment process

is the encouragement and acceleration of the natural process of bacteria, breaking down organic material. This begins in the aeration tank. The primary function of the aeration tank is to pump oxygen into the tank to encourage the breakdown of any organic material (and the growth of the bacteria), as well as ensure there is enough time for the organic material to be broken down. Aeration can be accomplished with pumping and defusing air into the tank or through aggressive agitation that adds air to the water. This process is managed to offer the best conditions for bacterial growth. Oxygen gas [O₂] levels below 2 ppm will kill off the bacteria, reducing efficiency of the plant. Dissolved oxygen monitoring at this stage of the plant is critical. Ammonia and nitrate measurements are common to measure how efficient the bacteria are in converting NH₃ to N₂.

Stage Five — Secondary Clarifier

Treated wastewater is pumped into a secondary clarifier to allow any remaining organic sediment to settle out of treated water flow.

As the influent exits the aeration process, it flows into a secondary clarifier where, like the primary clarifier, any very small solids (or fines) sink to the bottom of the tank. These small solids are called activated sludge and consist mostly of active bacteria. Part of this activated sludge is returned to the aeration tank to increase the bacterial concentration, help in propagation, and accelerate the breakdown of organic material. The excess is discarded.

Stage Six — Chlorination (Disinfection)

Chlorine is added to kill any remaining bacteria in the contact chamber.

With the enhanced concentration of bacteria as part of the aeration stage, there is a need to test the outgoing effluent for bacteria presence or absence and to disinfect the water. This ensures that higher than specified concentrations of bacteria are not released into the environment. Chlorination is the most common and inexpensive type of disinfection but ozone and UV disinfection are also increasing in popularity. If chlorine is used, it is important to test for free-chlorine levels to ensure they are acceptable levels before being released into the environment.

Stage Seven — Water Analysis & Testing

Although testing is continuous throughout the wastewater treatment process to ensure optimal water flow, clarification and aeration, final testing is done to make sure the effluent leaving the plant meets permit specifications. Plants that don't meet permit discharge levels are subject to fines and possible incarceration of the operator in charge.

Stage Eight — Effluent Disposal

After meeting all permit specifications, clean water is reintroduced into the environment.

There are additional industrial wastewater treatment technologies, including physicochemical, biological and advanced oxidation processes, used in processing industries.

Oil removal

Conventional approaches to treating oily wastewater have included gravity separation and skimming, dissolved air flotation (DAF), de-emulsification, coagulation and flocculation. Gravity separation followed by skimming is effective in removing free oil from industrial wastewater. Oil-water separators such as the API separator and its variations have found widespread acceptance as an effective, low-cost primary treatment step. The API oil-water separator is designed to separate the oil and suspended solids from wastewater. An API separator or other basic oil-water separator, however, is not effective in removing smaller oil droplets and emulsions. Oil that adheres to the surface of solid particles can be effectively removed by sedimentation in a primary clarifier.

DAF is one of the most effective methods to treat small oil droplets and emulsions. DAF uses air to increase the buoyancy of small oil droplets and enhance separation. Emulsified oil in DAF is removed by de-emulsification with chemicals, thermal energy or both. DAF units typically employ chemicals to promote coagulation and increase flock size to facilitate separation. Emulsified oil in industrial wastewater is usually chemically pretreated to destabilize the emulsion followed by gravity separation. The wastewater is often heated to reduce viscosity, accentuate density differences and weaken the interfacial films stabilizing the oil

phase. This is followed by acidification and the addition of cationic polymer/alum to neutralize the negative charge on oil droplets, followed by raising the pH to the alkaline region to induce flock formation of the inorganic salt. The resulting flock with the adsorbed oil is then separated, followed by sludge thickening and sludge dewatering.

Coagulation and flocculation

Most industrial wastewater treatment units include sedimentation in their processes. Sedimentation, also called clarification, is a treatment process in which the velocity of the wastewater is lowered below the suspension velocity, and the suspended particles settle out of the wastewater due to gravity. Settled solids are removed as sludge, and floating solids are removed as scum. Industrial wastewater leaves the sedimentation tank over an effluent weir to the next step of treatment. The efficiency or performance of the process is controlled by retention time, temperature, tank details and other factors. However, without coagulation/flocculation, sedimentation can remove only coarse suspended matter that will settle rapidly out of the wastewater without the addition of chemicals. This type of sedimentation typically takes place in a reservoir, sedimentation or clarification tank at the beginning of the treatment process. Coagulation/flocculation is based on the addition of chemical products that accelerate the sedimentation (coagulants) in the clarification tanks. The coagulants are inorganic or organic compounds such as aluminum sulphate, aluminum hydroxide chloride or high molecular weight cationic polymer. The purpose of adding coagulant is to remove almost 90 percent of the suspended solids from industrial wastewater at this stage in the treatment process.

About the Author

Dushyant Jindal is an Engineer with MBA has an extensive experience working on environmental project for different sectors of Government and non-government organizations in India. He is the Co-Founder at Hitech Enviro Solutions, engaged in environmental monitoring services and consultancy.

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OPPORTUNITIES TO STRENGTHEN THE EFFICIENCY OF THE INDIAN WASTEWATER MANAGEMENT SECTOR

By Sanjeev Sirsi, Head – Municipal Business – INDO Region, Water Utility, Grundfos India



The key necessity of the wastewater systems to be reliable and effective can only be met with intelligent and sustainable solutions.

Advanced pumping systems strengthening reliability

Intelligent pumps are an integral part of refining the country's wastewater management sector. With implementation of digital technologies

such as Artificial Intelligence (AI) and Internet of Things (IoT) in pumping systems, the treatment of wastewater will see a huge change. These systems can adapt their functioning in real time by analyzing and reading data of the processes. The systems hence are less prone to downtime, saving energy, maintenance, and lifecycle costs.

Intelligent pumps or E-Pumps enabled with energy

The Indian wastewater treatment sector was estimated to be worth \$2.4 billion in 2019 and is projected to be worth \$4.3 billion by 2025 according to Mr. Amitabh Kant, CEO, NITI Aayog. This phenomenon stems from the rising demand for municipal water and increasing wastewater generated, which is estimated to reach over 120,000 MLD by 2051 as per the Central Pollution Control Board (CPCB).

The reuse potential of the wastewater is humongous. It is said that if 80% of the untreated wastewater from the country's 110 most populous cities is reused, 75% of the projected industrial water demand can be met by 2025. The focus should therefore be on upgrading the current wastewater management systems across the country with new and innovative technologies.



efficient motors provide massive energy savings. Specifically, pumps with IE5 rated motors are said to incorporate intelligent and smart technologies providing to the current need of climate positive systems. These pumps also provide high filtration potential aiding the much essential process of wastewater management.

For instance, in the North of Daxing city, in China, lies a mountain of rubbish from the residents that seeps to the bottom of the landfill pit, where it is collected into a water leachate accumulation pond for treatment. The Daxing treatment plant implemented a range of Grundfos industrial and

water treatment pumps – from heavy-duty, multistage CRN pumps to NKG and NKG end-suction pumps to BM high-pressure booster modules. This resulted in the treated water being discharged directly while some of the water is even reused.

With the rising need in automation of the systems, also comes the need for advanced maintenance. With technologies such as Grundfos Remote Management (GRM), these systems can be monitored and operated through an internet-based system. This goes on to provide extra security to the lives of employees at the water treatment plants and ease of running day to day operations in a hazardous environment.

For instance, residents in a neighborhood in Hobro, Denmark, were plagued by the smell of hydrogen sulphide that came from manholes outside the city where a pumping main transports wastewater. The production of hydrogen sulphide in the pressurized pipes was so significant that concentrations of up to 500 ppm were measured in the manholes. GRM was installed in this system to help cut down the production of this gas.

GRM receives signals from a gas phase logger installed in a manhole. Based on the data received, the solution automatically calculates the correct dosing amount of iron sulphate. GRM warns operators in case of problems, and the staff can access the internet-based system at any time to view operational status and make any necessary adjustments. After installing the Grundfos solution, the smell problem is completely gone. The hydrogen sulphide sensor in Hobro indicated zero.

Shifting trends in wastewater sector

With the enhanced implementation of AI and IoT, huge amounts of data are now available to analyze the wastewater sector. With the implementation of advanced technologies, the potential to reuse treated wastewater will also need to be of high priority in the years to come. Integrating systems that function by analyzing data in real time, will enable the wastewater segment to perform predictive and remote maintenance of infrastructure, thereby reducing downtime and improving reliability. Implementing digital solutions can enable the segment to optimally

manage proper treatment and well as reuse and discharge of wastewater.

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Sanjeev Sirsi is the Head of Municipal Business, Water Utility at Grundfos India. In his role, Sanjeev oversees the municipal business for India and neighboring countries.

Sanjeev has more than 28 years of industry experience in several marketing, sales, design and project management both in India and abroad. He has been with Grundfos since February 2007 handling the Water Utility business for the company in India, Bangladesh, Bhutan and Maldives. He has been involved in the initialisation of innovative products in solar and water supply segment for Grundfos in India that focus on water and energy conservation.

In the past, Sanjeev has been associated with organisations such as Greaves Cotton Limited and Sykes Group where he was responsible for sales development across various markets such as the Middle East, Africa and Eastern Europe.

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SEWAGE WATER TREATMENT AND WASTE WATER MANAGEMENT

By Gowthaman Desingh, Director – Technology, Transwater Systems



Conventional wastewater treatment consists of a combination of physical, chemical, and biological processes and operations to remove solids, organic matter and, sometimes, nutrients from wastewater. General terms used to describe different degrees of treatment, in order of increasing treatment level, are preliminary, primary, secondary, and tertiary and/or advanced wastewater treatment.

In Urban cities, majority of the Sewage/Waste Water treatment plant does the primary and secondary treatment addressing the reduction of BOD, COD, TSS, Ammonical Nitrogen, etc to meet the disposal norms but not completely eliminating them. Due to this treated sewage has a limited scope of utilization like toilet flushing, gardening& landscaping due to the stages of treatment

involved.

Due to rapid urbanization, cities are facing daunting task of supplying potable water to the residents & safe disposal of waste water. Increasing shortfall in the water supply, Cities have to look at alternate sustainable source of water like rain water, reusing of treated waste water, etc.

Existing Scenario:

BWSSB (Bangalore Water Supply &Sewerage Board) depends on Cauvery River for the water demands of the city and it spends huge cost in pumping 1475 MLD of water every day and it supply it to the residents at subsidized rates.

Bangalore Water Supply Demand Gap

With close to 5000 apartments in Bangalore, majority of them have their in-house waste water treatment plant and re-use portion of the treated waste water. Remaining treated sewage is drained which gets mixed with untreated waste water and make it inutile. Apart from that, BWSSB (Bangalore Water Supply &Sewerage Board) has an installed STP capacity of 1112 MLD.Commercial, Industrial

& Institutional water use in Bangalore alone stood close to 400 MLD which is majorly catered by the fresh water currently.

Way Forward:

Increasing the quality of treated sewage upto potable standards and supply them to the industries will reduce the demand for fresh water. Pollution Control Boards (PCB's) started enforcing new guidelines to install the advanced waste water treatment technologies like (Membrane Bio Reactor) MBR or to add Ultra Filtration (UF) System to the conventional waste water treatment technologies to improve the quality of waste water further to increase the utilization.

With the advent of new membrane technologies, recovering potable quality water has become practically viable and it can be implemented even at lower volume. However, there are few challenges which needs to be addressed which will make it economically viable.

Challenges:

➤ **Guidelines:** Currently PCBs are

Year	Population (Million)	Water Demand (MLD)	Water Demand (TMC)	Present Supply		Shortfall in Demand	
				MLD	TMC	MLD	TMC
2011	8.499	1400	18.05	950	12.25	450	5.80
2021	10.581	2100	27.1	1450	26.7	650	0.4
2031	14.296	2900	37.39	2070	26.7	1450	10.69
2041	17.085	3400	43.84	2070	26.7	1950	17.14
2051	20.561	4100	52.86	2070	26.7	2650	26.16

Bangalore Water Supply Demand Gap

recommending to use the treated waste water in residential complexes to use in the toilets & flushing, in case of Municipal Body it is recommended to use for landscaping, parks, etc. Guidelines to be created for increased utilization of treated waste water for construction, Industries, Cooling towers, etc.

- » **Awareness:** Awareness to be created among Industries to use the treated waste water to be used for Industrial activities and it has to be incentivised.
- » **Incentivise the Service Provider& residential complexes:** Currently the Service providers are liable to pay GST for recovering and supplying the potable water recovered from waste water which increases the cost of the water. Power subsidies can be provided to the residential complexes, especially for the deployment of potable water recovery system.



BOSON White Water System Installed at a commercial Mall

We at Transwater Systems, help the commercial spaces& Residential Complexes to install our BOSON White Water System, which help them in recovering potable water from their waste water. Over the past 3 years, we helped over 5 commercial spaces to recover approx. 900 ML of potable water from their waste water.

In one of the commercial malls, who were spending close to 6 lakhs a month in chemicals & water to run the cooling towers. By using the high-quality potable water recovered from BOSON White Water

System, they reduce the operation cost of cooling towers by 50% and they reduce the environmental impact of disposing the treated waste water.

BOSON white water system is a fully automated system comes with real time monitoring system to measure the quality of water. With the help of using the AI/ML and predictive analysis our systems have 99.9% uptime thereby providing the continuous supply of high-quality water to our clients.

About the Author

Gowthaman Desingh, a passionate water conservationist, technology enthusiast and Director, Technology at Transwater Systems. He has more than 5 years of experience in domestic water treatment plants, waste water treatment plants and Industrial water treatment plants. His interest lies in design, implement and troubleshooting of high recovery RO water purification system, domestic water treatment plants.

Apart from the designing water treatment plants, he has interest in developing IoT platform for water treatment plants. He developed the real time water quality & predictive maintenance system for their water treatment plants. Recognised by Republic TV and featured in 'Har EkBoond' for the contribution of water recovery system.

Has 15 years of experience in Information Technology developing various Collaboration products worked in several MNC's like Cisco Systems, ALTRAN. Holds a Bachelor of Engineering degree in Electronics & Communication Engineering.

To know more about the contributor of this article, you can write to us. Your feedback is welcome and should be sent at: deepak.chaudhary@eawater.com.



BOSON Realtime Monitoring & predictive System

PROMOTING APPROPRIATE LOW COST & LOW MAINTENANCE WASTE WATER TREATMENT SOLUTIONS

By Santwana Sneha, Board Member, FINISH Society



The Looming Water Crisis of India

Almost all of the world's major cities have gone into the 21st century facing an environmental crisis, including India. Resource depletion, environmental degradation and climate change are among the greatest challenges we face today. In this context, the proper management of solid & liquid waste along with efficient resource recovery have become relevant aspects of environmental management systems that could support a circular economy and assist in addressing these global challenges. As a result of rapid urbanization, India is witnessing depletion of the water resources and continued pollution of the remaining fresh water bodies. This makes preservation of lakes and rivers of paramount importance. Wastewater is the sewage and non-potable water that flows back

into the environment and most of it is untreated. The discharge of untreated wastewater is a major contributor to deteriorating health conditions and pollution of the nearby water bodies.

Current situation in most of the villages and small towns can be summarised as below:

- » No common drain connecting all houses in most of the cases.
- » Non-operational infrastructure due to OPEX related challenges.
- » Discharge of waste water is often into local water bodies or on surface.
- » May contain chemical impurities from agricultural or small industrial waste water, needing specialized treatment in some cases.
- » May contain certain amount of partially



**Yellow Water**

Yellow water is pure urine with or without flush water.

**Grey Water**

Wastewater that comes from sinks, bathrooms and showers or food waste.

**Black Water**

Wastewater from bathrooms and toilets that contains faecal matter.

Figure 1: Types of Domestic Sewage

treated sewage (from on-site facilities and toilets connected directly to drains).

- » Land is available but limited funds and skills.
- » Low level of awareness and accountability.

Waste water, if not treated well, can contaminate land, agriculture and eventually lead to contamination of vegetables, fruits, fish etc. and consuming these eatables may lead to diarrhea, skin infections, parasitic and bacterial infections. Collection and treatment of wastewater have a huge impact on the environment and economy, both at the local and global levels.

Types of Waste Water

Waste water can also be categorised into following three types:

- » **Domestic sewage:** Domestic sewage also called as sanitary sewage, carries used water from houses and apartments. Domestic sewage is very likely to contain disease-causing microbes.

» **Industrial sewage:** Industrial sewage is used water from manufacturing or chemical processes and usually contains specific and readily identifiable chemical compounds.

» **Storm sewage:** Storm sewage, or storm water, is runoff from precipitation that is collected in a system of pipes or open channels.

Further domestic waste water or domestic sewage can be categorised into the following types:

Waste Water Treatment, Disposal & Reuse

The problem to address waste water management starts with conscious use of water leading to reduction in waste water generation. Once waste water is generated, it must be treated, reused and recycled before disposing into water bodies.

Waste Water Treatment

The size, capacity and type of wastewater

treatment systems are determined by a various factor including:

- » Characteristics of effluents to be treated
- » Flow patterns and Flow management options
- » Availability of Power/Power source
- » Availability of Land
- » Availability skilled operators
- » Mechanism of O&M
- » Cost of installation and O&M (site dependent)
- » End use

There are mainly three levels of wastewater treatment: primary, secondary, and tertiary (or advanced). Following three methods are likely to be part of most treatment systems for liquid waste management in rural areas:

- » Wastewater Stabilization Ponds
- » Roughing filters or Rock Filters
- » Constructed Wetlands

Primary treatment	Secondary treatment	Tertiary or advanced treatment
Removes about 60 % of total suspended solids and about 35 percent of BOD; however dissolved impurities are not removed.	Removes more than 85 percent of both suspended solids and BOD.	Tertiary or advanced treatment Removes more than 99 percent of all the impurities from sewage, producing an effluent of almost drinking-water quality.

Figure 2: Different Levels of Water Treatment

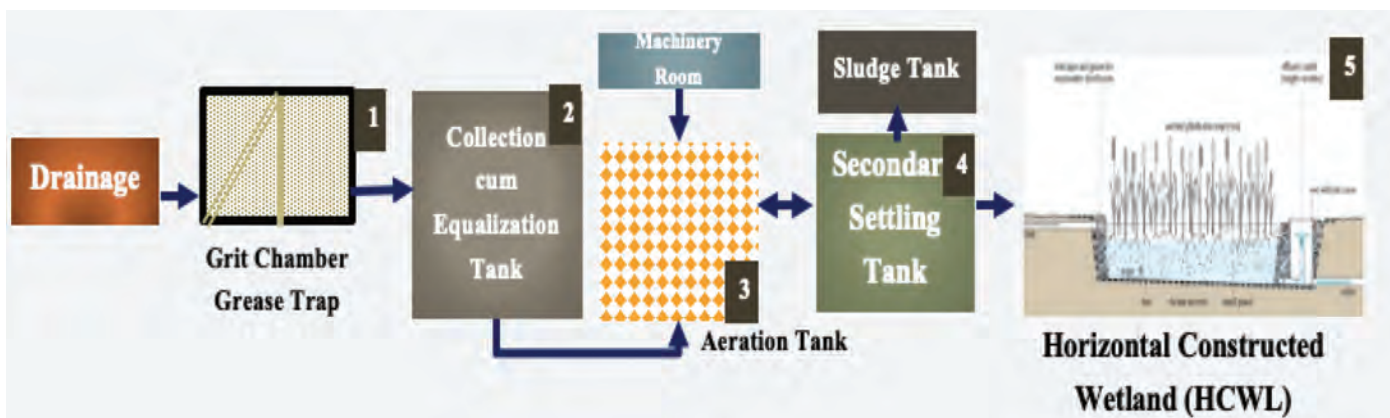


Figure 3: Gep Sagar Wastewater Treatment Plant, Dungarpur

Waste Water Disposal & Reuse

Waste water is a valuable resource than a problem to be disposed after meeting one or more legal/statutory requirements. The treated water is disposed in one of the four manners:

- » Reused directly as per the degree of treatment. (Non-contact uses like as cooling water in heat exchangers, flushing or contact applications like agriculture/irrigation, carwash etc.)
- » Disposed to the ground by per collation after necessary treatment. The treated wastewater even if not reused directly improves the quantity of ground water.
- » Disposal into a water body from where it is directly being reuse or disposal into a water body which sustains groundwater sources in the vicinity.

Our Initiatives in Waste Water Treatment

Water has played a critical role in development of civilization and has a direct connect with wellbeing of people. FINISH Society since beginning, strongly promotes safe sanitation technologies as it affects the ground water quality. Over time, FINISH expanded its initiatives in solid & liquid waste management as a natural extension of sanitation programs. FINISH Mondial, the Govt of the Netherlands supported ODF+ programme, in India aims to improve status of health, hygiene and cleanliness by interventions in WASH (households and schools), Solid & Liquid Waste Management and Faecal Sludge Management, inclusively and sustainably.

We help designed-based, nature-based and decentralized treatment options, that are better

suited for villages and small towns— instead of collecting and transporting such waste over long distances for treatment in large waste-water treatment plants. Our activities currently focus both on grey and black water treatment at households, communities as well as large water bodies.

Following are some of the interventions of FINISH Society supported under different programs to help manage the waste water in rural and peri-urban areas:

Dungarpur Municipality, Rajasthan

In Dungarpur municipality, two treatment systems (Gepsagar and Soneriya) were setup at a distance of 2km from each other. In one case, the technology adopted was a HCWL while in the other, which had a higher organic load due to presence of industrial effluents, the technology

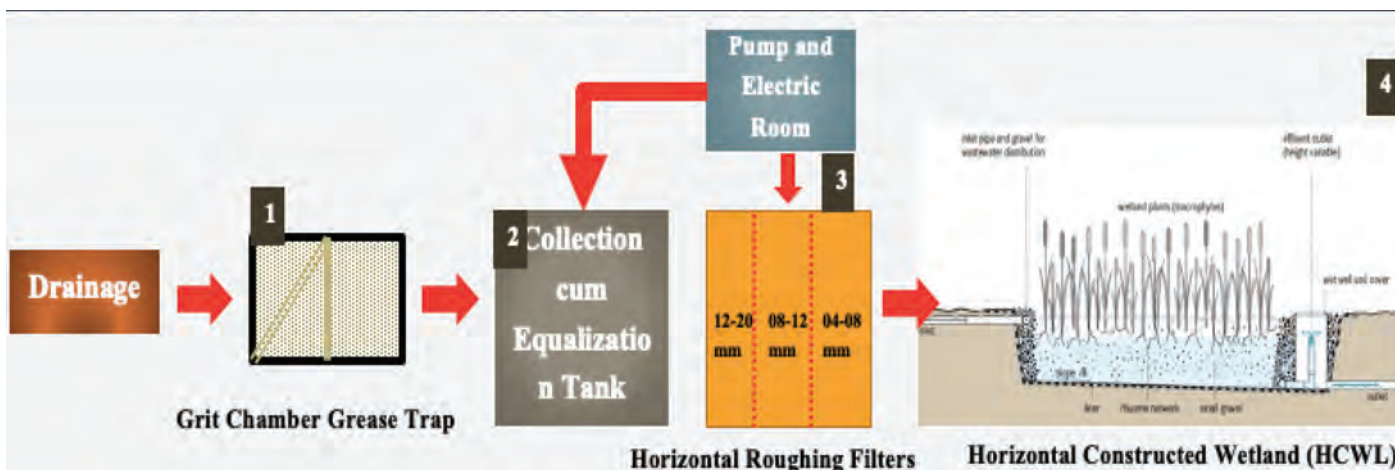


Figure 4: Treatment at Soneriya Lake, Dungarpur



Figure 5: Treatment Flow–Sembakkam Lake, Chennai





adopted was a combination of MBBR and HCWL.

Gep Sagar Wastewater Treatment Plant has a capacity of 20m³/day (KLD) is designed and constructed to treat both blackwater and greywater.

Soneriya Wastewater Treatment Plant has a capacity of 50m³/day (KLD) is designed and constructed to treat both blackwater and greywater. The drainage water now is treated before getting discharged into Soneriya lake in Dungarpur and the treated water is being reused.

Sembakkam Lake, Chennai supported by The Nature Conservancy

In the Ecological Rejuvenation Project of Lake Sembakkam, Chennai, 2 Sewage Treatment Plants (STPs) of 1 MLD and 6 MLD capacity respectively at two major inlets, are being built to treat the influents from multiple drains. The STP will be based on Semi-Natural Treatment Technology which means both aerated lagoon and reed bed.

Over a period of time, the dependence of freshwater provided in trucks can be reduced to a great extent and later completely eliminated. Over

and above the positive economic impact for the residential area, the rejuvenation of the lake will facilitate use of the lake and its banks for various types of recreational and social activities.

Evapotranspiration Technology in Ashramshala School, Nasik

The waste water from 'Point of use-POU' goes to the earthen trench which is earlier filled up thick coarse aggregate with a perforated PVC pipe. The waste water gets distributed throughout the trench and percolates. The balance water evaporates in the sunlight and some water gets consumed extensively by the water consuming plants (like Cana-Indica, banana & other similar plants). The unit was supported by WaterAid and NSE Foundation.

Waste Water Treatment: Umarpata Ashram school, Nasik

The school faced water scarcity issue, because of which toilet usage was very low in the school. The waste water from bathrooms (was treated for reuse in toilet flushing).

Grey Water Treatment Plant at Shrirampur GP, Nandurbar for Treating Household Waste Water

The grey water treatment plan is supported by NSE Foundation, treating water from over 100 households. Treated water is being used for farming.



Sedimentation Tank

Rock filter

Roughing filter

Constructed wetlands

Treated water for reuse in farming

About the Author

With almost over a decade of experience in corporate and social sector, she brings a unique perspective. Her expertise includes research, knowledge management, and design-thinking solutions. Her work focuses on an inclusive approach to gender equality and climate change mitigation through sustainable waste management. She has a management degree in agri-business from Vamnicom and a diploma in leadership and change management from XLRI. She serves on the board of FINISH Society and also supports Monitoring & Evaluation work for FINISH.

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DECENTRALIZED SEWAGE TREATMENT PLANT

By Arya Water Technologies



Lonavala also known as the 'Jewel of Sahyadri' is a hill station situated in the western ghats. It is a well-known tourist spot attracting large number of tourists every year. Increasing local population and floating population of visiting tourists has increased pressure on the limited natural resources. Presently, water demand of Lonavala is about 19–20 ML and projected water demand of different sectors viz., domestic use, industrial, tourism would be around 22–23 MLD and 30–35 MLD by the year 2025 and 2040, respectively.

According to Commission, Government of India, about 80–81% of water supplied by municipality is finally disposed as sewage. Domestic wastewater consists of collection treatment and disposal. The wastewater generated by different sectors needs monitoring and treatment before being discharged into water bodies.

In Lonavala city, the existing lines require upgradation to meet ever increasing demands. The terrain of Lonavala, particularly in Khandala and Gold Valley area, poses a problem in laying down of conventional gravity flow sewer lines, which requires connecting each resident to a single collection system. So, it is not practical to treat wastewater through centralized wastewater treatment system.

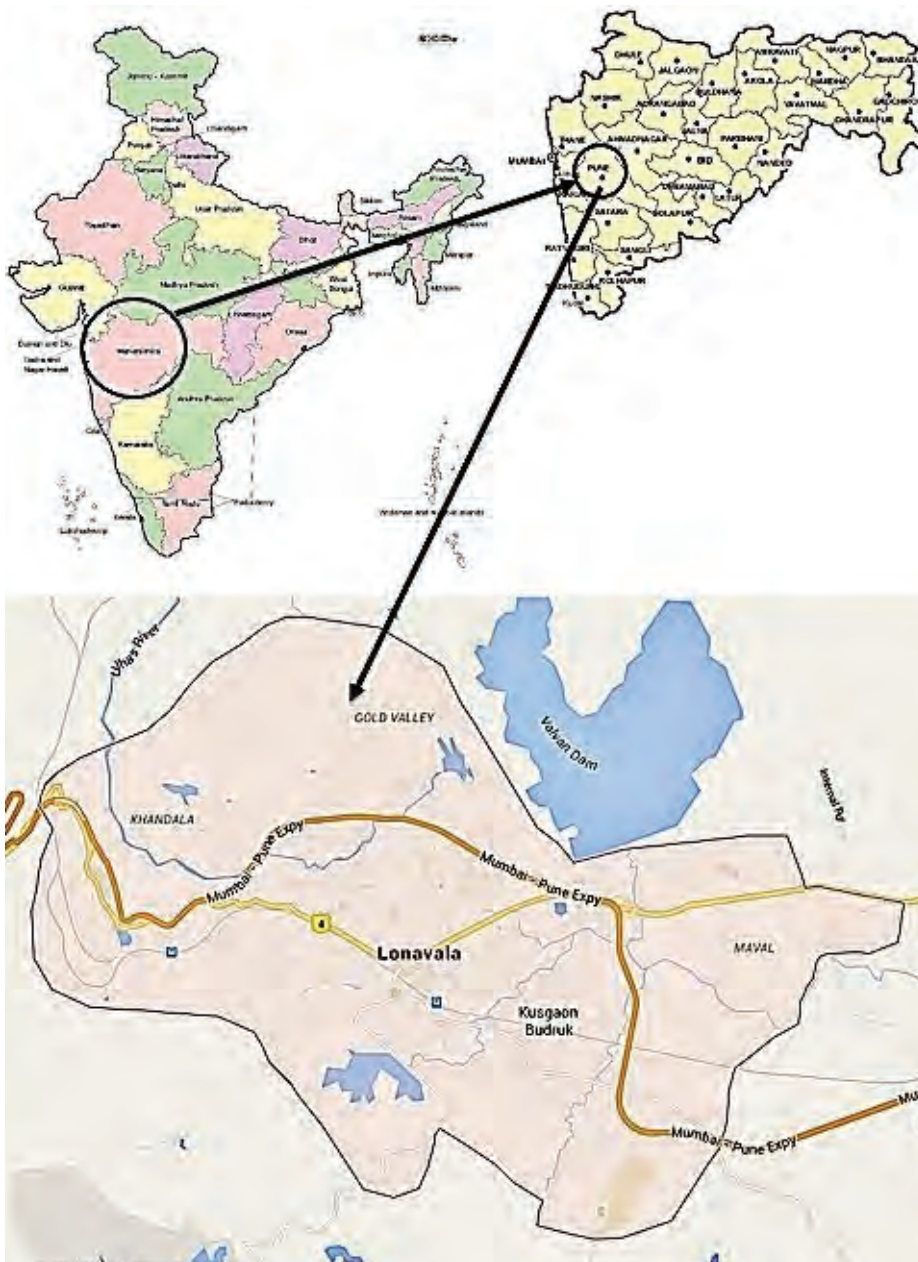


Figure: Location of Lonavala on India's Map



Location: Khandala Lake



Decentralized Sewage Treatment: DST

The most feasible approach would be to use a decentralized sewage treatment system. A decentralized wastewater treatment system is a smaller individual wastewater treatment system, which treats water in a particular territory. Onsite or localized treatment and reuse is the basic approach. The overall treatment process in a decentralized system includes primary, secondary, and tertiary treatment installed in a centralized system but on a smaller scale. It is desirable that in the decentralized wastewater treatment system the treated sewage is recycled and reused.

Decentralized sewage treatment can be a smart alternative for communities considering installation of new systems or modifying, replacing, or expanding existing wastewater treatment systems. For many communities, decentralized treatment can be:

- » 1. Economical and Cost-effective • Eliminating large capital costs / huge investments • lower operation and maintenance costs • creating business and job opportunities
- » 2. Green plus sustainable • Benefiting water quality and availability • Using energy and land wisely • Responding to growth while preserving green space
- » 3. Safe in protecting the environment, public health, and water quality • Protecting the community's health • Reducing conventional pollutants, nutrients, and emerging contaminants • Mitigating contamination and health risks associated with wastewater.

In line with above, under the Government of India Swachh Bharat Mission Lonavala Municipal Corporation – LMC decided to install 4 Nos of

decentralized STP's for treating sewage / sullage at following places

- » Ram Nagar Slum Area.
- » Khandala Lake
- » Chhatrapati Shivaji Maharaj Garden
- » Lonavala Bhaji Market

Sine IIT Bombay Company was engaged for preparation of DPR for above project.

Ram Nagar

Ram Nagar is a slum area having a population of about 4000 people which is further growing. This slum area is near the Lonavala lake, towards the bushy dam road. The sewage water coming from the slum area directly enters the lake and pollutes the lake water which turns to be harmful for the living beings in the lake.

LMC decided to partially treat the sewage and hence decided to install a package STP Plant. The space allocated for installation of above sewage treatment plant is near Lonavala lake.

Khandala Lake

Khandala lake is one of the beautiful tourists spot and is enroute from Khandala to Lonavala. Some slums have emerged in the border of this lake

The sewage water coming from the slum area directly enters the lake and pollutes the lake water which turns to be harmful for the living beings in the lake. LMC decided to partially treat the sewage and hence decided to install a package STP Plant.

Chhatrapati Shivaji Maharaj Garden

CSMG is a garden in the heart of Lonavala. An open sewage line passes through this garden and hence LMC decided to treat the sewage and use the water for gardening.

Bhaji Market

Bhaji Means Vegetable and there is sewage nalla passing nearby through the Bhaji Market. LMC decided to install the STP Plant at this location to partially treat the sewage and reuse the same

Case study of Package STP Plant – OSNOS– FFBM

LMC had tendered the above plant to a local civil contractor who in turn had on back-to-back basis given the order to Arya Water Technologies – AWT Mumbai.

Arya had in-house designed and engineered, fabricated, supplied and erected the package decentralized sewage treatment plant based on fixed film bio media technology which is simple to operate, has low maintenance cost and consumes very less energy.

The complete package unit is prefabricated at our designated shops / sub vendors shop and shipped to the site for installation on civil foundations.

To help with operator training, operators can watch the training and maintenance videos, which was filmed onsite. Pretrial / Pre commissioning completed, and results are satisfactory. Water is gravity fed in sewage collection sump from the existing nalla.

Basic Principle:

Fixed Film Bio Media (FFBM) based wastewater treatment plant works on the principle of 'Aerobic Hybrid System' with 'Attached Growth

Technology'. Core of system is 'Air Permeable Type' media that provides 1 substrate for an aerobic biofilm to grow. constant recirculation is provided to the reactor allowing sufficient time for degradation and higher MLSS at lower HRT,

enabling an efficient mechanism for reduction of COD, TSS & nutrients in wastewater. Treated water can subsequently be used for various non potable applications.

Process Description

Collection chamber:

The Collection Chamber connects homes to the vacuum sewer system. Wastewater flows by gravity into a collection chamber where the untreated waste is collected for treatment.

Reactor Tank:

The wastewater is transferred from collection

pit through reactor feed pump via bar screen to reactor tank. The reactor tank is layered with multiple layers of membrane on which wastewater is sprayed through multiple nozzles. These specially designed membranes allow formation of aerobic bacteria. Multiple nozzles allow air to mix with wastewater naturally or via air supplied through blowers aiding multiplication of bacteria while the membrane provides nesting support.

Recirculation Settling Tank:

The mixture of sludge and water from reactor tank is passed to recirculation settling tank. The sludge settles at the bottom and clarified water

is collected from the surface. The bottom sludge is transferred through recirculation pump and sprayed again in the reactor tank to further aid aerobic bacteria growth and in turn accelerate BOD & COD removal.

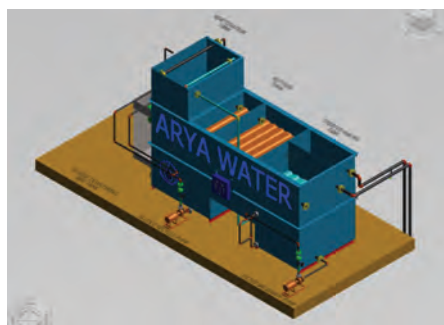
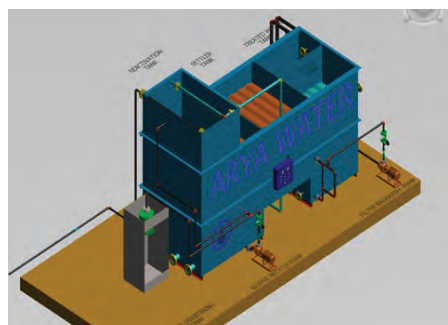
Filtration Unit:

Clear water from the top-level recirculation settling tank overflows into the Gravity Filtration Tank that consists of granules, sand and activated carbon layers. Treated sewage from filtration unit can be used in horticulture.

Tertiary Treatment:

Tertiary treatments such as Chlorination/UV/ Ozonation can be added to make the treated water suitable for floor washing, toilet flushing and other applications.

The package type FFBM are available in sizes of 15 KLD, 25 KLD and scalable up to 50 KLD & 75 KLD. Higher capacity package plants available are based on MBBR / other technologies.



Our Installations at Lonawala



Bhaji Market



CSMG



Khandala Lake



Ram Nagar

About the Author

Arya Water Technologies (AWT), is a technology driven entity, specializing in end-to-end environment solutions – Water Treatment Plants, Sewage & Effluent Treatment Plants, Recycle & Reuse Plants, Zero Liquid Discharge & Seawater Desalination based on a wide spectrum of technologies ranging from conventional to the next generation. We not only provide small and medium size projects but also undertake Augmentation and Retrofitting job, O and M Contracts, Chemicals and Components related with water treatment.

AWT is a division of Arya Communications & Electronics Services Pvt. Ltd. (ARYACOM), company of century old illustrious JM Baxi (JMB) Conglomerate, one of Asia's leading shipping & maritime logistics support service provider having customer base in over 56 countries worldwide. Besides, its group companies are leading solution providers in the field of comprehensive oil & gas logistics, domestic logistics, port cost services, infrastructure management, wireless communication, high end locking solutions, banking support services, among others.

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SOLAR POWERED WASTE WATER MANAGEMENT (WWM)

By Dilip Yewalekar and Manisha Kinge, Jain Irrigation Systems Ltd., Jalgaon India



to water management & treatment because of unlimited availability of free solar radiation without proprietorships and non-judicial! Concerning to use of solar power in waste water management sector is in primitive stage because of lack of awareness on design aspects and exceptional types of electro-mechanical machines for waste water management system.

In the waste water treatment, all the electro-mechanical devices are working on electrical power supplied either by Govt or DG Set. So recurring, maintenance, fuel cost & overall energy cost of such waste water treatment plants is significantly higher than solar energy. The concern article throws lights on fundamental & design aspects of solar powered waste water management system, contributes to achieve certain objectives of COP26.

Solar power is very curious subject flaming all over the world in all sectors from space station

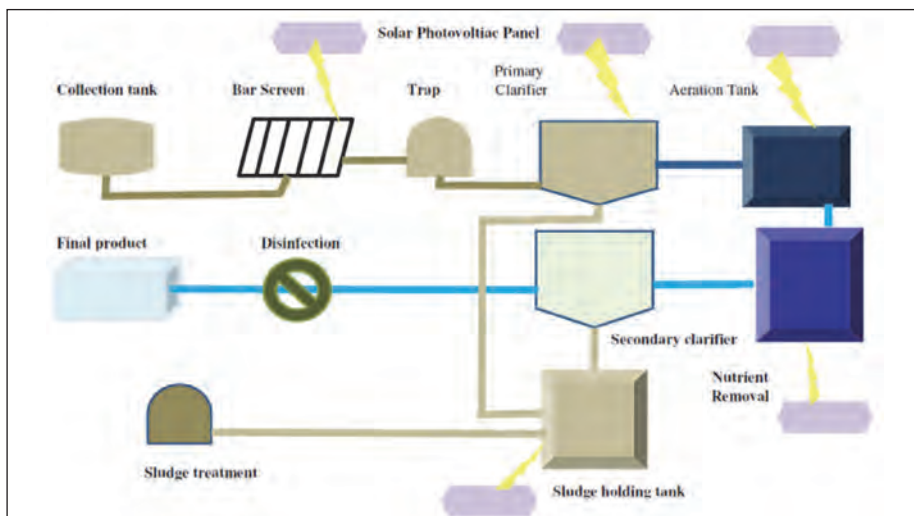


Fig. 1. Architect of Solar Powered Waste Water Treatment Plant.

Review

Wastewater treatment means removal of impurities from wastewater, before reaching to aquifers or natural bodies of water such as River, Lake, and Oceans. Water pollution, therefore, is caused primarily by the drainage of contaminated waste water into surface water or groundwater. More than 80 percent of the world's wastewater flows back into the environment without being treated.

Principle Stages of Waste Water Treatment

There are three levels of wastewater treatment: primary, secondary, and tertiary (or advanced). Fig. 1. Shows an Architect of Solar Powered Waste Water Treatment Plant.

- » **Collection tank:** To collect raw water / waste water.
- » **Bar Screen /Grit:** To separate solid matters, debris.
- » **Trap:** To separate solid matters.
- » Primary clarifier
- » Aeration tank
- » Nutrient removal (if)
- » Secondary clarifier
- » Disinfection
- » Final produce.
- » Sludge holding tank.
- » Sludge Treatment.

Primary treatment

Primary treatment removes physical debris by process of screening. Suspended particles that pass through screens and grit chambers are removed from the sewage in sedimentation tanks, called as primary clarifiers.

Secondary treatment

Secondary treatment removes the soluble organic matter and suspended solids that escapes primary treatment. Removal is usually accomplished by biological processes with microbes.

Disinfections

Disinfection is the last step prior to discharge of the sewage effluent into a water body which destroys any remaining pathogens in the effluent & protects public health, is usually done by injection of chlorine bases chemicals.

Change of Electrical Motor Pumpset to Solar Power.

Electrical motor pump sets are provided to lift and transfer the sewage from one point to another point for treatment purpose. Special non-clogging pumps are used for this purpose and mainly operated by electrical power.

Same electrical motor pumpset can be operated by solar power without making any changes in the entire system. Selection of such motor pumpset is dependent on volume of waste water to be handle and head requirement.

Review Solar Photovoltaic (PV)

The photovoltaic effect refers to photons of light exciting electrons into a higher state of energy, allowing them to act as charge carriers for an electric current. The photovoltaic effect was first observed by Alexander-Edmond Becquerel in

ANNUAL MEAN DAILY GLOBAL SOLAR ELECTRIC
CONVERSION [POTENTIAL INDIA (MW)]



Fig. 3. Intensity of Solar radiation: India

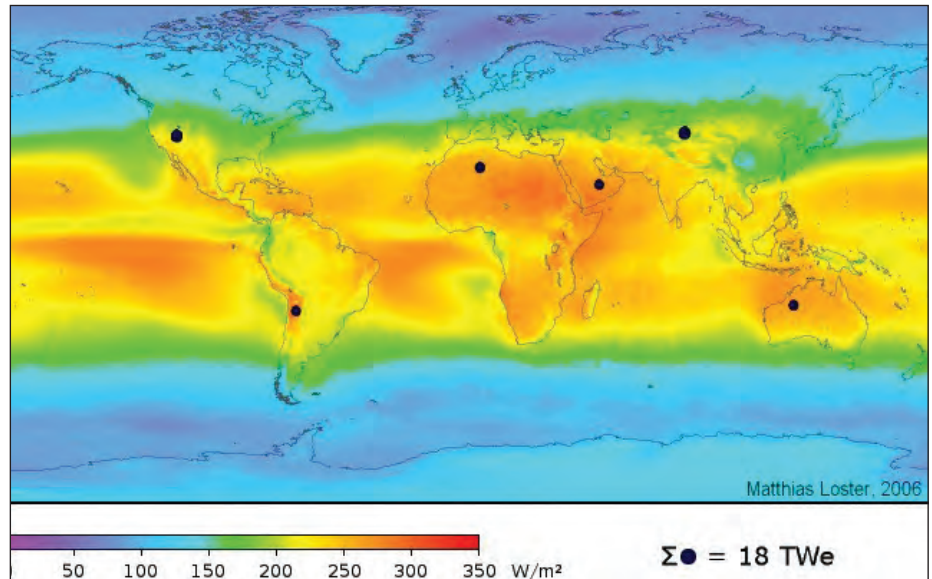


Fig. 2. Global solar power available.

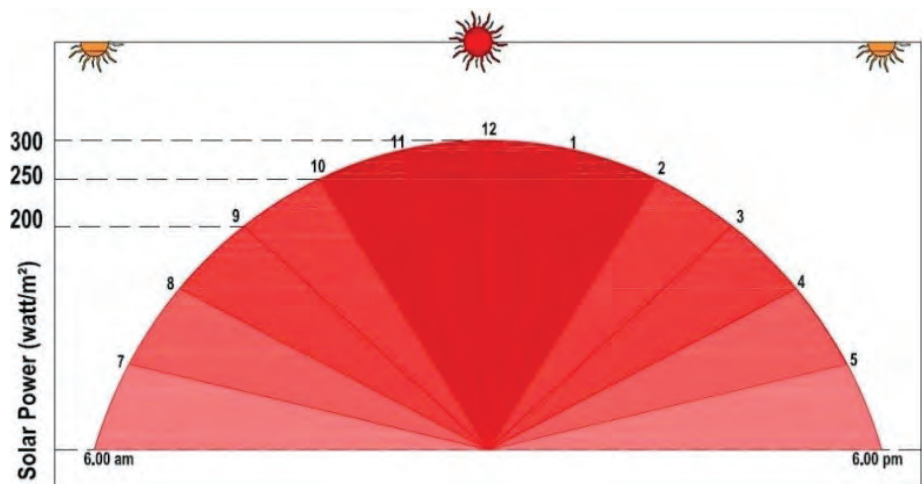


Fig 4: Solar Power monochrome

1839. Solar cells produce direct current electricity from sun light, which can be used to power equipment or to recharge a battery. In this case an inverter is required to convert power DC to AC.

Countries positioned (Fig 2 & 3) across the equator have wide scope of harvesting solar power @ 350 w/m². India is located between equator & tropic of cancer, can harvest solar energy @ 250–350 w/m² for 6–8 hours consistence throughout the year. Potential of solar energy decreases while proceeding towards north–south poles @ 3 to 5 % per degree of latitude. However, solar energy harvesting is dependent on temperature,

relative humidity, clouds, latitude, longitude and obstructions at the particular location. Therefore, it is necessary to acquire the climatic data from nearest meteorological station. Base on meteorological data, potential of solar energy harvested can be estimated for design purpose along with solar module and allied equipment.

Design considerations

Since the solar radiation is available in day time, so entire waste water treatment process has to be completed in a day time only. Obviously all the design calculation is based on the fluctuation of solar radiation from morning to evening and

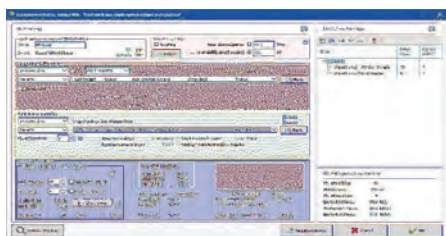


Fig 5. Pvsysts –Software

season to season. However, following factors have to be considered while designing waste water treatment.

- » Average solar radiation from morning to evening on monthly and seasonal basis.
- » Inflow of waste water on daily, alternate and monthly basis.
- » Quality of waste water (water analysis data).
- » Master plan – waste water treatment process and stages.
- » Operation / management of system.
- » Optimization of requirement of motor–pump–set (solar powered)
- » Photovoltaic Solar Module.
- » Techno–commercial parameters.

Determine the solar PV energy output of a photovoltaic system.

There are various methods and formula available to determine the solar energy. Average solar energy can be harvested to 200–300 Wm⁻² at various locations base on latitude and longitude. It varies from season to season and mainly affects the cloud cover and haziness. Maximum solar power can be harvested in summer season and minimum in rainy seasons due to cloudiness. Similarly in a day solar energy is minimum in morning, maximum in noon and again minimum during evening. Fig 4. Shows the solar monochrome, it is very clear that the design of WWT should be made corresponding to available solar radiation only.

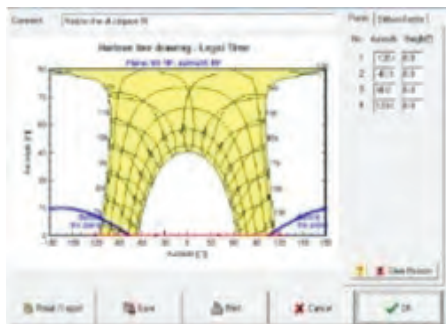


Fig 6. Horizon yield of Thohoyandou Solar Radiation

$E = A * r * H * PR$ (Pvsyst(Switzerland), RETScreen (Canada), Synergy Enviro Engineers(Hyd), <https://photovoltaic-software.com/>)

E – Gross Energy (kwhr)

A – Total area of solar panel (sqmt) r – Solar panel yield (%)

H – Annual average irradiation on tilted panel

PR –Performance ratio, coefficient for losses (range between 0.9 and 0.5, default value = 0.75)

$NetSE = E * L$

$NetSE$ – Net Solar Energy (kwhr)

L (%) = Power Losses (in Inverters, Temperature, Cables (AC/DC), Shading %,

Weak Irradiation, Dust, snow fall, RH, Cloud cover & unforeseen losses)

However, there are various software available to determine the harvesting of solar power, sun–path and duration as highlighted in figure 5, 6 & 7.

Benefits to Nation

- » Dependency on Government Power supply will be ended and project will become self–sufficient in power.
- » No electrical Bill.
- » Import of fuel, coal, nuclear power will be reduced over great extend and thereby saving in forex.
- » Pollution, environment, ecological & health control can be achieved.
- » Indirectly help to increase GDP.
- » Helps to achieve targeted aims of COP26.
- » Wide scope for employment generation.

Limitations

- » Initial investment is high.
- » Advanced technology in design and manufacturing of solar panel is not available easily.

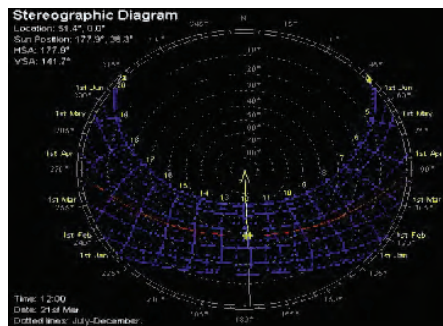


Fig 7. Stereographic diagram –Sun path

- » Lack of awareness among the department and extension works need to be done.
- » Availability of skilled manpower and special tools.

About the Author

Dilip Yewalekar is the Senior Vice President of Jain Irrigation Systems Ltd. He has over 36 years of experience. He has done M.Tech– Civil– Structural Engg, PG Diploma in Piping Engg, AMIE,UK, ASAE, USA. He is a Google scholar, Member of ICID.

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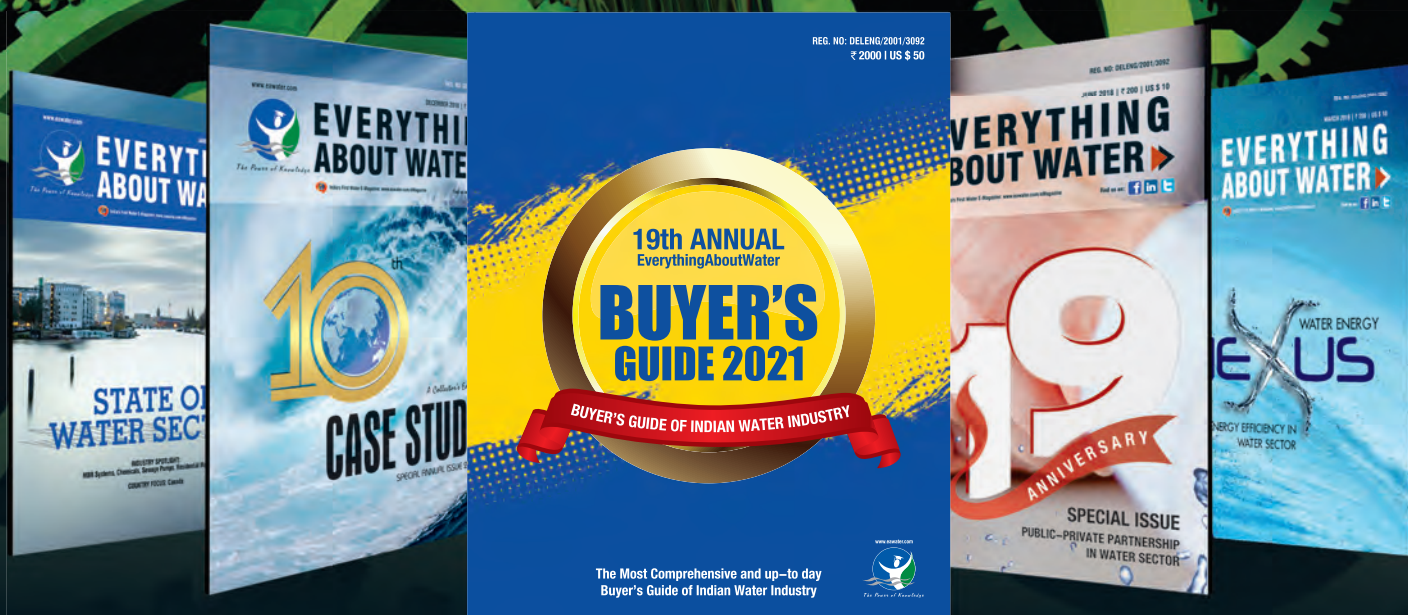
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SUSTAINABLE WATER MANAGEMENT WITH REUSE OF WASTEWATER

By Ms. Janshi.G, Murugappa organo water solutions private limited



Water has been the backbone of evolution of life. Starting from mere existence to engineering achievement, the usage of water has been the catalyst. The water source decided the course of all the civilizations. It boosted the economy and trade. Along with improvising the standards of living, the anthropogenic water application equally

resulted in the exploitation of the hydrosphere. Agriculture led to formation of civilized colonies and the later era industrial revolution led to urbanization in selected regions. Thus, started the challenge of water & wastewater management. Water due its chemical nature can dissolve a large range pollutants. The direct human generated waste was categorized as sewage and the other contaminated water was generally termed as wastewater. As the human activities increased, the need the use of fresh water increased, resulting in raise in generation of contaminated wastewater.

With developing countries like India working hard to boost the economies, the demand for fresh water will increase rapidly. Based on the quality and demand, over the last decade there is a huge focus on various technologies to retrieve pollutant free water from all sources. In India as fore casted by the ministry, the water demand shall be 1180 billion cubic meters by 2050 from the existing usage of 750 billion cubic meter. (1) Strikingly the supply of fresh water cannot be completely under

the human governance. Unlike the past where the abundance of water decided the growth, in present conditions the efficient water management will decide the growth of the nation.

Globally 72% of all water withdrawals are used by agriculture, 16% by municipalities for households and services, and 12% by industries. (2). There can be variation based on the country's main economic activity like India being an agricultural country, almost 91% of water is used by the

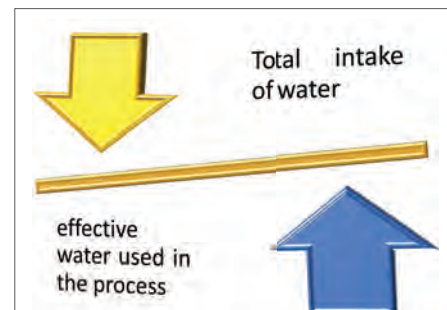


Figure1: Water use efficiency balance

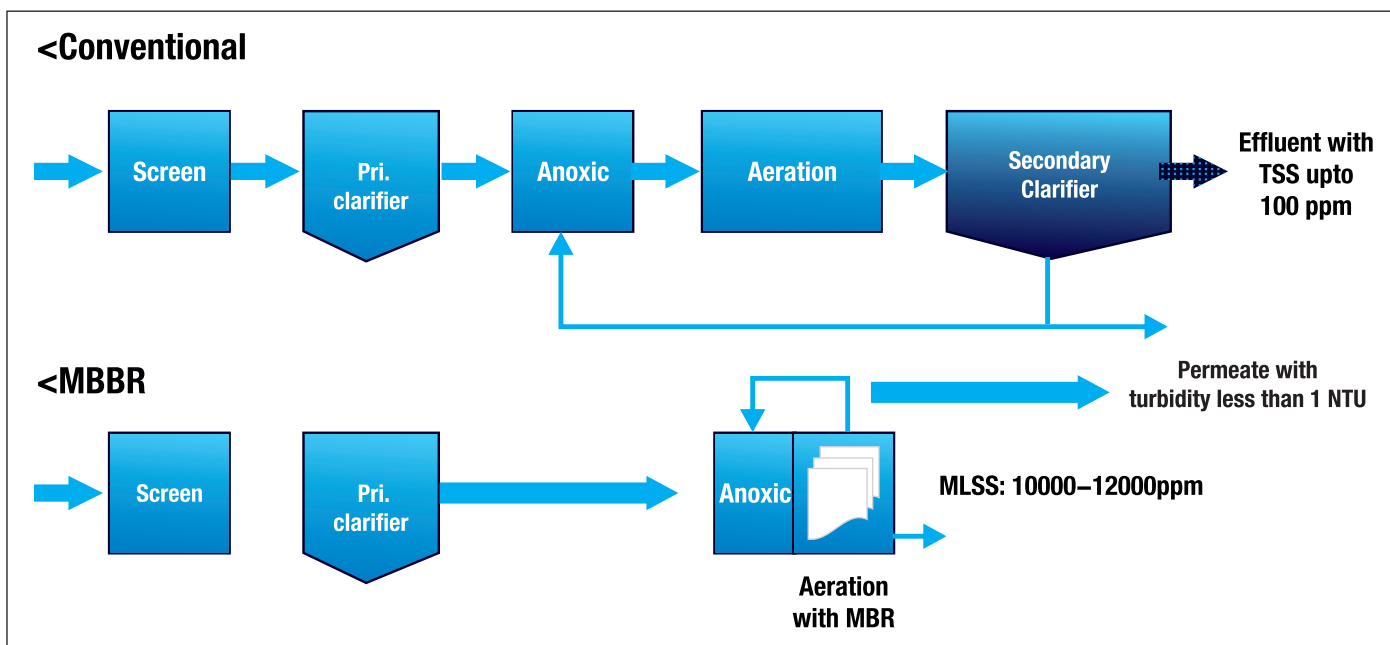


Figure 2: Conventional and MBR based waste water treatment process

irrigational sector, followed by Industrial & domestic use. Though the industrial share of usage is 2% of total water demand, the water usage efficiency in Indian industries is far beyond the global standards.(1)

Striking the balance

With the widening supply to demand gap, the cost of raw water in arid semi-arid zones are reaching new heights over the years. Water is emerging as one of most influential commodities. Global & national governing bodies are declaring new targets of water use efficiency (WUE) in agricultural, industrial, and municipal uses. National water mission, India has set up the goal raising the WUE to 20%, which is still less than the global average.

Though all these measures appear to strike only one side of the balance—the management of fresh water, there is the major insight of water reuse and recycle. Managing to save the depleting source of fresh water, the necessity for the search of sustainable water management has also evolved. The Indian water governance body, Jal sakthi aims to meet a considerable amount of urban water needs through reuse and recycling. The Industrial sector is also regularized on water reuse, recycle under Goal of Zero liquid discharge.

Sustainable reuse

When it comes to benefiting out of fresh water, the complexity of treating is less as it is considerably purer than the generated used water. Converting the wastewater (Sewage, industrial effluent) up to the standards of reuse, equivalent to the standards of fresh water is the challenge for the Industry. Thanks to the technological advancements, where there is a focussed treatment, removal process aiming at different micro level pollutants based on their nature.

Conventional treatment methods had held their guard when it comes to pollution mitigation. Whereas reuse demands advanced treatment technologies so that the recovered water meets the best of its quality, sometimes even exceeding the raw water. The advanced technologies are upgradations which have overcome the conventional limitations and thus they have set the new standards of reusable water. Physical unit operations, chemical & biochemical unit processes have always been the crux of wastewater treatment.

The Era of polymeric membranes

With the invention of polymeric membranes, membrane separation techniques have long been applied in process industries. Out of all Membrane

separation techniques, Ultra and micro filtration separation found varied application because of



Figure 3: MOWS Ultra–PUREIT Hollowfibre modules ready for installation for food industry, Tamilnadu 2021



Figure 7: Sugar industry condensate after biological & UF treatment

high recoveries and low power consumption (3). In 1962 when Loeb and Surirajan succeeded in a polymeric membrane fabrication methodology, the membranes with improved physiochemical structure, high strength and high recoveries were commercially available.

These UF membranes were getting applied in wastewater treatment for solids separation and thus a full-fledged Membrane bioreactor was commercialized.

The Biological treatment technologies had the limitation on maintaining the microbial population, since the sedimentation and recirculation was dependant on the settling nature of the biomass. The Membrane bio reactors came as boon to face this challenge. Changing the concept of settling to filtration, the biological system has better control on the microbial population because the retention of biomass is no more dependent on the settling characteristics of the consortium.

The multiple benefits being more microbes can be accommodated without fear of bulking with higher recirculation rate and the predatory slow growers have enough sludge retention time for their

effective action on the organics. Since the MLSS is subjected to membrane filtration, the quality of recovered water is far better than the conventional clarifiers making it for reuse directly.

Different waste waters require different treatment

Not all waste waters will require immense biological treatment since they would have lesser organic load. Interestingly we could find one such application, where the used water required a polishing treatment, and it could be used back in process. The sugar industry is known as of the most water intensive industry and generates effluents with high organic load. The industry was facing a deep-water crisis and was totally dependent on its ground water borewells.

Depleting borewells had set us on search for opportunities to look for reuse options. Out of conventional outcomes, the condensate from the sugar processing unit was identified as renewable source. From the analysis, it could be concluded that it was a low – medium strength wastewater and required biological treatment but the residual organics to be removed effectively as the intended use was for boiler.

The challenges of microbial contamination and Consistency of water quality had set the faintest hopes for the conventional filters to match the requirement. Ultrafiltration at a filtration range of 0.01 to 0.1µm was the best fit for microbial & residual colloidal contaminant removal.

Process	Baseline Removal Rate		
	Bacteria	Viruses	Protozoa
Chlorine Disinfection (Ct99 at pH7–7.5, 0–5°C)	12mg • min/l	12mg • min/l	Giardia: 230mg • min/l Cryptosporidium: Not killed
Granular high-rate filtration	–	–	70%
Slow sand filtration	50%	20%	50%
MF	99.9% – 99.99%	<90%	99.9% – 99.99%
UF/NF/RO	Complete Removal	Complete Removal	Complete Removal

Table 1: A comparison of removal efficiencies

With Phase 1 upgradation, it was evident that Ultrafiltration would deliver consistent output quality, better than the earlier bore well water. The Bore well also had the limitations of silica, since the condensate is free of silica, the end user's efforts for silica removal was also reduced

S. NO	Description	Parameters	
		Raw water	UF permeate
1.	pH	7.2	6.8–7.7
2.	Conductivity	442	149–323
3.	TDS	287	96–120
4.	Total Hardness	144	40–110
5.	Calcium	90	25–70
6.	magnesium	54	15–40
7.	Total Alkalinity	186	20
8.	Chloride	27	20
9.	Silica	60	<1

Table 2: The treated reused water quality vs Raw water

By end of phase 1, the client was all set to let go 1 out of 4 of their borewells for fresh water and the wastewater discharge was reduced by 50%.

The Volumetric reduction for silica treatment was rendering a savings of INR 25 per cubic meter of raw water treated. Thus, wastewater reuse and recovery were paving their way to achieve sustainable water management, as result of which, phase II expansion with Ultrafiltration had commenced & commissioned successfully. The other unit of the same industry at Bagalkot, Karnataka are adapting the same treatment structure to enhance their water reuse standards.

Conclusion:

Global water sustainability goals (SDG 6) have been set with a broader objective of providing water and sanitation for all. Driving deep into this objective, when we need to revive around 733 million people who are under extreme water stress, renewable water sources and sustainable water management becomes the fundamental approach. Beyond the regulatory acts, the driving force should be how best can we use



Figure 8: MOWS Ultra Klean UF train – Phase II condensate treatment, Sugar processing Unit, Nellikuppam, Tamilnadu.

our water. While wastewater recycle and reuse are significantly cutting down the expenditure on freshwater usage, it is also reducing the impact on the surrounding environment. Each industry must relook on their water footprints and compare with the global averages. There is a constant drive to improve the sustainability index across all segments, thus there should be ceaseless watch for new technologies and adaptation of new practices which can improve the water footprint. Periodic water audits can be eye openers for a new source of used water which can be treated and reused with minimal technologies.

As our search for water is exceeding our planetary boundaries, the responsibility of maintaining a better planet still lies with us. After all we can find, extract, treat, reuse, and replenish water but can never create the elixir.

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About the Author

Ms. Janshi.G holds a masters degree in Environmental science and technology. Associated with MOWS since 2012, she has been the process lead for various total water solutions and ZLD projects across various industries. Currently she will be focussing on development of new technology & technology tie ups.

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MUNICIPAL WATER MANAGEMENT – A PERSPECTIVE

By Subhash Sethi, Chairman, SPML Infra Limited

More than 70% of the Earth's surface is covered with water, but for our actual water supply, we have very limited sources.



Water is essential for life. We need water for everything; from our personal use, to grow food, and to produce virtually everything required for our survival on the planet earth. Water is also equally important for the economic growth of the nation. Practically all of society's commercial activities, from agriculture, industrial and electricity generation to the production of consumer goods depend on the availability of water.

For years, we have taken the water supply for granted. Earlier the availability was much more than any demand for water and drinking water used to flows in abundance from the taps in our

homes, schools, and workplaces. Many of us did not give a second's thought to the challenges that lie behind getting clean water to our taps or indeed how much of this finite resource we consume on a daily basis. But for most of the world, clean drinking water is now a precious commodity and the same is true for India. Although water covers more than 70% of the Earth's surface, but we have to rely on annual rainfall for our actual water supply. About two-thirds of annual rainfall evaporates into the atmosphere, and another 20–25% flows into the oceans and is not fit for human use. This leaves only about 10% of all rainfall available for personal, agricultural and industrial use.

India has about 4% of world's freshwater resources ranking it among the top ten water rich countries. The situation is changing very fast and as per international reports, India is designated to become a 'water stressed region' with current utilizable freshwater standing at 1122 cubic meter (cum) per capita per year compared to international standards of 1700 cum. The per capita water availability in the country is reducing due to increase in population and several other factors. The average annual per capita availability of water taking into consideration the population in various censuses has come down by 70% from 1951 to 2011, in a span of 60 years. The per capita availability of water as per 1951 census was 5177 cubic meters. In future, at the current

rate it is expected that India with high demands will be termed a 'water scarce region' as utilizable freshwater level falls below the international standard of 1000 cum per capita. Water demand is on a high from industries along with the traditional demand for agriculture.

The Challenges Limited Supply

India with the current population of 1.39 billion people gets over 4000 cu km of freshwater in the form of rain and snowfall, of which 2047 cu km return to oceans or is precipitated. A small percentage is stored in inland water bodies and groundwater aquifers. Topographic constraints, distribution pattern, technical limitation, and poor management do not allow India to harness its water resources efficiently. Moreover, precipitation is not evenly distributed and millions of people are living in areas of water scarcity. Pollution has also made much of that water undrinkable and unsafe for use. Meeting India's increasing water needs has fast becoming one of the biggest challenges

Globally, the volume of renewable water per capita has declined by 40% in the last 22 years.



68 MLD WTP, Hubli Dharwad, Karnataka

being faced by the water utilities. The available resource has reduced over the years but the demand escalated due to population growth, rapid urbanization, higher level of industrialization and it is projected to very soon overtake the availability of water. The per capita availability of water has significantly reduced and is likely to reduce further. As per the Ministry of Water Resources per capita water availability in 2025 and 2050 is estimated to come down by almost 36% and 60% respectively of the 2001 levels.

Demand for Water

Demand of water in India is growing exponentially and projected to very soon overtake the availability. In some regions of the country, it has already happened. With fast paced urbanization and changes in economy, the water demand will continue to grow and by the year 2025, it is expected to increase by over 20% fueled by the industrial requirements which are projected to

double from 23.2 trillion liters at present to 47 trillion liters. Domestic demand is expected to grow by around 40% from 41 to 55 trillion liters while irrigation will require 14% more to 592 trillion liters up from 517 trillion liters currently. The water ministry predicts that per capita water availability will reduce by 36% in 2025 and by about 60% by the year 2050 from the level of 2001. While agriculture will remain be the major water user in India, the challenges posed by growing urbanization on municipal water supply calls for a monumental change. But there is reason for optimism; in the past, shortage of vital resources has driven the need to innovate, discover new materials and generate new technologies. The water challenge is no exception, and countries across the globe are seeking to find solutions for water demand supply problem.

Population Growth

India's population is growing faster than many

countries and currently equivalent to 17.82% of the total world population, the second most populated country in the world. Kingslay Davis's report shows that India's population remained almost stationary since 1800 at around 125 million for about 50 years. The rate of population growth was moderate till 1921. The year of 1921 is known

Eleven countries
accommodating almost half
of the world's population
– including China, India,
Pakistan, U.S., Israel, Egypt,
Libya and Algeria – have
a negative groundwater
balance.



2587 MLD Pumping House for SAUNI Yojana Phase-1, Gujarat

as the year of great divide. The rate of population growth fluctuated between 1.0 and 1.35 per cent per annum during the 30 years period of 1921 to 1951. In 1951, total population was recorded to the extent of 361 million only. The year of 1951 is also termed as population explosion year. During the period of ten years, population increased by 7.81 million at the growth rate of 21.5% in the decade of 1951–61 compared to the previous ones. During the period of 30 years from 1961 to 1991, population has increased by 400 million at the rate of around 25%. This increase was 10 times more than the increase in the previous 30 years, from 1901 to 1931. The population of India reached 1.02 billion by the year 2001. The main factor responsible for this tremendous rise in population in the last 50 years was fall in death rate due to improvement in medical facilities whereas the birth rate continued on the same pattern. With annual increase of about 1.3%, India's current population has reached around 1.39 billion. The water sources remained unchanged and the

pressure of population explosion is evident with the availability of water supply.

Water Quality

One of the major concern is the poor quality of water that is available in many states of India. Millions of people in India are still deprived of piped water supply and despite progress made in several fields; the level of water pollution is increasing considerably. Many residents of urban areas are not connected to a proper sewerage system and the wastewater from these households is released into the environment without any form of treatment, polluting groundwater and surface waters in the process. Solid waste is also frequently dumped into water sources. Industrial effluents are inadequately treated and being dumped into local rivers and water bodies further limiting the availability of clean water sources. It is estimated that almost 70 per cent of generated wastewater in India is not being properly treated and untreated sewage is released to water bodies thus contaminating the already depleting groundwater sources. The range of potential pollutants is enormous, threatening the environment and human health, and their impacts are widespread. Excessive groundwater extraction increases soil salinity. Heavy metals and toxic compounds from industrial processes further contaminate drinking water.

Aging infrastructure

As the economy of the country developed, people have steadily moved from rural to urban areas to improve their standard of living and quality of life. In 1901, only 11% of India's population was urban as compared to over 34% of people now living in urban areas which are expected to grow further to reach 60% by the year we reach 2050. A rapidly increasing urban population and the expanding middle class have driven up water demand. There are several challenges being faced by water utilities in India, but ageing infrastructure is at the root of them all. In particular, urbanization and population growth contribute to water scarcity and intensify the strain caused by ageing infrastructure. Water utilities in India are faced with the need to address all these challenges and revamping of infrastructure on priority for social, economic and environmental implications. Global non-revenue water estimates ranges from 30 to 40% of water produced, whereas it is as high as 50 to 60% in several cities in India and main reason behind it is the aging and debilitated water infrastructure. Water supply and sewer systems have a service life of roughly 60 to 80 years and in many cities of India, our water infrastructure have reached the end of their useful lives. In addition, the water mains are not being adequately maintained. Therefore, huge investments are needed in many areas to repair and upgrade the

Each year, an estimated 5 million deaths worldwide are caused by contaminated water.

aging water infrastructure.

Among other key challenges is the problem of water loss or non-revenue water. In India, it is the considerable loss for the utilities that the amount of water put into distribution system and the actual water billed to consumers varied drastically. A phenomenon called as non-revenue water (NRW), a well-known issue that results in large volumes of water being lost through leaks in supply system. The classic example of NRW management in India is the Bangalore water loss management project which is being executed by SPML Infra Limited. By using innovative technology of helium leak detection to accurately identify and locate hidden leaks in large and small pipes, the NRW reduced significantly from 53% at the beginning of the project to 21% currently thus saving 48.34 million litres drinking water per day. The water saved from the project is being used to provide drinking water facilities to over 110 new residential colonies. Same type of project needs to be initiated by all major cities in the country where NRW level is well above 40% to improve upon the services and reduce the financial loss of water utilities substantially.

The Solution

Consolidation and privatization

The water industry in India is fragmented and over the last two decades has seen a number of consolidation and partial privatization under public private partnership mode which is expected to continue. Consolidation of the water industry opens up opportunities for private sector service providers. SPML Infra has executed such projects earlier. The management contract of water supply and distribution network is another mode of consolidation where the private companies are given charge of infrastructure development and rehabilitation along with operation and maintenance for a specified period. SPML Infra is currently executing several such 24x7 urban water supply projects in Delhi and Karnataka whereas it is providing drinking water facilities to over 1.5 million people. In recent years, the number of people whose drinking water and wastewater services are provided by private companies has increased. Globally, about 14% of the world's population is served by private operators that provide drinking water and wastewater treatment



Public Stand Post Water Supply, Gagreen, Rajasthan

services, and this figure is expected to rise to 21% by 2025.

Water Tariffs

Water tariffs are essential to ensuring that utilities can cover the costs of providing services to the citizens as well as raising enough funds to expand and upgrade the existing water distribution infrastructure. It is also an important mechanism to encourage consumers to use water more carefully. Normally consumers tend to use too much water if the water prices are too low thus putting pressure on utilities to supply more water. In India, due to political and social considerations and due to poverty and affordability issues, water tariffs can take the form of a tiered pricing system. This enables water provision at very low prices to cover basic household needs, typically 30–50 liters per person per day, but acts as a deterrent to overuse. Tiered pricing schemes have been successfully implemented in Israel, Australia, Hong Kong, Japan, Korea, USA and several other countries. In India, it is also being followed by few utilities which need to be considered nationally.

Water Reuse

The total volume of municipal wastewater produced per day in India is estimated to be about 72,368 million litres per day and the total capacity of sewage treatment per day is only about 31,841 million litres. The operation and maintenance of existing plants and sewage pumping stations are

not satisfactory and actual sewage being treated is much lower than the capacity. We need to develop not only the treatment plants, but also making reuse of treated water obligatory for select sectors and agriculture. The challenge lies not only in channeling used water back into the waterways once it has been treated, but also in processing it so that it can be reused for other applications. There has been a growing trend towards water reuse projects in Singapore, Australia, USA and Israel to deliver high-quality treated water that can be used to augment the potable water supply. India needs to follow the best practices from these countries to make water reuse a lucrative affair.

Desalination

Desalination is a viable solution to water scarcity, especially in dry, coastal regions like Mumbai, Chennai and other cities where no other options exist. Globally, coastal regions where water is scarce are increasingly trying to expand their freshwater supplies by installing desalination plants. It is estimated that over 150 countries are using desalination facilities to serve more

Huge investments are needed to repair and upgrade the aging water infrastructure.



Water Treatment Plant at Pokhran, Rajasthan

than 300 million people. More than 90 million cubic meters water per day is being produced by desalination plants. In India, there are around 1,000 desalination plants having total capacity at about 0.3 million cubic meters per day.

Smart Water Technologies

Globally, utility companies could save an estimated USD 7–12 billion each year by using smart water solutions such as advanced leak detection and pressure management techniques to maintain and build water networks; information systems enabling the collection and interpretation of data, which can optimize capital expenditure management; and smarter water quality monitoring systems that include remote-controlled devices and sensors. SPML Infra has indigenously developed an Integrated Management Information System (IMIS) for smart management of water utilities. A powerful enterprise management system designed specifically as per Indian requirements and working conditions to meet day to day operations of water utilities to develop and manage smart water supply system. It provides technologically advance services which include GIS, Network Analysis, Hydraulic Modeling, Water Loss Reduction thru NRW & UFW Management, Demand Management, Customer Relationship, Financial Management, and complete Asset

Management of the system.

Smart Metering

Smart water metering is crucial to limiting water losses in the distribution network and reducing non-revenue water. The faulty water meters contribute to water loss as it is not billed due to leakage, illegal use and inadequate measurement. In order to reduce NRW rates, water needs to be metered to identify and track water leakage rates. At the same time, consumers need to be billed based on their water use to encourage water conservation. Modern water meters now have components that automatically record and/or transmit electronic data on water use directly to the utilities. SPML Infra follows modern metering techniques with AMR meters using AMI technology to help water utilities in NRW management, accurate billing, online reading, data analytics, and optimized network management.

Way Forward

Water recycles and reuse, groundwater development (new resources and artificial recharge) and desalination are key supply options that should be pursued with dedicated planning and resources. There should be strong focus on protecting water quality, resolving regional disputes and contentious issues, application of

new technology, reduction in water loss, smart metering solution, and enabling municipal water conservation and water demand management activities. The national water regulatory authority along with a strategy steering committee consisting of representatives from state government and other key stakeholders involved in water resources management must be setup to support the development of a robust municipal water supply system in the country.

About the Author

Mr. Subhash Sethi is Chairman of SPML Infra Limited, a listed infrastructure development company with focus on creating sustainable solutions for water, power and sanitation. Mr. Sethi's innovative leadership, visionary approach and business management is a source of constant inspiration for the employees of the company and under his guidance SPML Infra has executed more than 650 projects and created significant value for the country that have touched the lives of millions of people. His valuable contributions towards the development of infrastructure have been recognized widely and he has received several awards and accolades.

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SPECIALTY SOLUTION FOR EFFICIENT SEPARATION OF OIL FROM PRODUCED WATER

By Amit K., Prabhat R., Pushkar S., Sanjeev G., Hiten M., Water application and product development centre, Grasim Industries Ltd., Bharuch, Gujarat, India



Large quantity of water is generated during crude oil exploration called as 'Produced water' (PW). The produced water contains oil mostly in emulsified form along with a lot of suspended impurities, making it one of the most difficult to treat. With the increase in emphasis of recycling of water in oil exploration units, the treated wastewater is used as Well Injection Water and the prime challenge remains in making the

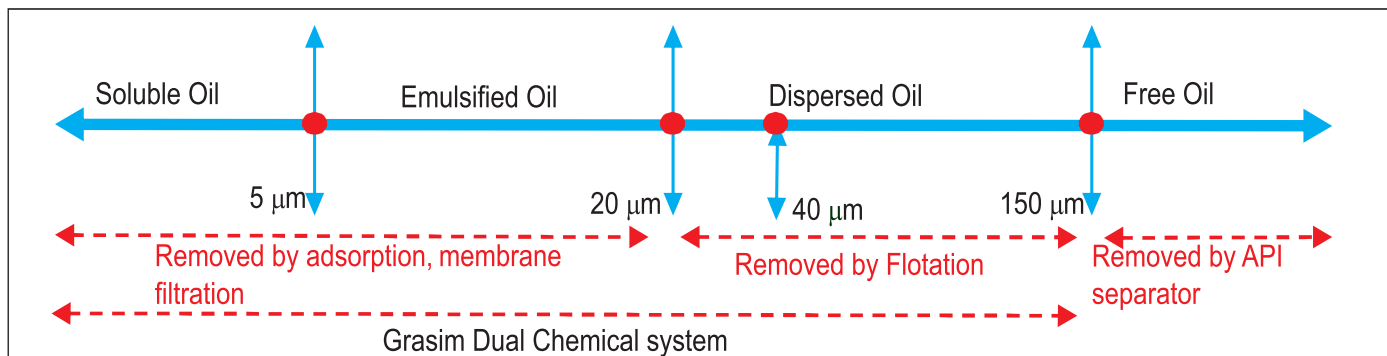
water fit for Well Injection or Discharge. The direct injection/disposal of produced water to the well/environment may cause disturbances in well/ecology. Therefore, treatment of produced water prior to injection/ disposal is very essential.

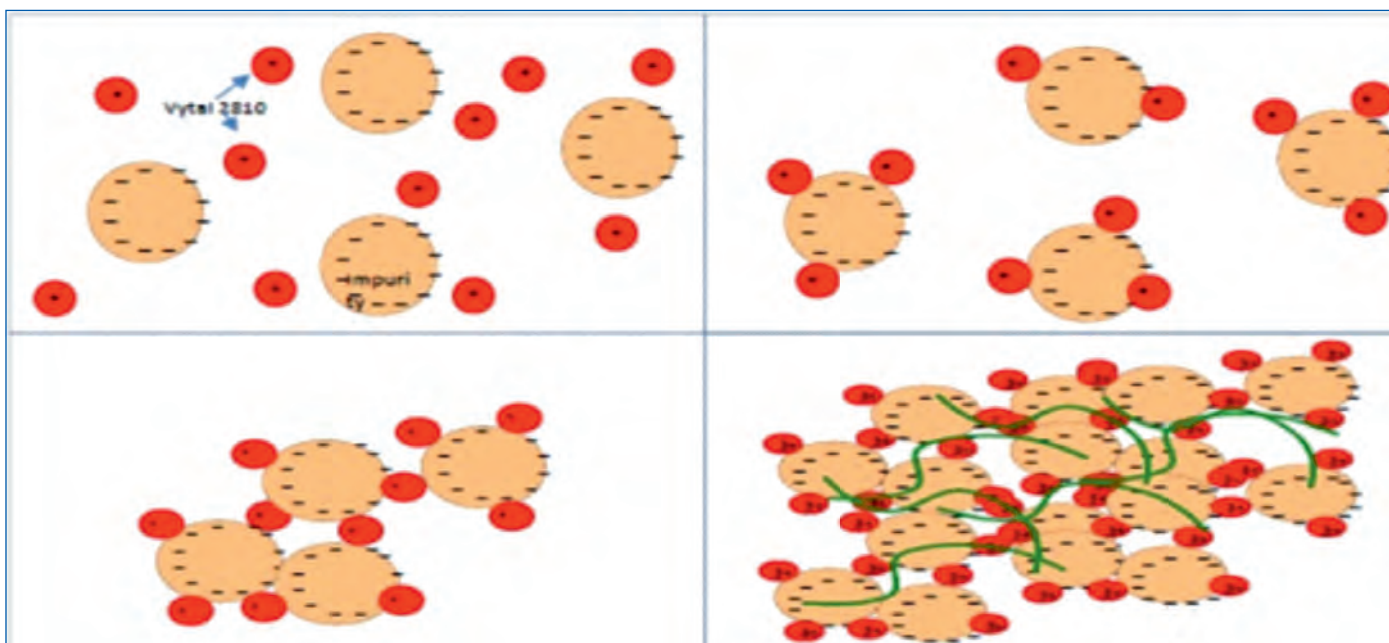
Physical and chemical methods such as adsorption coagulation & flocculation, filtration technique and advanced oxidation processes have been well evaluated but still industry faces issues for handling of oil rich wastewater.

Treatment of oil containing wastewater OR Produced water (PW) is one of the most important environmental problems throughout the world as the oil (as O & G) in the oil industry i.e. oil exploration and production, oil refining, oil storage, transportation and petrochemical industries in the production process generate lot of oily wastewater. Produced water is one which is produced as byproduct in large quantity during production of oil and gas from oil well. This water contains ample amount of free & emulsified oil, grease, dissolved & suspended solid. Typically, ~100–1000 ppm oil & grease present (depending upon oil well conditions) in produced water in free, emulsified & dissolved form. Discharging of this water may pollute surface and underground water as well as soil. As per environmental regulation, max. 10 ppm of oil and grease is permitted in discharge water. Few industries also re-inject produced water in oil well after removing oil and suspended solids to enhance oil well recovery.

The organic nature and constituents of the wastewater varies with the type of crude i.e. light, medium and heavy, sour and sweet. Produced water contain emulsified oil which remain recalcitrant to biological treatment and hampers bioprocess by fouling the microorganisms. Organic toxic waste (oil and grease (O&G)) causes ecology damages for aquatic organism, plant, animal, and equally, mutagenic and carcinogenic for human being.

Presented case study focuses on improvement in treatment of oil rich wastewater and meeting the quality of treated wastewater for recycling using specialty solution as de-emulsifier and coagulating aid.





Treatment of oil containing wastewater and challenges:

The wastewater from process contain oil in different forms along with suspended solids, oil may be free, emulsified and dissolved form. Application of technique widely depends on nature of oil being separated and can be classified based on size of droplet of oil in the medium.

Free oil can be separated using API separator whereas Tilted plate interceptor (TPI) can be used for separation of dispersed oil. Techniques like coagulation, adsorption, filtration etc. are used for removal of emulsified and soluble oil from the wastewater but have limitation to ensure low oil content in treated water. Grasim dual chemical solution has been found capable to handle all forms of oil and separate it from water to ensure oil content less than 10 ppm in treated water with excellent clarity by removal of suspended and colloidal impurities.

Grasim Specialty solution for separation of emulsified oil from produced water:

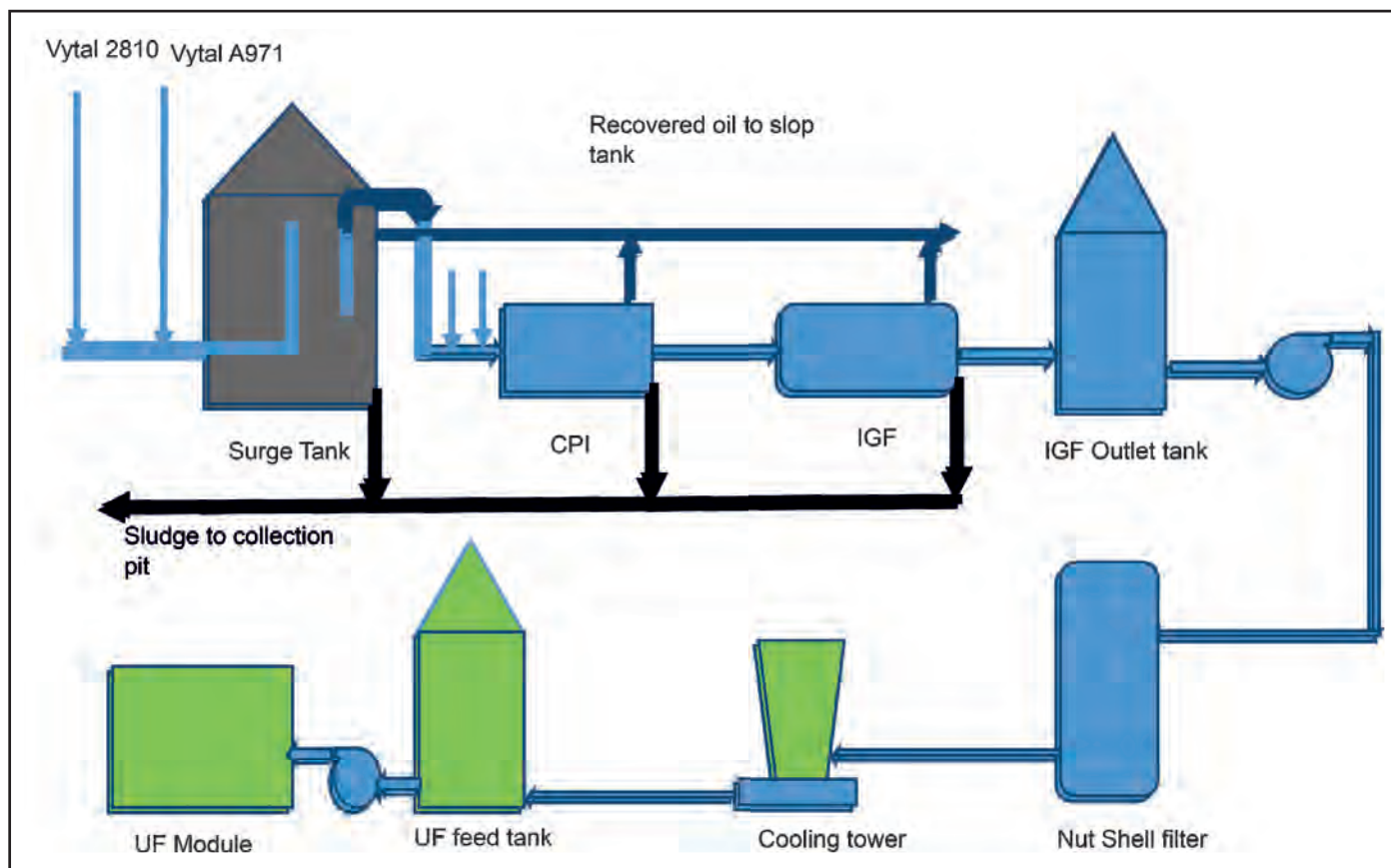
Removal of emulsified oil is critical for the overall wellbeing of wastewater treatment plant and the same remains the focal point of operations. Oil content greater than 10 ppm is not acceptable for discharge as per CPCB guidelines. Also, high oil content and Suspended matter prevents use of water for reuse. Specialty solution VYTAL 2810 was developed for efficient separation of oil which deemulsifies oil and separates it from wastewater, it also neutralizes the charge on colloidal suspended matter leading to de stabilization of suspended material.

Wastewater from oil processing industry contains oil–water emulsion along with colloidal and suspended matter. Vytal 2810 de–emulsify (demulsifies) oil and separate (separates) it from wastewater, it also neutralizes the charge on colloidal matter leading to de–stabilization of suspended material.

The neutralized particles then form agglomerates by coming together. The agglomerates thus formed can be removed by addition of a high molecular weight flocculent which will float (DAF/IGF process) or settle at the bottom of the clarifier.

Produced water from different oil and gas exploration region were evaluated with Vytal 2810 followed by Vytal A971. Required customization were made to make it suitable for all types of oil (Table 1).

Oil exploration site	Particulars	Snapshot
Onshore Western Oil field-1	Nutshell filter back wash Inlet Oil content – 457 ppm Vytal 2810 – 200 ppm; Oil in treated water – <5 ppm	
Onshore Western Oil field-2	Group Gathering Station Inlet Oil content – 103 ppm; Vytal 2810 – 40 ppm; Oil in treated water – <5 ppm	
Onshore Western Oil field-3	Group Gathering Station Surge tank Oil content – 98 ppm; Vytal 2810 – 30 ppm; Oil in NSF outlet water – <10 ppm	



It is quite evident from the table that performance of Vytal 2810 was effective for different types of produced water although chemical dosages varied with nature of crude oil source. Other advantages observed were as following:

- » Dual chemical system hence eases operations
- » Effective at low dosages against presently used conventional chemicals
- » Efficient removal of oil and excellent clarity of treated water
- » Stable at high temperature (80–90 C) for treatment of hot wastewater streams without effecting treatment efficiency
- » Can work for oil concentration from few ppm to percentage level without compromising with treated water quality
- » Vytal 2810 has robust performance against all types of wastewater irrespective of source of oil

Produced water treatment in Western Oil–Field in India – Case study

Present case study focuses on treatment of oil in effluent generated at a Group Gathering Station (GGS) of an oil exploration unit in western Indian oil–field. Wastewater collected from the process was pumped to ETP where Alum and de–oiling polymer (DOP) were being added (Figure 3). This Effluent treatment plant consisted of Surge tank, CPI, induced gas flotation (IGF), nutshell filter (NSF) & Ultrafiltration Unit. The treated water from this ETP is used for injection into the Oil wells and must meet the norms for TSS, Turbidity and Oil & Grease content in treated water prior to discharge to Well. Plant management wanted

to improve the Oil & Grease content, TSS & Turbidity in treated water.

In the present case, the GGS was partially able to meet discharge norms for Oil content in wastewater due to fluctuations in treated water parameters based on quality of raw wastewater. It was understood that the oil was mainly in emulsified form indicating poor performance of existing chemical treatment (Non–ferric alum & DOP).

The Dual Chemical System Comprising of VYTAL 2810 & VYTAL A971 has the capability to separate emulsified oil efficiently leading to better performance of DAF/IGF. Vytal 2810 can be used as primary treatment of wastewater and can be added prior to Gas flotation (DAF/IGF) unit under flash mixing followed by addition of high molecular weight polymer. Both the chemicals were added at the existing dosing point of ETP i.e inlet to surge tank. Dosage of existing chemicals Alum and DOP was 50–60 ppm and 20–30 ppm, respectively whereas dosage of dual chemical Vytal 2810 and Vytal A971 was 20–25 ppm and 2–3 ppm, respectively. Dosage of proposed chemicals was only ~30% of the existing treatment.

The treated water must contain TSS and Oil less than 100 & 10 ppm, respectively for disposal of treated water by re–injection in abandoned well below a depth of 1000 meters. Treated water met the requirement very well with proposed treatment where oil content in treated water was 8.1



Figure 3: Raw and treated water at different stages (Left to right Surge Tank Inlet, Surge Tank Outlet, CPI Outlet, NSF Outlet)

ppm (Table 2). There was visual clarity in treated water after each stage of treatment (Figure 3).

Table 2: Raw and treated water characteristics during the trial

Parameter	TSS, mg/l	Turbidity, NTU	Oil & grease, mg/l
Surge tank Inlet	23.9	49.7	68.0
Nutshell Filter outlet	6.4	8.5	8.1
Reduction, %	72.8	82.9	88.1

Conclusion:

Raw produced water is commonly regarded as a high-volume toxic waste but can be beneficial to humans if properly managed. The treatment of produced water is very important due to legislation and environmental concerns. With detailed studies of general compositions of produced water and strong understanding of coagulation and flocculants chemistry, ABWAPDC team

has come up with dual chemical treatment system which has following advantages against conventional and inefficient technologies

- » VYTAL 2810 & VYTAL A971 (dual system) is effective and economical due to lower chemical doses consumption.
- » Dual system shows good reduction in Turbidity, TSS and Oil & Grease and very well meeting norms of discharge.
- » Reduction in Turbidity, TSS and Oil & Grease helps in improving the Nutshell Filter Life by reducing load and back-wash frequency on a long-term basis.
- » Improved Floccs size has also results in efficient Sludge removal with the Belt Filter Press.
- » Improved performance of Belt Filter Press eliminates need of Sludge recirculation back to the system and reduces operation cost

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INITIATIVE TO MODIFY THE EXISTING TREATMENT UNITS WITH NEW ADVANCED TECHNOLOGIES

By Hemalatha A G, Water Management SME, Embassy Services



- » Physical treatment: involves removal of floating and suspended solids. Terms belonging to this category are screens, sedimentation, sand filters, carbon filters, etc.
- » Chemical treatment: involves removal of pollutants. Terms belonging to this category are coagulation & clari-flocculation, disinfection using chlorine, etc.
- » Biological treatment: heart & art of sewage treatment through aerobic treatment & anaerobic treatment; Where microbial growth happens in controlled environment to reduce the organic pollution load from sewage.

Present Challenges:

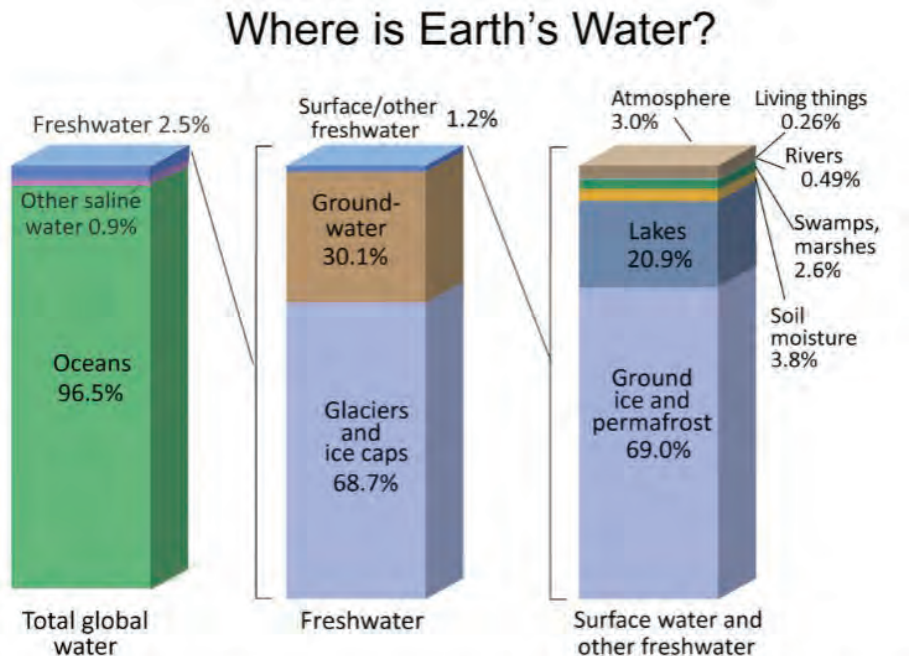
Above treatment sequences are typical conventional treatment methods in general. In the present condition, the chances of modifying the existing system into new technology requires high Capex and Opex costs, larger space availability, and good expertise on treatment processes. Due to the above concerns, organizations are hesitant to take up modifications with the treatment process. Though old conventional methods perform moderately well, to achieve best quality output and meet standard requirement for high customer satisfaction, new and improved technology adoption is a must.

Executive summary

Water is one of the basic essential elements to all living creatures in the world. We are experiencing water scarcity because of exponential increase in population and unethical sewage/waste disposal to the water source. Providing good quality water in sufficient quantities to end users is a big challenge for the facility management teams. Small modifications in treatment processes can help the maintenance team to perform better. Using Disc filters & Screen filters in place of pressure sand filter is just one of the few ideas that can better the efficiency. The disc & screen filter require less space, are more efficient, provide uniform output & more water saving in terms of backwash water.

Treatment units

Whether it may be water or wastewater, proper treatment systems need to be adopted in the property to achieve a good, treated water quality for primary/secondary use and to fulfil statutory compliance. The treatment of water & wastewater has been divided into 3 stages:



Credit: U.S. Geological Survey, Water Science School. <https://www.usgs.gov/special-topic/water-science-school>
Data source: Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick (editor), 1993, Water in Crisis: A Guide to the World's Fresh Water Resources. (Numbers are rounded).

THE SEQUENCE OF TYPICAL WATER TREATMENT PLANT



THE SEQUENCE OF TYPICAL SEWAGE TREATMENT PLANT



Suggestions:

- » adoption of conventional ASP to SBR/MBBR/ MBR technology
- » Adopt UV disinfection instead of Chlorine disinfection

These are some of the approved technologies by Pollution Control Boards:

Disc Filters and Screen Filters (Replacing Pressure sand filters with Disc filters at STP & Screen filters at WTP):

Pressure sand filters are used to remove suspended solids present after Secondary treatment of sewage. Recently, the technology of disc filter has been improvised which can be used in lieu of pressure sand filter. This can save significant water used for backwash and reduce maintenance costs. These Screen & Disc filters are proven technologies used in Israel.

Current challenges:

- » For WTP, even though the quality of potable water is good, sand filters are used, and backwash is done manually. There is no mechanism to prevent unnecessary backwashes and the pressure gauge 'delta p' method is not always accurate
- » If the backwashing schedule is missed, there are chances of sand carrying over due to channeling
- » Requires yearly media replacement which

involves cost and shut down time

- » Most of the filters are kept at basement level with which makes movement of media difficult
- » The old media needs to be disposed off
- » Internal painting is needed every year to prevent corrosion. A workman entering inside the small vessel and painting it involves safety risk due to low oxygen concentration and toxic paint VOC
- » Bacterial growth in the sand media which increases chlorination requirement
- » Sand filters cannot be adjusted to varying TSS loads

The Solution:

SCREEN FILTER FOR WTP

THE FILTRATION PROCESS:

Raw water enters through the filter inlet and



passes through the screen. Clean water flows through the filter outlet. The gradual dirt buildup on the screen's inner surface causes a filter cake to develop, creating an increase in the pressure differential across the filter system. A differential pressure (DP) switch senses the pressure differential and when it reaches a pre-set level, the self-cleaning process begins.

THE SELF-CLEANING PROCESS:

The self-cleaning cycle is initiated by any one of the following conditions:

- » Signal from the DP switch, pre-set at 7 psi (0.5 bar)
- » Time interval parameter set at the controller
- » Manual start triggered by the electronic controller keypad
- » The flush valve opens to atmosphere creating a strong suction force at the scanner nozzles, effectively removing dirt particles from the screen and discharging them from the filter.

DISC FILTER FOR STP

THE FILTRATION PROCESS:

The discs are stacked on the spine and assembled according to pre-determined water filtration requirements. During filtration, the discs are compressed by means of a pre-loaded spring and differential pressure, forcing the water to pass through the grooved disc surface, thus trapping the solids.

THE BACKWASH PROCESS:

Activated by a pre-determined time trigger or differential pressure, the filter enters backwash mode. The inlet valve port shuts while the drain

valve port opens. Water flows through a bypass filter screen into the outlet valve and into the filter. During the backwash process, pressure is released, and the spine's piston elevates, releasing the compression on the discs. Tangential jets of filtered water are then forced through the nozzles positioned along the spine. At this stage the discs spin freely, loosening the trapped solids which are then flushed out.

ADVANTAGES & FEATURES:

- » Micron-precise depth filtration of solids
- » Innovative disc technology captures and retains large amounts of solids
- » Long-term operation with minimum maintenance –less need for media replacement since the Disc/Screen lasts for over 5 years
- » Fully automated, simple to operate
- » Short automatic backwash with regulated water volume for a small water footprint
- » Backwash time as low as 15–20 seconds per cycle
- » Zero biological growth in the disc/screen due to innovative MOC used.

Case study on savings through water efficiency generated by using Screen Filter:

- » Quantity of water treated : 304 KL
- » Quantity of water consumed for back wash : 105 Lts against 35 KL thru PSF
- » Percentage of water saving by using screen Filter in place of PSF: 11% of total flow

Case study on savings through operational efficiency using Disc Filter:

- » Quantity of water treated: 304 KLD
- » Quantity of water consumed for back wash : 2600 lts against 14250 Lts per day thru PSF
- » Percentage of water saving by using of Disc Filter in place of PSF: 4.68% of total flow

STP	
Cost of Filters	3,80,000
Annual Maintenance cost of new Filters	5,000
Total	3,85,000
Savings	
Maintenance cost of existing Filters	1,25,000
Water savings @Rs.100 KL	75,000
Total	2,00,000
Pay back(Years)	1.90

NON-QUANTITATIVE SAVINGS:

Reduction in environmental impact by eliminating the use of sand in the filters and reduced human-hours for activities like cleaning, painting, etc.



WTP	
Description	Amount in Rs.
Cost of Filters	2,64,000
Annual Maintenance cost of new Filters	5,000
Total	2,69,000
Savings	
Maintenance cost of existing Filters	1,25,000
Water savings @Rs.100 KL	73,000
Total	1,98,000
Pay back(Years)	1.35

About the Author

Hemalatha A G works as a Water Management SME at Embassy Services – Integrated Facility Management arm of the real estate mammoth Embassy Group. She is currently in charge of handling drinking and sewage water management across the PAN India portfolio of Embassy Services spanning over 100 Million sq. ft. across 11 states. Holding a Technical Master's Degree in Environmental Engineering, she carries over 18 years of experience in various fields of Environment Management.

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GROUND WATER EXPLORATION IN HIGH ALTITUDE AREA OF JAMMU & KASHMIR

By S K Juneja Ex Scientist D and Head of Office Central Ground Water Board, Delhi Office



Location of Area

Cold deserts of the western Himalayas are unique ecosystems covering 80,000 sq kms of which major part falls in Ladakh region. Ladakh region is one of the inhabited plateaus in the world ranging in altitude from 2100 m to more than 5000 m amsl. Temperature goes as low as -50°C and Drass is the second coldest inhabited place in the world. Siachen glacier, largest outside the Polar region, is an inhospitable terrain which provides subhuman conditions. Lack of oxygen, frost bites, problems in logistic and non availability of drinking water is because of freezing makes living worse.

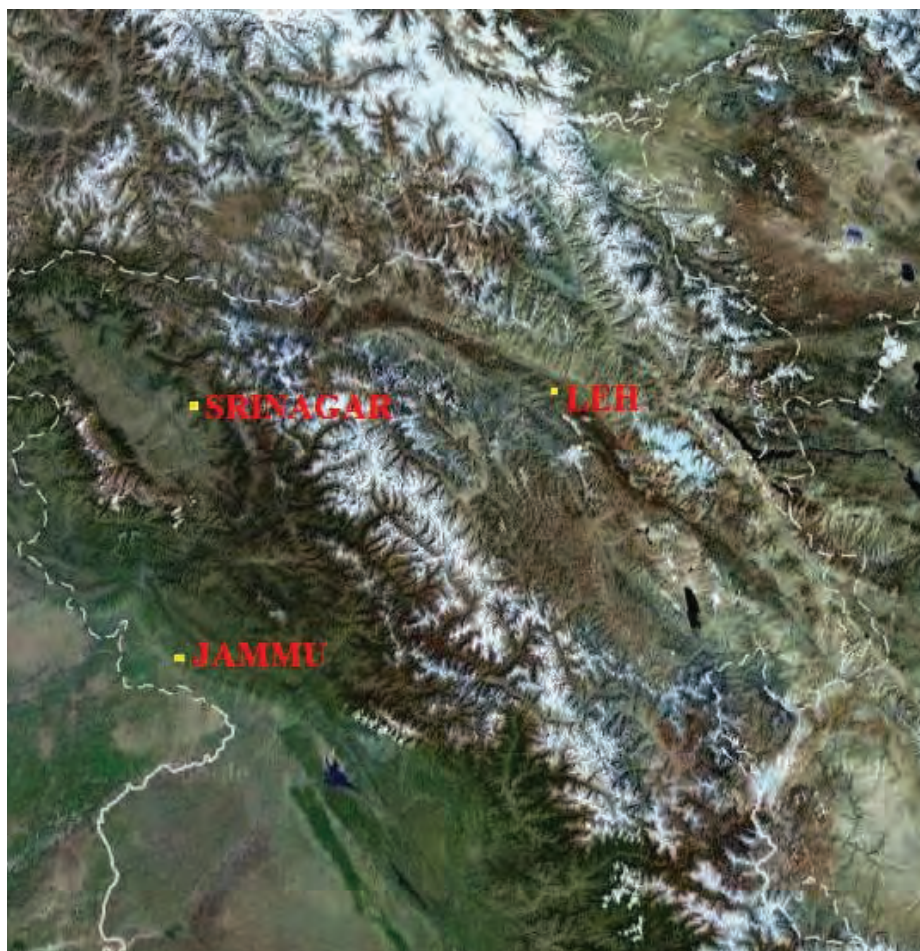


Fig-1' Location of Area

Need for Exploration

There is acute scarcity of water during winters due to freezing of water as well as scarcity again after melting of snow as sources dries up. Highly turbid surface water during summer season is unsuitable for drinking and providing perennial water supplies to troops is the biggest challenge. As water hauling from far off places is difficult & uneconomical and to augment perennial water supplies to troops alternate source of water was required. This necessitated the need to explore ground water, its occurrences, distribution and assessment for planned development in scientific manner.

Type of Formations

There are mainly two types of formations found at high altitudes of Himalaya

- » Morainic Deposits consisting of boulders, cobbles, pebbles, mixed with sand/clay.
- » Hard Rocks These may be Igneous, Sedimentary or Metamorphic.

Ground Water Exploration in Ladakh

Central Ground Water Board, Ministry of Water Resources carried out Ground water exploration in this area in collaboration with Army from August to October 2005. In these areas drilling

for ground water is done by Percussion drilling also known as Cable Tool drilling and DTH Rig (Down The Hole) with ODEX attachment. CGWB carried out exploration with DTH Rig (Down The Hole) with ODEX attachment. The salient features of the exploratory wells of some of the wells are as under.

Hazards in High Altitude Exploration of Ground Water

The problems faced during ground water exploration were unique and different from the problems faced in other areas. Some of the main problems faced are given below:

Sr. No.	Location	Year of Construction	Depth drilled (m)	Depth of Well (m)	SWL (mbgl)	Discharge (lpm)
1	Partapur-I	2005	60.00	59.00	24.00	1500
2	Partapur-II	2005	58.00	57.00	18.00	1800
3	Transit camp-221 (Partapur)	2005	50.00	50.00	20.75	2300
4	Siachen Base-I	2005	48.00	49.00	8.00	1700
5	Siachen Base-III	2005	44.00	44.00	9.60	1100
6	Siachen Base-III O.w	2005	10.00	10.00	9.60	Recharge Well
7	Sasoma	2005	45.00	44.00	25.00	30

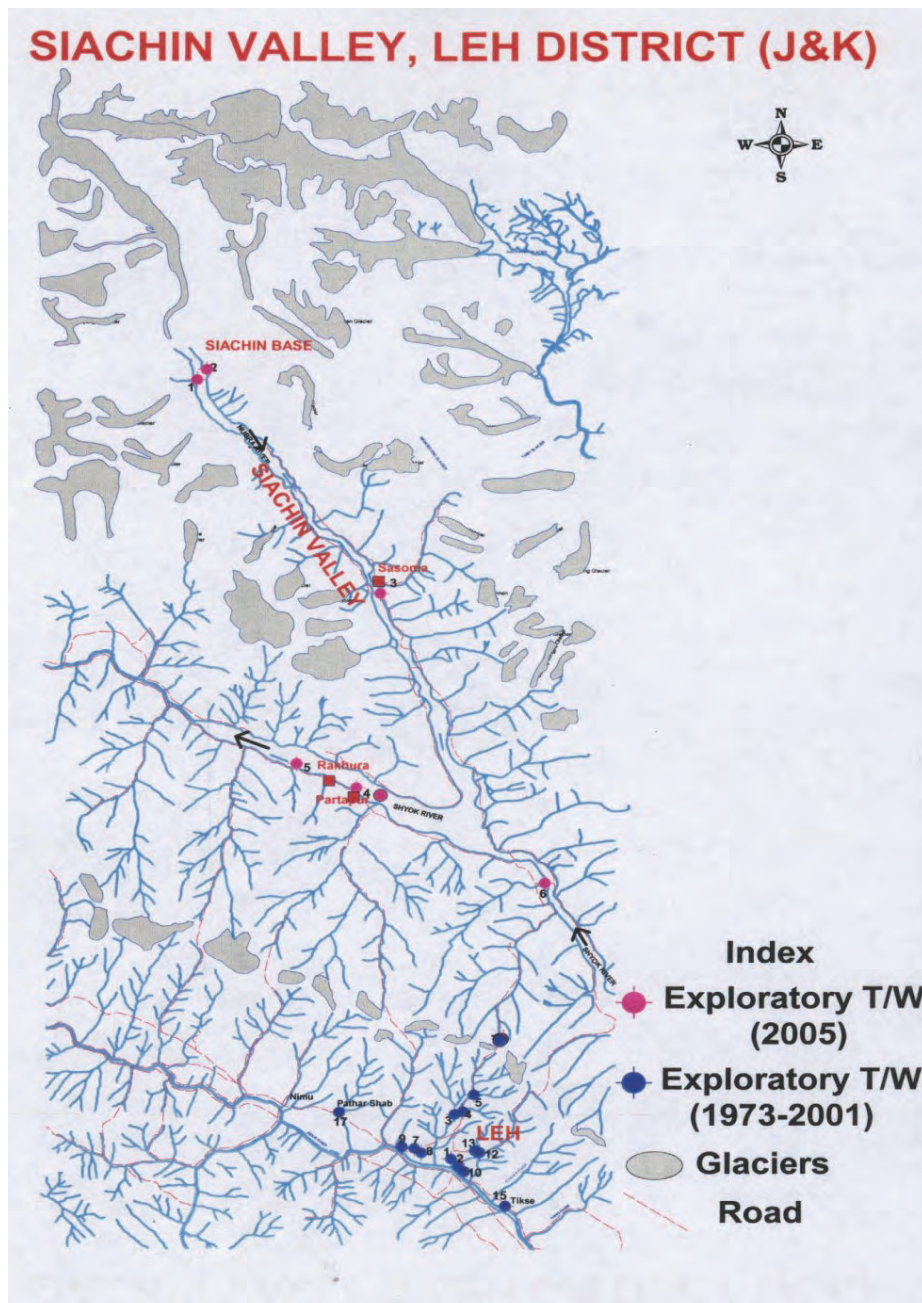


Fig-II LOCATIONS OF EW

1. Formation Problem

Morainic Deposits consisting of boulders, cobbles, pebbles, mixed with sand/clay. During drilling process the sand/silt/clay is removed due to air pressure of compressor with the result that boulders, which becomes free due to removal of fine particles, strikes the casing pipes causing there by bend/dents result due to which some

times it is very difficult to retrieve the bit after the drilling.

Hard Rocks: These may be Igneous, Sedimentary or Metamorphic

Due to the tectonic activity, the formations are highly sheared & DTH drilling with ODEX

attachment is must in such formation till the hard compact & massive formation is encountered.

2. Problems Faced by Drilling Crew

Some of the problems faced by drilling crew are given below:

- » Sever Chilled conditions hampers the efficiency of man as well as machines due to low oxygen content.
- » Respiratory Problems—Man feels tiresome early.
- » Freezing of Diesel affects the work badly due to late starting of machines
- » Working hours are less
- » Sun Rays cause skin burns due to which colour of face gradually turns black
- » Due low Oxygen content nostril problems are also common.
- » Persons working must take care of snow bite which is frequent problem in such areas. Skin also get dried & needs Vaseline / cold creams treatment.
- » Due to remote areas even any minor break down in the machinery needs at least one week as for repairs/spares one has to come to Srinagar or Jammu
- » During pumping test it is not possible to take one minutes readings as it takes longer time to get the measuring tape dry. Electric sounder was tried at Kumathang site in Kargil district but due to chilled conditions the electric wire got harden and ultimately broke down.

Conclusions

Utmost care is required in the drilling operations. Persons engaged in drilling operations must take care of themselves in facing problems of low oxygen & frost bite.

About the Author

Mr. S. K. Juneja is a Ex- Scientist D & Head of Office of Central Ground Water Board. Through out his career he has held various positions such as Scientist D Hydrogeology at CGWB & CGWA New Delhi. He has done M.Sc. Hons. in Geology from Panjab University.

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FLUORIDE ISSUE IN GROUNDWATER, ITS HEALTH IMPLICATIONS AND WAY FORWARD

By Ranjit Kumar, IVLP Fellow (Water Pricing and Water Economics), USA, Water Expert, KPMG



is not properly studied due to its complexity. In spite of the complex hydro and biogeochemical factors, the number of dissolved constituents in ground water is limited. In addition to the trace constituents in water, the major constituents are $\text{Na}^+ \text{Ca}^{2+} \text{Mg}^{2+} (\text{SO}_4)^{2-}$ (as acid and salts), $\text{Cl}^- \text{HCO}_3^-$ etc., and the secondary constituents are $\text{Fe}^{2+} \text{Sr}^{2+} \text{K}^+ \text{CO}_3^{2-} \text{NO}_3^-$ and F^- (fluoride) (Datta et al, 2014).

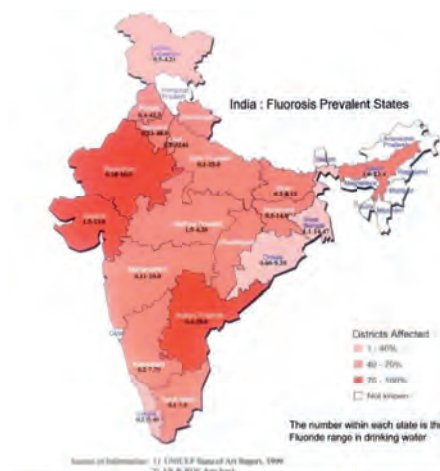
Fluorosis is a communal health problem which is caused by superfluous intake of fluoride through different sources like drinking water, food products, etc. In general, fluorosis is mainly caused by the

drinking of ground water where the geological crust of the aquifer is heavily encumbered with fluoride and it subsequently leaches into the ground water and thereby contaminates them. Half of the world's population uses groundwater as a source of potable drinking water (Ibrahim et al, 2011). It is widely believed that drinking water is typically the largest single contributor of daily fluoride intake (Scott, 1937). Groundwater constitutes 97% of global freshwater; therefore, primarily people are dependent on groundwater sources for daily consumption.

Water is considered as a universal Solvent, it dissolves almost every organic and inorganic substance, however, any of these solvents is required in human diet within a permissible limit. The fluoride required in the body is in the range of 1 to 1.5mg/L (Handa, 1975).

Background:

Water is essential for all physiological activities associated with humans, animals, and for plant. However, the nature and quality of surface and ground water are widely variable and are determined by the local geological history, including the rocks and hidden ore deposits surrounding the sites for the collection of the water, and other factors, such as the movement of elemental particles and pollutants by lentic and lotic waters and underground aquifers (Datta et al, 2014). All organic and inorganic minerals dissolved in water and its interaction with different minerals are different in nature. The interaction



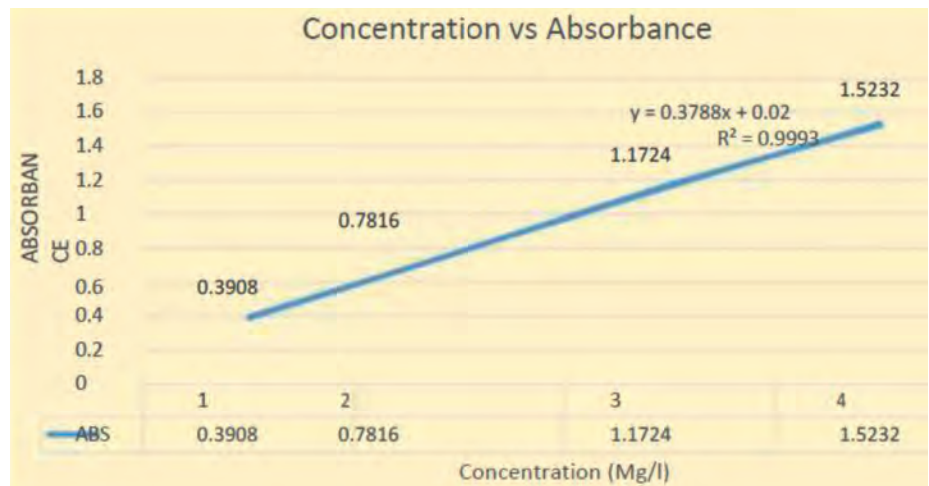
In India, this problem has troubled nearly 177 districts covering 19 states out of 28 (Kumar and Kumar, 2015). Efforts are being taken to address the problems of fluoride contamination in drinking water in rural areas in India by the inception of flagship programs like Rajiv Gandhi National Drinking Water Mission, along with extensive Support from an external agency like The United Nations Children's Emergency Fund (UNICEF) (Fawell et al, 2004; WHO, 2006). Several types of research and studies have been conducted by

Central Ground Water Board (CGWB) in India to estimate and map the fluoride affected districts. These initiatives highlight the present condition of fluoride contamination in Bihar. As fluoride contamination is considered as endemic and there are increasing number of cases of fluorosis coming especially from rural areas of Bihar. Till now, there is no appropriate solution to handle the fluoride contamination issue. The dataset reveals that out of 37 districts in Bihar, 9 are severely affected. CGWB has clearly declared that many cases of dental, skeletal and non-skeletal fluorosis have been

reported in Nawada, Jamui, Bhagalpur, Jahanabad, Gaya, Aurangabad, Munger, Nalanda, Banka districts of Bihar (NPPCF, 2014).

Occurrence of Fluoride

Ground water is the nation's principle reserve of fresh and potable water and will serve as a future reserve for the upcoming generation. Ground water can be easily contaminated with the presence of different minerals and rock present in the crust. Such contamination termed as Geogenic contamination. Statistically, it's seen that groundwater constitutes about 30.1% of total available freshwater on the earth (Mehta and Lyla, 2010). Fluoride is a naturally abundant element and found mostly in granite rocks. These rocks contain fluoride varying at a concentration from 20–360 0 ppm and is one of the largest sources of fluoride to the underground water. These rocks generally form the layers of aquifers and are continuously submerged in the groundwater, but the whole process of dissolution of fluoride in water has not been well understood till now (Saxena and Ahmed, 2001). The decomposition, dissociation, and dissolution are considered as the main chemical processes for the enrichment of fluoride in the ground water. Studies show that an alkaline environment (pH of water ranges between 7.6 to 8.5) with high bicarbonate concentration in the medium will provide a conducive environment for the dissolution of fluoride in ground water (Ayoob and Gupta, 2007). The space and time of rock-water interaction augment the concentration of fluoride in the water. The concentration of contaminants also increases with the increase in the residual timing of water in the aquifer (Saxena and Ahmed, 2001) and supplement the



concentration of fluoride in the water. Another source of fluoride is soil which contains nearly 200 to 300 ppm of it (Saxena and Sewak, 2015). Most of the fluoride is found in complexes with either aluminium or iron in the soil. Intake of foods and beverages are other sources through which fluoride enters the human body.

History of fluoride and its distribution

There are 60–65 million people in India who are consuming fluoridated water and are being severely affected by it (Ibrahim et al, 2010). The case of fluorosis is more severely found among children; about 6 million children are captured in a vicious fluorosis circle (Ayoob and Gupta, 2007). Children are more vulnerable to dental fluorosis as their teeth are in the crucial stage of development and even a small and continuous dose of fluoride can easily damage the developing permanent teeth and enamel. Therefore, the number of dental fluorosis cases is mostly observed in children. In the case of India, fluoride-related cases are more endemic in rural conditions, but the contamination and related disorders to this pollution like cases of dental, skeletal and non-skeletal fluorosis are spreading to different parts of the Indian sub-continent at a very rapid pace (Saxena and Sewak, 2015).

Region	Fluoride Concentration (mg/L)	Severity of Fluorosis Observed
North India	0.4 – 19	Severe
Central India	0.2 – 10	Moderate

South India	0.2 – 20	Severe
West India	1.4 – 12	Moderate
North East India	1.5 – 25	Severe
East India	0.4 – 16	Severe

Fluorosis can be identified through physical examination i.e. morphological Changes in teeth, joint pain, stiffness in joints, skeletal deformities and other muscular and neuro-related issues Fluorosis mainly causes three issues (Limeback, 1992).

- » Dental fluorosis
- » Skeletal Fluorosis
- » Non-Skeletal Fluorosis

Case Study:

A case study of Nawada district of Bihar has been discussed here for dipper understanding.

The geology of Nawada area indicates the presence of considerable amount of granite, quartzite and quartz schist. According to the study of CGWB, the areas of Nawada show a variable thickness of aquifer and alluvial content in different blocks. The studies conducted by CGWB in Roh block of Nawada district reveals that the concentration of fluoride is well above the permissible levels set by the BIS and WHO and it is about 1.7 mg/L (CGWB, 2014). It is proved that the presence of bicarbonate and carbonates in the rocks determine the concentration of fluoride mobilization within the aquifer and the geology



Figure 1 Skeletal Fluorosis

of Nawada shows this property very evidently. The pH of groundwater is also very crucial in determining the mobility of fluoride and it is proved that alkaline medium highly facilitates the conductivity of the element, and knowing the fact that the pH of groundwater in Nawada district varies from 6.96 to 8.41, it further legitimates and concretizes the enhanced expression of fluoride activity in the district (CGWB, 2014). Experimental studies indicate that the presence of alkaline media, high amount of bicarbonate and moderate specific conductivity are favourable factors for fluoride dissolution (Saxena and Ahmed, 2001).

The contamination of fluoride in drinking water is mostly due to geogenic process. But, a number of anthropogenic activities can also upsurge fluoride

concentration in water and soil (Fawell et al, 2004; WHO, 2006). Utilization of agricultural fertilizers in the field, agricultural runoff, and sewage treatment plant are some of the point and non-point sources of fluoride pollution. Both, artificial and geogenic activities enhance the probabilities of fluoride admission into the human body. We see that the tropical regions are highly infested with fluorosis and the cases of fluorosis is highly prevalent in developing countries.

Apart from the consumption of fluoride from polluted groundwater, lack of proper and balanced nutritional diet also enhance the process of fluorosis (Moynihan Paula et al, 2004) Nawada district of Bihar is prone to fluoride contamination due to its geological features and the type of

fluoride-rich granite rock that lines the aquifer of the groundwater source. A number of cases of fluorosis have been registered by the government officials in the Bihar government's survey report and it also shows the number of fluoride impacted people are growing (Ayoob and Gupta, 2015).

The reasons for the high amount of fluoride contamination in water is due to prolonged retention of water in the mineral rich aquifer, elongated residual time and limited fresh water interactions. This type of attribute and characteristic is shown by a closed aquifer and the geology of Bihar advocates that this condition is usually prevalent in other 9 districts of Bihar including Nawada.

A research has been conducted in different villages of Roh Block, Nawada district, Bihar in order to observe the concentration of fluoride. The research includes the study of social behavior and also scientific study of water sample from Eight village of Roh, Village. The study of social behaviour of the people regarding the fluoride contamination in drinking water reveals the understanding of people about fluoride, related disease and degree of acceptance among people. The technique devised for analysis of social behavioural pattern is via Focused Group Discussions (FGDs) and comprehensive questionnaire survey of one village based on the laboratory testing of the collected water sample. This was second important components of the research. As per the objective of the research, analysis of public perception regarding fluoride and its impact on their health in the context of fluoride contamination was extremely vital to understand during the research. Hence, the combination of scientific and social science approach is the best way to synthesize and explain the holistic details regarding contamination of fluoride and peoples' view regarding the fluoride contamination in the ground water.

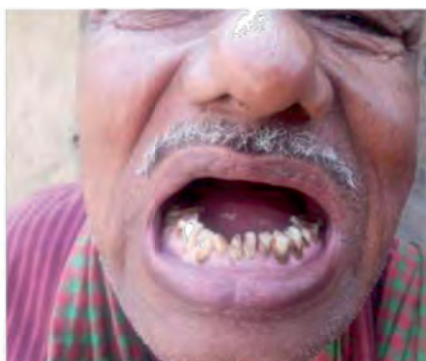


Figure 2 Dental Fluorosis

The water samples were collected from deep and shallow borewells after flushing the water for 7–10 minutes to remove stagnant water and to collect the fresh water from the aquifer. The process of scientific study of water involved laboratory testing of water with the help of spectrophotometer SPADNS method. It is the

most recognized and authentic way to conduct a laboratory test of fluoride. In the SPADNS (parasulfophenylazo)-1,8-dihydroxy-3,6-naphthalene disulfonate) colorimetric method, fluoride reacts with the dye lake, dissociating a proportion into a colourless complex anion (ZrF_6^{--}) and the dye. As the amount of fluoride increases, the colour obtained became progressively lighter. After preliminary distillation, the distillate is reacted with the zirconium-dye lake and measured calorimetrically at 570 nm (nanometre) in a spectrophotometer. The working of spectrophotometer required a huge amount of accuracy and precision. The process involved preparation of standard curve between fluoride

concentration vs absorbance; followed by a process of calculation of fluoride concentration with the linear equation obtained from the graph (figure 05)

- » Fawell and WHO followed the following steps in order to evaluate the standard curve: (Fawell et al, 2004; WHO, 2006).
- » Fluoride standards were prepared with the help of known concentration of fluoride. 5 mL SPADNS and Zirconyl-acid reagent were prepared.
- » Spectrophotometer was set to zero absorbance absorbance readings of standards was obtained.
- » A curve of the fluoride-absorbance relationship was plotted. And linear equation were obtained from the graph.

Estimation of fluoride was done in the laboratory with the help of Agilent Carry series UV-V spectrophotometer 1 cm Quartz crystal for the measurement of absorbance at a fixed wavelength of 570nm. This wavelength was selected as per the wavelength scan function of the dyed solution. A standard solution was prepared with the known Concentration of chemical reagent in order to examine the fluoride concentration of unknown substance. Four different standard solutions were prepared to generate the standard curve through spectrophotometer. The curve was prepared from standard solution so that it allows the same properties to be determined by unknown samples by interpolation on the graph. The standard curve between absorbance vs concentration was plotted

(figure 05) SPANDS reagent was prepared by mixing 958 mg of SPANDS and dilute to 500 ml of double distilled water. Zirconyl reagent was prepared by mixing 133 mg of Zirconyl acid ($ZrCl_2 \cdot 8H_2O$), and 350 mL of concentrated HCl and the double distilled water was added until the total volume of solution was 500 mL.

SPANDS and Zirconyl reagents was mixed in 1:1 volume ratio to prepare SPANDS- Zirconyl reagent. The standard reactions is shown below (Kongpun et al., 2013)



Dark Red | Colorless Colourless | Bright Red

Grade of Dental Fluorosis	%age of suffering people
GRADE 0	12.3
GRADE 1	7.4
GRADE II	17.2
GRADE III	41.9
GRADE IV	20.9

According to these statistics, there seems to be little or no awareness about the relation between the water quality and the health conditions. The awareness about fluoride contamination was abnormalities. The most common speculation about the reason for teeth staining and decay is tobacco and "paan" consumption. Skeletal fluorosis is the worst case due to fluorosis. The bone becomes brittle and weak due to this disease. Though the number of cases of extreme skeletal fluorosis was not very significant but five people lying in the age group of sixty and eighty years were having skeletal fluorosis. Their legs were not straight and they needed support for walking.

was examined, 87.6 % were effected by Fluorosis and none of them even remotely aware about fluoride or the symptoms due to its contamination. These two major observations stand out through the social survey as conditions of this degree of

severity were not anticipated before the field work began

Conclusion:

It has been found through pilot study and other studies also shows a comparative high level of fluoride contamination i.e. 2.2 mg/L which is much greater than the desired level, in the eight targeted villages present in Nawada district of Bihar. The health conditions of the people in these places is largely effected by fluoride related diseases. Yet, there is zero knowledge about fluoride contamination among the masses and very less awareness about water contamination and the symptoms of diseases caused by fluoride and water contamination. Research on fluoride contamination was done by a governmental research institute – Central Ground Water Board. But, currently the representative population chosen for the study are not accessing them and seem to be unaware of any governmental schemes and programs for water purification. Campaigns and awareness programs regarding contamination issues and ways to mitigate them can help to alleviate the issues to certain possible extent.

In order to deal with this menace the entry point activities that are designed for fluoride contamination, need to be more effective by designing appropriate schemes that fit with the social contexts and preferences of the population and this can be achieved by well-designed and targeted social surveys

About the Author

Ranjit Kumar has 10+ years of experience, working as a Water Expert in KPMG, India. He is an IVLP Fellow (International Visitor Leadership Program) by US Bureau of Educational and Cultural Dept, USA. He has worked in Africa, USA and South East Asian countries in water sectors.

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EDC

(MICRO POLLUTANTS) IN WASTE WATER

THE OZONE SOLUTION

Different groups of persistent micro pollutants are daily released by human activities into the water cycle

EDC's (Endocrine Disrupting Compounds), pharmaceuticals (antibiotics, hormones) and , x ray contrast media, personal care products are groups of emerging contaminants all over the world

EDC's are substances which impact hormone function in animals and humans.

Natural or man made that disrupt growth, development, or reproduction

These are Anthropogenic substances that affect the hormone balance. .Growing concern is the Multiplier effect these substances produce .This has forced detailed Investigations into this topic all over the world by countries such as Australia, Switzerland, UK, & USA

What are these Substances

There are more than 2000 different veterinary and human pharmaceutical agents that contribute to these micro pollutants. Some common compounds are:

- » 17a –Ethinylestradiole
- » Doxycycline
- » Sulfametoxazol
- » Lipid regulator
- » Betablocker
- » Ibuprofen
- » Paracetamol

50% of these drugs will be secreted unchanged from our Bodies. Pharmaceutical waste water has also been found to contain these compounds in fairly large proportions.

Also, water works were tested for these Micro pollutants. The finding was that low concentrations were detected in the intake but the normal treatment chain for surface waters that usually consists of a combination of flocculation, sand filtration, ozone, is very well suited to reduce the pollutants to lower than the detection limit.

Hence the problem is more in eliminating these products from the pharmaceutical waste waters. These tend to pollute underground water more than the pollution through human excretions

Effects of Pharmaceuticals in the water cycle –Imbalance Ecosystem in River

Fish evidence exist for Intersexes males & Decreased sperm counts

Contamination of Drinking Water &/Food

Human evidence exist for reduction of fertility & Higher tumor incidence

The following Treatment concepts have been discussed all over the world.

- » Improve the existing biological system
- » Evaluation of the best additional treatment step (depending on the water source, contaminant and treatment goal) such as
 - Activated Carbon
 - Oxidation Process (Ozone(UV/H₂O₂))
 - Membranes (Nano, RO)
 - Process combination of different steps

Independent studies conducted by RWTH Aachen, EAWAG and others identified Ozone treatment as most effective in terms of elimination rate and treatments costs

Laboratory Trials for EDCs Removal from a Pharma Effluent in India

OTSIL is at present conducting laboratory trials in collaboration with a MNC company with effluents from many location, and a reputed laboratory in Chennai .The main Goal of this project was : Reduction of the EDC's in the pharma effluent so that the norms for safe discharge are achieved . It is expected that these norms are likely to be introduced in India soon. Some conclusions of the trails but still awaiting more conclusive reports

- » Ozone treatment achieves removal rates > 90% for most investigated compounds
- » Relatively low doses (3 to 10 mg/L) ensure selective oxidation of contaminants
- » Ozone reactions are more selective and predictable in waste water than radical reactions
- » Ozone is best available technology for EDC treatment
- » Ozone technology is available and reliable in large scale – practical experiences and references exist from other international pilot trials
- » There are some compounds that are not readily acted upon by Ozone
- » No overall estrogenicity test were conducted

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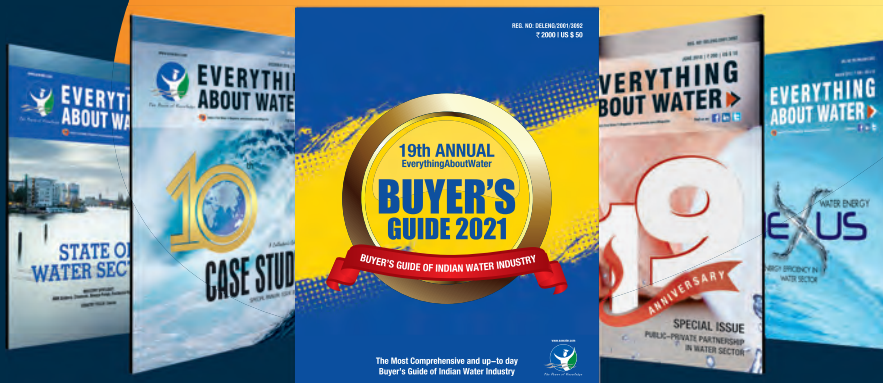
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- Account Number: 10056535743
- IFSC/RTGS/NEFT Code: IDFB0040101
- Bank Address: Unit No. 18-A, Ground Floor, Gurgaon- 122102

Date _____ Signature _____

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T E N D E R S

Authority: Municipal Corporation
30 Mld L Water Treatment Plant Back Wash Pipe Maintenance Work
City: Navsari
Location: Navsari, Gujarat, India
Bid Open Date: 10 Dec 2021
Tender Value: 8.10 Lac
Doc Collection Date: 10 Dec 2021
Competition: Domestic Competitive Bidding
FTID: 2111304113490

Authority: Kerala Water Authority
Mace Of Jica Assisted Kwss To Meenad And Adjoining Villages Package I Intake Works And Water Treatment Plant Revamping The Control Panel Components Of Edamon Feeder And Supply And Installation Of Lbs To The Multi Panel At Intake Pump House Tholiko
Name: Asst. Executive Engineer, P H Sub Dn Valakom
Address: Asst. Executive Engineer, P H Sub Dn Valakom
Location: Kollam, Kerala, India
Bid Open Date: 15 Dec 2021
Tender Value: 3.32 Lac
Doc Collection Date: 15 Dec 2021
Competition: Domestic Competitive Bidding
FTID: 21113026730

Authority: Kerala Water Authority
Mace Of Jica Assisted Kwss To Meenad And Adjoining Villages Package I O And M Intake Pump House And Water Treatment Plant Supplying And Installing 225kw Soft Starter For Pump No 101 In Treated Water Pump House
Name: Asst. Executive Engineer, P H Sub Dn Valakom
Address: Asst. Executive Engineer, P H Sub Dn Valakom
Location: Kollam, Kerala, India
Bid Open Date: 15 Dec 2021
Tender Value: 2.09 Lac
Doc Collection Date: 15 Dec 2021
Competition: Domestic Competitive Bidding
FTID: 21113026750

Authority: Bharat Heavy Electricals Limited
Annual Contract For Operation Maintenance Of 2 X 4 Mld Sewage

Treatment Plant In Factory And Township Of Bhel Rc Puram Unit
Bhel Ramachandrapuram Hyderabad
Dated: 27.11.2021
Venkatesham@Bhel.In
Location: Hyderabad, Telangana, India
Bid Open Date: 17 Dec 2021
Tender Value: 21.66 Lac
Doc Collection Date: 16 Dec 2021
Competition: Domestic Competitive Bidding
FTID: 211130216000

Authority: Uttarakhand Jal Sansthan
Construction Of All Civil And E And M Works Consisting Of Dry Intake Well Rapid Gravity Filter Type Water Treatment Plant, Supplying, Laying And Jointing Of Api/Mserw/Gi Heavy/Medium Pipe In Rinsing Main, Gravity Main And Distribution System, Pump House A
City: Tehri
Location: Tehri, Uttaranchal, India
Bid Open Date: 06 Dec 2021
Doc Collection Date: 06 Dec 2021
Competition: Domestic Competitive Bidding
FTID: 2111304113150

Authority: Bharat Coking Coal Limited
Rewinding Of Burnt 75 Hp 1480 Rpm 440v Motor At Water Treatment Plant Under Govindpur Area.
Name: Area Manager (Enm) Govindpur Area
Address: Govindpur Area Officepost–Sonardihdist– Dhanbad, 828125
Location: Dhanbad, Jharkhand, India
Bid Open Date: 18 Dec 2021
Tender Value: 56 Thousand
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Authority: Public Health Engineering
Providing Roofing With Steel Truss Over Clear Water Sump At 1.125 Mgd Water Treatment Plant Mehjoor Nagar. Jkidfc 1203
Name: Executive Engineer Water Works Division Srinagar

Address: Executive Engineer Water Works Division Srinagar Lal Chowk Exchange Road Srinagar
Location: Srinagar, Jammu & Kashmir, India
Bid Open Date: 07 Dec 2021
Tender Value: 5.81 Lac
Doc Collection Date: 07 Dec 2021
Competition: Domestic Competitive Bidding
FTID: 21113022420

Authority: Public Health Engineering
Maintenance Of Illumination And Allied Electrical Accessories Of All Building In Treatment Plant Compound, Yard, Inspection Bungalow, Rw Compound Etc. At D. Roypure Under Aaa Surface Based Water Supply Project In S24pgs. District Under Smd, Phe, Dte.
Name: Executive Engineer Smd Phe Dte
Address: Chetla, Kolkata– 700027
Location: Kolkata, West Bengal, India
Bid Open Date: 20 Dec 2021
Doc Collection Date: 20 Dec 2021
Competition: Domestic Competitive Bidding
FTID: 211130223080

Authority: Rural Development Department– Ceo–Latur
Providing And Erecting Of Water Treatment Plant (R.O.) At Nagzari TQ Dist Latur
Name: Sarpanch Gramsevak GP Nagzari Tq Dist Latur
Address: Gp Nagzari Tq Dist Latur
Location: Latur, Maharashtra, India
Bid Open Date: 06 Dec 2021
Tender Value: 2.94 Lac
Doc Collection Date: 06 Dec 2021
Competition: Domestic Competitive Bidding
FTID: 21113028750

Authority: Municipal Affairs Department
Procurement Of Electrical Parts For Power Control Console Of Ht And Lt Pumps At Cwps Of 104 Mld Water Treatment Plant (2nd Call)
Address: 1/1, West Ghoshpara Road, Post – Kankinara, Dist – North 24 Parganas, Pin – 743126, Pincod

743126
City: Kankinara
Location: Kankinara, West Bengal, India
Bid Open Date: 08 Dec 2021
Doc Collection Date: 06 Dec 2021
Competition: Domestic Competitive Bidding
FTID: 211130435590

Authority: Municipal Affairs Department
Procurement Of 16 Nos Drive End And Non Drive End Bearing For Motors Of Batch A,B.,C At Water Treatment Plant Under Bhatpara Municipality (2nd Call)
Address: 1/1, West Ghoshpara Road, Post – Kankinara, Dist – North 24 Parganas, Pin – 743126, Pincod 743126
City: Kankinara
Location: Kankinara, West Bengal, India
Bid Open Date: 08 Dec 2021
Doc Collection Date: 06 Dec 2021
Competition: Domestic Competitive Bidding
FTID: 211130435690

Authority: National Thermal Power Corporation Limited
Biennial Maintenance Contract For Desalination Cpu Regeneration And Cw Chlorination Plant
Address: Ntecl, Vallur, Pincod 600103
City: Ambattur
Location: Ambattur, Tamil Nadu, India
Bid Open Date: 14 Dec 2021
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Competition: Domestic Competitive Bidding
FTID: 211130446250



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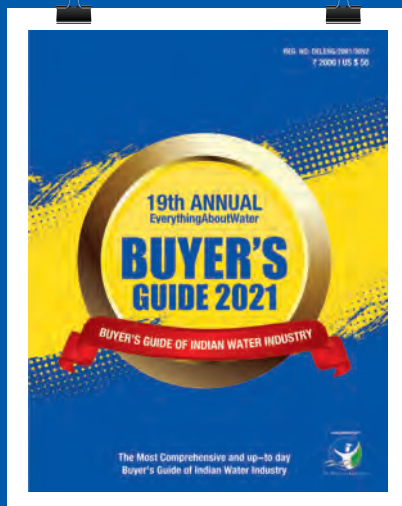
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173. Pumps – Sewage
174. Pumps – Submersible
175. Pumps / Pump Spares / Services
176. Rainwater Harvesting Systems
177. Reclamation Systems
178. Regeneration Equipment
179. Regulators
180. Removal – Ammonia
181. Removal – Arsenic
182. Removal – Bacteria
183. Removal – Chlorine
184. Removal – Colour
185. Removal – Grit
186. Removal – Hydrogen Sulfide
187. Removal – Inorganic Contaminants
188. Removal – Iron
189. Removal – Lead
190. Removal – Manganese
191. Removal – Metal
192. Removal – Nitrate
193. Removal – Phosphate
194. Removal – Rust
195. Removal – Scale
196. Removal – Sludge
197. Removal – Sulphur
198. Resins
199. Reverse Osmosis (RO) – Components / Equipment / Housings / Systems
200. RO Cabinets
201. RO Plants – Commercial
202. RO Plants – Domestic
203. RO Plants – Industrial
204. Sanitary Ware
205. Sanitizers
206. SCADA
207. Screens / Screening Systems
208. Scrubbers
209. Sedimentation
210. Sensing Equipment / Sensors
211. Separators
212. Sequencing Batch Reactors
213. Sewage – Ejection Systems
214. Sewage Treatment – Equipments / Plants
215. Sewer – Rehabilitation
216. Sewer – Vacuum / Flushing
217. Silver Disinfection
218. Sludge – Disposal
219. Softeners – Components / Accessories / Systems
220. Solenoids
221. Sterilizers
222. Storm Water Management
223. Strainers
224. Surface Water Equipment
225. Surge Control
226. Swimming Pool Related Products
227. Switches
228. Tanks
229. TDS Indicators
230. Testing – Equipments / Kits / Labs / Services
231. Transducers
232. Trenchless Technology
233. Tubes / Tube Fittings
234. Turbidimeters
235. Turnkey Projects
236. Ultrafiltration Systems
237. Ultrapure Water Systems
238. Ultraviolet (UV) Systems
239. Valves – Equipment / Supplies
240. Variable Frequency Drives
241. Wastewater
242. Wastewater – Collection Treatment
243. Wastewater – Package Plants
244. Wastewater – Treatment Components / Plants / Systems
245. Water – Analysis
246. Water – Audits
247. Water – Conditioners
248. Water – Conservation
249. Water – Coolers
250. Water – Dispensers
251. Water – Distribution
252. Water – Proofing
253. Water – Purification
254. Water – Purifiers
255. Water – Quality
256. Water – Recycling / Reuse
257. Water – Standards
258. Water – Suppliers
259. Water – Treatment Components / Plants / Systems
260. Water / Wastewater Association
261. Water Vending Machines
262. Zero Liquid Discharge Systems
263. **OTHER: (please write):**



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