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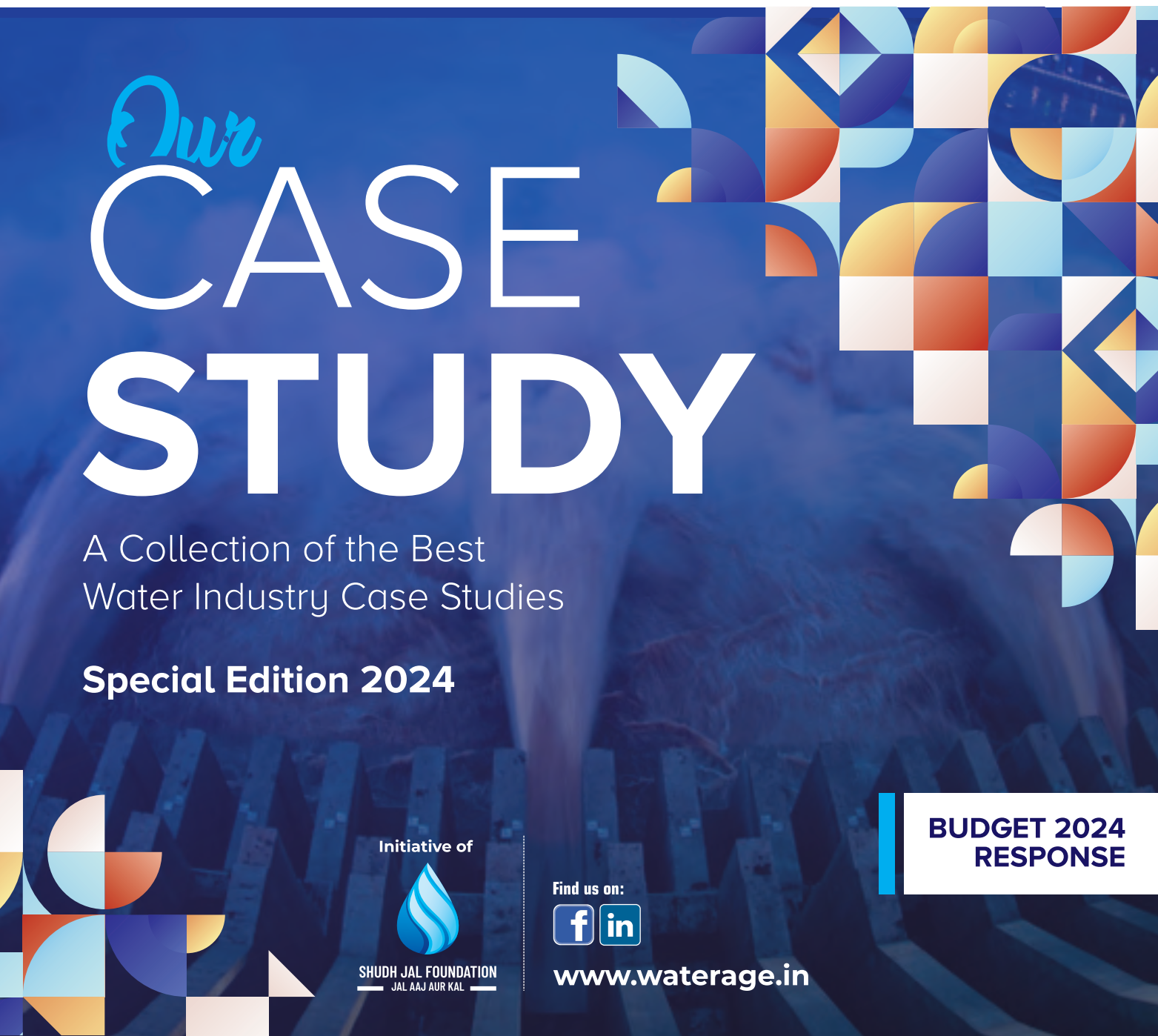

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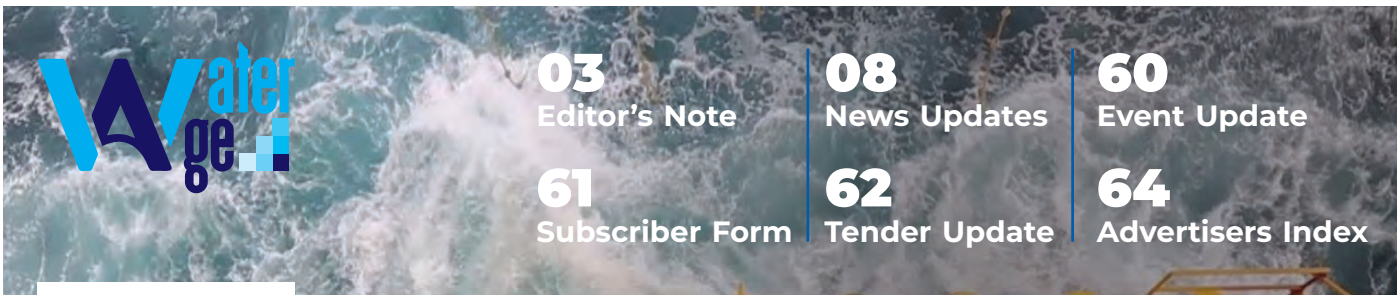

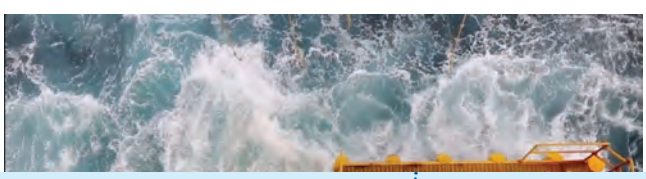

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Editor's Note

RENU TOMAR
(Editor-in-Chief)

In the year 2023, depleting water reserves of Southern India at an alarming rate has become a matter of serious concern. Undeniably, this depletion would not just be a threat for the livelihoods of millions but poses concerning environmental risks as well.

For Indians, the southern regions of the nation have been known for its diverse climatic zones as well as rich water zones which has been historically been a region with water in abundance. However in the recent years, an immensely worrying trend of declining levels of water in the reservoirs, groundwater sources and rivers have been witnessed.

Talking about the factors contributing to this critical situation then there are many such as:

Climate Change: It had been one of the major reasons as altered rainfall patterns have caused prolonged drought situations in many areas and floods in other regions.

Water Pollution: The increase in the level of industrial and domestic waste has led to the contamination of several water bodies.

Excessive Groundwater Extraction: Be it for agricultural or urban needs, the excessive borewell water drilling have been causing serious depletion of groundwater.

Rapid Urbanization: Another biggest matter of concern of present time has been rapid increase in natural water recharge.

In the year 2019, the Chennai water crises served as a wakeup call regarding the dire state of water management. In fact, Bengaluru, the city once known for numerous lakes is now grappling with water scarcity issues because of unchecked urban sprawl.

To address such alarming state of water depletion and water scarcity in not just Southern India but throughout the length and breadth of India, there is imperative necessity of adopting effective solutions with multi-faceted approach.

Rainwater Harvesting is undoubtedly the best solution to encourage rainwater collection and storage, resulting less water wastage.

Sustainable Agriculture is another effective solution of promoting water efficient techniques of irrigation.

Policy Reform is one of the most necessary regulations to implement for preventing excessive groundwater extraction and to control water pollution.

Involving the Community in raising the awareness about water conservation is one of the biggest ways of assuring a disciplined management of water by every single citizen of the nation.

The depletion of water reserves in Southern India is a crisis that demands immediate attention. Sustainable water management practices, community involvement, and effective policy implementation are imperative to safeguard our water future.

This edition of 'WaterAge' will be throwing light on the best water stories of the year 2023 with an intent of covering every major happenings of 2023 through the best Case Studies published throughout the year to explore the underlying water issues and its potential solutions.

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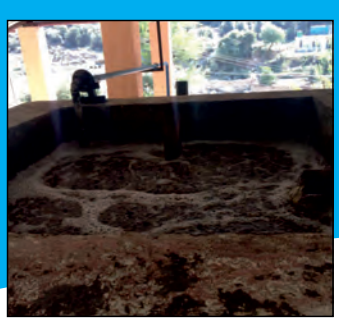

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RESERVOIRS LESS THAN HALF FULL, WATER ONLY FOR DRINKING: NORTH KARNATAKA GRAPPLES WITH DROUGHT IMPACT

Industries and agriculture are expected to be impacted the most

By M Raghuram – Published: Friday 19 January 2024

Pipes carrying water to the Alamatti dam. File photo: iStock

Karnataka is facing a severe water crisis as its reservoirs run dry following a drought in the last monsoon season. The northern part of the state has been particularly hard–hit, prompting authorities to launch into crisis mode. Industries and agriculture are expected to be impacted the most, as water may be reserved exclusively for drinking purposes.

In September 2023, Karnataka declared 195 out of total 236 taluks drought–hit. However, 130 taluks were initially believed to be the worst affected, of which over 80 per cent were in 12 districts in north Karnataka.

State reservoirs should have collected at least 230–250 TMC of water by June 20, 2023, but this time it collected just 165 TMC, said a minor irrigation department official.

Irrigation Consultative Committees (ICC) are now raising awareness about water usage in irrigation, industry and domestic sectors. Judicious use of water could help avoid a drinking water crisis, but water for irrigation was another matter, Water Resources Department Secretary Krishnamurthy B Kulkarni said in September 2023. "The ICCs of various reservoirs are making efforts to create awareness among farmers to avoid water–guzzling crops," he said.

Bagalkot district in north Karnataka saw no rain last monsoon. However, heavy rains in central Maharashtra flooded the Ranyakeshi river, a tributary of the Ghataprabha river, dumping a large volume of water into the Dakal reservoir. The Raitha Sangha (farmers' association) began cultivating both banks of the Ghataprabha.

Crops grown in drought–affected districts in north Karnataka are rice, maize, pulses and oil seeds. Water–guzzling crops like areca nut, sugarcane, cashews, cardamom and chillies are also grown despite adverse expert opinions.

"We hoped the reservoirs would hold water until December, but they didn't. Now over 800,000 hectares of Rabi crops have wilted," said Bharamappa Bilaga, association secretary, Mudhol. A sub–divisional official at Banahatti taluk in Bagalkot told this reporter they had directions to release only drinking water on both banks of the river.

Major North Karnataka reservoirs running dry

Dam	Total capacity	Current storage
Krishna Raja Sagara dam	49 TMC	9.9 TMC
Tungabhadra dam	105 TMC	4.5 TMC
Alamatti dam	130 TMC	19.9 TMC

Karnataka has 24 reservoirs and many of them are below dead storage (volume of water held below the minimum pool level) even during peak monsoons last year. Several reservoirs didn't reach full capacity even once, so in December, there was a deficit of 11 thousand million cubic feet (TMC) compared to last year, said an official in the minor irrigation department.

The situation has worsened in January, with little water for drinking. Civic bodies in the taluks and districts all along the river course are now contemplating deepening the jack wells in the reservoirs, the official added.

According to Department of Water Resources officials, major reservoirs are classified into three types based on their respective rivers: Krishna, Kaveri, and Godavari. The Krishna Valley has the most dams, with 17, followed by five in the Kaveri River basin and two in the Godavari River basin.

The Krishna Valley reservoirs currently hold 112 TMC of water, while the Kaveri Valley holds 47 TMC and the Godavari Valley retains 6 TMC. Remarkably, this is the first time in three years that water levels in the dams have dropped so low, causing genuine concern as they fail to reach even half of their capacity.

About 12,000 cusecs of water will be released from Lal Bahadur Shastri Water Reservoir, also called Alamatti dam for up to 10 days for chilli growers, according to Deputy Chief Minister DK Shivakumar and Minor Irrigation Minister NS Boseraju. In the Alamatti dam, one of the biggest reservoirs in north Karnataka, water inflow dropped as early as November, said an official at the dam maintenance office.

An official from Krishna Bhagya Jala Nigam Limited (KBJNL) stated that the Almatti Dam has a gross capacity of around 19.036 TMC. "The live storage capacity stands is 1.416 TMC. There is no inflow to the dam and the outflow is 578 cusecs," the official said. The live capacity at Almatti Dam has been recorded at less than 2 TMC for the first time in the last five years.

The reservoir has about 70 metres of water, compared to about 100 metres same time last year. Krishna valley reservoirs are at 23 per cent capacity, Kaveri Valley at 27 per cent and Godavari Valley at 64 per cent, according to Karnataka State Natural Disaster Monitoring Centre.

With this water, the catchment area of over 700,000 hectares will need to hold out until the next monsoon, which is five months away. Right now the government has decided to tune down the outflow to a minimal level and reserve much of the water just for drinking purposes. The outflow will be maintained for chilli growers.

Comparing the data from the past three years, the minor irrigation department officials say that by June 20th 2023, we should have accumulated at least 230 to 250 TMC of water in our state's reservoirs. Unfortunately, this year paints a disheartening picture, with only 165 TMC of water stored by the same date.

These alarming figures emphasise the severity of the situation as we enter the summer season, fueling concerns about the potential consequences that lie ahead. The distressing decline in water levels is also evident in some of our state's primary reservoirs.

All 24 dams across the state face similar circumstances, resulting in an average water storage deficit of 40 per cent compared to last year.

TO BEAT WATER SHORTAGE, THESE YOUTHS IN KINNAUR'S COLD DESERT CREATED ARTIFICIAL GLACIER BY WATCHING YOUTUBE VIDEOS

Himachal Pradesh is already showing signs of drought–like situation, with hardly any snow or rain this winter

By Rohit Prashar – Published: Monday 15 January 2024

The youths of Hango village in Kinnaur, Himachal Pradesh. Photo: Rohit Prashar

Tribal youths in Kinnaur district of Himachal Pradesh, in the environmentally sensitive Trans–Himalayan region of the state, have constructed an artificial glacier to solve the problem of water scarcity. This, even as there has hardly been any snowfall in India's Himalayan states this winter.

Over 20 youths have constructed the artificial glacier in Hango village of Kinnaur district on the Indo–Tibetan border.

Hango is located at a height of 11,000 feet above sea level and frequently faces water scarcity in the summer. Kinnaur is a part of the cold desert landscape which also includes the districts of Leh and Kargil in Ladakh and Lahaul–Spiti in Himachal Pradesh.

The youths devised the plan to construct the glacier a week ago. The structure now measures over 50 metres. It was constructed by the youths by looking at videos on YouTube.

Himachal has been witnessing a long dry spell since the past three months. This is the first time in 20 years that there has been no snow or rain the state during January. In 2007, the state recorded a –99 per cent drop in rainfall. But this time, there has been no rain at all. The maximum temperature has also increased this year, according to meteorologists.

Surendra Singh Negi, one of the youths from Hango who constructed the artificial glacier, told this reporter that the village has been witnessing changes in rainfall and snowfall patterns in the last few years.

"This causes scarcity of water in the village during summers. We are mostly horticulturists and pea farmers. Lack of water leads to heavy losses for us. Since there has been no snowfall this year, we decided to make an artificial glacier so as to pre–empt the problem of summer water scarcity," Negi added.

Others in the team, including Anu Negi, Thupten, Tsering Dorje, Pradip Negi, Sagar Negi and Tenzin, told this reporter that they will construct more such glaciers wherever they can be made, so as to ensure an adequate supply of water in summer.

They told this reporter about how the glacier was made. The youths brought water from a natural source to a secluded, shaded nullah by using a pipe. They then attached a sprinkler used in agriculture at the end of the pipe. The water from the natural source thus fell all over the nullah, instead of one place. This then froze into ice with the help of low temperatures in the area during winter.

Kamal Prakash Negi, the deputy head of the Hango Panchayat, appreciated the move by the youths. He said the villagers faced difficulties in ensuring water for their cash crops due to the scarcity in summer. "But such glaciers can store water for a long time, which can be used in times of need," he told this reporter.

Artificial glaciers can be a viable alternative for high altitude, cold desert regions in the Trans–Himalaya like Kinnaur, Lahaul and Spiti, where water scarcity is a serious and growing concern.

Such structures can help residents ensure drinking water supply as well as grow their crops.

DRY WINTER: WATER LEVELS IN DAMS ON HIMACHAL RIVERS DECLINE TO HALF OF THEIR CAPACITY; EXPERTS WARN OF THIRSTY SUMMER

Snow & rain during December and January was supposed to replenish state's glaciers

By Rohit Prashar – Published: Monday 22 January 2024

The town of Kaza in the remote Spiti Valley of Himachal Pradesh. The area is a cold desert. Photo provided by Rohit Prashar

The people of Himachal Pradesh, who struggled last year with floods and have been experiencing a 3–month–long dry spell, may be in for more trouble. The state may suffer from water scarcity during summer in the months ahead, experts have warned.

Their warning is substantiated by data. The lack of rain and snow in the last three months have caused a severe reduction in the water levels of rivers that either originate in or flow through Himachal to the plains below, data from the Central Water Commission (CWC) shows. These include the Chenab, Ravi, Beas, Satluj and Yamuna.

The amount of water in the reservoirs of Himachal Pradesh, Punjab and Rajasthan had reached half of their capacity as of January 18, 2024, according to CWC data.

Gobind Sagar, the reservoir of the Bhakra Dam on the Satluj in Una and Bilaspur districts just before it enters Punjab, has a capacity of 6.229 billion cubic metres (BCM). The reservoir had 3.115 BCM of water on January 18.

The Maharana Pratap Sagar created by the Pong Dam on the Beas in Kangra district, which has a capacity of 6.157 BCM, had 3.457 BCM water on January 18. The Thein or Ranjit Sagar Dam, built on the Ravi in Punjab's Pathankot district, has a capacity of 2.344 BCM. It had only 0.567 BCM of water left on January 18.

There will be no rain and snowfall in Himachal Pradesh till January 24, due to which concerns of local people have increased.

SS Randhawa, environment and glacier expert and principal scientist at the Himachal Pradesh Council of Science, Technology and Environment, told this reporter that snowfall in December and January replenishes a glacier.

When this snow and ice thaws, rivers and streams get water. "The effect of prolonged drought can create water shortage during the summer. A study is being done regarding the impact of the current drought," said Randhawa.

The impact of prolonged drought will be most pronounced in the form of water shortages in urban areas as well as in high–altitude tribal areas.

Senior journalist and environmental expert Archana Phull told this reporter that in the recent past, rapid environmental changes have been seen in the states situated in the foothills of the Himalayas.

"This past year, there was a lot of rain during the monsoon and the rainwater mostly flowed downstream instead of recharging aquifers. Now, due to the drought of the last three months, there has been a shortage of drinking water. If the situation continues like this, there will be a huge shortage of water in urban and rural areas in the coming months. Besides, its impact will also be seen in the agriculture and horticulture sector," said Phull.

Experts said the maximum impact of the prolonged drought will be seen in the high–altitude areas of Kinnaur and Lahaul–Spiti.

Sujata Negi, block technical manager in the state agriculture department in the cold desert Spiti Valley, told this reporter that there has been no snowfall at all this time. Whereas this was not the case last year.

She said farming is done only in one season in the Spiti Valley and people are completely dependent on glaciers and snowfall for farming. Due to lack of snowfall this time, people may have to face shortage of water for farming as well as drinking water during summer.

Water expert Pratik Kumar said that in view of the future challenges related to water due to the prolonged drought, the government and people in rural areas should be ready.

"Himachal is anyway a tourist destination and water shortage has been seen in cities like Shimla. The effects of the drought can already be seen. Hence, work towards saving water should be started from now itself," said Kumar.

CLEAN WATER CRISIS: NITROGEN POLLUTION TO TRIPLE SCARCITY IN RIVER SUB–BASINS WORLDWIDE

In India, Africa, sewage to be biggest contributor of nitrogen pollution in water in worst climate scenario

By Susan Chacko – Published: Thursday 08 February 2024

Water scarcity is exacerbated by declining water quality in numerous regions, and the situation is expected to worsen in the years to come, a new report underlined.

A significant factor contributing to this crisis is nitrogen pollution in rivers, a concern that emerged in 2010 and is anticipated to persist until 2050,

Photo: iStock

the findings showed. The global impact of future nitrogen pollution is alarming, with the number of sub–basins experiencing water scarcity expected to triple.

A recent study, published on February 6, 2024 in Nature Communications highlighted that an additional 40 million square kilometres of river basin area and three billion more people may face water scarcity in 2050 than previously estimated.

The study introduces the term "clean–water scarcity" and provides a comprehensive assessment considering both water quantity and quality. This assessment, based on global nitrogen pollution and incorporating various climatic and socio–economic scenarios, reveals a more dire situation than previous evaluations.
Comparing the clean–water scarcity assessment to the traditional water scarcity assessment based solely on quantity, the number of sub–basins facing severe scarcity doubled in 2010 and is projected to potentially triple by 2050. Water pollution, particularly nitrogen pollution, played a significant role in aggravating water scarcity in 2,000 sub–basins worldwide.

In 2010, 984 sub–basins were deemed water scarce based on quantity alone, while 2,517 sub–basins faced scarcity due to both quantity and quality. This number is anticipated to increase to 3,061 sub–basins in the worst–case scenario in 2050, as outlined in the study. This alarming projection indicates a more than doubling of the global area and population affected by severe water scarcity.

When considering only water quantity, the study estimated that 45 per cent of the global population lived in areas with severe water scarcity in 2010. However, when water quality is factored in, this estimate rose to 80 per cent.

Future clean–water scarcity hotspots were identified in China, India, Europe, North America, and potentially Central Africa in the worst–case scenario, each with unique challenges requiring targeted solutions.

Nitrogen losses in rivers can stem from various sources, including human waste, agricultural practices and fertiliser applications. In the worst–case scenario, sewage is projected to become the dominant source of nitrogen pollution in rivers due to rapid urbanisation and inadequate wastewater treatment infrastructure.

India, for instance, experiences nitrogen pollution primarily from agriculture in the first two climate scenarios, but sewage is projected to surpass agriculture as the main source in the worst–case scenario.

A similar trend was observed for Africa, where both agriculture and sewage contribute to nitrogen pollution, but sewage was projected to be the main source in the worst–case scenario.

The study underscored the urgency of addressing water quality in future water management policies to align with Sustainable Development Goals.

In India, the State of India's Environment Report 2023 indicated a concerning deviation from the Sustainable Development Goals (SDG), particularly SDG 6 (clean water and sanitation) in 15 states.

The impact of Shared Socioeconomic Pathways — climate change scenarios projecting global socioeconomic changes up to 2100 — further emphasises the need for proactive measures.

A previous analysis by the Centre for Science and Environment and Down To Earth magazine in 2016 revealed unsafe disposal practices of excreta in Indian cities, with 78 per cent of sewage remaining untreated.

Mitigation strategies addressing water pollution require increased attention, as low water quality emerges as a critical or even dominant factor contributing to water scarcity in many river basins. Controlling nitrogen pollution is identified as a challenging yet imperative aspect of these strategies.

BENGALURU: NGT SEEKS RESPONSES ON ALLEGED ENCROACHMENTS IN PATTANDUR AGRAHARA LAKE'S BUFFER ZONE

The case adds to the ongoing challenges faced by civic authorities and environmental activists in preserving Bengaluru's water bodies and green spaces against unauthorised encroachments

By Coovercolly Indresh – Published: Friday 26 January 2024

Activists hold a placard on World Environment Day at the Pattandur Agrahara Lake in Bengaluru East. Photo arranged by Covorcolly Indresh

The National Green Tribunal (NGT) has initiated action on alleged encroachments in the buffer zone of the Pattandur Agrahara lake in Mahadevapura, east Bengaluru. The move comes in response to a newspaper report highlighting unauthorised construction activities, particularly the building of roads, in the area.

The NGT, chaired by Justice Prakash Shrivastava and expert member A Senthil Vel, took suo motu cognizance of the matter. The tribunal expressed concern about potential violations of environmental norms.

In its order dated January 23, the NGT issued notices to the Karnataka State Pollution Control Board (KSPCB) member secretary, the revenue department of east Bengaluru, the Commissioner of Bangalore Development Authority (BDA), and the member secretary of the state wetland development authority.

It asked them to respond to the allegations and scheduled the matter for further hearing on March 6.

The case has generated interest among environmentalists, local authorities, and residents who are keenly observing the legal proceedings.

The case

Sandeep Anirudhan, convenor of citizen organisation Namma Whitefield, told this reporter that this is not the first time the Pattandur Agrahara lake has faced encroachment issues. The local community had previously fought legal battles to protect it, filing two public interest litigations.

Thanks to concerted efforts, including legal action by the BDA, the state government filed a case against encroachers and obtained a stay on their claims. The government also allocated Rs one crore for fencing the lake in 2022.

However, fresh reports have emerged of owners and developers near the lake openly defying regulations. Developers had submitted that they are constructing a road to the Sri Muneshwara temple. The said road has been designated as a Kaludari (walking path) in revenue records.

Anirudhan claimed that the road was, in fact, illegal. It will connect to a new unauthorised layout in Whitefield, he added. This is happening even before the lake fencing has been finished.

Bengaluru East tahsildar (revenue official) Ravi Y said he had directed the revenue inspector to inspect the site. The authorities reportedly halted the road construction and instructed the developers to provide relevant records.

Regarding the alleged unauthorised layout, the executive engineer of Mahadevapura Zone BBMP stated that the tahsildar must take action. The revenue department needs to verify land conversion and secure BDA approval for the layout's development. If these checks are not in order, the layout formation is deemed illegal and must be stopped.

Saving Bengaluru

The incident adds to the ongoing challenges faced by civic authorities and environmental activists in preserving Bengaluru's water bodies and green spaces against unauthorised encroachments.

As India's Silicon Valley developed over the years, the land value skyrocketed, inviting encroachments by the land mafia. The majority of lakes in the city are encroached by land developers, either fully or partially, with the support of revenue and Bruhat Bengaluru Mahanagara Palike (BBMP) authorities.

A BBMP deputy commissioner told this reporter on the condition of anonymity that land records are with the revenue department. The BBMP and BDA issue permissions for the construction of houses and layouts. If the lakes and revenue lands were handed over to BBMP, the encroachment would be effectively stopped. He said the digitalisation of land records of BBMP would prevent encroachments. But it is being delayed.

Government lands and lakes are threatened with encroachments not just within Bengaluru. Reserve forest land situated on the city's outskirts is also not safe.

One instance of this is the dispute concerning an 8–acre 35–guntha (one acre is 40 gunthas) plot of land in Bhuvanahalli, adjacent to the Kempegowda International Airport.

The Karnataka High Court recently issued an interim order restraining any third party from declaring the title of 'immovable property' in the case.

Justice H T Narendra Prasad, heading a single–member bench, heard the regular first appeal filed by the Karnataka chief secretary and Devanahalli taluk range forest officer on January 22.

Additional Advocate General Kiran M Rona, representing the state government, argued that a notification under Section 17 of the Mysore Forest Control Act was issued on January 8, 1921. This designated the area as a 'state forest'.

The disputed land falls within Survey No. 69 of Chikkasanne village in Bhuvanahalli State Forest Block. It was alleged that the appellants and their associates constructed a layout in the disputed area and allowed a third party to claim ownership of the forest land.

Rona pointed out that third parties have encroached upon and developed layouts in other state forests too. They have almost erased the forest area in the process.

The government is obligated to identify and prevent forest area encroachments and maintain accurate records. In this case, the range forest officer UJ Pavitra diligently codified the documents related to the state forest area in compliance with the Supreme Court's order. Rona demanded that the court review these codified documents.

After hearing the arguments, the bench ordered the execution of notice to the defendant, wholesale fruit trader MA Mohammad Sanaullah of Chikkasanne, and adjourned the hearing.

The land dispute dates back to 1936 when a portion of Bhuvanahalli state forest was auctioned. Subbaraya Kandaliar purchased 43 acres and 24 gunthas of land during that auction, and the present defendants acquired the property in 1977.

Civil litigations ensued, leading to the ongoing legal battle.

WHO CALLS FOR TECHNICAL EXPERTS FOR SUPPORT AND GUIDANCE ON GLOBAL MONITORING OF WASTEWATER

6 February 2024 Expression of interest

WHO is seeking expressions of interest from individual consultants for technical support and guidance on global monitoring of wastewater. The selected consultant will work under the supervision of the WHO JMP team lead and will work closely with UN–Habitat as the co–custodian agency for SDG target 6.3.1, as well as with UNICEF as a co–custodian for SDG target 6.2.1.

The consultant will engage in the work of the Department of Health, Environmental and Climate Change, within the Water, Sanitation, Hygiene and Health Unit (WSH), on multiple activities related to the global database on domestic wastewater maintained by WHO. Activities will include contributing to the development and dissemination of a global report on SDG indicator 6.3.1; developing training materials for strengthening the capacities of member countries in monitoring sanitation and wastewater; improving indicator 6.3.1 data management and organization; providing technical guidance to a collection of peer–reviewed papers on monitoring sanitation and wastewater; and preparing for the 2025 update to the global database on domestic wastewater.

Full details on the main outputs/activities and specific qualifications and experience requirements are included in the following ToR:
ToR guidance on global monitoring of wastewater
Application details:
Applications should be submitted by midnight GMT on 20 February 2024 to wsh@who.int and include:

- Up–to–date curriculum vitae
- Brief cover letter outlining:
- Skills, experience and contributions that you bring to the specific ToR;
- Expected availability during 2024;
- Daily or monthly rates
- Application review criteria includes:
- The required qualifications, experience, technical skills and knowledge and language skills as outlined in the ToR;
- Availability for specific tasks in consideration of needs during 2024;
- Cost effectiveness.
- Deadline for application: 20 February 2024

POLLUTION RISKS WORSENING GLOBAL WATER SCARCITY: STUDY

Eutrophication in a lake in China. Credit: Mengru Wang

Water scarcity could affect three billion more people than previously expected by mid–century, with increased pollution rendering river sources "unsafe" for humans and wildlife, researchers warned Tuesday.

The UN's climate science panel has said that around half the world's population currently faces severe water scarcity for at least a month a year and warned that global warming impacts and rising demand are key risks to global supply.

But new research by scientists in Germany and the Netherlands has found that if harmful nitrogen pollution is factored in the number of areas considered water scarce increases dramatically.

"In general, people worry more about water scarcity—whether you have enough water," lead author Mengru Wang, of Wageningen University & Research, told AFP.

"But I also see that water pollution is really becoming a more and more important issue that makes water unsafe to be used by nature and humans."

Human activities are spewing large amounts of nitrogen, pathogens, chemicals and plastics into water systems.

Nitrogen, from agricultural fertilizers in particular, contributes to algae growth that can choke waterways, threaten marine life and compromise water quality.

The new study, published in the journal Nature Communications, analyzed river basins around the world, which are key sources of drinking water and hubs for urban and economic activities.

According to the authors' computer modeling, the number of sub–basins—smaller units in the river basins—facing severe water scarcity was twice as much as previously thought in 2010 and could get much worse in the coming decades.

They estimate that in 2010, 2,517 sub–basins in the world were facing water scarcity, when nitrogen pollution's impact on water quality was taken into account, compared with just 984 according to conventional assessments based on quantity.

That figure could rise to up to 3,061 by 2050, they found, estimating this would affect roughly 6.8 to 7.8 billion people—or roughly three billion more than in conventional estimates.

Co–author Benjamin Bodirsky, senior scientist at the Potsdam Institute for Climate Impact Research, said the modeling of three different scenarios that affected pollution levels showed "we do have choices and can improve the situation".

But he said that even in the most optimistic estimates, nitrogen pollution would stay at "substantial levels" in important agricultural areas like Europe, China and India.

"The deterioration of water access can be halted, and to some extent even reversed, by adopting more efficient fertilizer use as well as more vegetarian diets, and by connecting a larger proportion of the global population to water treatment facilities," Bodirsky said.

BUSINESS CASE WATER TALE!

Tracking down Grasim Nagda's water management success story from scarcity to sustainability…

By Veolia Water Technologies & Solutions

As reports of alarming water table depletion and contamination continue to rise across Planet Earth, an extraordinary first–of–its–kind tale of successful collaboration for industrial water management, has emerged from 23.4453° N, 75.4098° E.

The location in Central India is of the Grasim Industries Limited's plant in Nagda. A flagship company of the $65–billion Aditya Birla Group (ABG), and a leading global producer of viscose staple fibre (VSF), the Grasim plant has adopted cutting–edge technologies in its efforts to revolutionize water management practices at its manufacturing unit.

The Nagda plant today leads the way with the VSF business being the lowest water consumer globally. The facility also meets water needs of the entire city, railway and irrigation needs of the farmers through the 30 billion litres storage capacity built by Grasim. The Aditya Birla Group's emphasis on the three R principles: Reduce, Recycle, and Reuse to protect and conserve water has also resulted in a significant reduction in freshwater intake of its fibre production units.

It wasn't always like this though.

Nagda, located in a region with limited rainfall, has always posed a significant challenge for Grasim's water–intensive industry, which relies primarily on the Chambal River for its production requirements.

Over the past seven decades, water needs have surged from 200 million cubic feet (MCFT) to nearly 1300 MCFT, leading to operational interruptions during peak summer months due to water scarcity. Grasim's VSF plant at Nagda started production in 1954, and since

About Veolia Water Technologies and Solutions:

Part of the French major Veolia Group, Veolia Water Technologies & Solutions (formerly SUEZ Water Technologies & Solutions) is a technology company focused on environment sustainability through its wastewater and water treatment businesses. Headquartered in Bengaluru, India, Veolia Water Technologies has been pioneering technological solutions for ecological transformation and sustainable development goals.

Veolia Group aims to become the benchmark company for ecological transformation. Present on five continents with nearly 220,000 employees, the Group designs and deploys useful, practical solutions for the management of water, waste, and energy that are contributing to a radical turnaround of the current situation. Through its three complementary activities, Veolia helps develop access to resources, preserve available resources, and renew them.

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www.veoliawatertechnologies.com

then the Aditya Birla Group has diversified into various new sectors and industries, including the production of cement, sponge iron and chemicals.

Ergo, the growth of its industries has not only served to emphasize upon water requirements for the ABG, but has naturally led to its commitment towards water stewardship and concern for the environment. With excellence in water management practices being integral to its approach to growth, the company has been at the forefront of innovations to improve the efficiency of processes to reduce consumption and reuse of water multiple times. For this, Grasim has adopted state–of–the–art novel technologies, such as membrane processes, which clean up and recycle the wastewater. With its unwavering focus on environmental impact deriving inspiration from the UN SDG 6 to protect, conserve and regenerate the water eco–system, Grasim remains committed to improve the availability of water, the most precious shared resource, for everyone.

K. Suresh, Senior President, Staple Fibre Division, Grasim Industries Ltd. reflects on his company's water reform journey: "When I began my career here, we consumed approximately 200 cubic meters per ton of fibre. Through dedicated efforts spanning 35–40 years, we've reduced this consumption to a meagre 20 cubic meters per ton of fibre. This reduction involved intensive work on water consumption reduction, recycling, reuse, and process innovation."

It is therefore easy to see why Grasim Industries, Staple Fibre Division has been at the forefront of receiving industry accolades for industrial and environmental best practices – this includes Stockholm Industry Water Award 2004,'TERI–IWA–UNDP Water Sustainability Awards 2021–2022' in the category of "Water for All, Water Stewardship category of the Network18 (CNBC) Sustainability 100+ Award and The Economic Times Promising Plants 2021.

Veritably, the Grasim Nagda story serves as an unprecedented case study, illustrating a remarkable success in water management within the global VSF industry. The solution is the outcome of a collaborative effort, 'co–invented' by Grasim and global water technologies specialist Veolia Technologies.

PROFITABLE PARTNERSHIP

A background update would be instructive here. In 2019, with a growing need to conserve water and reduce the usage of fresh water and to further cut down on production costs, Grasim extended invitations to prominent players in the water industry – this included the world's three foremost companies specializing in membrane technologies – to collaborate on the creation of cutting–edge systems. This endeavour presented a significant challenge since there was no Zero Liquid Discharge available which could effectively address the intricate aspects of viscose effluent treatment. Following extensive deliberations, followed by visits to model plants across the world by Grasim officials, it was decided to harness energy efficient technologies which could meticulously address the intricate aspects of viscose effluent treatment. The result of this pioneering initiative was that Veolia emerged as the player selected to meticulously craft a state–of–the–art Zero Liquid Discharge System.

"We had to collaborate with global technology suppliers to ensure the sustainability of our proposed facility. After thorough evaluation, we selected Veolia, as our partner. Together, we visited numerous facilities to fine–tune technology suitable for our operations and environment. We prioritized capability, equipment reliability, and the trustworthiness of technology suppliers throughout this collaboration," explains Grasim's Suresh.

It needs to be underlined here that developing such projects typically involves years of conceptualization before reaching fruition. The partnership between Grasim and Veolia commenced in late 2018 and continued through 2019–2020 even as Covid struck industries and businesses across the world.
The joint venture progressed smoothly, overcoming challenges, and delivering a successful solution. By August 2021, the project was not only operational but also thriving, showcasing exceptional efficiency and success.

Suresh is naturally delighted with the outcomes achieved at his plant which celebrated Grasim's 75th anniversary in 2022.

"Nearly two years after commissioning the plant, we remain satisfied with its performance. We aim to replicate this model at various other facilities and make this environment friendly, cost–effective, and efficient technology available to similar situations globally, emphasizing resource recycling. Currently, we recycle nearly 98 per cent of the resources entering our plant and are actively working to further reduce the remaining 2 per cent."

WHY VEOLIA?

Commenting on the choice of technological partner and reasons for the success of the ground efforts, Suresh is led to explain, "The collaboration between Grasim and Veolia was driven by Veolia's status as a global leader in this technology, which was paramount for our company's risk mitigation strategy. Although we contemplated handling the project internally, the learning curve and time constraints led us to prefer a globally reputed and established vendor. We didn't want to go with untested players. Veolia's track record with nearly 200 plants worldwide instilled confidence in our choice. During the design phase, our experts and Veolia's collaborated closely, addressing equipment construction, operating parameters, chemical usage, dosage patterns, recovery techniques, and membrane selection. This collaboration resulted in the creation of a pioneering recycling plant, marking a significant milestone in our industry."

MISSION CLARITY

The project derived its success from clear objectives which were as follows: Firstly, the aim was to achieve Zero Liquid Discharge compliance, which involved treating various effluent streams and recycling the treated water to reduce the reliance on fresh water. Additionally, it aimed to provide comprehensive solutions that included effluent collection, membrane–based recycling, and crystallization processes. Another critical objective was to optimize recovery rates, thereby reducing the need for evaporators and crystallizers in the water treatment process. Maintaining a consistent Total Dissolved Solids (TDS) level of

less than 200 ppm in the treated product was essential to meet water quality standards. Lastly, the challenge was to develop an operationally efficient system with minimal manpower requirements, a reduced physical footprint, and a high degree of automation, enhancing overall system efficiency and cost–effectiveness. These goals collectively addressed the complex challenges associated with industrial water management while emphasizing on sustainability.

INNOVATIVE SOLUTIONS

Grasim and Veolia innovated a series of innovative solutions involving optimal brine treatment, RO, and evaporation processes. The first notable installation was a patented clarifier, which played a pivotal role in enhancing water treatment efficiency. Subsequently, Veolia introduced the high pH RO system, a cutting–edge recycling system. This system proved highly effective, enabling the recycling of nearly 92 percent of water from the Reverse Osmosis (RO) process alone. To tackle the issue of RO reject and achieve Zero Liquid Discharge, Veolia further innovated by introducing thermal solutions.

One critical aspect of the project was sodium sulfate, which, though environmentally benign, raised concerns among certain stakeholders. The partners then innovated a solution which combined Veolia's expertise with Grasim's, resulting in an optimal brine treatment, RO and evaporation process by Veolia. Grasim officials reduced the brine concentrate volume by extracting sodium sulfate and then returned it to Veolia for final processing further highlighting the project's commitment to sustainability.

PROJECT EXEMPLAR

The uniqueness and exemplary status of the project stems from its innovative solutions, which bring forth a multitude of benefits.

Notably, this high recovery solution achieves an impressive recovery rate of over 98 percent, setting a new global benchmark for Zero Liquid Discharge (ZLD) plants. Unlike many VSF plants that often bear substantial operational expenses, this plant was meticulously designed to address their primary pain point, Opex, making it a standout success. The revolutionary aspect of this solution lies in its recognition of the vast potential for resource creation and utilization within the VSF industry. The process generates valuable sodium sulfate and other usable salts, which are subsequently sold in the market, establishing an additional revenue stream.

In fact, this innovative approach has proven to be a significant revenue generator for Grasim, capable of recovering a substantial portion of the chemical solution production costs, accounting for 40–50 percent of Opex.

In terms of tangible benefits, the project not only positions the plant as a producer of sodium sulfate and usable salts but also as a source of recycled water. These interventions not only tackle water treatment challenges but also contribute significantly to income generation, operational efficiency enhancement, and overall sustainability. This project stands as an outstanding case study, showcasing Veolia's pioneering technologies and execution capabilities, particularly its Zero Liquid Discharge solutions.

The Grasim Nagda project has without doubt created reference data with global applicability, paving the way for broader market penetration and a substantial contribution to global water recycling and pollution reduction efforts.

That augurs well for industries, businesses, water technology players – and most critically for an increasingly fragile global environment.

ENVIRONMENTAL URGENCY

Veritably, it is empathy towards the environment, depleting earth resources, and the consequent need for application of industrial best practices which binds responsible global entities like Grasim and Veolia together. Grasim Industries' Viscose Staple Fibre plant at Nagda in Madhya Pradesh, certainly is an outstanding example of the success of Veolia's technology solutions as can be seen from the dramatic water tale turnaround.

For sure, while the use of membrane based novel technologies and the installation of the world's first Zero Liquid Discharge (ZLD) for the viscose industry at Nagda can be viewed as an exemplary solution for the country's water table depletion and contamination problems, there is a growing need for such technologies to be applied across the board in water reliant industries, and in civic settings. As it is indiscriminate urbanization, lack of planning, and the sheer absence of water and waste water treatment and disposal systems across residential, civic and industrial facilities, have led to almost 70 per cent of surface water in the country being rendered unfit for consumption. So much so, that India is counted among the most water stressed countries. Almost 40 million litres of waste water enter our rivers and water bodies each day, and only a fraction of the national water resource is 'properly managed'. This has negative ramifications for the country's social and economic growth. According to a recent World Bank Report, water pollution not only costs the national exchequer up to $7.7 billion a year in losses, but also leads to a 9 per cent drop in agricultural revenue, a 16 per cent subtraction in crop yield, 40 million Indians being affected by waterborne diseases and 400,000 fatalities. All of these challenges, compounded further by lack of water conservation efforts, can pose a severe threat to the growth now being projected.

FUTURE PROSPECTS

As India and many other countries continue to grapple with water scarcity and pollution, the Grasim Nagda project serves as a testament to the potential of industrial best practices and innovative technologies to reverse the tide of water depletion and contamination. It sets a new standard for sustainable water management, both in India and globally, offering a promising path toward a water–secure and environmentally responsible future.

It is here that entities like Veolia Water Technologies can step in as

key contributors to the India Growth Story. The French multinational, which has been in India for close to two decades now, has over 500 references of completing the most complex projects starting from treatment of drinking water, sewage treatment and industrial wastewater treatment. The solutions being offered include Zero Liquid Discharge with Mechanical Vapour Recompression (MVR), crystallizers and evaporators, Reverse Osmosis membranes etc. In India Veolia has successfully completed more than 25 Zero Liquid Discharge projects, also contributing to the delivery of a wide variety of equipment, water management solutions and other services for civic, industrial, residential and commercial projects across the country.

Gopal Madabhushi, Senior VP & Business Unit Leader India & South Asia, Veolia while underscoring his company's intent to make the world a water secure place dilates on business prospects: "With freshwater depleting very fast worldwide, the success being demonstrated at Grasim's Nagda plant sets an important precedent not only for India, but also for Veolia's global water agenda. It shows the user's confidence in our systems. We stand out because of our very own technologies and execution capabilities which differentiate us from the competition in the market. Veolia has introduced some unique solutions to this country for the first time, successfully delivering projects on site as a team. Our key goal is primarily to penetrate more markets on the membranes side which offer the best solutions for customers, also make strides in the Zero Liquid Discharge market so that we are able to recycle as much as possible and reduce pollutants on the surface water."

That should be happy news for the future of water ravaged Earth.

GRASIM NAGDA: PROJECT BENEFITS

- Veolia achieves 98% recovery rate, a ZLD benchmark for VSF industry
- Leads to creation of valuable products, like sodium sulfate, for added revenue.
- Innovation boosts Grasim's income by recovering chemical production costs.
- Benefits include recycled water and near–zero pollution discharge for Nagda's sustainability.
- Project while showcasing Veolia's tech process, enhances efficiency and sustainability.
- Grasim Nagda has contributed globally to water recycling and pollution reduction.
- Technology offers benefits for industries, businesses, and global environment.

REDUCE THE TREATMENT COST IN RO BASED ZLD SYSTEM IN TEXTILE INDUSTRY BY INCORPORATING PRO–XS1 NF MEMBRANES

By Yasuhiro Tomi, Manikandan Vasudevan

> Reduce the operating cost of textile dyeing process by recycle and reuse the salt solution from waste water

The Problem

Textile manufacturing involves the production or conversion of textile fiber through a defined process which includes sizing, desizing, scouring, bleaching, mercerization, dyeing, printing, chemical finishing, etc. The wastewater from the textile processes contains high TSS, fibers, TDS, BOD, COD, Color, starch, alkalis, and bleaching compounds. Because of their composition and variability, industrial wastewater is some of the most challenging water to treat for reuse.

But in regions experiencing extreme water stress, industries that had previously performed minimal treatment before discharging their wastewater are now being forced to use membranes to reclaim and reuse 100% through a ZLD process. Depending on the type of textile being processed, effluent TDS can be in the range of 8,000ppm to 12,000ppm. COD levels can be in the range of 2,000 mg/l to 3,000 mg/l and BOD is in the range of 1000 to 2000 ppm and Sulphate is in the range of 3000 to 5000ppm.

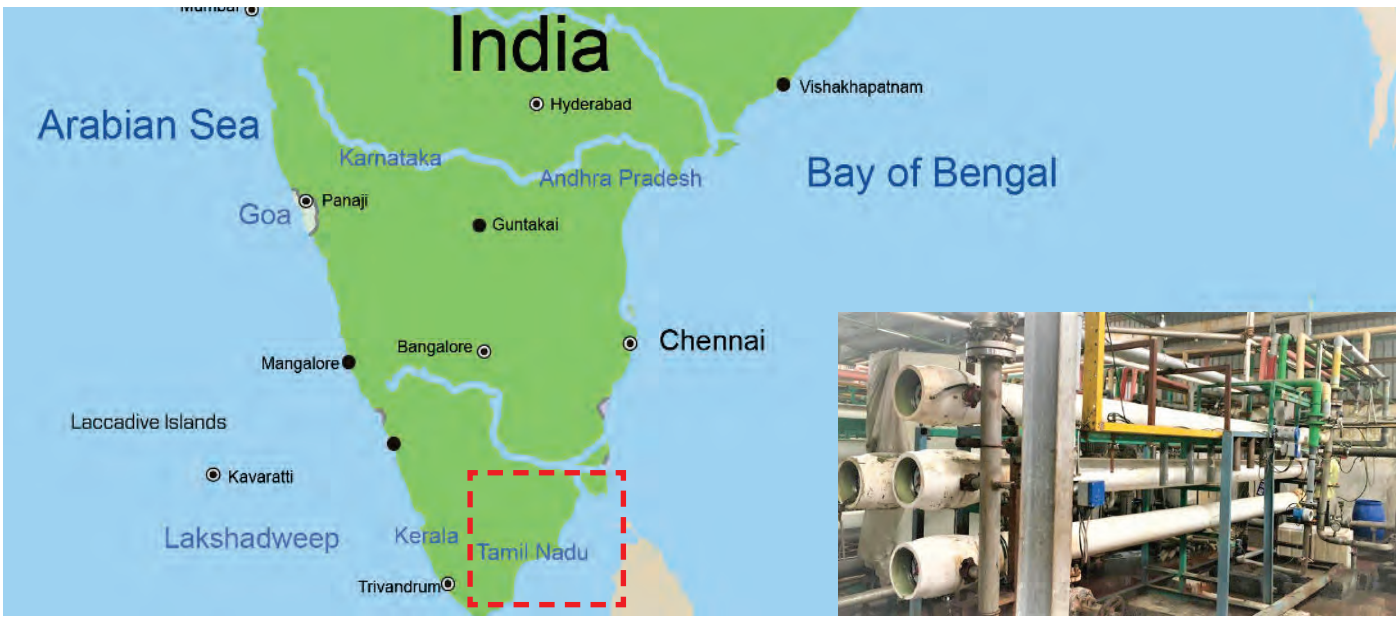
Depending on the textile processing capacity, the effluent treatment plant capacity is in the range of 500KLD to 4KLD and Multiple small textile unit in one region send their effluent to a Common Effluent Treatment Plant or CETP. Total CETPs in Tirupur textile belt are treating 100 MLD of wastewater and achieving ZLD.

About Hydranautics

Since our founding in 1963, Hydranautics has been committed to the highest standards of technology research, product excellence and customer fulfillment. Hydranautics entered the Reverse Osmosis (RO) water treatment field in 1970 and is now one of the global leaders in Integrated Membrane Solutions. Hydranautics became a part of the Nitto Group in 1987. Nitto is Japan's leading diversified materials manufacturer. The group offers over 13,000 high value specialty products worldwide including optical films for liquid crystal displays, automotive materials, reverse osmosis membranes for desalination and transversal drug delivery patches.

As leaders of high quality membrane solutions, we believe our commitments extend beyond manufacturing and selling our products. Our skilled staff of technicians, engineers and service professionals assist in designing, operating and maintaining a robust, reliable and efficient membrane system to meet your requirements and exceed your expectations.

g@nitto.com or visit our website at **membranes.com**



The wastewater entering a wastewater treatment plant will undergo numerous pretreatment steps before going to the multistage RO to reduce the TSS, Color, Hardness, COD and BOD. At a minimum, the wastewater will undergo primary clarification, biological treatment, clarification, chlorination, dechlorination, softening and ultra–filtration for suspended solids removal.

After the multistage RO and other membrane–based processes recover 85% to 90% of the waste water, the remaining 15% to 10% will be treated through an evaporator and crystallizer to convert to solids. Earlier the recovered solids from evaporator is disposed in secured land filling because of high colour and mixed salts and also the challenges in the evaporator operation are more maintenance and frequent shutdown due to more number of rotating equipment and heavy scaling and higher power consumption, so evaporator operating cost is expensive and more than 6 to 8 times higher than RO membrane operational cost.

Evaporators consumes 20–25 kWh of power per m^3 of water treated and crystallizers consumes 52–66 kWh of power per m^3, but reverse osmosis system consumes at 1.5 to 6.0 kWh/m^3. Unfortunately, the current technology for treating the last portion of the RO brine before the evaporator is limited, costly, and requires high maintenance. A more efficient Nano filtration process was incorporated before thermal process to separate the sulphate stream and reduce the load on the thermal process.

The Solution

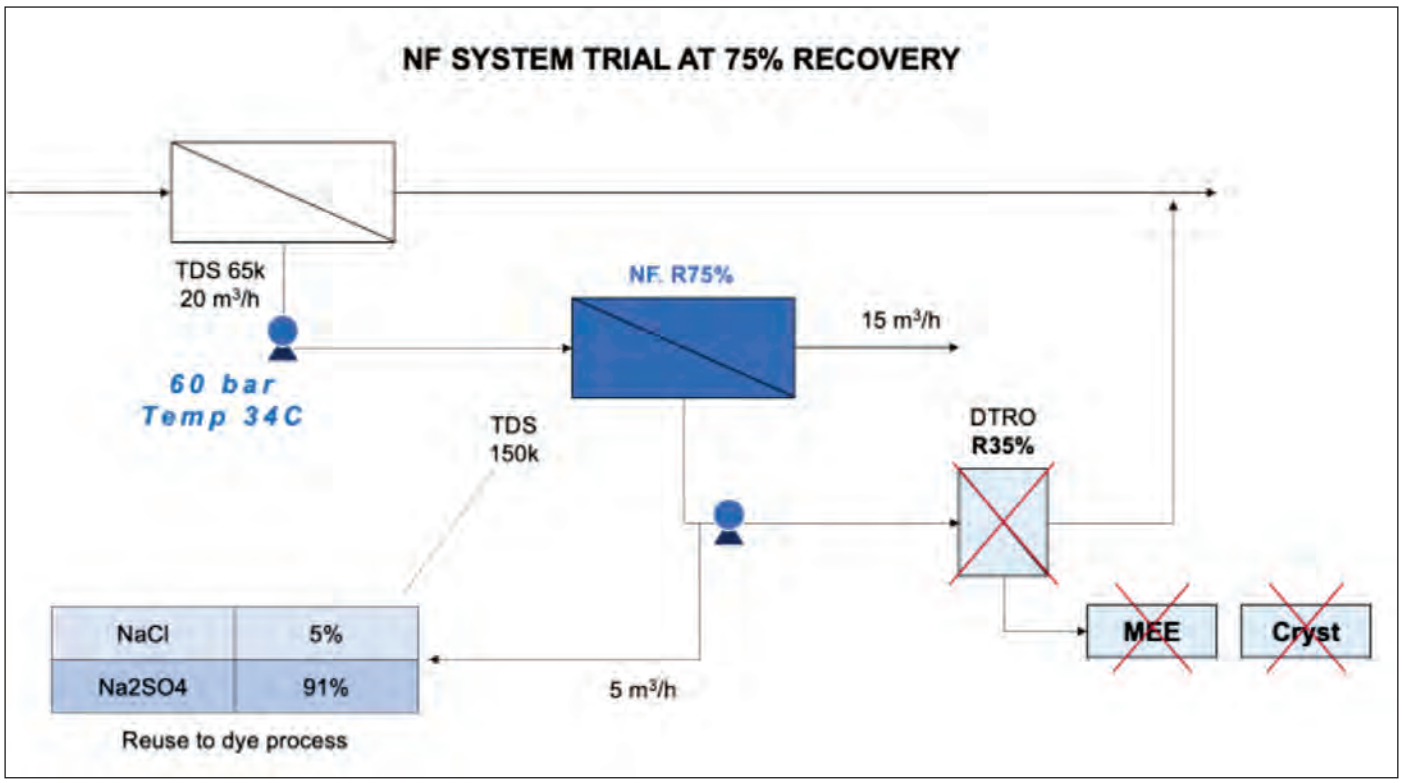
Multi–stage RO systems is concentrated the reject based on the limitation of maximum feed pressure and Salt saturation limit and fouling tendency. The existing systems is five stage RO system and concentrating the TDS to about 65,000 mg/l. RO reject contains 30000 mg/l of sulphate , 2500 PtCo of colour,2000 mg/l of COD and 150 mg/l of total hardness. To separate the sulphate for reuse in dying process, Hydranautics developed a new, Nano filtration membrane, PRO–XS1, that can operate up to 82.7 bar (1200 psi) at 25 C. This allows to concentrate the TDS up to 150,000 mg/l or higher.

To demonstrate the feasibility of this new Nano filtration membrane PRO–XS1 for study the maximum possible separate the sulphate salt solution from existing RO reject in the textile processing unit, Hydranautics proposed to replace the RO membrane to NF membrane(PRO–XS1) in 5th stage RO for avoid the capital cost and conduct the study. 5th Stage RO plant is having five elements long 3 vessels with 20m^3/h feed capacity of plunger pump system which was used to conduct the trial of PRO–XS1.

Study done using 15 Nos PRO–XS1 NF membranes installed in three pressure vessels in parallel.

This plant operated continuously at 50% recovery because of single stage system and achieved 95,000mg/l of TDS in the NF reject which is more that 95% of sulphate salt contribution. The Dying process is required 140,000mg/l solution for better colour absorption, so partially treated in MEE to increase the concentration as per the dying process requirement and reduced the treatment cost around 20% of earlier treatment cost.

Arranged the reject recirculation line to demonstrate to operate at 75% recovery. 65,000 mg/l of TDS of RO reject water concentrated to 1,57,000 mg/l of TDS at 75% recovery and recommended to install second stage of NF system for continuous operation to save 85% of exiting treatment cost by reduce the evaporator operational hours, reuse the salt solution and avoid the raw material cost of buying Globar salt. The existing 5th stage RO system was converted to a nanofiltration



system which operated at a feed flow of 20 m^3/h, a flux of 19 LMH and a recovery of 50%. An additional vessel was added to reduce the flux to 13 LMH to minimize the fouling from organics and TSS. The Customer is planning to further increase the capacity to 40 m^3/h using two more stages of PRO–XS1.

Parameter	Feed (ppm)	Perm. (ppm)	Conc. (ppm)
TDS	65,500	22,200	157,000
TH	140	8	560
Cl	8,933	9,926	4,963
SO4	31,860	2,400	96 g/l
COD	2,620	400	9,600

The Impact

After existing multi–stage RO, incorporated the NF system, so we can further reduce the flow to the evaporator and crystallizer by 50% to 80% because only NF permeate can be treated in the thermal process, so the corresponding reduction in the size of the evaporator/crystallizer will reduce both capital cost and operating costs. Assuming the thermal, originally designed to treat 10 m^3/hr were reduced in capacity by 50% to treat only 5 m^3/hr.

Assuming evaporator operational cost is INR 350/m^3; operating 300 days/year; 20 hours/day, the total operational cost would be INR 21,000,000/year for 10 m^3/h flow rate evaporator system. Assume that NF recovery is 50%, then saving will be maximum 50% from the total evaporator operational cost by using PRO–XS1 NF membrane which is INR 10,500,000/year. PRO–XS1 NF plant operational cost is INR 35~45/m^3, so additional cost for operating NF system would be INR 2,700,000/year, So total saving is INR 7,800,000/year which is less than one year of return of investment and apart from that solid disposal cost is saved and raw material cost also saved.

Treating and reclaiming textile wastewater is both challenging and costly, especially when seeking to achieve zero liquid discharge (ZLD). The overall cost of textile processing was reduced at one plant by installing the innovative, PRO–XS1, membrane after a multistage RO to recover raw material from the textile waste water. By using PRO–XS1, the customer was able to separate the sulphate salt solution and further concentrate the solution to a level that meets the dying process requirements. Using PRO–XS1 also reduced the waste stream flow to the evaporator and crystallizer. At the same time, a colorless sodium chloride solution was recovered from the PRO–XS1 permeate and sold as a valuable byproduct. This study successfully achieved 157,000 mg/l of TDS in the PRO–XS1 reject while operating at a maximum feed pressure of 60 bar at 34C. Pretreatment before the NF was crucial for reducing fouling. The use of the PRO–XS1 in the ZLD process reduced the total water cost at the 2 MLD textile plant by $107,000 per year. The PRO–XS1, with its ability to run at pressures up to 83 bar, can be used on any high sulphate stream to increase the salt concentration and reduce treatment cost.

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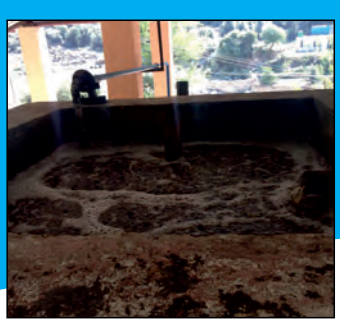

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HOW AYODHYA IS STRENGTHENING ITS RELATIONSHIP WITH THE SARYU RIVER?

Sahil Bhardwaj
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Victor R. Shinde
Head, Climate Centre for Cities, National Institute of Urban Affairs

Ayodhya is a city that needs no introduction. With strong connotations to our traditional belief, the city is fast becoming a hub for tourists from across the country. That the area under Ayodhya Development Authority is set to grow from 133 to 873 square kilometers speaks volumes of the extent of expansion that has been envisaged. While there is going to a spurt of development going forward, it is crucial to ensure that this development does not come at the cost of the environment. One of these vital environmental features in the city is the Saryu River, which so far has been bereft from pollution concerns. However, the burgeoning development that is planned in the future can tilt this delicate balance. To ensure a symbiotic relationship in the river, going forward, in 2022, the city embarked on the preparation of the river management plan for the Saryu River.

Incidentally, Ayodhya is a member of India's River Cities Alliance that was established by the National Institute of Urban Affairs (NIUA) and the National Mission for Clean Ganga (NMCG) in 2021. The objective of the River Cities Alliance is to create a platform for river cities across India to ideate and discuss solutions for managing different aspects of urban rivers. NIUA and NMCG provide handholding support to any member city that is interested in enhancing its relationship with their rivers. Ayodhya decided to leverage this and requested support from NIUA for the preparation of the river management plan for the city. At the onset, NIUA introduced the city officials to the national framework that they had developed in 2020 for managing urban rivers. The framework which is called Urban River Management Plan (URMP) framework requires cities to take actions against ten agenda items, covering environmental, social, and economic aspects. This framework is markedly different from the conventional approach to manage rivers in India that has solely focused on pollution control. Because the URMP framework considers

several aspects beyond mitigation of pollution, it is more holistic and if implemented correctly, creates a premise for sustainable management of rivers.

Among the first activities that the city did was to form a Working Group for the preparation of the URMP for Ayodhya. The Working Group was chaired by the Municipal Commissioner and featured representation from diverse government agencies such as the Ayodhya Municipal Corporation, Ayodhya Development Authority, Forest Department, Tourism Department, Irrigation and Flood Control Department, Jal Nigam, NGOs, and local universities. The purpose of the Working Group was to drive the preparation of the Plan as well as to facilitate inter–departmental coordination and cooperation, which is so vital for interdisciplinary plans of this nature.

A fundamental step for any Plan is developing a robust baseline to understand the 'status quo' of the existing conditions on the ground vis–à–vis different parameters. Ayodhya also followed the same procedure and developed several spatial maps and databases to inform decisions making. One such map, for example, marked the location and areas of all water bodies (lakes and ponds) in the city. Another marked the areas within the city that are not serviced by the existing sewer network. These baseline maps provided valuable and tangible insights to the Working Group to identify and propose actions (or interventions) that need to be taken up on a priority basis against the ten–point agenda of the URMP framework. Over a period of four months, the Working Group decided upon nineteen interventions for Ayodhya's URMP that would be implemented over the next five years. The following sections highlight some of these interventions.

A core intervention of Ayodhya's URMP is to strengthen the 'river consideration' in its Master Plan. The purpose of doing so is to create a long–term strategy for protecting

However, these are only point locations with no other information available besides their coordinates.

Figure 1: The ten–point agenda of the Urban River Management Plan framework

The Plan also proposes celebrating an annual 'Sarayu Nadi Utsav' where activities like cleanliness drives, yoga sessions, and cultural programs will be organized.

Figure 2: Glimpse of the Saryu–based tourism activities in Ayodhya

the river and its floodplain through sound regulatory provisions. For example, one such provision proposed in Ayodhya's URMP is for the Master Plan to demarcate dedicated use zones for the river, floodplains, water bodies, and buffer areas. This zoning approach will ensure the proper regulation of activities and that only eco–friendly activities are permitted in these sensitive areas. Because agriculture is widely prevalent in the floodplain, the URMP advocates the regulating of type of crops grown in the floodplain, encouraging native species cultivation, and reducing chemical usage in agriculture. Similarly, the URMP calls for a mandatory buffer zones of certain width around lakes and ponds to aid their protection. The next Master Plan for Ayodhya is currently under preparation. Because the URMP Working Group also had representation from the Ayodhya Development Authority, these recommendations are being taken up in the Master Plan.

One of the issues that emerged strongly from the baseline analysis was the lack of a robust database of water bodies in the city. Some of the water bodies have been geotagged marked on GIS layers. However, these are only point locations with no other information available besides their coordinates. To plug this gap, one of the interventions under Ayodhya's URMP is for the city to prepare a comprehensive repository of the water bodies in the city on a GIS–based portal. At a minimum, this database will have information about the physical, chemical, and ecological parameters for each water body. City officials will use the 'Urban Water Body Diagnostic Tool' for this purpose which has been developed by NIUA and UNESCO. Such an inventory will provide valuable insights into the status and condition of each waterbody, allowing for targeted interventions.

While one bank of the Saryu River in Ayodhya is inhabited, the opposite edge of the river is pristine and untouched by human activities. The URMP recognizes that unless regulatory measures are put into place today, there is a high possibility that the pristine area may succumb to development pressures. To prevent this from happening, the URMP has earmarked a buffer width (also called riparian buffer) of 30 meters from the edge of the river throughout its length in the city. This buffer will feature a combination of green–grey bioengineering solutions for urban flood control, integrating ecological benefits without compromising on the rights of locals and tourists visiting Sarayu.

The URMP for Ayodhya also emphasizes strongly on the reuse of treated wastewater. Currently, there is hardly any reuse. However, the city acknowledge the importance of reuse to reduce the demand for freshwater from the Saryu and in the process helping it sustain its natural functions. To begin with the city will ensure that only treated wastewater is used for fulfilling the water requirement of parks and gardens within three kilometers of all sewage treatement plants.

In due course, the treated wastewater will be used for other purposes such as washing buses, cleaning roads, and developing artificial water bodies for groundwater recharge.

Ayodhya's URMP also features several eco–friendly practices for tourism and enhancing river–related livelihoods. For example, the city will replace traditional diesel–powered boats with solar–powered e–boats for boating activities at Guptar Ghat and Ram ki Paidi. This shift will reduce pollution and contribute to a more environmentally friendly tourism experience. Another initiative involves promoting community–based organic farming through agritourism. River islands and floodplains in Ayodhya offer fertile soil and water availability, making them suitable for agriculture. Native crops such as Indian mustard, millets, and oilseed cultivation, have been strongly promoted in the Plan.

Figure 3: Agriculture practiced along the Saryu in Ayodhya

Through another novel initiative, the URMP for Ayodhya has proposed the setting up of a river sanctuary. The purpose of this sanctuary is to protect the rich biodiversity of the Saryu River— Gharials, Gangetic dolphins, Freshwater turtles, and the rare Gangetic Shark. The Ayodhya Development Authority along with the State Forest Department, Irrigation and Water Resources Department, and Tourism Department, would coordinate efforts to establish and manage the sanctuary, ensuring controlled and regulated activities that prioritize wildlife conservation over tourism.

A central tenet of Ayodhya's URMP is to strengthen the citizen–river connect, bringing more people to the river, thereby creating a social value for the river. Therefore, the Plan proposes a dedicated river–based sensitization program to involve schools, colleges, and youth organizations in river conservation and rejuvenation activities. Under the program, dedicated spaces along the river stretch have been earmarked for schools and colleges to organize classes, allowing youth to learn more about the Sarayu River and develop sensitivity towards it. The Plan also proposes celebrating an annual 'Sarayu Nadi Utsav' where activities like cleanliness drives, yoga sessions, and cultural programs will be organized.

A river, in so many ways, is a city's greatest environmental asset. How a city manages this asset will go a long way in determining its sustainable development trajectory. Ayodhya has taken steps in the right direction by developing a dedicated plan for the River Saryu. As the city starts implementing the interventions proposed in the Plan, it takes a step further towards the grand ambition of making Ayodhya a world class city.

Figure 4: Saryu Aarti performed on the banks of the river

A CASE STUDY FOR "IN–SITU" GREYWATER MANAGEMENT IN VILLAGES

By A. Mohan, Co–Founder, WSAFE (WaterSpaceAirFireEarth) Sustainability Services

Water is a complex and often misunderstood subject, and waterbodies are usually undervalued as mere pools or reservoirs of Water, whereas they are God's gift to all the terrestrial life forms. These bodies of water uniquely converge soil, water, and air, enabling them to naturally decontaminate water, recharge and enrich groundwater, mitigate air pollution, conserve biodiversity, maintain & manage the ambient temperature in the vicinity and act as a blue carbon sink, through their native aqua ecology – all as a part of ecosystem services. However, this capacity is dependent on the health and vitality of the waterbody.

Ecological rejuvenation of waterbodies is vital for sustainable & holistic natural resource management, for climate change mitigation, combating global warming, promoting biodiversity, carbon sequestration, and biodiversity conservation.

This article explores an In–Situ waterbody rejuvenation project by WSAFE Sustainability Services that was implemented at Hassanpur Village in Murthal, district Sonipat, of Haryana state, showcasing substantial improvements in water quality and positive impacts on behavioural changes as well as community engagement. The project was funded through NGO and was implemented using our Cownomics® Technology.

Pre–treatment

Water Dosing

Post Treatment

A. Mohan, Co–Founder, WSAFE (WaterSpaceAirFireEarth) Sustainability Services

A. Mohan is a seasoned IT professional who has developed a strong interest in water conservation and revitalizing water ecosystems. He firmly believes in the restorative abilities of natural waterbodies, provided that their native aquatic ecology is revitalized. A. Mohan is dedicated to advancing year–round water conservation efforts through his initiative "Catch The WasteWater," which aims to promote the significance of water conservation beyond just seasonal "Catch the Rain" campaigns.

☞ www.grundfos.com/in

Problem Statement

Over the past two decades, the primary water source for this village Pond has been the greywater and sewage generated by the surrounding village households, resulting in a consistent supply of contaminated Water. However, the area is plagued by foul odour and the stagnant waterbody serves as a breeding ground for mosquitoes, leading to the spread of vector–borne illnesses. The surrounding region is littered with solid waste, rendering the water unsuitable for any form of life – all contributing towards WASH (Water, Sanitation & Hygiene) problems for the entire village.

By leveraging Cownomics® Technology, we can resurrect the native microbiota of the Waterbody augmenting the natural ecosystem in ponds, lakes, and rivers through harnessing the power of sunlight, water, soil, air and the aquatic food chain to consume & digest the nutrients overload.

This process involves breaking down organic matter in wastewater using the native aerobic microbes. Moreover, the autotrophic microbiota also produces oxygen through their metabolic processes thereby naturally oxygenating the water body.

Ease of implementation

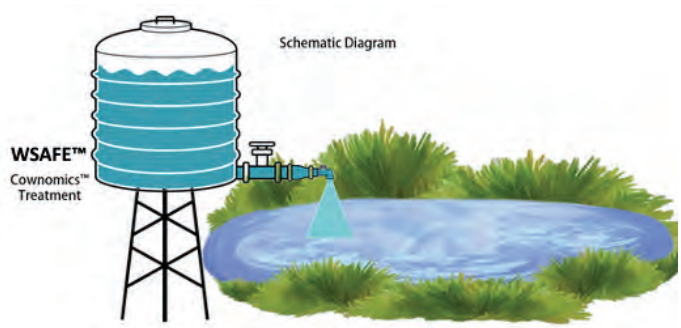


Figure –1, basic schematic diagram for the rejuvenation treatment

Water Tank @Site Picture

1. WSAFE team does the detailed site survey and basis that our research team prepares the medicine (Cownomics® Extract – a 100% botanical extract based liquid medicine).
2. Site preparation done by the local body – Installation of water tank, fresh Water/borewell water is made available at the site for amalgamation of the Cownomics® Extract.
3. Daily Dosing process by Village Community Stakeholders –

    a. The Cownomics® Extract, is amalgamated with fresh borewell water to create a homogenous mix, of the same agro–climatic zone as the Waterbody in the filled water tank.
    b. This diluted concentrate is poured in the Waterbody at the time of sunrise (6am–8am). During the day, in presence of sunlight, the medicine gets synthesized by the aqua–ecology and the resurrection of limnology, starts to happen.
    c. Same process mentioned in point a & b shall be repeated everyday in the morning time and as per the response from the waterbody, if needed, same may be repeated at evening Sunset time.
    d. The treatment is divided in three phases – Resurrection, Restoration and Rejuvenation.

Outcome of 4 Months of Project

S.No.	Project Success Criteria	Achieved/ Not Achieved	Remarks
1	Entire **foul smell** in the vicinity due to anaerobic digestion will vanish	Achieved	Villagers' testimony
2	The **Water viscosity** shall reduce to give its natural flowing status	Achieved	Waves were back, captured in Photos/Video
3	The entire **mosquito colonies** shall be abolished, finishing the threat of vector borne diseases in the vicinity	Achieved	Villagers' testimony
4	All the **Water weeds like BGA, lilies, Hydrilla** etc. will start to dry and sink in Water clearing the entire surface of the waterbody	Achieved	No BGA/ Waterweeds observed till the time of treatment
5	Natural photosynthesis shall start in Water and **emission of oxygen** in air shall start making the air quality better	Achieved	Animal drinking water and increase in DO as per Lab report

Bio–Diversity Change observed.

As observed by Villagers, new flock of birds started coming, buffalos seen drinking water from the pond, monkeys seen taking bath in the pond water.

Villagers Testimony

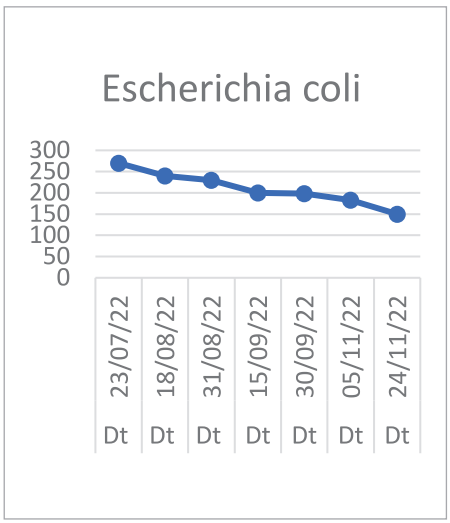
Very happy with the services provided by WSAFE, now no foul smell in the vicinity, no mosquito breeding observed in pond. Now animals are back and seen drinking from the pond. All captured in the testimony videos below.

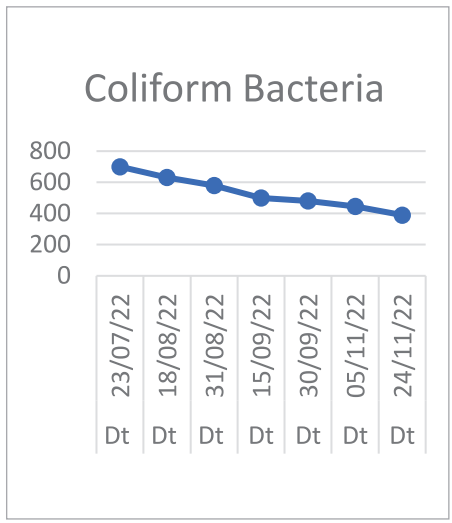
https://youtu.be/LOqlwSkjz1g

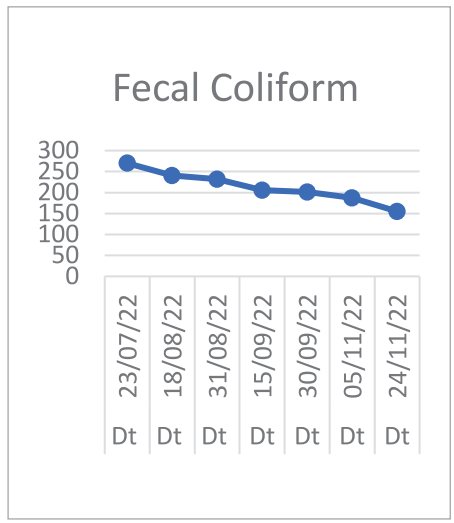
https://youtu.be/nxiMsJlu–xk,

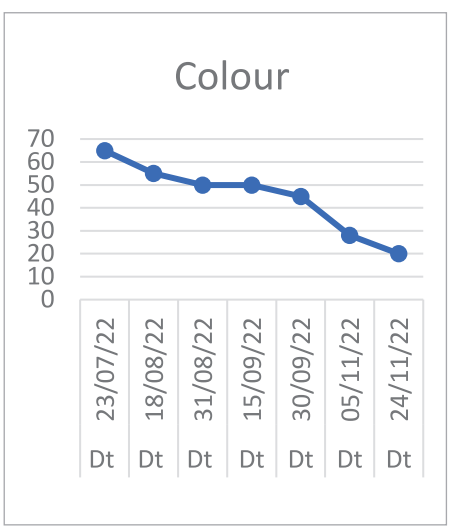
https://youtu.be/50C6lvlhSbY

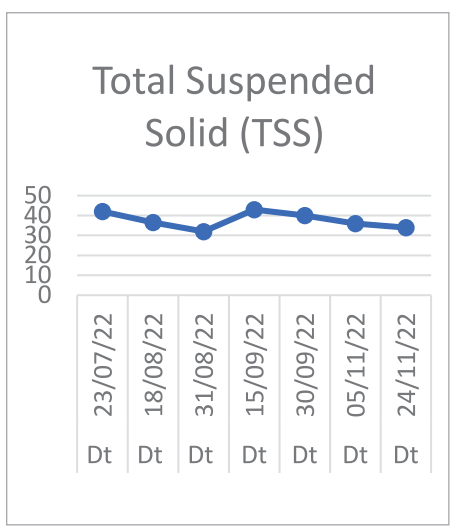
Change in Lab Parameters over 4 Months of Project

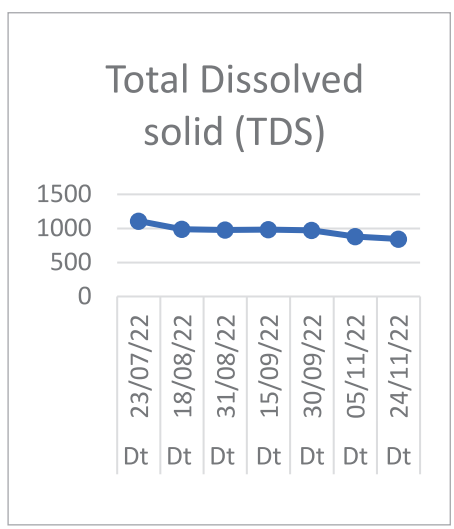


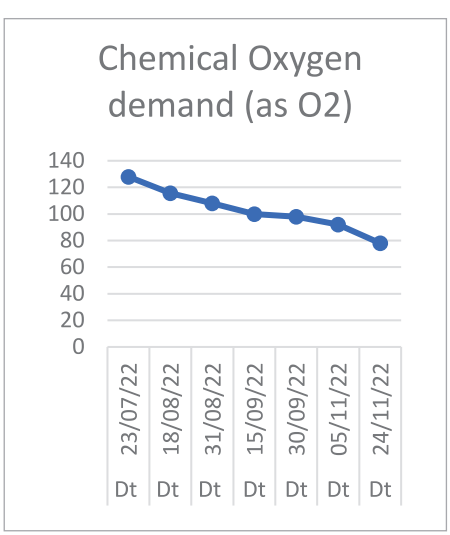


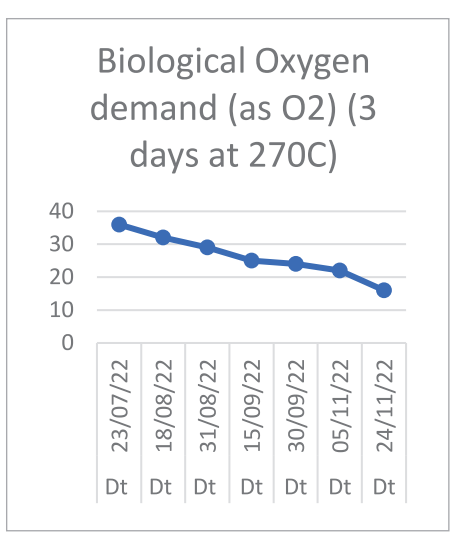


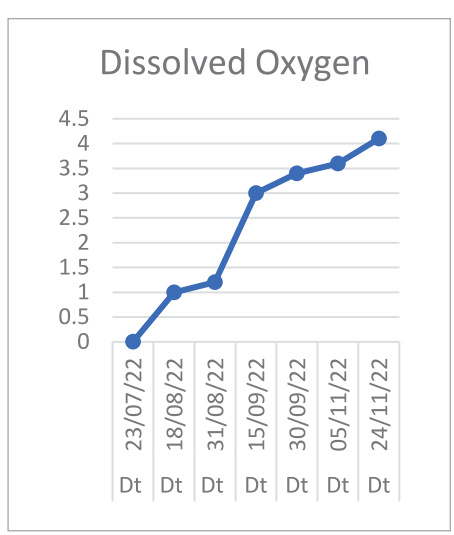


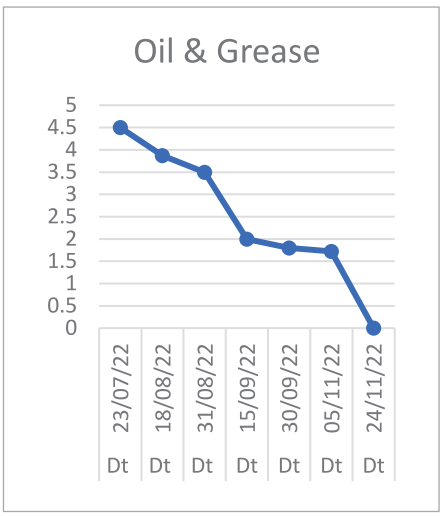


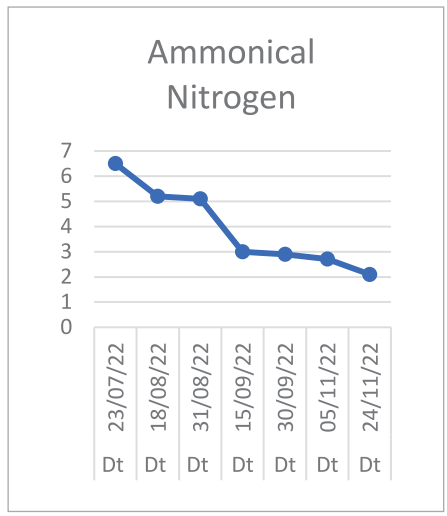


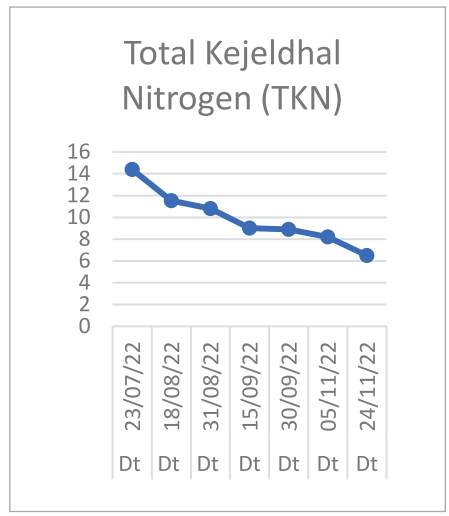


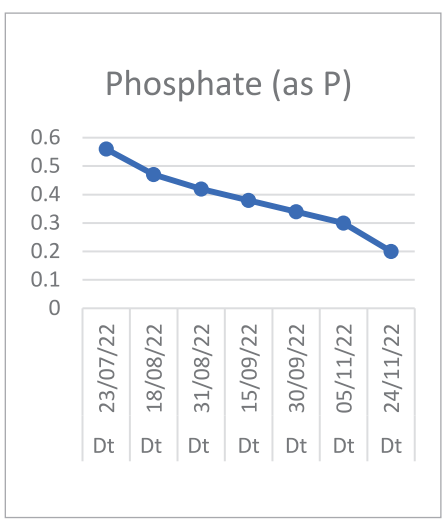


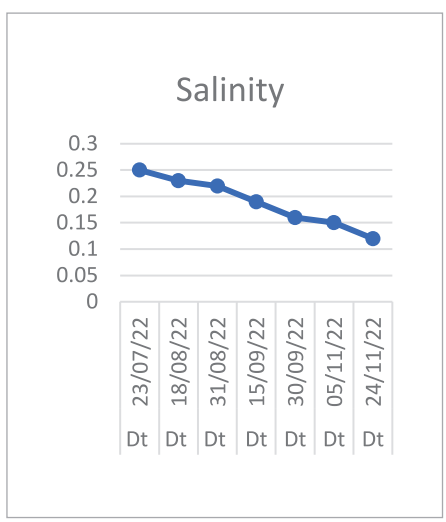












CommunityAwareness&Trianing

Conclusion and way forward

In conclusion, the project of in–situ greywater/sewage pond rejuvenation using natural botanical extracts –based dosing has shown promising results. The foul smell was completely removed, mosquito & mosquito colonies was fully eradicated, biodiversity was conserved, and the water was made useful for all plants & animals.

The lab reports confirmed the success of the project, and the testimony of the people who have benefitted from it is even more convincing.

The Cownomics® Technology, used here, has the potential to be used on a large scale for all surface Waterbody Rejuvenation, In–Situ greywater treatment, especially at the Gram Panchayat level, as the implementation is simple and cost–effective.

By adopting this innovative approach, we can ensure a healthier environment and better living conditions for everyone, as well as restore the sustainability of life on our planet.

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DIGITAL TWINS FOR WATER UTILITIES VALIDATE THEIR ECONOMIC FEASIBILITY BY LEVELLING SYSTEM OPERATIONS AND IMPROVING DECISION–MAKING

By Sandra DiMatteo, Industry Marketing Director, Bentley Systems – Water Infrastructure

From aging infrastructure and changing environmental regulations to funding gaps and climate–fueled natural disasters, water utilities around the globe face a range of problems in their effort to deliver reliable and affordable water to their communities. Their potential solutions are similarly wide–ranging, from stimulus grants and conservation programs to smart water technologies.

Utilities are employing a variety of digital strategies to address urgent risks as well as meet the requirements for digital transformation aligned to strategic investments in water systems. One very compelling digital strategy that water utilities are adopting is a digital twin. Digital twins of water infrastructure can help utilities get the most out of their data to improve their decision–making. Most utilities have the key building blocks in place to make digital twins economically feasible as a short–term strategy with long–term benefits.

What is a Digital Twin?

A digital twin is a realistic and dynamic virtual representation of a physical asset, process, or system. Creating a digital twin for a water system involves integrating existing models and data. This could include engineering models (hydraulic models of the water network and 3D models of the water treatment plant and pumping stations), new virtual reality models (if 3D models are inadequate, outdated, or non–existent), and GIS, asset management and customer data. Additionally, digital twins are continuously updated with operational data from SCADA systems, sensors, meters, and other measured sources—creating a real–time model that can be used in operations and maintenance.

The integration of isolated, disparate data into a unified view provides a uniquely collaborative and connected digital twin environment that water utility personnel can use to gain insights from their data for better decision–making. The dynamic integration of operational data enables

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Sandra DiMatteo is the Industry Marketing Director, Water Infrastructure at Bentley Systems. She has more than 25 years of experience in reliability and asset performance management software, and asset lifecycle information management, and is an expert in digital twin cloud solutions in the water and wastewater, energy, and process industries. Sandra holds an honors degree in accounting and is a Certified Reliability Leader. She sits on the Reliability Leadership Institute Board of Advisors and founded the Ontario Chapter of the Society of Maintenance and Reliability Professionals.

☞ www.bentley.com/software/water–utilities/

utilities to see what's happening in real–time or review any moment in time, while also providing a definitive ledger of changes of the water systems and assets as they evolve. This dynamic aspect is also what differentiates digital twins from the static 3D models typically used for design and construction.

The end result is an information–rich digital infrastructure model that supports engineering, operations and maintenance, and capital planning for smart water networks. With digital twins, utilities can perform "what–if" analyses and simulations to make informed decisions throughout the lifecycle of a water system – from long–term system vulnerability and capacity planning to immediate performance monitoring and emergency response.

The process enables utilities to better understand the past and current performance of their water systems while helping them predict future performance and simulate the impact of potential changes in the virtual world before funds are committed.

Digital twins help develop smart sustainable water management platforms and powerful decision–support frameworks for the modern workforce. In particular, digital twins that are cloud–based enable the remote sharing of data, dashboards, and situational intelligence.

Thus, a cloud–based digital twin overcomes the limitations of legacy water control rooms since it interoperates with systems and real–time data, SCADA, and data historians. A digital twin handles large volumes of disparate data sources to gain insights in near real–time, and reduce or eliminate false alarms.

Bricks and Mortar

Moving toward a digital twin may seem daunting, but in reality, most water utilities have already started. They have in place a variety of systems that they use in their day–to–day operations: sensors, SCADA, automated metering, asset registry, hydraulic modeling, and so on.

And since the fundamental purpose of a digital twin is to unite the data from those different sources and provide a unified view of that data, utilities have already done the difficult work of implementing systems that generate digital data: aka the building blocks of their digital twin.

The next step involves the mortar that connects that data. And for a smooth journey, the mortar–slash–technology underpinning a digital twin must be open. Digital twin technology is not off–the–shelf software. Instead, every digital twin is assembled, built, customized, and advanced using pieces from many sources that will change over time. To ensure that a utility controls its digital twin and can include the systems and data important to them, they need to rely on technology that is open–sourced. This "openness" signifies that the digital twin can connect smoothly with other technologies.

The technology within that mortar must also include these other key

features— decision–making tools and scalability. The importance of digital twins rests on the ability to use data to make informed decisions. This implies the use of built–in decision–making software that can link current status or conditions data with a robust, mature portfolio of tools for analyses and simulations.

And scalability means that a digital twin can see and analyze at the scale of (for example) a city or a treatment plant, all the way down to an individual pump or valve.

Digital Twins for Network Operations and Management

Many utilities already have hydraulic models of their water networks that they use for planning and design. Incorporating those models within a digital twin helps utilities simulate events such as pipe failures, power outages, and so on, to analyze the resilience of their water network systems and assess their risk. Furthermore, integrating those models with SCADA data provides an accurate assessment of how a water system is currently behaving. This enables utilities to simulate and test different ways that their water systems could be operated to improve emergency response, increase efficiency, or save energy.

Continuously updating digital twins with measured operational data also helps a utility determine the location of potential leaks and reduce water loss. And a digital twin can leverage data from existing

work management and asset management systems, as well as other enterprise systems, to support risk–based asset management – informing their decisions such as repair vs. replacement and helping them prioritize capital improvement projects.

Digital Twins for Plant Operations and Management

Digital twins of water and wastewater treatment plants are particularly useful for improving plant efficiency, reliability, and resilience as well as for training and safety compliance. Virtual walkthroughs, Communications and simulations give personnel enhanced visibility of plant data and insights for better decision–making. For example, reliability engineers can simulate hypothetical events such as multiple screening systems or pump failures to evaluate the severity and consequences of the failures and take preventative actions.

Digital twins can also be used to flag real problems, such as equipment that is not operating properly – enabling virtual exploration and quick access to pertinent data. For example, operators can zoom into the equipment area and pull up data related to that particular item (such as manufacturers' specifications or repair manuals).

This gives personnel immediate access to information without wasting time digging through file cabinets or hunting through document libraries.

Conclusion

Digital twin technologies (such as Bentley's OpenFlows™ powered by the Bentley iTwin® platform) are smart integration solutions that connect information technology, operational technology, and engineering technology. These connections are helping water utilities exploit the potential of their data in a way that was economically unfeasible just a few years ago—uniting legacy data with operational and engineering data to provide a wider view of a utility's water system and enable data–driven decision–making.

In the coming years, digital twins will become an ingrained part of every aspect of the water utility control room. Utilities can start building digital twins overnight with the data and systems they already use. As they become the new normal for water utilities, digital twins will improve the reliability of water systems, reduce utilities' capital and operating expenditures, lessen their environmental footprints, and provide their customers with safe and efficient services.

BAD ODOUR REMOVAL FROM HAZARDOUS WASTE MANAGEMENT SITE

By Mr. Ashutosh Vadanagekar & Mr. Rajesh Narayan

Background

Amalgam Biotech is manufacturer and supplier of Bio cultures, Odour Control enzymatic Biotechnology products for environment pollution control. Odoserve is a plant chemistry based organoleptic compounds and used by misting to remove smell of mercaptan, ammonical, faecal, putrefying, garbage, fishy etc. Amalgam Biotech took an initiative of testing gases emitted at Hazardous waste management sites.

This 50 meters * 20 meters campus provides facility for hazardous waste collection, segregation from nearby areas of Ahmedabad, Gujarat, India

Challenge

This Hazardous waste management facility are sources of emission of toxic gases, strong fumes, stringent chemicals and mixed Odor. Approximately known measurable 24 gases are released from this hazardous waste management facility. These gases caused adverse impact on the environment and occupational health of the workers.

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

No	Emissions	No	Emissions
1.	Ammonia	13.	Methyl sulde
2.	Acetaldehyde	14.	N – butyraldehyde
3.	I – valerate / Butyl Butarate	15.	Propionaldehyde
4.	I – butanol/ Butanol –1	16.	N – valeraldehyde
5.	Methyl disulde/ Di Methyl disulde	17.	Propionic acid
6.	Ethyl acetate	18.	N – valerate
7.	Hydrogen sulphide	19.	Styrene
8.	N – butyric acid / iso butanol	20.	Tri methylamine
9.	I – butyl aldehyde	21.	Toluene
10.	I – valeraldehyde / iso valeraldehyde	22.	VOC
11.	Methyl isobutyl ketone	23.	Xylene
12.	Methyl mercaptan	24.	SO2

Table 1: Emissions at hazardous waste management facility

About OdoServe

OdoServe is a plant chemistry based organoleptic compounds. OdoServe misting can be done by cold fogging machine which deliver 25 micron or lower mist particles. Also, this liquid can be added in Process water/ Treated water/ Condensate water/ ETP Wastewater to remove bad odour.

Observation

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

Solutions to the problem:

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

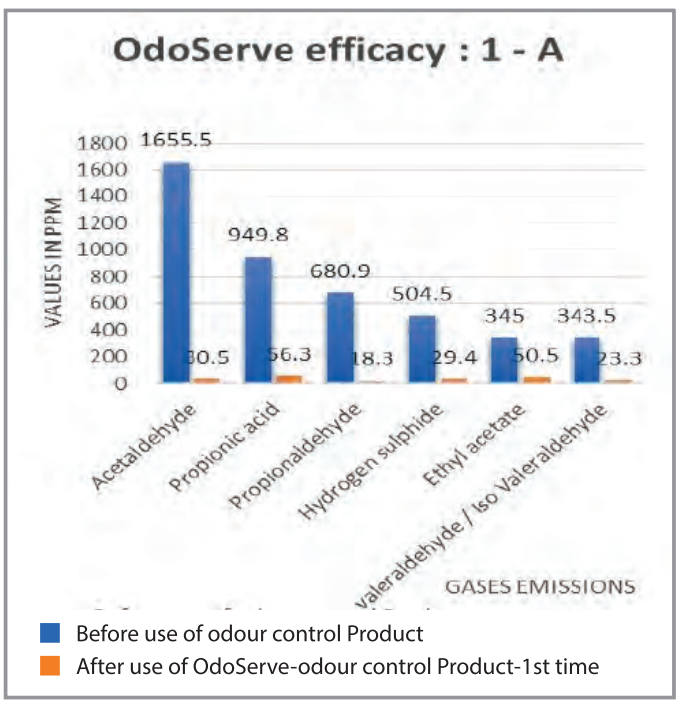
Sr. No	Name	Unit	Before use of Odour control Product	After use of OdoServe – Odour control Product 1st time	% Reduction –1st	After use of OdoServe– Odour control Product – 2nd time	% Reduction – 2nd
1.	Ammonia	ppm	234.0	36.2	84.5	34.5	85.3
2.	Acetaldehyde	ppm	1655.5	30.5	98.2	38.2	97.7
3.	I – valerate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

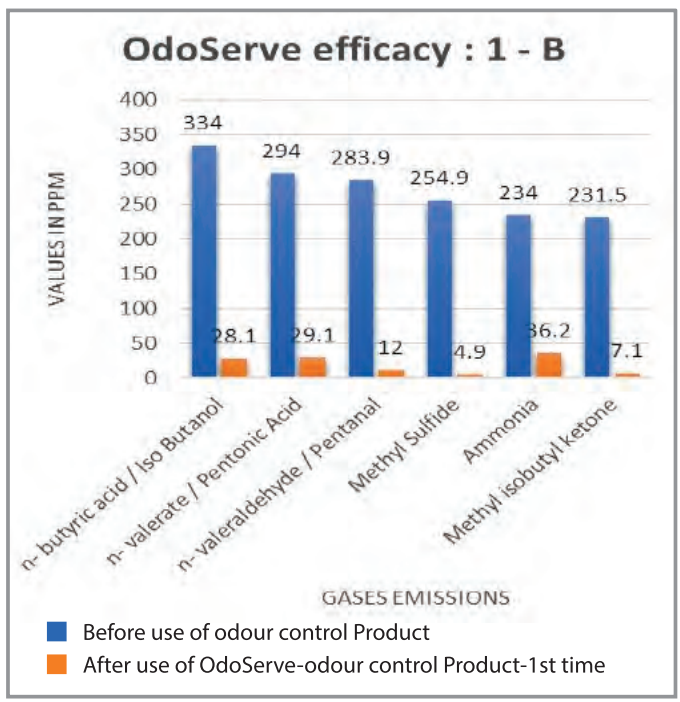
Table 2 : Results of before and after OdoServe – Odour control product

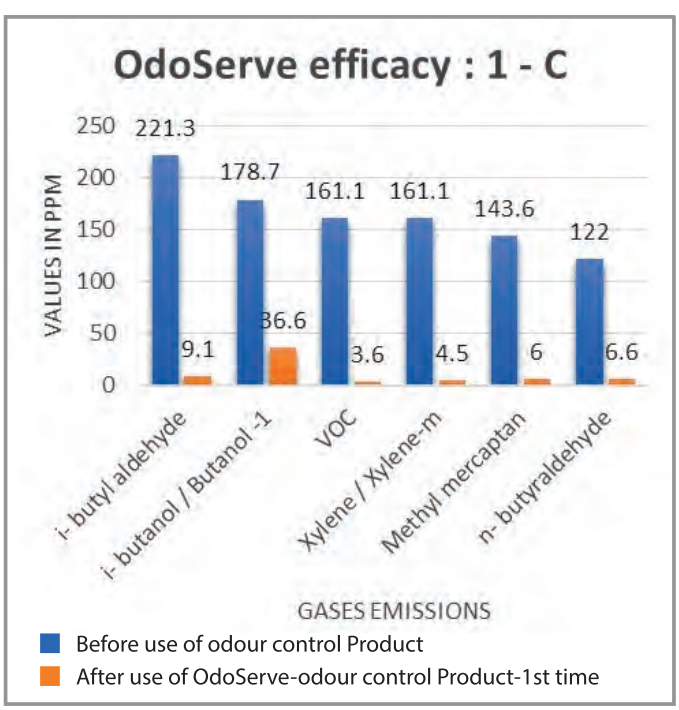
Highlight .... We have achieved ....

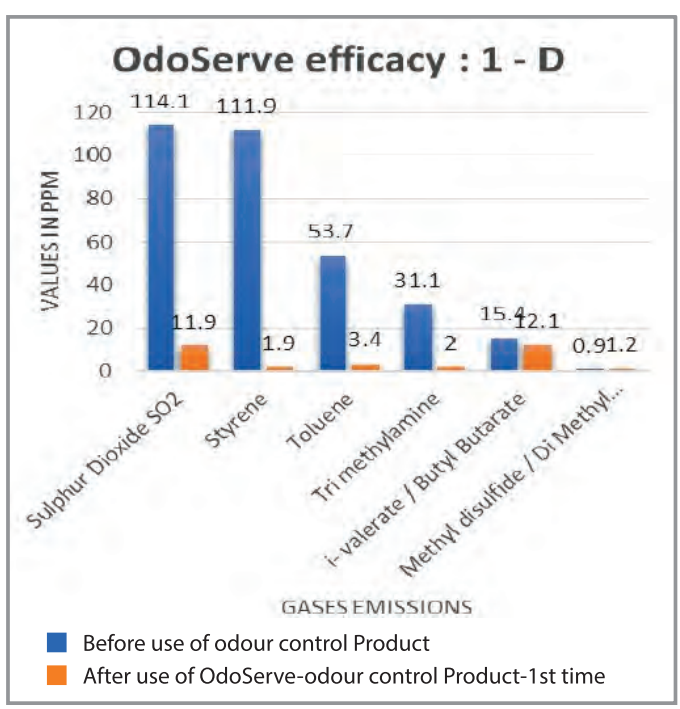
- 95% reduction in Acetaldehyde, Iso Butanol, Methyl Sulfide, Sulphur Dioxide SO2, Xylene were observed.
- Also, reduction in concentration value is below permissible limits for Ethyl acetate, Methyl isobutyl ketone, Toluene and ammonia.
- Considerable reduction in concentration of Methyl Sulfide that is 98%,
- Styrene also 98%, VOC 97% were achieved, which is favorable for toxicological, ecological & occupational health aspects.
- Methyl mercaptan has OSHA limit of 10 ppm & after OdoServe misting it was detected to 6 ppm from 143 ppm on site!!
- Quantity of OdoServe dosed was 4 lit/day and 90% of all bad Odour was gone!

Graphical presentation of OdoServe misting efficacy – before & after:

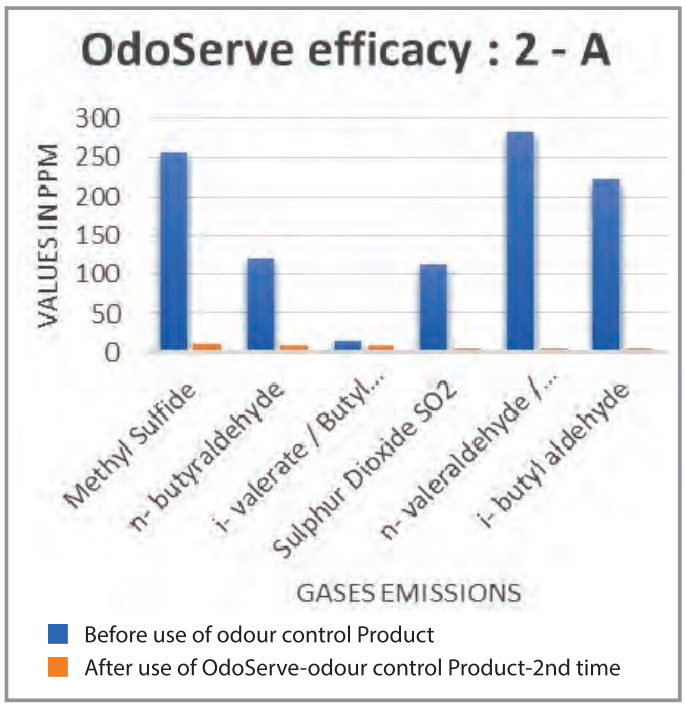


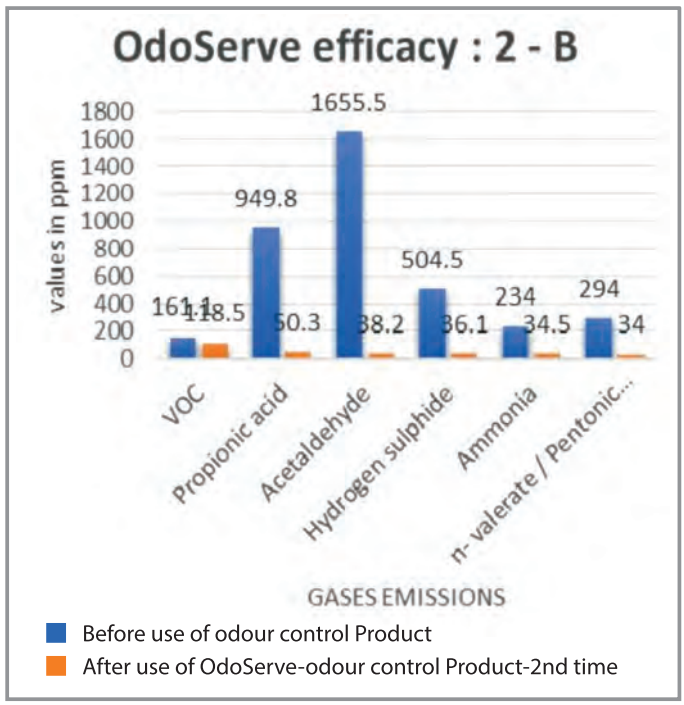


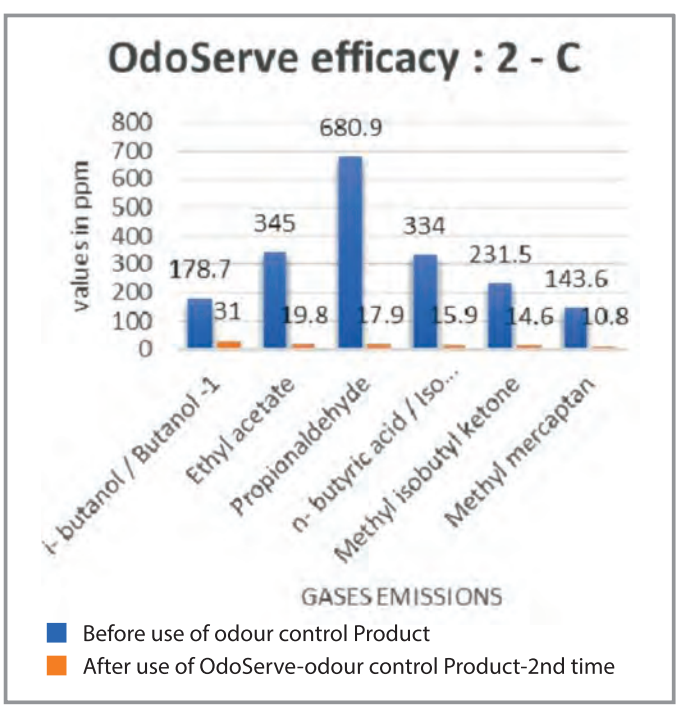


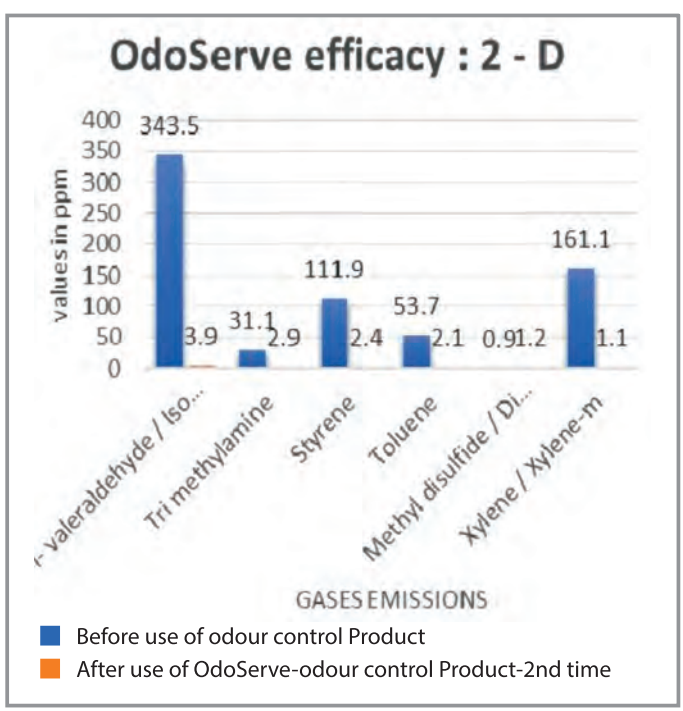


Graphical presentation of OdoServe misting Ecacy–Before & After:









Executive summary

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

OdoServe is an excellent Odour removing solution!!

Photographic Presentation of Site

Amalgam Biotech

- Helps in Providing optimized and sustainable solutions for different category waste
- A Biotechnology company is one–stop solution for your generated waste type.
- Has expertise in ETP–CETP–WWIP–STP process.
- Hands–on experience in Primary, Secondary and Tertiary treatment processes.
- Has Engineering solutions for Odour Control Systems.

For Wastewater Treatment (BactaServe): We provide customized sustainable solutions for different categories of wastewater treatment and solid wastes; in the form of Specialized Bacterial cultures for Industries like Pharma, Textile, Chemical, Dairy, Tannery, Slaughterhouses, Food Processing, Oil Refineries and others. We are also associated with the Government of India Research Institutes for Specialized technologies for treating specific wastes.

For Process Additives (NutriServe): We are providing the products mainly essential micronutrients that nourishes the essential bacteria for aerobic and anaerobic process associated with WWTP. The other products mainly required in enhancing the conditions of Aerobic and Anaerobic Process is also being manufactured and supplied like BOD enhancer, Supply of Nitrogen–Phosphate from Organic sources, others.

Mr. Ashutosh Vadanagekar

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

Mr. Rajesh Narayan

(Business Development Manager, at Amalgam Biotech)

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

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LEACHATE TREATMENT – AN IMPORTANT ASPECT MISSED OUT OR LESS ATTENDED FOR LEGACY WASTE, FRESH WASTE TREATMENT PLANTS & BIO REMEDIATION DUMPS IN VARIOUS CITIES ACROSS INDIA

Vinayak Kadam, General Manager – Operations, HWT

In today's world when wastewater is mainly sewage and effluent treatment is prioritized as a reusable water source, we tend to overlook one of the most difficult to treat effluent. Having an impact on the groundwater/surface water contamination, when on the other hand treatment of leachate can provide us most valuable Green Energy as one of the byproducts, The quantum generated is not as much, as compared to other effluents like industrial or sewage wastewater.

Leachate is a highly concentrated solution hence very difficult to optimize the process, even though fully organic matter is very harmful to mother earth especially in countries like ours so it's necessary to attain it.

Usually, the generation of leachate is a slow process, it starts with a hydrolysis process in solid waste dumps or during solid waste processing if not treated it will be absorbed in the soil beneath in legacy dumps or waste storage areas after the strict guidelines issued by NGT there are efforts to collect It scientifically and treat the same to dispose of as per Pollution control norms in India.

There are organizations now working in scientific waste management mainly (waste to energy plants) for fresh waste and legacy waste in which leachate treatment plants are made mandatory.

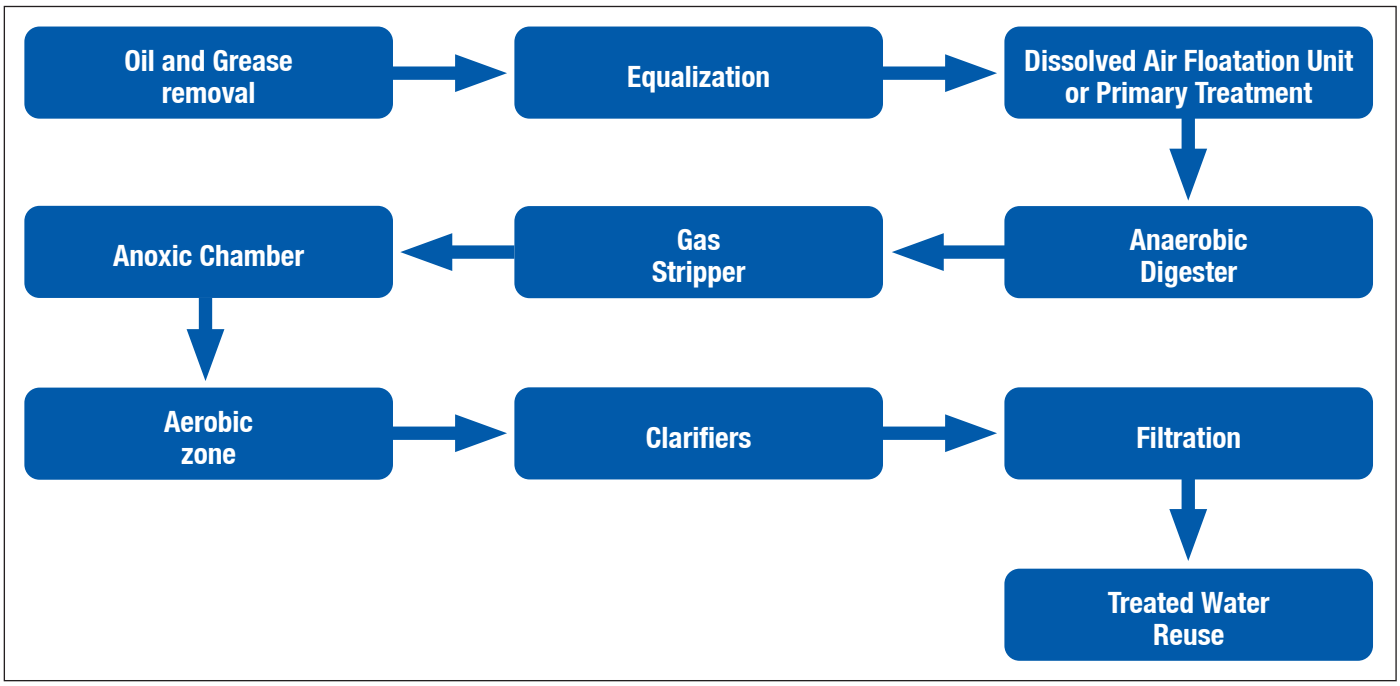
The best way to treat is by conventional biological treatment and if needed we can add physical membrane filtration.

Characteristics of leachate usually observed are mentioned below:

The below parameters change drastically based on: weather conditions, age of legacy dumps, and volume

1	TDS	PPM	50000–75000
2	COD	PPM	20000–70000
3	BOD	PPM	7500–25000
4	TSS	PPM	2000–3000
5	Oil and Grease	PPM	1500–5000
6	pH		4.5 – 7.5
7	TKN	PPM	400
8	Ammoniacal Nitrogen	PPM	1000–2000
9	Nitrogen	PPM	3000

Vinayak Kadam is an experienced General Manager of Projects and Operations with a demonstrated history of working in the municipal solid waste management Water and Wastewater, oil & energy industry.



The common and as–on–date successful treatment Process Flow Sheet

- The Products are : Bio Gas for use
- Treated Water : For Secondary use
- Compost : As an organic fertilizer

All this starts with a scientific collection system to be in place so that the leachate is collected in a collection pit and then further transferred to the treatment plant

Dissolved Air Flotation units or Primary Treatment

To Reduce the TSS and this process will bring down the COD Levels 0f 20 to 25% reduction

Anaerobic Digester

- **The terminology used in Digester:**

  - **Chemical Oxygen Demand (COD)**
    Oxygen is required for the complete oxidation of biologically degradable and non–biodegradable organic matter. The organic matter in the reduced state such as Cl, CN, and NO also gets oxidized.

  - **Biological Oxygen Demand (BOD)**
    BOD is the oxygen quantity demanded by aerobic micro–organisms (bacteria) to stabilize the organic matter. Since BOD is directly proportional to the organic matter concentration.

  - **Total Solids**
    The amount and nature of dissolved and dissolved matter present in liquid very greatly. In potable waters, most of the matter is in dissolved form and consists mainly of inorganic salts and small amounts of organic matter. The amount of dissolved colloidal and suspended matter increases with pollution. Sludge represents extreme cases of pollution in which most of the solid matter is dissolved.

  - **Anaerobic Digester**
    Organic materials are decomposed biologically by various species of bacteria. Bacterial decomposition can occur without air in an anaerobic digester. These bacteria are Acetogenic bacteria and methanogen bacteria.

  - **Acetogenic Bacteria**
    Acetogenic bacteria are described as non–methanogenic or simply they are called 'acid formers'. Among the non–methanogenic bacteria that have been isolated from anaerobic digesters are Clostridium, lactobacillus, etc.

  - **Methanogenic Bacteria**
    Methanogenic bacteria are simply called methane formers. They are strictly called anaerobes. Methanogenic bacteria are H2–utilizing bacteria (methnospirillum hungates) and acid–utilizing bacteria.

  - **Biogas**
    Biogas produced from an Anaerobic digester consists of CO2 (38 to 48 %), CH4 (50 to 60 %), H2 S (1 to 2 %). The biogas has a high calorific value – 4500 Kcal / m. This can be used for various purposes it can be directly sent to the boiler as fuel for steam generation. Also, Biogas is used for gas engines

after removing H2S from biogas or else can be further used in vehicles after further purification.

- **Description Of Anaerobic Digester**
  Anaerobic Digester consists of a continuously stirred tank reactor where continuous mixing of effluent and biomass takes place with the help of agitators. The essential feature of that the washout of the active anaerobic bacterial biomass is recirculated.

  The basic idea underlying the anaerobic contact process is that;
  - Provide contact between the active biomass and feed.
  - Utilize the digester volume effectively.
  - Prevent stratification and temperature gradient
  - Minimize the formation of the scum layer and the deposition of sludge solids.

- **Basic Reactions in Digester System**
  Anaerobic digestion is performed by two groups of bacteria.
  - Acid–producing bacteria: –
    Acid–forming bacteria – butyric & propionic acid &
    Acidogenic bacteria – acetic acid & hydrogen
  - Methane–producing Bacteria: –
    Acetoacetic bacteria (Acidophilic) & Methane bacteria.

- **Basically, three stages are involved in the process of anaerobic digestion**
  - Hydrolysis:
    It is a process of suspended organics and soluble organics of higher molecular weight to a simple organic molecule

  - Acidogenesis:
    Degradation of small organic molecules to various volatile fatty acids ultimately to acetic acid. The process of conversion of a small organic molecule into acids is carried out by a group of anaerobic bacteria known as acid formers.

  - Methanogenesis:
    Production of methane, primarily from acetic acid produced at the end of the Acidogenesis process is converted into carbon dioxide and methane gases. The process of conversion of acid into carbon dioxide and methane gases is carried out by a group of anaerobic bacteria known as methane formers.

    Note: The Digestion process can reduce COD Levels up to 75 %

- **Aerobic Zone**
  This is basically aeration with a diffuser or aerator system to further reduce the COD Levels to acceptable limits

Conclusion

Leachate treatment nowadays is an need of an hour as the ground water contamination is maximum in this case if untreated it might get flown in near by waterbodies and can cause major damage to even surface water, we also need to note that as the concentration levels are very high without treatment it can't be disposed of off in the nature.

The conventional treatment with Digestors is an economical way to handle this affluent as other treatments are costly and involve much more tedious operation and more electrical power.

This treatment will also give us the much–needed green energy and organic fertilizer also treated water which can be used for gardening/ Toilet flushing or any other secondary operation.

Even though we develop a suitable system most of the success depends on the operation of the plant, operating the digesters, which is the heart of the system, and as it is the skilled process mentioned above the quality of leachate is not constant hence the feed to digesters is to be observed closely.

Feeding more than designed feed is not good also lesser than designed feed can also affect the health of the digester. There are some key parameters that give you the health of the digester to be monitored weekly. More important is that we are contributing to the environment by not disposing of untreated.

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GRAFiL 4040	100 (4)	1146 (45)
GRAFiL 6040	175 (7)	1290 (51)
GRAFiL 8040	215 (8.5)	1300 (51)

Ultrafiltration Module Specification	Module Diameter mm (Inch)	Module Length mm (Inch)
GRAFiL 8060	215 (8.5)	1524 (60)
GRAFiL 10060	250 (10)	1670 (67)

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- No chemical enhanced backwash
- No HCl & No NaOH
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ETP FEEDS WITH BACTASERVE FOR COD/ BOD REMOVAL FROM PHARMA INDUSTRY'S WASTEWATER

By Mr. Ashutosh Vadanagekar (Managing Director, at Amalgam Biotech)
By Mr. Sanket Chawke, (Application Specialist, Amalgam Biotech)

Background

With a presence in 138 countries on six continents, pharma company is now the world's largest integrated supplier of solid dosage products and services – providing hard–shell capsules, lm and foil barrier solutions. Founded in Mumbai in 1961, now serves pharmaceutical companies all over the world, touching almost every aspect of solid dosage manufacturing. Company has built over 60 years long term relationships with renowned customers.

Table of Inlet Parameters:

Parameters	Days	INLET FEED ppm
COD ppm	Day 1	7120
	Day 5	7150
	Day 10	7009
	Day15	6955
	Day 20	6991
	Day 25	6989
	Day 30	6800
	Day 35	7005
Avg		**7002**
BOD ppm	Day 1	2373
	Day 5	2383
	Day 10	1752
	Day15	1739
	Day 20	2330
	Day 25	2330
	Day 30	2267
	Day 35	1751
Avg		**2116**

Photographic view of site:

Challenges

Challenges in ETP operation & the problem:

- COD and BOD were very high in the euent. COD 7000 ppm, BOD is 2000 ppm and it was in the same higher range through out.
- A high level of BOD can reduce dissolved oxygen (DO), thereby harming the local environment if the euent is discharged Excess COD/BOD content contributes to environmental pollution.
- Water with high COD/BOD often has poor aesthetic qualities, such as bad odour, murky appearance, and an unpleasant taste Which can impact its usability for drinking, recreational activities, and industrial processes.

ETP Flow Diagram:

- ETP Initial ow rate of the euent was 265m^3/day, aeration tank 110 m^3, MBR tank 80 m^3

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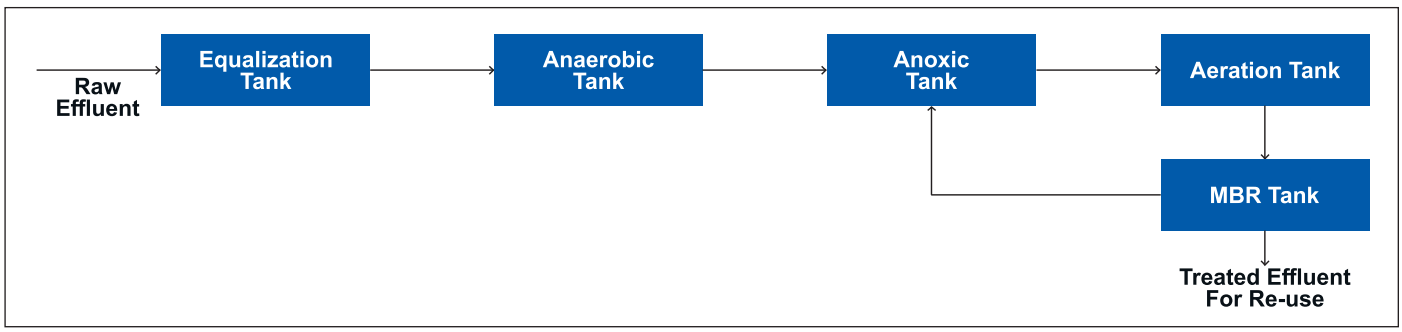


Special Technical Solution:

Initial feed of BOD/COD was extremely high. We have suggested a solution – BactaServe Anaerobic and Pharma bioculture.

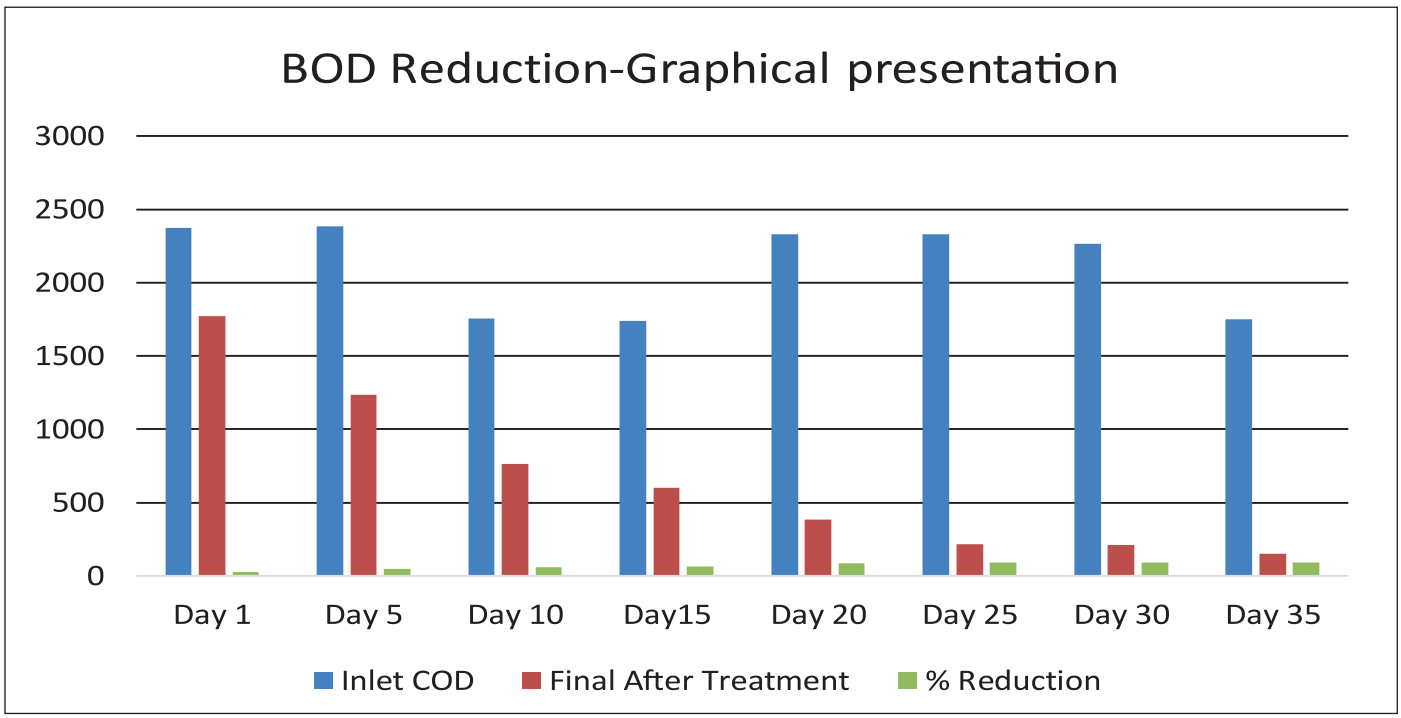
BactaServe is specially formulated naturally occurring, nonpathogenic, Non genetically altered blend of bacteria which can grow over wide temperature range 5–45°C. BactaServe when added in waste water treatment systems, bacteria starts multiplying immediately to create higher Biomass content. This helps in bio–degradation of BOD content of the waste water.

These microorganisms are not harmful and completely environmentally safe.

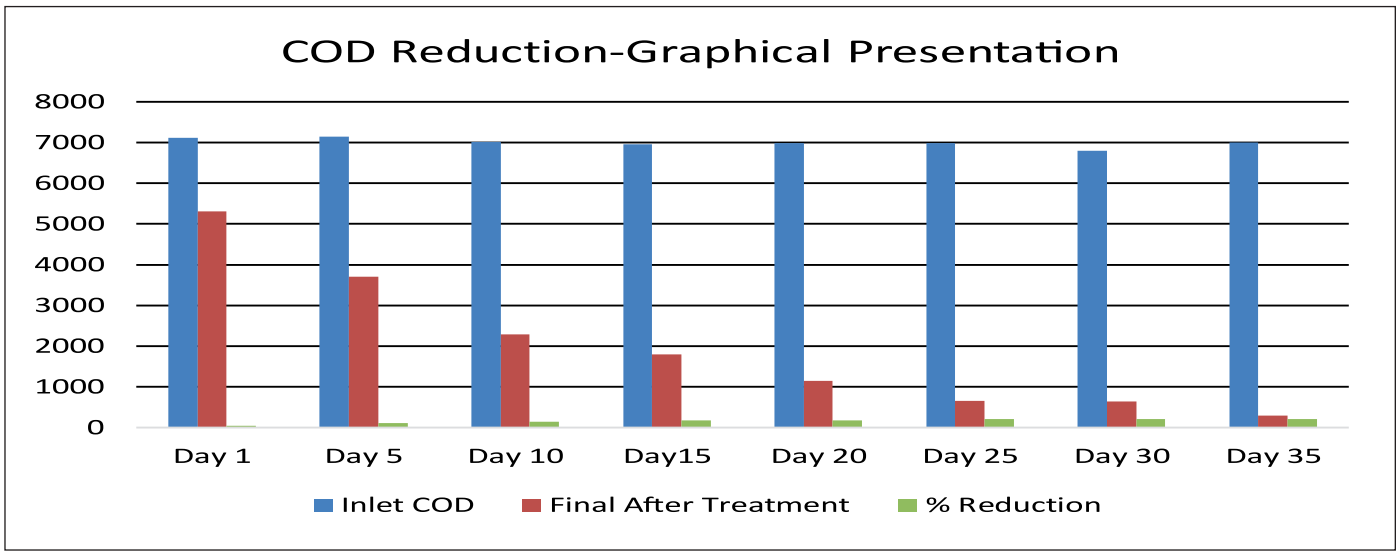
Special features to highlight:

- COD of day 1 at Anaerobic tank outlet was 6408 ppm, at Aeration tank outlet 5895, in MBR tank outlet 5306 ppm
- Day 10, Anaerobic tank outlet COD was 4556 ppm, Aeration tank outlet 3326, MBR tank outlet 2295 ppm
- After 15th days BactaServe dosage 48% reduction achieved in Anaerobic tank for COD
- After a month, 82% reduction found in MBR tank outlet COD
- Total 96% COD reduction achieved Sucient growth of MLSS found in 20 days
- Maintaining ow 2 m^3/hr, after 10 days of MLSS development
- Increased ow from 3.5 m^3/day to 4.5 m^3/day, during this DO – 4 ppm, pH – 6.5 to 7.5
- BOD of inlet Day 1 was 2373 ppm, Anaerobic tank outlet 2136, MBR tank outlet was 1769 ppm
- BOD of Day 15 – MBR Tank outlet was 598 ppm 91% reduction in BOD value achieved

Dosage of BactaServe		
Days	**Estimated Kg**	**Actual Kg**
Day 1 – Day 15	85	80
Day 16 – Day 35	70	60
Total	**155**	**140**



Parameters ppm	Days	Inlet Feed ppm	Anaerobic Tank Outlet	Aeration Tank Outlet	MBR Tank Outlet	% Reduction
COD ppm	Day 1	7120	6408	5895	5306	25
	Day 5	7150	5649	4632	3705	48
	Day 10	7009	4556	3326	2295	67
	Day 15	6955	4521	2848	1794	74
	Day 20	6991	3635	1890	1153	84
	Day 25	6989	2865	1089	653	91
	Day 30	6800	2788	1059	636	91
	Day 35	7005	2102	546	301	**96**
BOD ppm	Day 1	2373	2136	1965	1769	25
	Day 5	2383	1883	1544	1235	48
	Day 10	1752	1519	1109	765	56
	Day 15	1739	1507	949	598	66
	Day 20	2330	1212	630	384	84
	Day 25	2330	955	363	218	91
	Day 30	2267	929	353	212	91
	Day 35	1751	1051	182	150	**91**



Executive Summary

- This project of pharma ETP was challenging due to high COD/BOD. Average MLSS earlier was 2000 ppm and after Bactaserve 4000 ppm
- Earlier average MLVSS– 1400 ppm and after Bactaserve bioculture dosing its 2800 ppm.
- This time increased ow by 20% of 170 m^3/day.
- Bactaserve slurry preparation and dosing has clearly shown, a spike in MLSS
- COD of Anaerobic tank has achieved 70% reduction

Achievements

- Bactaserve bioculture solved this issue with bacterial strains
- COD day 1 inlet was 7120 ppm and after Bactaserve pharma dosing, at day 35 outlet was 301 ppm
- BOD at day 1 inlet was 2373 ppm & at day 35, outlet was 150 ppm
- We are happy to highlight 91% reduction in BOD and 96% reduction in COD – We have successfully solved the problem of ETP

'BactaServe found an excellent product for COD – BOD removal'!!

Mr. Ashutosh Vadanagekar is the Managing Director of Amalgam Biotech.

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

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Mr. Sanket Chawke is an assistant manager and application specialist at Amalgam Biotech. He manages challenging technical environments in the field of wastewater and bioremediation. Sanket provides flawless operational continuity and consistent technological growth through exceptional engineering. He has completed B Tech in Chemical Engineering from MITAOE, Pune. You can reach by
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BUDGET 2024: IMPLEMENTING VISION FOR DEVELOPMENT

Anil Sethi
Chairman,
Pump Academy Private Limited

Anil Sethi is the Founder Chairman of Pump Academy Private Limited. With deep knowledge of water sector, he has established the company to provide innovative solution to water utilities for making pumping stations technologically advance, automated and responsive with robust processes. He is a well–recognised industry captain, conferred with numerous awards for his significant contribution towards nation building.

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

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

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

Key highlights of Interim Budget 2024

- Under the interim budget 2024–25, the Ministry of Jal Shakti (MoJS) has received an allocation of INR 984.18 billion. The allocation is 1.93 per cent higher than the revised estimate of INR 965.48 billion for 2023–24. Of the total allocation, an outlay of INR 699.26 billion has been made for the Jal Jeevan Mission/ National Rural Drinking Water Mission while INR 71.92 billion has been earmarked under the Swachh Bharat

Mission (Gramin).

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

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

BUDGET 2024: FUNDING THE FUTURE THROUGH INFRASTRUCTURE DEVELOPMENT

Subhash Sethi
Chairman,
SPML Infra Limited

Subhash Sethi is the Chairman of leading water company – SPML Infra Limited. He has been instrumental in developing India's water sector with EPC and BOOT projects to help water utilities deliver safe and clean drinking water to millions of people in India. For his valuable contribution in water and infrastructure sector, he has been conferred with several prestigious awards including Economic Times Global Asian Business Leader.

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

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

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

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

The FM has allocated Rs.2.55 lakh crore for railways to implement three major economic

railway corridor programs, energy, mineral, and cement corridors, port connectivity corridors, and high traffic density corridors aimed at enhancing logistics efficiency and reducing costs.

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

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

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

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

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

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

BUDGET 2024: PRUDENT & FORWARD–THINKING

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

Mohammed Naser Azeez is the Managing Director of acclaimed Aquality Water Solutions Pvt. Ltd. that provides technologically advance treatment solution for making water clean and usable. He has contributed immensely with clean drinking water facilities to help improve the life of people with commitment, technological innovations and quality excellence.

The World Economic Outlook report from the International Monetary Fund (IMF) anticipates an improvement in global economic growth in 2024, reaching 3.1%. The IMF also projected that India will attain the position of the third–largest economy by 2027. India has showcased resilience throughout 2023, overcoming challenging global economic conditions. The initial advance estimate indicates a projected gross domestic product (GDP) growth of 7.3% for the financial year FY24.

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

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

The water sector, being a growth harbinger for various industries, has witnessed commendable attention from the government. The strategic push towards establishing a robust water infrastructure is not only vital for addressing immediate concerns but also

contributes significantly to the overall development of other sectors. This foresighted approach aligns with the government's commitment to fostering sustainable growth and ensuring the well–being of the nation.

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

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

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

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

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

BUDGET 2024: VISION AND DEVELOPMENT PERSPECTIVE

Mohammed Abdul Rahman
CEO,
Sahara Industry

Mohammed Abdul Rahman is the CEO of Sahara Industry formed in 2003 with the sole purpose of providing best quality water treatment solutions to industries. An MBA in marketing & finance, he has 15 years of rich experience in handling various business activities and has been instrumental in taking his company towards success. His modern business approach supported by the technological intervention and his dynamic leadership qualities has made his group companies turnover exceeding INR 1000 million.

www.saharaindustry.com

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

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

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

Under the interim budget 2024–25, the Ministry of Jal Shakti (MoJS) has received an

allocation of Rs. 98,418 crore. Out of this, the share of the Jal Jeevan Mission, which aims to provide safe and adequate drinking water by 2024 to all households in rural India, is Rs. 69,926 crore. Out of the 19.26 crore rural households in the country, 14.22 crore have already been provided tap water connection under the mission till now.

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

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

The Rural Development Ministry's budget to Rs. 1.77 lakh crore for 2024–25 is increased by around 12 per cent from last year's Rs. 1.57 lakh crore. The Swachh Bharat Mission (Rural) got Rs. 7,192 crore for 2024–25. The same amount was allocated to it in 2023–24 as well.

The substantial allocation for water supply projects across various schemes is highly appreciated, and at Sahara Industry, we eagerly anticipate contributing to the efforts to ensure clean and safe water for both drinking and industrial purposes. Leveraging our extensive experience and an innovative, technologically advanced NDF certified product range, Sahara Industry, along with its parent organization Anu Advance Composite Products Pvt. Ltd., is poised to lead in delivering advanced water and wastewater treatment solutions in adherence to international standards. We are pleased that the Government of India is demonstrating a strong commitment to the water sector by allocating a substantial budget for its development.

Smart Tech India
17th – 19th January 2024
Pragati Maidan, New Delhi, Delhi

India Water Show (IWS)
10th – 12th January 2024
10 am – 6 pm
Auto Cluster Exhibition Center, H–Block, Chinchwad East, 181, Old Mumbai – Pune Hwy, MIDC, Chinchwad, Pimpri–Chinchwad, Maharashtra

Waptema Water Expo 2024
22th –24th January 2024
India International Convention and Expo Center, Sector 25 Dwarka, Dwarka
New Delhi, Delhi

JAQUAR IPA NEERATHON 2024, DELHI
4th – 6th February 2024
Major Dhyan Chand National Stadium, India Gate Cir, National Stadium, India Gate, New Delhi, Delhi

IWF Water Transversality Global Awards And Conclave
2nd – 3rd February 2024
New Delhi, Delhi

WATER INTEC Feb. 2024
1st –29th February 2024
CODISSIA TRADE FAIR COMPLEX, G.V. Fair Grounds, Avinashi Rd
Coimbatore, Tamil Nadu

Water Expo Pune 2024
8th –10th February 2024
Deccan College Ground, Deccan College Rd, Ranjeet Nagar, Yerawada
Pune, Maharashtra

International Conference on Desalination and Renewable Energy
22nd – 23rd February 2024
New Delhi, Delhi

Water Today's Water Expo
28th February – 1st March 2024
SRW INDIA WATER EXPO, New No.23, Old, 10, 3rd St, Postal Colony, West Mambalam
Chennai, Tamil Nadu

Water Expo – Kolkata
28th – 29th February 2024
G9VW+45X Science city, Kustia Rd, East Topsia, Kustia
Kolkata, West Bengal, India

WAPTAG Water Expo 2024
29th February – 2nd March 2024
Mahatma Mandir Convention and Exhibition Centre Managed by the Leela, Sector 13C, Sector 13
Gandhinagar, Gujarat

Water Expo Chennai 2024
28th February – 1st March 2024
A2B Building, ANT Biz Rooms near Chennai Trade Centre, New No.7, Old No.2A, Mount Poonamallee Rd, Poonthottam Colony, Ekkatuthangal Nandambakkam, Tamil Nadu

International Conference on Advances in Water Treatment and Management
1st March – 2nd March 2024
Pandit Deendayal Energy University– PDEU (Formerly PDPU), Knowledge Corridor, Raisan Village, PDPU Rd
Gandhinagar, Raysan, Gujarat

WaterEX World Expo Mumbai
4th March – 7th March
Bombay Exhibition Centre, NESCO, Goregaon,
Mumbai, Maharashtra

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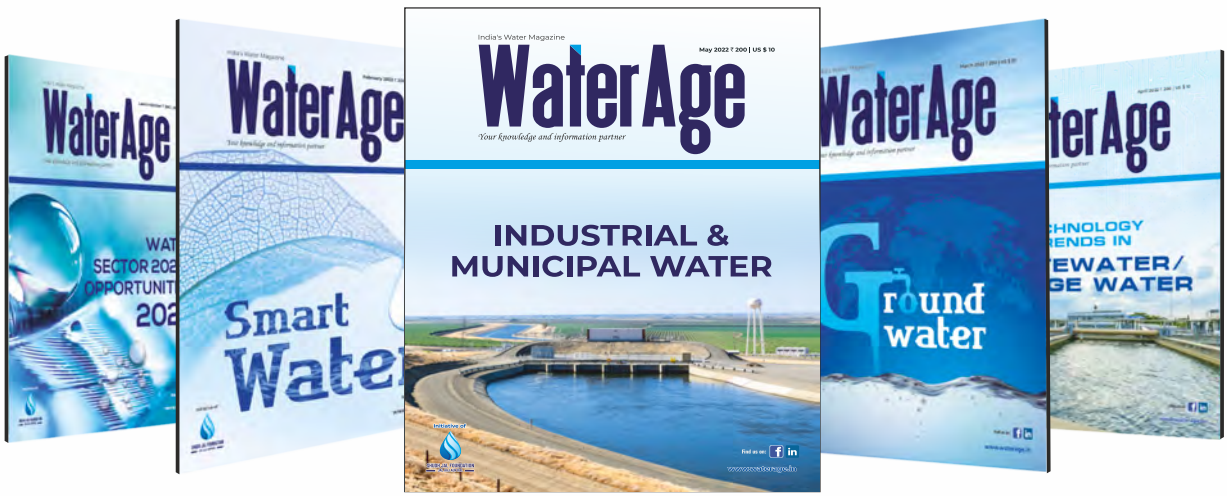

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TID – 69401155

Organisation Name – Rural Water Supply and Sanitation Division,
State & Country – Andhra Pradesh, India
Approx. Cost – 769.70 Cr
Tender Brief Due Date – Procurement of Material Required (HDP Pipes, GI Pipes, Di Pipes FHTCs Material & DI Valves) For Taking UP JJM Works through Community Contracting System By Grama Jala Sangam in AP State

26 February 2024

TID – 69334080

Organisation Name – Urban Administration and Development
State & Country – Madhya Pradesh, India
Approx. Cost – 379.62 Cr
Tender Brief Due Date – Augmentation, Renovation and Extended Area Coverage of Water Supply System in Bhopal City under AMRUT 20

29 February 2024

TID – 69326238

Organisation Name – Public Health and Municipal Engineering Department
State & Country – Andhra Pradesh, India
Approx. Cost – 339.22 Cr
Tender Brief Due Date – Contract for Public Health Circle, Ananthapuramu– Water Supply Improvement Scheme in Kadapa Municipal Corporation under AMRUT 2 0 (Tranche–1) With SPVBR as Source

23 February 2024

TID – 68918960

Organisation Name – Directorate of Municipal Administration
State & Country – Maharashtra, India
Approx. Cost – 247.44 Cr
Tender Brief Due Date – Augmentation of Existing Barshi Water Supply Scheme From Ujjani Dam – PH–II, Dist under Amrut 2 0

04 March 2024

TID – 69398827

Organisation Name – Karnataka Urban Water Supply and Drainage Board
State & Country – Karnataka, India

Approx. Cost – 194.92 Cr
Tender Brief Due Date – Providing Water Supply Scheme to Chincholi, Chittapur, Wadi, Kamalapur, Sedam and Kalagi Towns In Kalaburagi District under Amrut 2 0 Including O&M for A Period of 5 Years (Including 1 Year Defects Liability Period) Through Design, Build, Operate and Transfer (Dbot) Mode (Lumpsum) – No Variation

01 March 2024

TID – 69251118

Organisation Name – Kancheepuram Municipality
State & Country – Tamil nadu, India

Approx. Cost – 149.24 Cr
Tender Brief Due Date – Improvements to Existing Water Supply Scheme for Kancheepuram City Municipal Corporation – Package 2

28 February 2024

TID – 68550700

Organisation Name – Karnataka Urban Water Supply and Drainage Board
State & Country – Karnataka, India

Approx. Cost – 135.55 Cr
Tender Brief Due Date – Providing Combined Water Supply Scheme to Chincholi Town, Chittapur Town, Wadi Town & Kamalapur Town in Kalaburagi District under Amrut 2 0 Including O&M for A Period of 5 Years (Including 1 Year Defects Liability Period) Through Design, Build, Operate And Transfer (Dbot) Mode (Lumpsum) – No Variation

21 February 2024

TID – 69332435

Organisation Name – Directorate of Municipal Administration
State & Country – Maharashtra, India

Approx. Cost – 132.33 Cr
Tender Brief Due Date – Augmentation of Chakan Water Supply Scheme Under Maharashtra Suvarnjayanti Nagarotthan Mahaabhiyan

28 February 2024

TID – 68522618

Organisation Name – Karnataka Urban Water Supply and Drainage Board
State & Country – Karnataka, India

Approx. Cost – 124.80 Cr
Tender Brief Due Date – Providing Of Combined Water Supply Scheme to Humnabad, Chitguappa And Hallikhed Towns In Bidar District Under AMRUT 2 0 Including O&M For A Period of 5 Years (Including 1 Year Defects Liability Period) Through Design, Build, Operate and Transfer (DBOT) Mode (Lumpsum) No Variation

19 February 2024

TID – 69172105

Organisation Name – Irrigation and Cad Department
State & Country – Telangana, India

Approx. Cost – 118.41 Cr
Tender Brief Due Date – Flood Preventive Works Pertaining To Bhadrakali Tank Catchment and Surplus In GWMC Limit (Bondivagu) In City Of District

23 February 2024

TID – 69129501

Organisation Name – Maharashtra Industrial Development Corporation
State & Country – Maharashtra, India
Approx. Cost – 110.71 Cr
Tender Brief Due Date – Construction of ESR, GSR, Pump House Replacement Of Existing 900 Mm Dia Ms Pure Water Gravity Main

09 March 2024

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Duvera	47	+91 8595 149016, +91 8744 040406	sales@duverawater.com	www.duverawater.com
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