CII-TRIVENI
WATER INSTITUTE

Confederation of Indian Industry

OUR CUP OF JOY

INDIA INC GOOD PRACTICES ON WATER

VOLUME 3

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OUR CUP OF JOY

India Inc Good Practices on Water

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DIRECTOR GENERAL
NATIONAL MISSION FOR CLEAN GANGA

भारत सरकार
जल शक्ति मंत्रालय
जल संसाधन,
नदी विकास और गंगा संरक्षण विभाग
GOVERNMENT OF INDIA
MINISTRY OF JAL SHAKTI
DEPARTMENT OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION

Message

Nice to know that "Our Cup of Joy" is overflowing with examples of the Industry led initiatives and good practices in water and wastewater management by India Inc.

Water is an essential building block of life and is vital for supporting economic, social, and human development. Use of technology and nature-based solutions along with decentralized people's participation can solve many of the emerging water management related challenges in the country. As there is no one solution that fits all, showcasing of good practices on water management can help in generating awareness on the efforts being taken by the stakeholders on water management in different parts of country.

I am sure that the case studies presented in "Our Cup of Joy" would provide inspiration to others to embark on the journey of water management and emulate some of the good practices mentioned here."

Dated: 23rd Jan 2023

(G. Asok Kumar)

राष्ट्रीय स्वच्छ गंगा मिशन
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Foreword

Water lies at the core of sustainable development given that it is critical for social-economic development, healthy ecosystems and human survival. India is experiencing increasing variability in water availability, with differentials translating into iniquitous distribution and access.

Creating maximum impact with minimal resource utilization should be the mantra to achieve effective management of water resources. Indian industry has embarked in this direction by leveraging scientific tools and techniques that offer attractive returns on investment, while ensuring a secure water future for the nation.

CII's Centre of Excellence on Water, CII-Triveni Water Institute, through its unique services and state of art digital tools, WATSCAN, Water Audits, Water PINCH and Water Awards, is engaging with stakeholders to enable water security in the country.

"*Our Cup of Joy*", a compendium of best practices, is a compilation of select industry led good practices which have demonstrated uptake of strategies for improved operational efficiencies while ensuring resource sustainability.

Categorised into – Industry Initiatives Within the Fence and Beyond the Fence – the compendium highlights good water management practices that are scalable and replicable across sectors and geographies. It aims to promote new thinking processes on water use efficiency and management.

I hope that the publication will catalyse stakeholders to think strategically about future water management practices and undertake collective action towards a water secure future.

Nikhil Sawhney
Chairman, CII-Triveni Water Institute

Foreword

Indian industry has been taking action to improve availability and quality of water for communities, businesses and the environment by engaging, networking and partnering with diverse stakeholders. Businesses have played an important role over a period in not only transforming their own policies and operations to enhance water use efficiency but also influencing its value chain to manage water efficiently.

CII's dedicated Centre of Excellence on Water charts new techniques and water management strategies incorporating operational, technological, and behavioural changes that can contribute to improved water efficiency in industry. The Institute through its innovative tools and techniques has been assisting industry on the analysis of water usage and identification of cost-effective levers for attaining water use efficiency both within factory plants and at the watershed level.

The process of improvement in industrial water use efficiency requires not only various sectors to reduce their specific water consumption but also to share knowledge and good practices for replication by other sectors.

"*Our Cup of Joy*", a compendium of India's good practices on water management, is a flagship publication of the Institute. It showcases good practices on water management adopted by companies across sectors. I believe that the knowledge available in this compendium will encourage stakeholders to think innovatively about adopting and implementing sustainable water management practices in the country.

Chandrajit Banerjee
Director General, CII

Message

It is now well recognized that water management will be critical for sustaining societies and their prosperity, economy and the environment around. It is our joint responsibility to conserve water, create alternative resources and most importantly manage available resources prudently for a sustainable and secure water future. We must ensure that water bodies are free from pollution and are healthy living systems.

Indian industry has been undertaking numerous proactive measures towards water resource conservation and management within their plants. What is also heartening to learn is that companies are going past compliance and are implementing measures beyond their fence i.e. in their watersheds. Further, source sustainability is slowly emerging as a critical factor determining sustenance and future growth.

It is worthwhile to note the leadership role demonstrated by companies across sectors in spearheading water stewardship, creating a movement on water management. However, it is equally important to disseminate the prevailing good practices in various sectors for emulation by other stakeholders. Scale up of such experiences could make a much bigger impact on the overall water sustainability of the country.

I am happy that the third edition of "*Our Cup of Joy*", a compendium of industry good practices on water management, is now available as a resource book for stakeholders. This publication brings together some good practices from multiple sectors in a manner that is easy to comprehend. Most of these practices have emerged after careful shortlisting and verification of information received from companies under CII's National Awards for Excellence in Water Management across various editions.

I am sure the readers will find this publication useful in accelerating the movement on water management.

Dr Anil Kakodkar
Chief of Jury, CII National Awards for Excellence in Water Management
Member, Advisory Board, CII-Triveni Water Institute

Message

A scarce natural resource, water is fundamental to life, livelihood, food security and sustainable development. There are further limits on utilizable quantities of water owing to uneven distribution over time and place.

With growing population, rising water requirements as well as the given indications of the impact of climate change, availability of utilizable water will be under increasing strain with the possibility of deepening water conflicts amongst different user groups. Thus, optimum utilisation of water, land and natural resources is extremely important.

India is currently undergoing a paradigm shift in water resource management. At this juncture, wisely and strategically realizing effective management of water resources requires affirmative, effective and proactive measures and industry needs to play an important role as a key community participant. There is also a need to capture the opportunities in various areas including conservation, reduction, reuse and recycling treated water and wastewater through good governance.

In light of the above, CII formed the National Committee on Water, to act as a catalyst in promoting excellence in water management by facilitating self-sufficiency in water at the state and national levels. Over the years, the Committee has taken impressive strides towards creating greater awareness and helping industry achieve momentum in water management.

I hope this publication "*Our Cup of Joy*", will serve as a guidebook for those who wish to embark upon the journey and will excite, enthuse, and trigger behavioural change amongst stakeholders towards good management of water, a scarce and diminishing natural resource.

Rajesh Sharma
Chairman, CII National Committee on Water

Message

The impending threats on water availability present a significant risk to companies, with the potential to disrupt their operations and supply chains in many ways. The ability to manage and build water resilience depends largely on improving water use efficiency with a strong impetus for water reuse and recycle.

Industry is playing a proactive and positive role in water management through adoption of various innovative approaches, smart practices, and technologies and behavioural changes of stakeholders. However, larger awareness needs to be created on the positive steps being taken to encourage wider stakeholder engagement towards ensuring a water secure future for India.

This Compendium "*Our Cup of Joy*", is a collection of case studies on industry good practices that exemplify water use efficiency and sustainable water management. The Compendium lists best practices and case studies from multiple sectors – agriculture, construction, manufacturing, and rural water supply – which can help other stakeholders get insights into how and where they can adopt some of these practices. The strategies, shared in the compendium, range from low to medium cost and can be easily adapted as well as scaled to size.

I strongly urge all stakeholders, especially industry, to be both active advocates of water efficiency and also lead by example.

George Rajkumar
Co-chair, CII National Committee on Water

Industry Initiatives – Beyond the Fence

Improving Access to Drinking Water in Coastal Villages

Adani Ports and Special Economic Zone Limited, Mundra, District Kutch, Gujarat

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OBJECTIVE

- To ensure safe drinking water in saline-affected 10 coastal villages of Kutch by addressing ground water depletion and quality

RESULTS

- Drinking water need of 120 households (724 people) addressed with 10m^3/annum/household water harvested
- Post intervention ground water level improved by 9m to 15m
- Average depth of bore well reduced by 38m to 44m
- Borewell water TDS reduced by 500mg/l to 700mg/l with time
- Reduced dependence on tankers, generated savings of INR 10,000/household/annum
- With curtailment in occurrence of water borne diseases, especially amongst children, illness related expenditure reduced by 30%

HOW ACHIEVED

- Project Timelines – 2009 to ongoing
- Construction of Roof Rainwater Harvesting Systems (RRWHS) was prioritized in 120 economically weaker households
- Cost of RRWHS was shared by the community and Adani in the ratio of 30:70 respectively
- 190 unused borewells, the main source of water, have been converted into artificial recharge borewells
- Natural and sustainable farming practices have been promoted in 50 ha of land
- Village Development Committees have been formed
- 12 village level youth have been identified by Panchayat and Participatory Ground Water Management committee called as Bhujal Jankar
- Bhujal Jankar collects data, monitors the sites, drives demand side management activities, and creates awareness on RRWHS

Artificial recharge through abandoned bore wells

Checkdam, Bhujpur

Rooftop Rain Water Harvesting System

Achieving Water Security Through Community-led Programmes

Apraava Energy Private Limited, Khandke Windfarms, Ahmednagar, Maharashtra

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OBJECTIVE

- To increase access to water, for domestic and agricultural purposes through soil conservation and water harvesting
- To reduce women's drudgery in daily life by improving drinking water services and implementing related supportive activities
- To improve productivity through climate resilient agricultural practices
- To improve livelihood through small income generation and small-scale entrepreneurial activities

RESULTS

- Increase in water harvesting capacity – about 0.198MCM
- Ground water table increased – around 1.8 to 2m
- Project villages have been tanker free for last 2 years
- With new farming practices such as intercropping, using climate resilient seeds, local seeds, and bio-fertilizers crop productivity increased by 30-35%
- Adoption of water-saving devices such as drip, sprinklers, and participatory water management practices led to increased water savings – around 50%
- With establishment of 90 SHGs engaging 974 women, total savings generated – INR 5.30 million
- Drudgery reduced by availability of drinking water as well as increased water storage capacity
- Physical stress reduced by use of spray pumps, electric grinders, and bicycles

HOW ACHIEVED

- Project Timelines – 2017 to 2022
- Key stakeholders meetings were held to align them with the project objectives, awareness, and community sensitization programmes on water issues
- Exposure visits of villagers to model watershed villages, model gram panchayats, and village level water budgeting
- Construction and repair of 260 civil structures such as farm ponds, gabions, check dams of which
  - 246 were water harvesting structures
  - 14 were drinking water and other activity-related structures
- Sustainable and climate resilient agriculture practices such as organic and eco-friendly agriculture, vermicompost beds, multilayer farming, micro irrigation, and agro-horticulture were promoted
- Drinking water facilities have been improved by repairing existing drinking water structures and installing new drinking water tanks, distribution pipelines amongst others
- Women's drudgery has been addressed through social development activities, income generation/ livelihood development and training programmes

A farm pond for use in agriclture

Women SHGs have played an important role in project implementation

A cement nala bund to reduce water run off and increase water percolation

Improving the Standard of Living Through Water Management Interventions

Bajaj Consumer Care Limited, Wardha District, Maharashtra

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OBJECTIVE

- To strengthen livelihood of the distressed agrarian community through participatory local innovative interventions
- To increase the water carrying and percolation capacity of the riverbed
- To increase duration of river flow
- To promote less water intensive short duration crops, micro irrigation systems, agro forestry to develop a green cover and stabilize river rejuvenation structures
- To increase cropping intensity from single to double crops with increased availability of water through surface storage

RESULTS

- Additional water storage capacity created in Yashoda River Basin – 8.226MCM
- Water table increased up to 2.5m
- Water availability in the rivers and rivulets increased - up to 8 to 10 months in a year
- Number of existing water harvesting structures revived–140 nos.
- Land freed from water logging and brought under cultivation – 2022ha
- Cropping intensity increased from single to triple crops/annum
- Cost of cultivation reduced by –15%
- Cotton crop yield increased – from 1200 to 2500 kg/ha
- Farmer's average income increased – INR 74,000/ha

HOW ACHIEVED

- Project Timelines – 2018 to 2022
- A cadre of trained village volunteers has been developed as the link between Bajaj Foundation and village level organizations for day to day planning, implementation and management of programmes
- Initial phase included organizing consultation meetings with the community for strategic orientation of the project and communicating benefits of rejuvenation such as reduction in water logging and increased water availability in the recharge zone
- Integrated river basin approach was adopted to bring economic, social and environmental benefits
- In Phase 2, capacities of newly formed Water User Groups (WUGs) were built for
  - mobilizing community contributions
  - resolving conflicts
  - monitoring actual rejuvenation work and post management practices
  - monitoring the use of water for agriculture by each user group's members

- Length of river rejuvenated – 674 kms; No. of families benefited – 79587; Land recovered 121,312ha ; Villages covered – 1378
- After rejuvenation work, community meetings were organized to encourage adoption of micro irrigation systems in convergence with Bajaj Foundation and Government schemes
- Kisan Pathshalas were conducted to make farmers aware of natural farming practices to enhance economic and environmental benefits

Check dam, Wardha, Maharashtra

Beneficiary farmers, Wardha, Maharashtra

Stretch of river Yashoda rejuvenated, Nimgaon, Wardha Maharashtra

Ensuring Water Availability and Improving Livelihoods

Bosch Limited, Trimbakeshwar, Nashik, Maharashtra

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OBJECTIVE

- To ensure year round availability of domestic and agriculture water for the community

RESULTS

- Water storage capacity enhanced
  - water structures renovated – 6 nos.
  - water storage capacity created – 0.54MCM
- Drinking water availability ensured through
  - implementation of 3 water supply schemes
  - taking drinking water to the doorsteps of over 200 households
- Increase in agriculture water availability by 30.27%
- Livelihood enhancement and increase in per capita income
  - 39% farmers are now cultivating a second crop
  - paddy cultivation and production increased by 20%
  - 23% farmers are cultivating vegetables and profits have risen by 27%

HOW ACHIEVED

- Project Timelines – 2018 to 2021
- A need-based survey was carried out in 42 hamlets of Trimbakeshwar to prioritize the project list
- Inputs were taken from the local community and collaboration was forged with Government agencies such as Central Design Organization (CDO), Water Resources Department, Government of Maharashtra
- Damaged water structures (4 percolation tanks and 2 check dams) were repaired, and 2 village ponds were rejuvenated
- Piped water from the wells (recharged from percolation dam) is being provided to household's doorstep through water supply
- Training programmes on rice intensification, vegetable cultivation, and irrigation techniques were organized with help from Krishi Vigyan Kendra and the Agriculture Department

Green farms with second crop

Ground water in wells available throughout the year

Percolation dam at Lakshmanpada

Increasing Water Use Efficiency and Mechanization for Sustainable Sugarcane Production

DCM Shriram Limited-Sugar Business, Hardoi and Lakhimpur Kheri, Uttar Pradesh

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OBJECTIVE

- To improve water use efficiency and mechanization for expanding the sustainable sugarcane production programme, "Meetha Sona", across the sugarcane catchment area of 4 sugar mills

RESULTS

- Water saved – 5.74 MCM
- Water saved in 0.39 million ha, through mechanical interventions – 5.59 MCM
  - Trash mulching undertaken – 2.96MCM
  - Laser land levelling – 0.34MCM
  - Trench planting – 2.29MCM
- Certified by Indian Institute of Sugarcane Research, Lucknow (apex Government body for research on sugarcane)

HOW ACHIEVED

- Project Timelines – 2016-17 to ongoing
- Good agriculture practices promoted through training leading to capacity enhancement of 0.225 million farmers
- Adoption of trash mulching and use of bio-fertilizers promoted across the catchment area
- Practices such as furrow irrigation, drip irrigation, press mud / compost application, trench planting, wide row-spacing, green manuring, and laser levelling have been promoted
- A multi stakeholder partnership was forged with International Finance Corporation (IFC) and Solidaridad Network Asia
- 5000 demonstration plots were laid out on farmers fields to serve as virtual classrooms
- Entrepreneurs were developed to demonstrate the concept and implement custom hire model of agri machinery in rural areas
- Financial linkages with banks have been facilitated and subsidies on agri machinery have been offered by the company as well as the Government
- Digitized advisory services introduced during the pandemic included tele-conferencing with expert trainers, messaging on WhatsApp, introduction of services such as Suvidha Kendra (call centre) and e-Suvidha App for farmers

Laser leveler, Pat Kunwa

Green Manure, Dehra Ajitpur

Furrow Irrigation, Rebha Muradpur

Improving Access to Water and Safe Sanitation

Grundfos Pumps India Private Limited, Pattikadu, Chengalpattu, Tamil Nadu

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OBJECTIVE

- To provide sufficient, safe, and accessible drinking water
- To demonstrate sustainable agriculture practices to improve farmer livelihoods
- To build awareness about safe sanitation and eradicate open defecation

RESULTS

- After renovation of community's drinking water pond
  - the storage capacity increased by ~14% (up to 6000m^3)
  - safe drinking water is available to 250 households (~1270 individuals)
- After renovation of the community's minor irrigation tank
  - storage capacity was increased by ~80% to ~5000m^3
  - increased quantity of water made available for irrigation
  - cropping cycle increased from single to double crop
- Climate-resilient organic agriculture and horticulture inputs benefitted – 50 farmers (~250 family members)
- Sanitation units built for identified Below Poverty Line (BPL) families with a girl child – 5 units
- Awareness created to eliminate open defecation that was widely practiced due to non-availability of proper infrastructure

HOW ACHIEVED

- Project Timelines – January to December 2021
- In January 2021 Grundfos Water2Life, an employee-initiated and employee-driven programme, was launched in Pattikadu village in Tamil Nadu
- Pattikadu Water Conservation Committee (PCC) was formed, with seven members from the community, to enhance the maintenance and initiate activities for long term sustainability and impact
- The drinking water pond was renovated and a water storage tank was installed and fitted with a natural filter unit powered by a solar operated pumping system
- Minor irrigation tank was rejuvenated for increased water storage capacity and improved agricultural yields
- Organic seeds, horticulture seedlings, green fodder, and organic inputs are being promoted amongst 50 farmers
- Around 100 farmers have been educated on farming techniques such as organic farming, drought /pest tolerant traditional paddy varieties, and horticulture plantations through farm schooling

Toilet facility built for 5 BPL families with girl children, Pattikadu

Restored Minor Irrigation Tank, Pattikadu

Renovated drinking water pond, Pattikadu

Encouraging Adoption of Innovative Water Saving Practices

Hindustan Unilever Limited, Faizabad, Uttar Pradesh

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OBJECTIVE

- To reduce water footprint by demonstrating and encouraging adoption of water saving practices in farming
- To improve livelihood of small farmers with extension support system led by cadres trained on water and agricultural practices

RESULTS

- Paddy crop
  - water saved – 33%
  - farmer income increased by 62%
- Arhar farming
  - water saved – 94%
  - farmer income increased by 80%
- Sugarcane cultivation
  - water saved – 13%
  - farmer income increased by 16%
- Total water saved through the programme – 45MCM
- Carbon footprint reduced by – 1500 tonnes
- Fuel cost saved on water extraction INR 52.7 million
- Agri-production increased by 31,341 tonnes

HOW ACHIEVED

- Project Timelines – 2014 to 2020
- The programme was implemented through a consortium of 10 regional partners in 10 districts of Uttar Pradesh, with PANI as the anchor NGO partner
- PANI was responsible for mobilizing resources for the programme- Government collaborations and schemes, programme funding, and lead the overall governance of the programme.
- Regional NGO partners were responsible for implementing solutions unique to the crop patterns in their region
- Young women from programme villages, selected to join the CRP (Community Resource Person) cadre were trained in different agri-practices, audio-video dissemination, measurement systems, soft skills, and engagement with farming communities

- Project strategy mainly focused on 4 key parameters:

  Awareness → Engagement → Action → Recognition

  Awareness programmes to demonstrate efficient water practices to the farmers were delivered through group meetings, films and training sessions

  Engagement helped motivate farmers to act and adopt water saving practices on their respective fields

  When farmers observed substantial reduction in their input costs and improvement in yields, they motivated others to join and benefitted from the programme

Pigeon pea (Arhar) cultivation, Faizabad

Onfield training on Kono weeder in paddy plots, Faizabad

Ghod River Basin Water Security Programme

ITC Limited, Pune and Ahmednagar District, Maharashtra

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OBJECTIVE

- Achieve water positive status in Ghod river basin through a community driven water stewardship programme with focus on supply and demand management

RESULTS

- The water demand-supply gap (of 62MCM) in Ghod basin systematically bridged over 5 years
- Catchment covered under project – 384,451ha with maximum net water addition of 152MCM in one year through supply (1.4MCM rainwater storage) and demand side interventions (151MCM)
- Water harvesting and ground water recharge structures constructed – over 1900 nos.
- Land area covered under demand management practices – 32,658ha
- Sugarcane and onion demonstrated yield improvement of upto 21% and 17% and income improvement of upto 36% and 22%, respectively
- Water saved through trash mulching practice in sugarcane cultivation – 18-20%
- Average cost of sugarcane cultivation under drip method and wide spacing reduced by – 18.6% and 16.5% respectively
- Successful demonstration of collaborative PPP model that creates empowered grassroot institutions and community action to manage local water resources
- Multistakeholder partnerships forged with the Government of Maharashtra, agriculture institutes and other key stakeholders in the value chain, crucial to reach scale and sustainability

HOW ACHIEVED

- Project Timelines – 2015 to 2023
- Basin level water security assessment studies were undertaken during planning phase
- An integrated approach was adopted with a focus on co-creating solutions by engaging stakeholders with the intent of ensuring ownership and sustenance of interventions
- Supply and demand management interventions were initiated to improve ground water recharge, reduce water demand in agriculture and reduce silt load accumulating in the dam storage through:

  Supply Side Augmentation: most of the rainwater is being conserved during the rainy season within the watershed through surface storage, sub-surface flows and ground water recharge. The work included catchment treatment, water harvesting, managed aquifer recharge and improvement of biomass and biodiversity conservation

  Demand Management: Effective agronomical and micro irrigation practices demonstrated to farmers, through farmer field schools, included seedling plantation along with drip irrigation in sugarcane and raised bed plantation along with drip irrigation in onions. Adoption of these practices is being facilitated by offering technical and financial assistance to farmers under various Government schemes

Trash mulching in sugarcane to improve soil health and water holding capacity, Shirapur village, Parner block, Ahmednagar district

Water absorption trenches and percolation tank for ground water recharge, Narayangavhan village, Parner block, Ahmednagar district

Water harvesting structure (check dam), Uralgaon Village, Shirur block, Pune district

Encouraging Participatory Watershed Management in Coastal Areas

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OBJECTIVE

- To ensure 100% water availability for drinking and irrigation purposes
- To promote integrated water resource management and climate smart agriculture practices
- To train community for operation and maintenance of water conservation structures

RESULTS

- People benefitted under gram-samruddhi programme – 10,000 across 15 villages
- Additional water storage and recharge capacity increased by 13.17MCM against the ground water deficit of 44MCM
- Water saved due to enhanced efficiency achieved through sprinkler and drip system deployed across 575ha of land – 60-70% /ha
- 649 water harvesting structures helped increased water availability on 642ha of land
- Post construction of field bund, total soil conservation done in – 780ha of land, post construction of field bund – over 0.1 million running meters
- Area under irrigation increased by 4 times resulting in increased production of green fodder
- Agricultural production Increased by 20%
- Cultivation costs reduced leading to additional income for project beneficiaries – INR 180 million
- Number of farmers linked to a mobile-based voice messaging system for weather updates and best practices – over 1300 nos.
- Women empowered and linked to income generation activities – more than 1100 nos

HOW ACHIEVED

- Project Timelines – 2016 to ongoing
- A Participatory Rural Appraisal (PRA) and a hydrological study were conducted for all project villages
- Initially an inventory of 689 wells was prepared by NGO partner ACT which was followed by identification of an additional 167 wells for seasonal and monthly monitoring
- To meet the deficit of 44MCM, a detailed micro plan of individual villages and a 10 year perspective plan were developed for 15 villages
- Training has been provided to Bhoojal Jaankars and cadre of women i.e. Pashu Sakhis, Krishi Sakhis, Samuh Sakhis have been developed
- Crop diversification with inclusion of orchard (date palm, pomegranate etc.) have been introduced with current cropping system

- Soil health improvement achieved through testing of soil samples and promotion of composting, waste decomposer and green manuring, promotion of nitrogen fixing legume crops, seed treatment with bio pesticides and bio fertilizer applications
- IoT (Internet of Things) for sensor-based irrigation control have been utilized in the project
- A package of climate-smart agriculture practices has been integrated into ongoing programmes

Check dam, Jakhar

Red cabbage cultivation in Demo farm, Singach

Water harvesting, Jakhar

Improving Water Availability Through Watershed Interventions

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OBJECTIVE

- To transform the lives and livelihoods in water scarce Bapcha village of Agar, Malwa district by increasing water harvesting and recharge capacity through holistic watershed interventions

RESULTS

- Positive impact in overall quality of life of Bapcha village, with improved incomes, education, health, and the environment
- Village-level institution of farmers created with 195 members and 12 self-accountable community leaders
- Ground water table increased in Bapcha village by 1.5m
- Water harvesting capacity created – 8MCM
- Soil moisture conservation achieved through farm border bunding of 0.31 million m
- Land under assured irrigation, sustainable practices and developed fallow land – 7,280ha, 3,600ha and 1,180ha respectively
- Producer company formed for providing market linkages
- Increase in crop intensity to 200%
- Doubled agricultural income of 200 households
- Repayment experience of self-reliant "Apna Bank", a lending institution established by the community with contribution by members – 100%

HOW ACHIEVED

- Project Timelines – 2013 to 2019
- Community ownership was encouraged in planning, execution and monitoring of water interventions and deployment of low-cost solutions contextualized to local conditions
- Participatory water budgeting was introduced to tilt the community's water consumption behaviour towards balancing demand and supply
- Collaboration was forged with village institution, gram panchayat, SHG, Farmer Producer Company (FPC) and the Government for co-creating solutions, inclusive planning, and convergent actions
- The programme integrated interventions for soil health improvement, food and nutrition security, improved farming practices and backward and forward linkages through FPC
- Apna Bank established by villagers collected INR 1.5 million to provide members a loan of INR 20,000 for livelihood, children's education and in emergencies

Water user group closing shutters of gated check dam for water conservation

Orange plantation by family for boosting income, Bapcha village, Agar

Representatives of "Apna Bank Apna Bazaar," a community initiative at Bapcha village

Gated check dam at Aau River filled with water, ready to irrigate crops – Bapcha village, Agar

Initiating Integrated Natural Resources Management

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OBJECTIVE

- To increase ground water levels in the catchment area, thereby improving the river base flow, and ensuring secured water supply to the watershed community for irrigation and domestic purposes
- To increase green cover in the catchment area through social forestry and agro forestry
- To promote natural farming through knowledge dissemination and capacity building of local communities for sustainable natural resource management

RESULTS

- Water availability increased from 8 months to 12 months (year-round)
- Agricultural productivity increased – from single crop to two crops
- With multi-layering and multi-cropping system for improved and efficient farming, farmers are growing pulses, vegetables and fruits aiming to get year-round income
- De-silting has ensured elimination of field flooding during monsoons
- Increased dairy activities are indirectly helping to preserve the local Deoni cow breed
- Satellite imagery analysis of May 2021, revealed that area under
  - high vegetation has increased by 3.14% (82.97ha)
  - moderate vegetate zone 23.16% (748.20ha)
  - very healthy vegetation increased by 0.09% of the total area
  - water body increased by 0.62% (25.35ha)
- Dry land decreased by 27.01% (1734.18ha)
- Rainwater harvesting capacity created – 0.141MCM
- Trees planted under agro-forestry and social-forestry to increase green cover and income of farmers

HOW ACHIEVED

- Project Timelines – 2018 to 2020
- The approach involved a unique blend of social, technical, and financial strategy centred around community involvement in planning and execution
  - Social strategy included community mobilization, capacity building, and development of community leaders
  - Technical strategy was focused on design of scientific action plans using remote sensing data and field data
  - Financial strategy was aimed at leveraging existing Government schemes for scalability

- Water harvesting structures have been built using low- cost locally available material with a simple and robust design for a long life
- 5 demo farms have been set up in the area to help farmers learn and adopt the techniques of sustainable agriculture
- Nearly 1300 farmers have been sensitized on water conservation techniques and 200 farmers have been trained on sustainable natural farming techniques
- 100 youth have been trained under the leadership training programme for sustainability

Gabion bandhara, Wadmurambi, Latur

Rejuvenated village pond, Wadmurambi, Latur

Conserving Natural Resources to Mitigate Climate Change Impact

Tata Chemicals Limited, Okhamandal Block, Devbhumi Dwarka District, Gujarat

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OBJECTIVE

- To initiate participatory watershed development through sustainable resources management and ensure safe drinking water

RESULTS

- Additional storage capacity created – over 12.48MCM
- Tap water connections to 18,722 households
- Increased irrigation facility across 5694ha of land which accounts for ~14% of total agriculture land in the area
- Drip and sprinkler irrigation methods adopted by 1335 farmers
- Land irrigated through drip and sprinkler system – 2396ha
- Area covered by laser levelling – 34ha
- Land reclaimed through various soil conservation measures – 414ha
- Installed 2 RO plants, 2609 Rooftop Rainwater Harvesting systems in individual households

HOW ACHIEVED

- Project Timelines – 2011 to 2020
- As part of the implementation strategy, a Participatory Rural Appraisal (PRA) exercise was undertaken with participation of respective village panchayats and community members for social and resource mapping
- Rainwater conservation efficiency was maximized by creating additional water storage capacity through watershed management- small and medium structures
- Water use efficiency was increased through sustainable resource management by focusing on different aspects such as land management, micro irrigation promotion, and cropping pattern
- Governance
  - Institution Building: A participatory approach was adopted and promoted by the watershed committees, Pani Samities, and community contribution to develop a sense of ownership amongst stakeholders
  - For safe drinking water the following have been provided: Tap water connections up to the household level, Rooftop Rainwater Harvesting Structures (RRWHs) in remote households, and RO plants to villages and schools
- A clear exit protocol was defined and the required support was provided for setting-up an institutional arrangement for post project operation, maintenance and further development of assets created

Bandizar bandhara in Gurgadh, Kalyanpur

Drinking water project, Rangasar, Okhamandal

Community pond rejuvenated in Pindhara

Project Jalodari – Increasing Water Availability using a Participatory Approach

Tata Consumer Products Limited, Paonta Block, Sirmaur, Himachal Pradesh

Vinod Kothari
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www.tataconsumer.com

OBJECTIVE

- To increase water level of regional aquifer systems through scientific and participatory approaches
- To promote and strengthen the decentralized water governance pattern for water resource management on a sustainable basis
- To improve water quality in the area through adequate sanitation protocols and organic agricultural practices

RESULTS

- Number of villages benefited from the Jalodari Project – 14
- Number of households benefitted – 4134 nos.
- Soil erosion reduced with construction of loose boulder gabion structures
- Total groundwater recharged by one time filling during rainy season in Paonta valley aquifer System – 0.18MCM
- Provided livelihood to the local communities through project activities during COVID-19 pandemic

HOW ACHIEVED

- Project Timelines – 2019 to ongoing
- A Forest Development Committee (FDC) was constituted and has been registered for implementation of all water security and recharge activities
- Awareness activities in view of water quality and security are being undertaken through an IEC van, rallies, wall paintings, meetings, video films, and mainly through practical demo sessions
- Ground water recharge structure was constructed to create a capacity of 3050m^3 by digging continuous and staggered trenches and recharge ponds
- 23 loose boulder gabion structures with crate wire mesh have been constructed on the drainage line to prevent soil erosion during heavy rainfall
- 18 water quality and management training sessions conducted in 6 schools and villages for creating awareness on regular basis
- Active participation was received from different stakeholders such as the forest department, forest development council, district administration, and the local community promoted under the project

Recharge ponds filled, Naurangabaad reserve forest area, Paonta Sahib

Gabion check dam, Naurangabaad reserve forest area, Paonta Sahib

Grass plantation on recharge pond, Naurangabaad reserve forest area, Paonta Sahib

Industry Initiatives – Within the Fence

Improving Water Usage in Processes to Reduce Specific Water Consumption

Arvind Limited, Santej Unit, Kalol, Gandhinagar, Gujarat

Textile manufacturing unit

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OBJECTIVE

- To reduce specific water consumption by improving water use efficiency within the processes and thereby reduce cost of operations

RESULTS

- Industrial water saving – 20% (between year 2020 ~2021)
- Domestic water saving – 14% (between year 2020 ~ 2021)
- Specific water consumption reduced from 7.54 to 6.47m^3/million meters of fabric
- Saving in colour removal chemicals
- 80% of the total water demand is met from ETP-RO permeate

HOW ACHIEVED

- **Segregation of Wastewater Streams**
  - Wastewater from different divisions was collected in four separate tanks to dampen the fluctuation in flow and check for quality to ensure uniformity in effluent characteristics before further treatment
- **Reduce**
  - A SCADA system has been installed to scrutinize real time consumption data to help reduce losses
  - An overflow line has been connected to an empty storage tank to stop overflow
- **Recycle**
  - Machine process water is being recycled for fabric production
  - Sewage water is being treated and reused in humidification plant, DM water plant, gardening, and for chemical solution preparation
  - A high-pressure reverse osmosis system (4^{th} stage RO) was installed as a step prior to Multiple Effect Evaporator (MEE)
  - The dried salt recovered from this process is being used in the dyeing process
- **Reuse**
  - Steam condensate is being reused for membrane cleaning
  - Cooling water, earlier drained to the ETP, is being collected and reused in various processes
  - Condensate water recovered from dryers, sanfo machine and caustic recovery is being reused as product water in fabric processing
  - Humidification return water is being used for chemical solution preparation in ETP
- **Source Diversification**
  - Sewage water from Jashpur village is being treated in STP and re-used in cooling /boiler
  - This has helped save 2500m^3/day of water

Multiple effect evaporator

Mechanical vapor recompression evaporator

Effluent treatment plant

Reducing Fresh Water Consumption through 3R (Reduce, Reuse & Recycle) Approach

Balkrishna Industries Limited, Bhuj, Kutch, Gujarat

Tyre manufacturing plant

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OBJECTIVE

- To reduce fresh water consumption by installing air-cooled condenser (ACC) at the power plant, setting up a common RO reject recovery system and utilizing alternate sources of water such as rainwater

RESULTS

- **Reduce: Installation of Air – Cooling System**
  - Water saved – 1000m^3/day
  - Fresh water consumption reduced for thermal power plant – 2m^3/ MWh
  - Investment – INR 96 million
  - Savings - INR 21 million/annum
  - Payback period – 55 months
- **Recycle: Installation of 3rd Stage RO to Enhance Effluent Recovery**
  - Water saved – 61,320m^3/ annum
  - Steam saved – 20,000m^3/ annum
- **Reuse : Rainwater Harvesting**
  - Harvested rainwater available for natural recharge of ground water – 56,700m^3
  - Water saved – 100 to 140m^3/day (close to 3% of fresh water is utilized for industrial purposes)
  - Rainwater harvesting pond is helping aquatic life such as fish and bagula (stork)

HOW ACHIEVED

- **Reduce: Installation of Air – Cooling System**
  - The conventional cooling tower in the power plant has been replaced with an air – cooling system/condenser to reduce fresh water consumption lost through evaporation
- **Recycle: Installation of 3rd Stage RO**
  - Existing Multi Effect Evaporator (MEE) of 8.5 m^3/hr had the capacity to treat 7m^3/hr of reject from 2nd stage RO of the tyre and power plant wastewater treatment system
  - An additional 7m^3/hr reject is being produced by the 2nd stage RO of carbon black plant
  - A 3rd stage RO plant has been installed to treat the total reject of 14m^3/hr generated by the two plants
  - With the RO recovery plant having a capacity to recover 25,000 TDS, RO reject water at 50% recovery as permeate, reject of 7m^3/hr is being sent to the MEE
- **Reuse : Rainwater Harvesting**
  - The soil in the existing pond had low percolating capacity leading to the pond being in a nearly filled condition throughout the year and the harvested rainwater overflowing
  - An unlined pond has been constructed to enhance rainwater holding capacity to 56,700m^3 and allow the water to percolate freely
  - To avoid loss of collected rainwater, a filtration and pumping system has been installed to transfer the harvested rainwater to the industrial water treatment plant for utilization in operations

Air cooling at thermal power plant

Zero Liquid Discharge Unit

Rain water harvesting pond

Reducing Specific Water Consumption with Sustainable Practices

Bank Note Paper Mill India Private Limited, Mysore, Karnataka

Bank note paper manufacturing mill

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OBJECTIVE

- To reduce specific water consumption by recovering water and recycling in processes as well as by adopting sustainable water management practices such as diversification of water sources

RESULTS

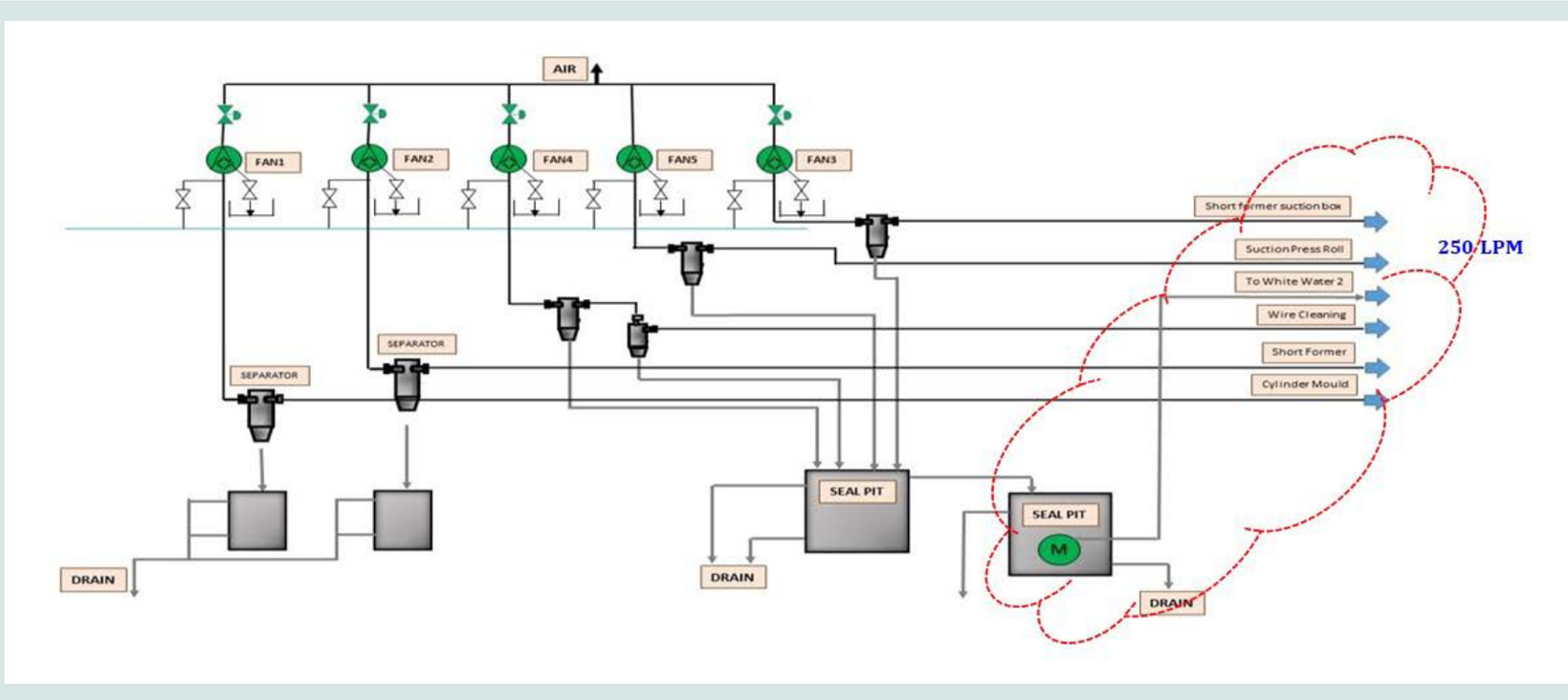
- Water saving through rainwater utilization – 34,400m^3 in one rainy season (equivalent to 30 days of entire plant water requirement)
- Water saving through utilization of recovered sealing water and back water of vacum system – ~300,000m^3/annum
- Effluent treatment plant load reduced – 900m^3/day
- Freshwater consumption reduced due to reduction in effluent generation – 825m^3/day
- Specific water consumption brought down to 56m^3/tonne of paper in December 2016 from 124m^3/tonne of paper in April 2016

HOW ACHIEVED

- **Source Diversification: Rainwater Utilization**
  - Utilizing BNPM's topographical advantage of 60 ft land elevation, the culvert is located at the bottom most point
  - A garland storm drainage system, with all drains connected to a culvert, has been constructed
  - Construction of a cross wall and pumping machineries have helped convert the culvert into a storage of 150m^3 capacity
  - Rainwater, runoff water and seepage from the entire premises are being collected in the culvert through storm water drainage and being transferred to a lagoon with 3600m^3 capacity
  - Harvested rainwater is being treated in secondary side of ETP and utilized for plant operations
- **Enhance Recovery and Recycling of Sealing Water in Process**
  - Earlier fresh water was being used in the vacuum system and pulp storage tank agitators
  - Backwater collected from vacuum seal pits and sealing water from agitators was being sent to ETP as effluent
  - After an exhaustive study of the prevailing systems, the processes were modified to collect and reuse the backwater from vacuum seal pit for level make-up and collect the sealing water from agitators in underground tanks, filter, and pump back to the process water system

Culvert connecting all drains

Rainwater storage at lagoon 3600m^3 capacity



Collection and reuse of vacuum sealing system water

Reducing Plant's Freshwater and Energy Consumption

Bosch Limited, Bidadi, Karnataka

Fuel injection equipment manufacturing unit

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OBJECTIVE

- To reduce freshwater and energy consumption by enhancing condensate recovery

RESULTS

- Freshwater consumption reduced by – 8800m^3/annum
- Costs saved – INR 1.1 million/annum

HOW ACHIEVED

- Condensate from Multiple Effect Evaporator (MEE) which was earlier going to Effluent Treatment Plant (ETP) is now being collected in separate tanks and polished through a recovery treatment plant resulting in reduction in water and energy consumption
- The treated MEE condensate is being reused for cooling tower make-up, MEE boiler make-up and surface treatment baths
- The Air Handling Unit (AHU) condensate generated by the Heat Ventilation and Air Conditioning (HVAC) process is being reused in the AHU's cooling tank make-up

Air handling unit

RO plant for ETP

MEE condensate recovery plant

Creating Infrastructure for Conserving Freshwater

CD Technotex LLP, Erode, Tamil Nadu

PP woven fabric and sacks manufacturing plant

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www.ceedees.com

OBJECTIVE

- To conserve water by reducing freshwater consumption through:
  - improved monitoring systems
  - reuse of STP treated water
  - installation of rainwater harvesting recharge structures

RESULTS

- Freshwater consumption reduced by 63% – from 60m^3/day to 22m^3/day
- Water saved by reusing RO reject in restrooms – 5m^3/day (1750m^3/annum)
- STP treated water utilized for green belt development

HOW ACHIEVED

- Six flow meters have been installed on the raw water line and 7 on the RO water line
- Two fully automatic sequential batch reactor based STPs of capacity 5m^3/day and 3m^3/day respectively have been installed
- A trench has been constructed along the plant's periphery to collect and direct rainwater into the open well
- RO reject is being collected for use in restrooms

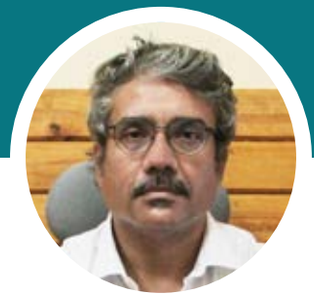
Trench Rainwater collection trench along plant periphery

Trench Rainwater collection trench along plant periphery

Green Belt

Optimizing Cycles of Concentration in Cooling Towers

CESC Limited, Budge Budge Generating Station (BBGS), West Bengal



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OBJECTIVE

- To reduce specific water consumption and cost of chemicals used in the cooling water system through installation of an advanced remote monitoring system in the Cooling Tower Circulating Water (CTCW) network

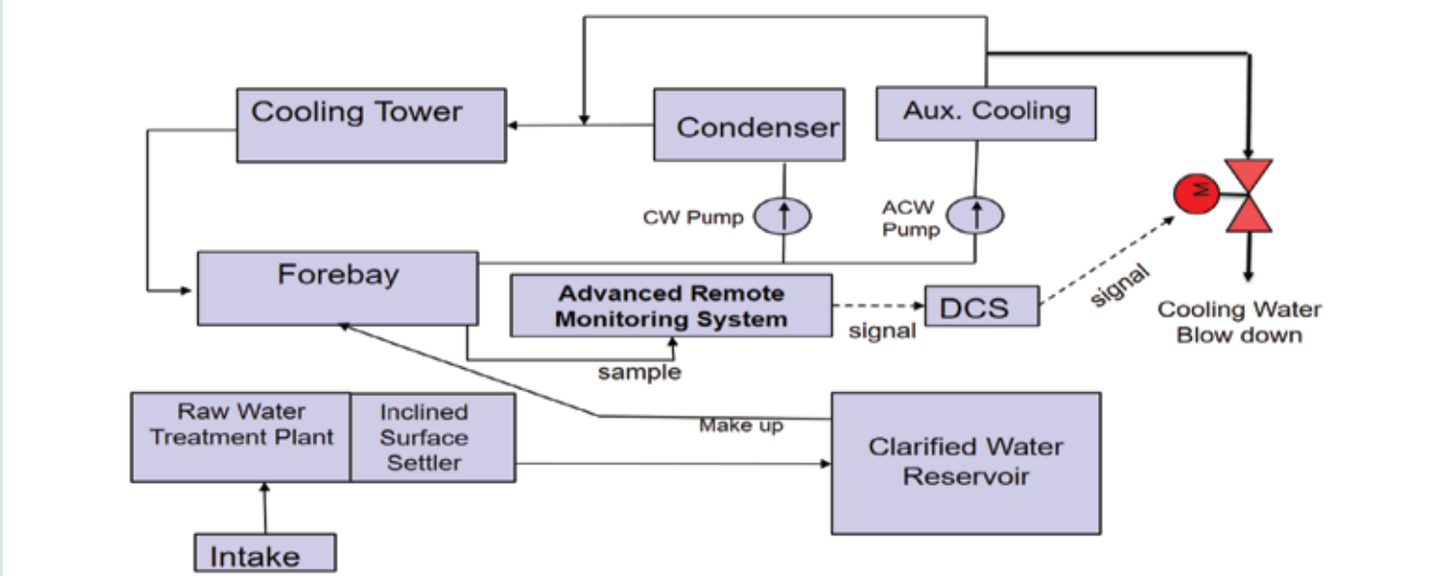
RESULTS

- Freshwater consumption reduced – around 1024m^3/day
- Specific water consumption reduced – 13%
- Substantial saving in cost of chemicals required for raw water treatment and cooling tower circulating water system

HOW ACHIEVED

- Earlier, the cooling tower blowdown was being performed after manual sampling, testing, decision making. The valve was manually operated in the field causing an inherent delay and increased use of water and chemicals
- An advanced remote monitoring system was installed for online monitoring of the chemical parameters of the circulating water
- The motorized cooling tower blowdown valve was replaced by an auto-controlled valve programmed to operate within a pre-set conductivity band and operable from the control room
- This process change ensures that blowdown initiates only when required with no time lag, resulting in reduced chemical costs and specific water consumption

Cooling Tower Blow Down Valve



Schematic Diagram CTCW system

Applying 4Rs for Water Conservation

Chitkara University, Chandigarh, Punjab

OBJECTIVE

- To conserve freshwater through adoption of the 4R approach – Reduce, Reuse, Recycle and Replenish

RESULTS

- Freshwater replaced by treated water for irrigation of 84,579m^2 green belt on the campus
- Campus ground water level improved – from 59mbgl (meters below ground level) to 52mbgl over 10 years

HOW ACHIEVED

- All water pumps have been automated with a sensor-based system and telemetric modules have been installed to enable online monitoring of freshwater motors
- Two Sewage Treatment Plants (STPs) and 7 dual plumbing systems have been installed on the campus
- The research and innovation department has developed 80wash, a washing machine which uses only a glass of water to wash clothes
- 1.42ha of land has been developed using Karnal Technology and sprinklers have been installed in the lawns
- Piezometers have been installed for monitoring ground water levels

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Sewage Treatment Plant

Sprinkler system for gardening

Rain-Water-Harvesting

Reducing Specific Water Consumption in Sugar Manufacturing Process

DCM Shriram Limited, Sugar Unit-Rupapur, Hardoi, Uttar Pradesh

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OBJECTIVE

- To reduce specific water consumption by 10%

RESULTS

- Specific water consumption reduced by – 12%
- DM water consumption reduced – from 7.4% to 5.4% in feed water

HOW ACHIEVED

- Turbine steam pipelines, de-aerator and feed tank have been insulated to save heat losses
- Steam traps have been installed to help reduce losses in return condensate
- Hydro jetting technology is being used for tube cleaning
- Preventive and condition based maintenance are undertaken regularly which have helped improve plant uptime
- Flow measurement and monitoring are being done in various streams
- Treated STP water is now being used for toilet flushing and car wash
- Water efficient faucet taps have been installed in the unit
- Excess condensate is being stored in the lagoon and reused during plant stoppage
- Water treated through a newly installed spray treatment plant is being reused for irrigation purposes

State of art ETP – footprint 10,000 sq.m

Lagoon – storage of reuse and recycled water to reduce borewell extraction

Secondary stage clarifier

Deploying Innovative Technology for Irrigation Automation

Delhi International Airport Limited, New Delhi

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OBJECTIVE

- To optimize irrigation water requirement at Indira Gandhi International Airport by using technologically advanced solutions

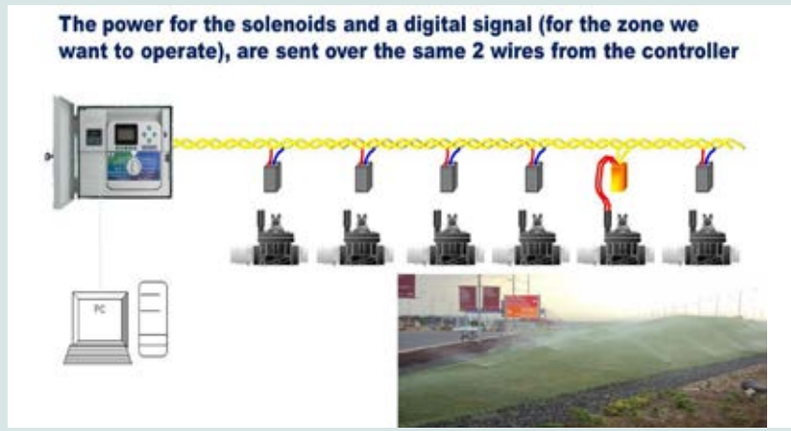
RESULTS

- Irrigation water demand reduced – from 25m^3/ha/day to 22m^3/ha/day.
- Fresh ground water saved annually by utilizing recycled water from STP – 30,976m^3/annum.

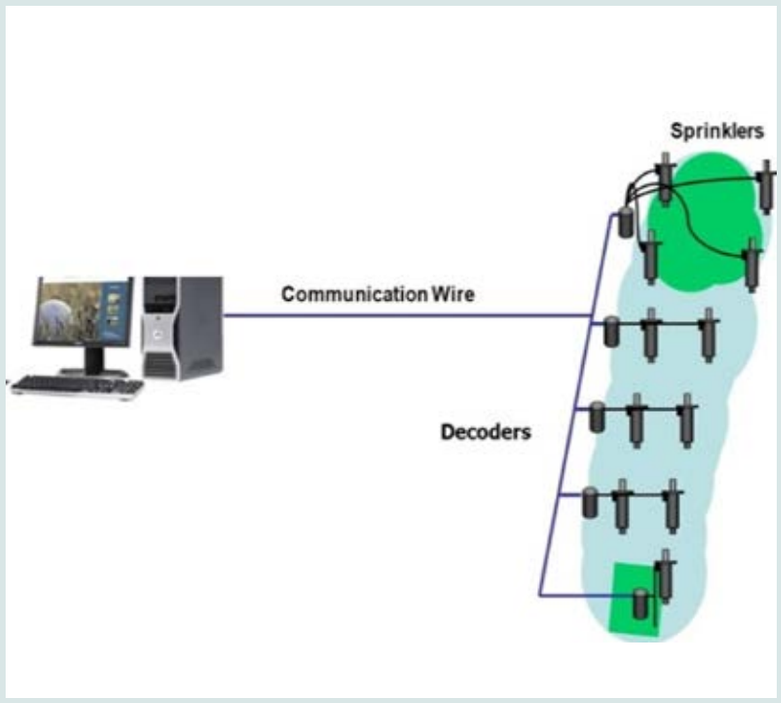
HOW ACHIEVED

- An advanced microprocessor based smart irrigation system has been deployed for precise, pre-defined and pre-calculated quantity of water to be used in the landscaped areas
- This irrigation system is based on the real-time weather sensors integrated with the control system and 180 nos. of solenoid valves
- **Key highlights of this customized automated system include:**
  - highly efficient "Variable Frequency Drive" operated booster pumping system
  - automatic control system including decoders, D B cables and over 400 solenoid valves
  - dedicated irrigation pipe network of 120km
  - a drip line network of 270,000m for regular watering of plants
  - advanced and efficient automated drippers, sprinklers and a fogger system

Green Corridor at IGI Airport- advanced microprocessor based smart irrigation system



Automated Irrigation System



Automated Irrigation System Decoders

Advanced and efficient automated drippers, sprinklers system.

Using Advanced IoT Enabled Systems for Improved Water Management

G. Kuppuswamy Naidu Memorial Hospital, Coimbatore, Tamil Nadu

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www.gknmhospital.org

OBJECTIVE

- To improve water management by installing water flow meters and recycling treated sewage and effluent for various applications

RESULTS

- Water related expenditure reduced – up to 15% in 2020 as compared to 2019
- Potential inefficiencies in water consumption was identified through "AquaGen" – The "Water Management Solution", which increases the awareness of water consumption at all consumption units and helps in optimizing the water usage
- Water saving – 691m^3/day

HOW ACHIEVED

- Water flow meters have been installed at the source and consumption points
- Level sensors have been installed in drinking and borewell water tanks
- A state-of-the-art IoT based real time flow monitoring and conservation system, AquaGen, has been implemented under a collaboration with FluxGen Sustainable Technologies Pvt. Ltd.
- A rainwater harvesting system has been constructed with 2 sumps having a total capacity of 600m^3 and 12 pits to recharge the ground water. The total rainwater harvesting potential of the facility is 11,028m^3/annum
- STP is used for recycling 368m^3/day of treated sewage
- In addition, 273m^3/day of recycled water from STP-RO is being used for landscaping, dual flush system, laundry, and chiller cooling tower
- Water from ETP is further treated in a 4 stage RO plant to achieve Zero Liquid Discharge (ZLD) status and the reject from RO is further used for gardening and landscaping
- 50m^3/day of wastewater from dialysis and laundry is being recycled

Rainwater harvesting system to recharge the ground water, G.Kuppuswami Memorial Hospital, Coimbatore

Sewage treatment plant at G.Kuppuswami Memorial Hospital, Coimbatore

Four stage RO (ZLD – Zero Liquid Discharge), installed at G Kuppuswami Memorial Hospital, Coimbatore

Improving Water Use Efficiency Through Enhanced RO Recovery

GMR Warora Energy Limited 2x300 MW, Warora, Maharashtra

A coal based thermal power plant

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deepakkumar.dash@gmrgroup.in
www.gmrgroup.in/energy/

OBJECTIVE

- To reduce fresh water consumption and minimize wastewater generated by improving RO recovery from 59% to 72%
- To reduce the specific chemical consumption in RO plant and improve the DM water quality

RESULTS

- Water saved – 108,709m^3/annum
- Mixed bed productivity increase – 75% (OBR improved from 1600m^3 to 2800m^3)
- Demineralised water quality improved – 62% (silica reduced from 14ppb to 9ppb)
- Energy saved – 13,024kWh/annum
- Specific water consumption reduced to 2.20m^3/MWh against the national benchmark of 2.25m^3/MWh

HOW ACHIEVED

- **Understanding Existing RO Plant and Recovery Process**
  - RO recovery was studied in different operating conditions such as clarified raw water and cooling tower blowdown as input and separate pH ranges for feed water from two different sources
  - Based on a physical inspection of RO membranes action has been taken to rectify defects, if any
  - Autopsy of old RO membrane helped to identify deposits in the membrane module
- **Process Improvement**
  - Suitable anti-scalant for high silica has been selected after several trials in RO membranes
- **Stream Segregation and Upgradation of Water Treatment System**
  - Streams have been separated to treat the clarified raw water and cooling tower blowdown water
  - Cooling tower treatment programme has been selected for low phosphate based chemical treatment
  - A provision has been made for a bypass line to cooling tower from RO permeate to increase productivity during cooling tower water treatment
  - The submerged UF system has been covered by an acrylic sheet to reduce treated water contamination
  - DM water is being circulated through the CIP system whenever RO system is idle for over 48 hours
  - MCF performance has improved after physical inspection and stability comparisons

RO Plant

Membrane unloading for inspection

Membrane loading after inspection

Conserving Natural Resources Through Effluent Recycling

Gujarat Fluorochemicals Limited, Dahej, Bharuch, Gujarat

Fluoropolymers, Refrigerants and Chemicals manufacturing unit

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OBJECTIVE

- To conserve natural resources, by recycling condensate and effluent and membrane based effluent recycling system

RESULTS

- Centralized Condensate Polishing Unit
  - Substantial savings in water, which is contributing to the company's CSR commitments – 437,500m^3/annum (FY 2018-19)
  - Coal saved through utilization of return condensate and heat recovery: 4900MT/annum

  Centralized Effluent Treatment Plant
  - Water consumption reduced – approximately 12%
  - Water saved - 1800m^3/day
  - Overall handling of effluent discharge to GIDC reduced by 40%

HOW ACHIEVED

- Centralized Condensate Polishing Unit
  - Condensate from individual plants in the complex is being collected and polished in dedicated "Condensate Polishing Unit" designed condensate with resins meant for high temperature treatment (80-85^0 C)
  - Inlet parameters defined as: conductivity <10 micro-siemens, silica: 0.05ppm and output between regeneration is 1000m^3/day
  - Outlet parameters defined as: conductivity <1 micro siemens, silica <0.02-0.03ppm
  - Specific steam consumption of turbine as well as the number of turbine washing have reduced to once a year from 3 times in a year, improving machine reliability and availability

- Centralized Effluent Treatment Plant
  - Effluent generated from all individual plants in the complex is being collected in the equalization tank and bifurcated in to two major streams viz. High TDS (HTDS) stream and Low TDS (LTDS) stream
  - HTDS streams are further separated into micro level of High -High TDS (HHTDS) streams for which a separate facility has been installed
  - LTDS effluent stream feeds into the effluent recycling system (membrane separation process) and the reject water from the ERS is being treated in HHTDS treatment system
  - An Effluent Recovery and Separation System, with designed capacity of 2400m^3/day, was installed for treating 2165m^3/day of LTDS effluent, which is saving 1800m^3/day of water

UF Membrane

RO Membrane

UF Basket Strainer

Conserving Water and Energy Through Source Diversification

Haldia Energy Limited, Haldia, West Bengal

OBJECTIVE

- To reduce freshwater consumption through source diversification such as use of rainwater as an alternate source of water

RESULTS

- Freshwater consumption reduced by – approximately 1.4 million m^3/annum
- Specific water consumption reduced by 18.5% – from 2.80m^3/MWh to 2.28m^3/MWh
- Power saved on account of pumping energy - 1000MWh per/annum
- Coal (fuel) saved - about 500 tonnes/annum
- CO_2 emissions reduced – over 900 tonnes/annum
- Effluent discharge reduced - 15%
- Overall cost reduced over 5 years – INR 8 million

HOW ACHIEVED

- More than 75% of the total plant surface area is now covered by a large-scale rainwater harvesting scheme
- Rainwater surface run-off areas were identified while ensuring that areas out of the scope of the systems, such as ash handling plant and water treatment plant, are first isolated by separate drains and isolation gates to help channel the water in guard pond
- All areas included in the rainwater harvesting system have been interconnected by modifying the drain network and drain slopes have been redesigned to divert water to the holding ponds
- Two water holding ponds, with capacity 89,000m^3 and 15,000m^3, have been created to store rainwater
- Holding ponds have been connected to the plant's main reservoir though non-concrete drains for both cost effectiveness and environmental sustainability
- Major rainwater is being utilized in the raw water reservoir, while water accumulated in low lying and catchment areas is being utilized in post monsoon months
- Holding pond water is being utilized in the summers for reducing the intake water salinity in various utilities, thus reducing water consumption in the blow down

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Rainwater harvesting pond with a capacity of 89,000m^3 has been created within the plant premises

Large numbers of birds (Lesser Whistling Teals)

Major rainwater feeds into a raw water reservoir in plants for reducing salinity

Adopting Reduce, Reuse, Recycle & Recharge (4R) Approach for Water Conservation

Hero MotoCorp Limited, Gurgaon, Haryana

Two wheeler manufacturing unit

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OBJECTIVE

- To reduce freshwater consumption by adopting the 4R approach – Reduce, Reuse, Recycle and Recharge

RESULTS

- Overall freshwater consumption reduced by 16% from year 2018 to 2019
- Enhanced recovery of 1st stage RO membrane from 75% to 85%

HOW ACHIEVED

- Recovery of 1st stage RO membrane has been enhanced by replacing existing membranes with high recovery DuPont (DOW) FILMTEC membranes
- 100% industrial wastewater being recycled through the 2nd stage RO plant, followed by Multiple Effect Evaporator is being utilized in the processes
- Treated sewage is being recycled and converted into softwater for use in the cooling process
- Cooling technology has been upgraded by replacing conventional type cooling towers with waterless closed loop heat exchangers
- Water cool teflon seal pumps have been replaced with mechanical seal type pumps
- An atmospheric water generator has been installed to produce 100 litres/day of drinking water from atmospheric moisture
- Rainwater harvesting and recharge system with potential capacity of 0.12MCM have been constructed
- Water supply lines pressure has been reduced and flow reducing nozzles installed in taps in hand washing area

STP Recycle Plant

Rain water harvesting

ETP Recycling Plant

Reducing Hazardous Waste Through Sodium Sulphate Recovery

Hindustan Zinc Limited, Dariba, Rajsamand, Rajasthan

Lead & Zinc smelting complex

OBJECTIVE

- To recover sodium sulphate from hazardous waste

RESULTS

- Hazardous waste to landfill reduced by – 70%
- Sodium sulphate generated with purity - > 99%
- Value generated – INR 35 million/annum
- Total investment in the project - approximately INR 112.5 million

HOW ACHIEVED

- Earlier, the Multiple Effect Evaporator salts, that contain sodium sulphate and sodium chloride, recovered after RO reject treatment were being disposed in a secured landfill (SLF)
- Now sodium sulphate is being used in the hydro smelting process in the leaching section
- Sodium sulphate recovery plant has been commissioned to generate 4500tonnes/annum, approximately 30% of process requirement
- Freeze precipitation followed by Multi Effect Evaporation system has been installed to recover sodium sulphate

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https://www.hzlindia.com/

Sodium sulphate bagging system

Sodium sulphate recovery system

Sodium sulphate drying section 1

Conserving Ground Water Through Rainwater Harvesting

Honda Motorcycle and Scooter India Private Limited, Narsapura, Kolar, Karnataka

Sunil Kumar Pandita
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sunil.pandita@honda2wheelersindia.com
www.honda2wheelersindia.com

OBJECTIVE

- To mitigate business risk of water availability with minimal environmental footprint and to achieve self-sufficiency in water through maximum rainwater utilization
- To eliminate use of freshwater for factory requirement

RESULTS

- 100% annual water requirement of the factory met by rainwater and treated effluent since financial year 2016-17
- Lowest specific water consumption (SWC) amongst automotive Original Equipment Manufacturers in Asia Pacific region - 0.063m^3/vehicle (Jan 2019 – Dec 2019)
- Zero Liquid Discharge factory since inception
- One of the first large scale companies to treat and utilize collected rainwater for drinking purposes
- Neighbouring factories and homes started replicating these initiatives, thus helping the society and resulting in enhanced ground water levels
- Water saved by the plant 149,487m^3/annum
- Amount of ground water being recharged 229,368m^3/annum

HOW ACHIEVED

- For rainwater collection a 24,000m^3 closed tank and 23,000m^3 capacity open tank have been constructed, considering the five-year rainfall trend
- Initially, 70% of water requirement was met through borewell and the remaining 30% from the closed rainwater collection tank
- Water treatment plants were setup to treat and use rainwater collected in tanks
- With daily water requirement rising after factory expansion a new rainwater collection tank of 33,000m^3 was constructed helping to increase total rainwater collection capacity to 80,000m^3 (sufficient to meet the factory's water requirement for 6 months)
- As the factory receives rain, both during the north-east and south-west monsoons, the unit utilizes rainwater collected across the year
- Out of the total rainwater collected, 90% is being used for domestic consumption and 10% for industrial consumption
- Remaining industrial water requirement is being met by treated effluent from the effluent treatment plant

Open water tank-23000m^3

Underground tank - 33000m^3

Advanced effluent recycling method deployed – electro deposition reverse osmosis

Aerial view of STP

Water Conservation Through Innovative Water Management Projects

Indian Farmers Fertiliser Cooperative Limited, Aonla Unit, Bareilly, Uttar Pradesh

Pradeep Sharma
T : 0581-2404034
pradeep_sharma@iffco.in
www.iffco.in

OBJECTIVE

- To conserve water by implementing various innovative schemes in IFFCO's Aonla Unit

RESULTS

- Total fresh water saved
  - 6,528m^3/day
  - 3,371,800m^3 /annum
- Total wastewater recycled: 3,252m^3/day

HOW ACHIEVED

- Operational practices for underground fire hydrant header have been improved
- A process has been designed for reuse of cooling water returning from lube oil/seal oil turbine bearings and condensate from gland condenser of compressor house in ammonia-I plant as cooling tower make-up
- Carbon dioxide Recovery (CDR) plant wastewater is being recycled as cooling tower make-up
- Condensate from intermediate coolers of compressor house and sample cooler water of ammonia-II plant are being utilized as cooling tower make-up
- CO_2 compressor inter stage separator condensate, seal condensate outlet, Vapour Absorption Machine (VAM) condensate amongst others are being recovered in urea plants through treatment and recycling
- Wastewater generated by the power plant is being used for irrigation
- Storm drain water/domestic effluent of plant is being used for irrigation of the plant's green belt and lawns
- Increased the limit of chloride content in circulating cooling water from 300mg/l to 500mg/l

Wastewater generated in power plant is reused for irrigation purposes

Storm water drain / domestic effluent from the plant is used for irrigation purposes

Cooling water return from lube oil / seal oil turbine bearings and condensate from gland condenser of compressor house is reused in Ammonia-I Plant as cooling tower make-up

Using Waterless Cleaning System to Reduce Freshwater Consumption

Indo Count Industries Limited, Kolhapur, Maharashtra

Prashant Patil
T : +91 9888239970
prashant.patil@indocount.com
www.indocount.com

OBJECTIVE

- To reduce freshwater consumption by eliminating water required for cleaning filters used in bleaching and mercerising, a key process in the textile industry

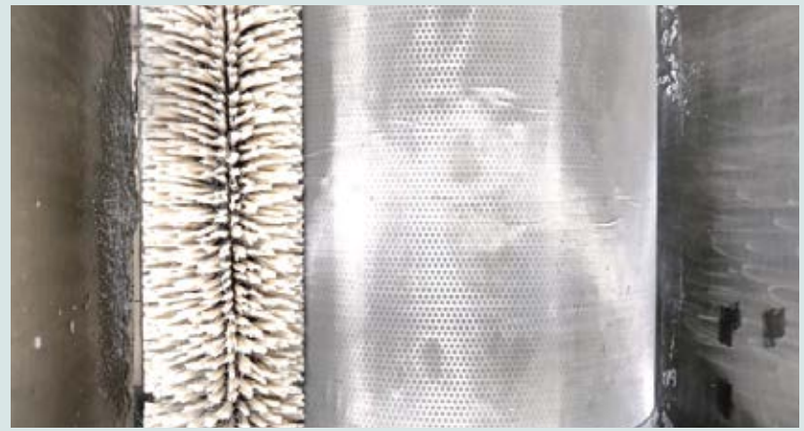
RESULTS

- Freshwater consumption reduced by 50,400m^3/annum/ machine resulting in saving of – 172,800m^3/annum
- Effluent volume in ETP reduced by – 172,800m^3/annum

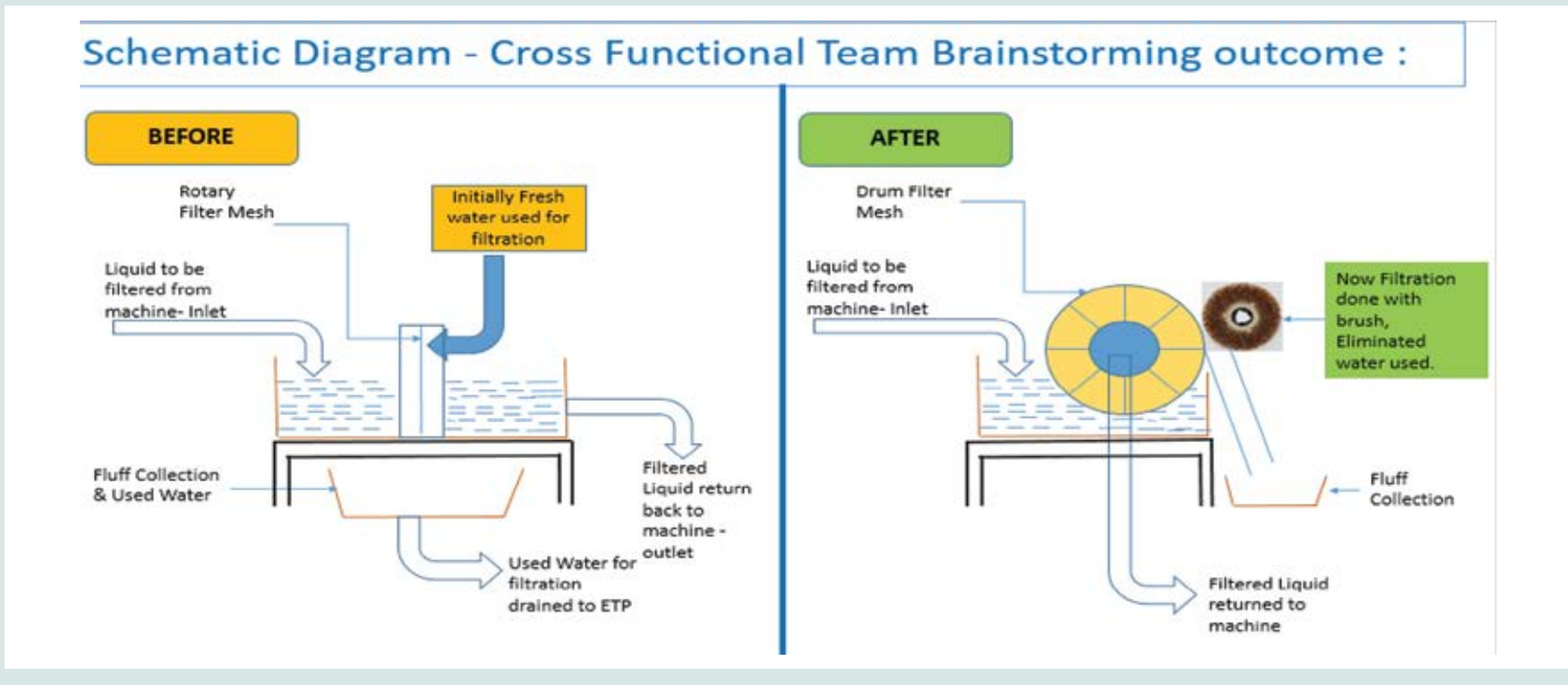
HOW ACHIEVED

- Filter cleaning assembly has been modified from water spray to "Cleaning by Brush" mechanism for cleaning online, the accumulated fluff on drum filters of wet processing machines. This helped to eliminate water required for cleaning
- Trials were performed on one machine first and then successfully replicated on all machines in the department

Before – Rotary Filter Mesh



After – Brush Filter Installation



Before After Schematic Comparison

Using Customised Technology for Improved Water Use Efficiency

ITC Limited - Paperboards & Specialty Papers Division, Bhadrachalam, Telangana

M Phani Kumar
T : +91 9866220187
phani.marella@itc.in
www.itcpspd.com

OBJECTIVE

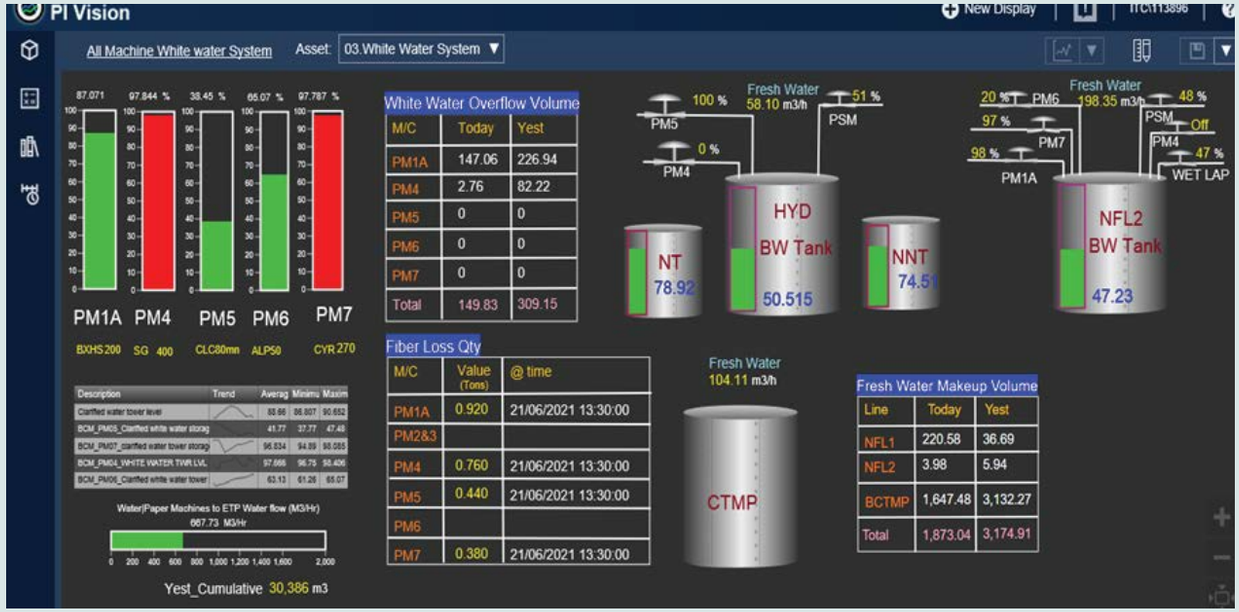
- To achieve continual improvement in water conservation by switching to water efficient technologies and processes
- To become a national and global benchmark for specific water consumption per ton of saleable product manufactured

RESULTS

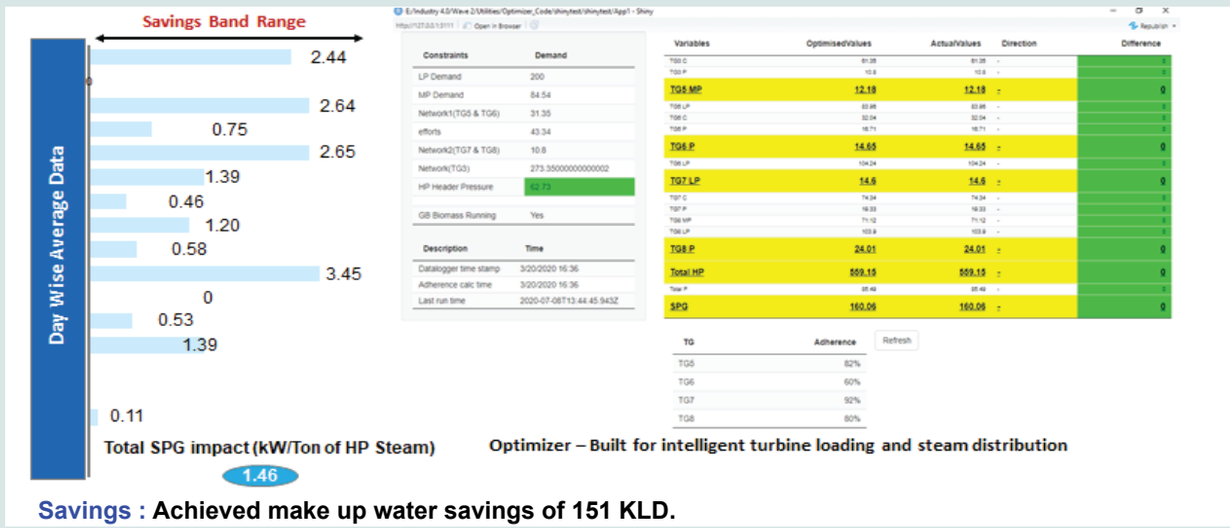
- Specific water consumption reduced from 42.4 to 31.5m^3/ton of product from financial year 2017-18 to financial year 2021-22
- Water consumption reduced due to various initiatives undertaken from financial year 2020-21 to 2021-22 is 2857m^3/day

HOW ACHIEVED

- A special algorithm has been developed for automatically optimizing set points of turbines for the operator
- On adhering to the set points, the specific power generation improved by 1.46 units
- The power demand being constant has helped to reduce inlet HP steam, thereby reducing condensate and evaporation loss in cooling tower by 151m^3/day
- A real time monitoring system has been developed and integrated with all paper machines and pulp mill daily management teams
- This helped to determine the real time availability of white water from paper machines. It is being used to optimize fresh water for pulp dilution and bringing consistency to 4%



White water reuse dash board



Specific steam saving algorithm in turbines

Adopting RO Processes to Optimize Water Consumption

ITC Limited, Foods Division, Malur, Kolar, Karnataka

Madineni Prasad
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madineni.prasad@itc.in
www.itcportal.com

OBJECTIVE

- To optimize water consumption by secondary treatment of RO reject water and reduce freshwater consumption by utilizing ETP treated water for toilet flushing

RESULTS

- Water consumption reduced by 4366m^3/annum
- Cost saving – INR 0.632million/annum
- RO-reject being directly drained to the ETP – reduced from 18m^3/day to 9m^3/day
- Utilizing ETP treated water for toilet flushing resulted in freshwater saving of 4m^3/day

HOW ACHIEVED

- After installation of a 2nd stage RO system in the water treatment plant to treat reject from 1st stage RO, the reject from 2nd stage RO is being sent to the ETP
- A similar technology, being used in the canteen RO system, has helped to increase water recovery by 50%
- Water consumption is being monitored using 15 water flowmeters available in the plant
- A pareto analysis performed on the water consumption data collected found that domestic freshwater consumption, in areas such as rest rooms in the plant, was averaging about 14m^3/day
- A 5m^3 overhead tank was installed to substitute freshwater with ETP treated water for use in toilets helping save 4m^3/day of freshwater

ETP treated water storage tank for toilet flushing

Water flowmeter for rest room

Second stage RO system installed in the water treatment plant to treat reject from first stage RO

Optimizing Cycles of Concentration to Reduce Freshwater Consumption

Jhajjar Power Limited (An Apraava Energy Company), Jhajjar, Haryana

Aananth R M
T : +91 8198900862
aananth.r.m@apraava.com
https://www.apraava.com/

OBJECTIVE

- To reduce freshwater consumption by increasing the cycles of concentration in the cooling tower

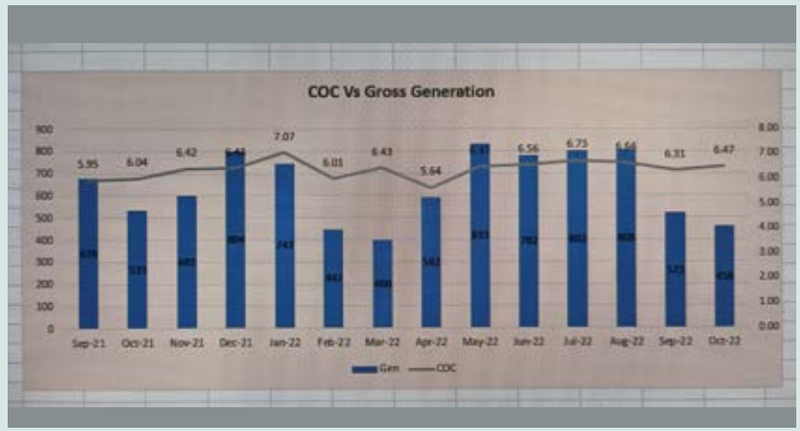
RESULTS

- Cycles of concentration (CoC) enhanced - from 5.00 to 6.50
- Freshwater consumption reduced by – close to 3000m^3/day
- Specific water consumption reduced - 2.07m^3/MWh in 2021

HOW ACHIEVED

- Chemical treatment programmes (polymers & biocides) have been streamlined by installing the 3D TRASAR™ automation system
- Parameters such as scaling inhibitors, corrosion inhibitors, pH and conductivity are being monitored online which has helped in maintaining chemical dosages as per the system's requirement. This has led to a reduction in chemical consumption and enhancing the CoC

3D TRASAR™ System



Cooling Water CoC trend

CW return line to sump to reduce evaporation loss

Adopting Zero Liquid Discharge for Enhanced Sustainability

JK Cement Limited, Mangrol, Chittorgarh, Rajasthan

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T : +91 9530407218
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www.jkcement.com

OBJECTIVE

- To cultivate Zero Liquid Discharge (ZLD) approach for reducing dependency on fresh ground water for horticulture, supressing dust and supporting Sustainable Development Goals

RESULTS

- 100% reuse of wastewater has reduced dependency on freshwater for horticulture, dust suppression and process cooling and helped to make the operations ZLD
- Fresh water saved – 2890m^3/annum (from financial year 2018-19 to financial year 2019-20)

HOW ACHIEVED

- Wastewater generated from the power generation water treatment plant was earlier used for controlling fugitive emission in coal storage area
- This storage has been covered, and the wastewater is being diverted to the mill spray, where it has successfully replaced freshwater consumption without impeding the manufacturing processes
- All utilities in the premises have been connected to the STP and the treated sewage is being used for agricultural purposes, thereby reducing freshwater consumption.
- Reduced dependency on ground water by utilizing abandoned mine pits for rain water storage

Sewage Treatment Plant

Waste Heat Recovery System (WHRS)

Sustainable Mine Pit Water Collection

Enhancing Water Use Efficiency for Reduced Freshwater Consumption

JK Tyre & Industries Limited, Chennai Tyre Plant, Chennai, Tamil Nadu

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satpathy.sk@jkmail.com

M Pandiarajan
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http://www.jktyre.com

OBJECTIVE

- To reduce demineralized water consumption and domestic water consumption in the plant and reduce freshwater consumption in industrial processes

RESULTS

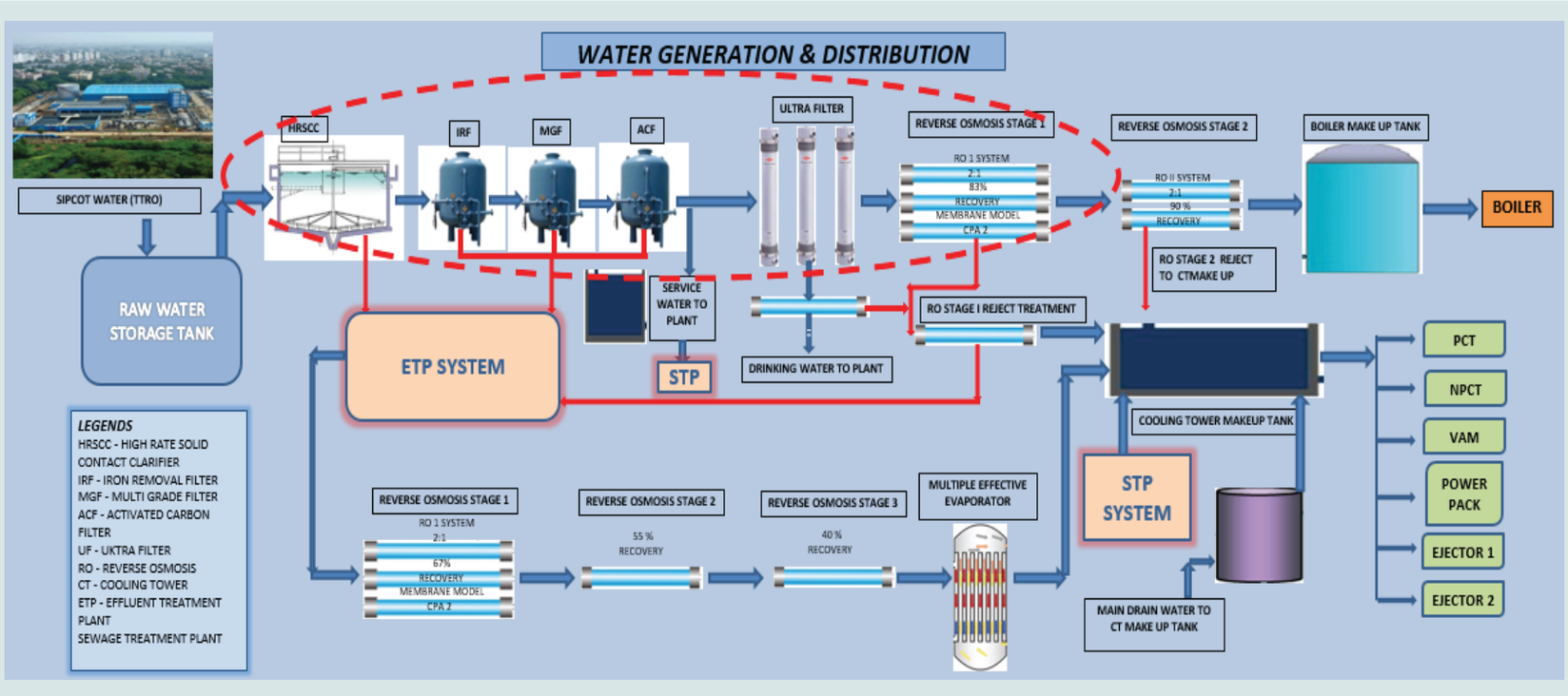
- Freshwater consumption in plant processes reduced by 124,250m^3/annum
- Effluent generation from RO reduced by 15,975m^3/annum
- Fresh DM water make up for boiler reduced by 23,075m^3/annum
- Boiler make up water decreased by 24%
- Domestic water consumption reduced from 35,500m^3/annum to 28,400m^3/annum

HOW ACHIEVED

- Tertiary treated RO water is being sourced from SIPCOT through a separate pipeline
- Plant treated sewage water is now being further treated in the RO and being used for in-plant processes
- Rainwater is being harvested and used for gardening through drip irrigation
- Using nitrogen as internal cure media has helped to eliminate the use of hot water as well as steam for the hot water system. Water used for boiler make up has also reduced
- Domestic water is being distributed through gravity flow instead of pressurized flow
- Aerators, with flow restrictors, have been installed on the taps to reduce domestic water usage during hand wash
- Toilets have been converted into waterless flushes or provided with sensors to reduce domestic water usage
- Float in 76 toilet flush tanks has been adjusted to reduce its hold up capacity form 6 litres to 3 litres

Hotwater plant

Nitrogen plant



TTRO Water

Eliminating Fresh Water Usage in Industrial Processes

JK Tyre & Industries Limited, Kankroli, Rajasthan

Davendra Singh Seervi
T : +91 9799999904
dsseervi@jkmail.com
www. jktyre.com

OBJECTIVE

- Achieving zero freshwater usage in the plant's processes by installing a Zero Liquid Discharge (ZLD) unit

RESULTS

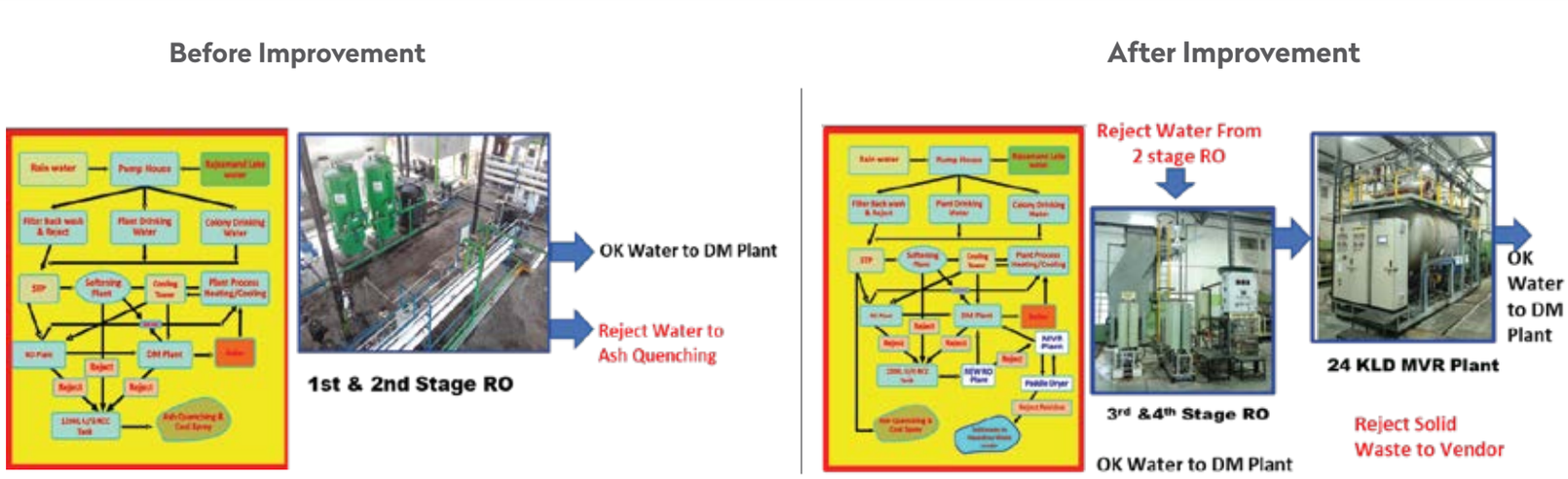
- Zero freshwater consumption in industrial processes since June 2021
- Recycled water consumed by plant processes increased (RO & MVR) – 174,00m^3/annum
- The plant attained ZLD status in the year 2021

HOW ACHIEVED

- The High TDS reject water from RO and DM plant, with a high probability of seepage into the ground, was earlier being used for coal wetting and quenching
- To address this important issue of ground water contamination, a 3rd stage RO has been installed along with a MVR (Mechanical Vapour Recompression) unit
- Now the reject water from DM and 2nd stage RO is being used in 3rd stage RO plant and the permeate water from 3rd stage RO is being sent to the DM inlet
- The reject water of 3rd stage RO is being used in MVR unit
- Condensate from MVR (95 % yield) is being used for DM plant inlet and solid waste from MVR is sold to an authorized vendor
- The improved wastewater recovery has resulted in eliminating freshwater consumption by the plant processes and converting the plant in to a ZLD Unit beyond compliance requirement.

24 KLD MVR unit installed at the plant

60 KLD RO unit



Process improvement to eliminate freshwater usage

Reducing Freshwater Consumption by Reusing Township Sewage

JSW Steel Limited, Vijaynagar, Sandur, Karnataka

R T Srinivasa Rao
T : +91 8395 244005
srinivasrao.raydurg@jsw.in
www.jsw.in

OBJECTIVE

- To reduce freshwater consumption in the Cold Rolling Mill (CRM-2) by using township treated sewage

RESULTS

- By using treated municipal wastewater RO permeate, freshwater consumption reduced by - 3800m^3/day
- Cost of freshwater consumption saved - INR 13 million/ annum
- Capacity utilization of the CRM-2 wasterwater-RO (capacity of 6900m^3/day) enhanced - from 42% to 92%
- Recycling township sewage aligned with JSW Vijaynagar's long-term target of achieving and sustaining Zero Liquid Discharge status

HOW ACHIEVED

- Township sewage is being treated through membrane bio reactor (MBR) and RO unit
- Conventional sewage treatment plant at Shankar Hill Township (SHT) has been retrofitted with a MBR of 3000m^3/day capacity, making it suitable to feed the wastewater RO unit at CRM-2
- A 1.12 mile pipeline has been laid to route sewage from VV Nagar Township STP (800 m3/day) to CRM-2 ETP aeration tank
- Routing this treated sewage from SHT and VV Nagar townships to CRM-2 ETP and WW-RO for further polishing led to improved capacity utilization of the CRM-2 WW-RO
- This wastewater RO permeate is being used in CRM-2 as DM plant feed and make up in cooling towers for CRM-2 and Hot Strip Mill-2 (HSM-2)

MBR Technology at Township STP

RO Plant at CRM-2

MBR treated water quality

Reducing Freshwater Consumption by Treating Wastewater

Kings International Limited, Unnao, Uttar Pradesh

Tannery and Finished Leather Products manufacturing unit

Amir Ausaf
T : +91 7379786644 / 9918921401
inspection@kings-international.net
www.kings-international.net

OBJECTIVE

- To reduce freshwater consumption by adopting the 3R approach
- To upgrade the wastewater treatment system with electro oxidation to reduce freshwater consumption

RESULTS

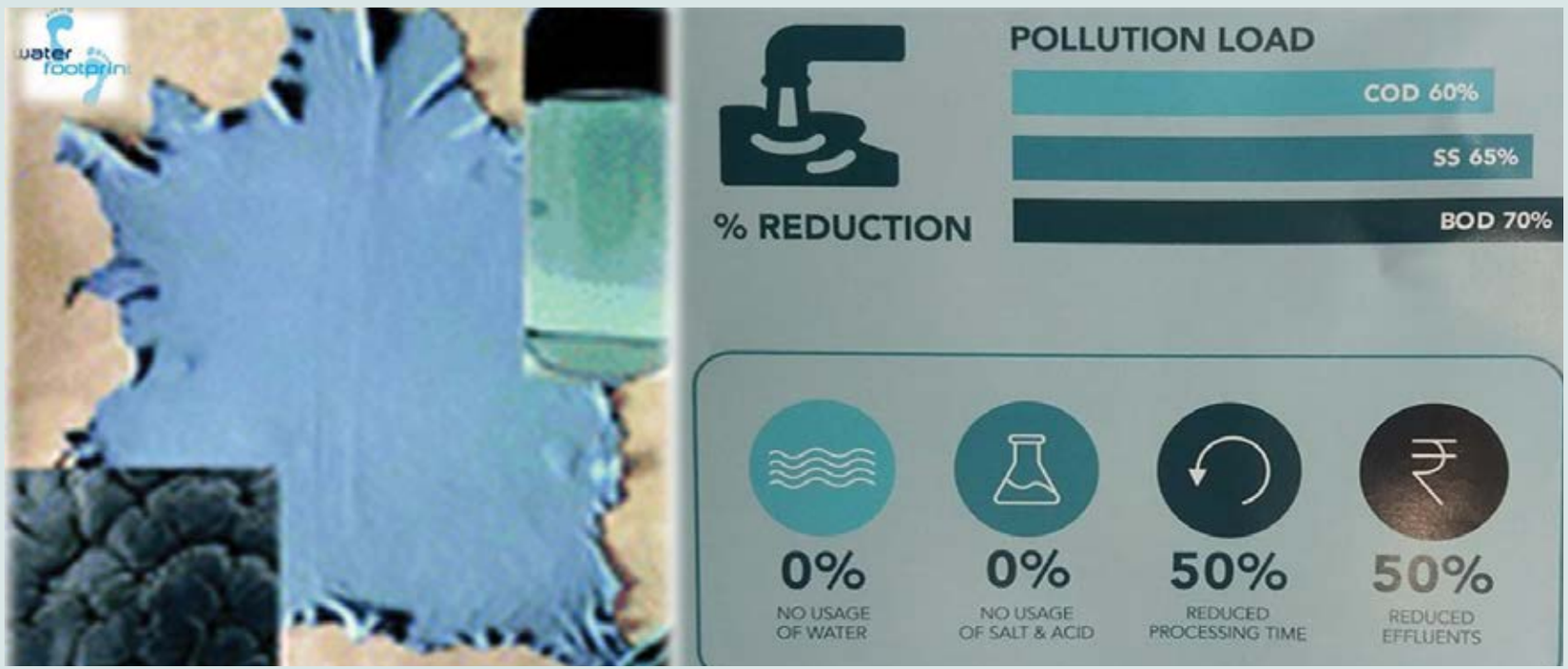
- Specific water consumption (SWC) reduced by – more than 40%
- Water used for processing raw hide to finished leather stage reduced to 0.016 m^3/kg (permissible limit by Pollution Control Board – 0.028m^3/kg)
- Overall consumption of ground water reduced by 6% between year 2018-19 to 2019-20

HOW ACHIEVED

- Waterless chrome tanning has helped to eliminate water usage as well as discharge of chrome bearing wastewater thus reducing freshwater consumption
- The proprietary lime water recycling and re-use system, designed and installed by the plant team, has the potential to reduce freshwater requirement of liming process by 60%
- Industrial waste water treatment system has been upgraded to Electro Coagulation and Electro Oxidation Based ZLD technology enabling Kings recycle and reuse of treated water in to the production processes

Electro Oxidation Plant

Lime Water Re-cycling & Reuse System



Waterless chrome tanning

Improving Water Use Efficiency Through Water Management Initiatives

Kirloskar Oil Engines Limited
Kolhapur, Maharashtra

Vivek Mukund Deshpande
T : +91 9922411737
vivek.deshpande@kirloskar.com
www.kirloskaroilengines.com

OBJECTIVE

- To reduce specific water consumption by maximizing use of filtered rainwater and recycled water
- To enhance water availability by constructing recharge pits and rainwater harvesting structures

RESULTS

- Specific water consumption over last 5 years (2017- 2022) reduced by 21%
- Rainwater as a percentage of total water used - 18%
- Capacity of ground water recharge wells constructed inside the plant - 40,000m^3/annum
- With construction of rainwater harvesting structures 200 days of rainwater backup maintained and sustained against total annual water requirement – 58,000m^3

HOW ACHIEVED

- A dedicated stormwater system has been constructed to collect and store surface and roof top rainwater
- Filtered rainwater is being used for various processes, such as paint booths, cooling towers, and coolant recycling
- An automated rain gauge as well as efficient fixtures such as water saving bush, waterless urinals, in-house kaizens for reduction in domestic water consumption have been installed
- Daily ground water level is being monitored through a piezometer with digital water level recorder (DWLR) and consumption is being monitored with other IoT based monitoring systems
- Variable Frequency Drives (VFD) have been installed for cooling tower fans and Air Handling Units (AHUs) to reduce energy and water evaporation loss
- Backwash water from sand filters and DM plant is being utilized in the paint booths
- Drinking water filtration without RO that meets the Maharashtra Industrial Development Corporation (MIDC) water specifications has been installed
- A water efficient irrigation system created for landscape management includes the following:
  - a scheduled irrigation programme designed based on a detailed study
  - trees are watered through a drip and sprinkler system based on their species and age
- Water efficient fixtures have been installed in various utilities to help save water

Rainwater harvesting pond

Ground water recharge pit

Reducing Freshwater Consumption by Installing High-Rate Thickener

LSC Infratech Limited, Bazpur, Udham Singh Nagar, Uttarakhand

Sand, stone, grits and silica sand production plant

Shiv Kumar Agarwal
T : +91 8392920242
shivkumar@lscinfratech.com
https://lscinfratech.com/

OBJECTIVE

- To reduce freshwater consumption by recycling and reusing industrial wastewater
- Saving and reusing every single drop of water

RESULTS

- Average water saved after installation of High-Rate Thickener Plant (HRT) – 30 lakh litres/annum
- Freshwater consumption replaced with treated water
- Extent of treated water being used for industrial purposes – 95%
- Investment in HRT plant – INR 7.5 million
- ZLD status achieved in the year 2017

HOW ACHIEVED

- A HRT, with 300m^3 capacity, has been installed in the plant to recycle 100% of the water
- Rainwater harvesting and settling ponds have been developed on the premises
- Industrial wastewater and rainwater collected in these ponds is being recycled by the HRT
- Recycled water is being used for washing sand after which the wastewater is recycled for reuse in industrial applications.

Wastewater management process

Conserving Water Through Source Diversification

Michelin India Private Limited, Tiruvallur District, Tamil Nadu

Heavy vehicles' radial tyres manufacturing plant

Rajesh Kumar N
T : +91 8939846492
rajesh-kumar.nachimuthu@michelin.com
www.michelin.in

OBJECTIVE

- To reduce freshwater consumption and undertake ground water recharge through alternate sources

RESULTS

- Extent of the plant's water demand being met through harvested rainwater – 45% (since 2015)
- Capacity of covered concrete tank – 20,000m^3
- Capacity of open rainwater harvesting pond – 27,000m^3

HOW ACHIEVED

- The rainwater collected using the recently installed dedicated piping network, going from the plant's roof to a covered concrete tank, is being reused in processes after minimal treatment
- A dedicated trench and a collection system have also been built to direct rainwater from roads and pavements to the strom water collection pond
- Ten Oil Water Separator systems have been installed in the network to ensure clean water enters the strom water collection pond

Oil water separator system

Storm water collection pond 27000m^3 capacity

Creating Systems to Reduce Ground Water Withdrawal

NACL Industries Limited, Srikakulam, Andhra Pradesh

Agrochemical active ingredients manufacturing plant

C V Rajulu
T : +91 9989433866
cvr@naclind.com
www.naclind.com

OBJECTIVE

- To reduce ground water withdrawal in a Zero Liquid Discharge (ZLD) unit manufacturing pesticide by using flash steam recovery and reusing harvested rainwater

RESULTS

- Water requirement met from recycled water from effluent treatment and recycling systems – 65%
- Specific steam consumption in MEE stripper reduced from 0.5 tonnes/hour to 0.23 tonnes/hour. As a result:
  - steam consumption reduced by – 1900 tonnes/annum
  - ground water consumption reduced by - 2100m^3/annum
- Rainwater collected and reused post treatment in plant operations – close to 1800m^3/annum

HOW ACHIEVED

- A ZLD plant has been installed to treat effluents produced by manufacturing processes
- The effluents are being segregated into High TDS (HTDS) and Low TDS (LTDS) streams for effective treatment through:
  - steam stripper, multiple effect evaporator (MEE), agitated thin film dryer (ATFD) system for HTDS effluent including wastewater RO reject
  - ammonia stripper, sequential (SBR), clarifier for treatment of LTDS streams
  - reverse osmosis (RO) unit to recover water
  - scrubbers, incinerator and spray driers for vent gases and liquid waste from manufacturing operations
- Advanced flash jet pump with steam trap system has been installed for recovering ATFD steam condensate
- The flash steam is being utilized in the MEE steam stripper thereby reducing the specific steam consumption
- An existing above ground level tank of 3600m^2 area, which was not being used, has been converted into a rainwater collection tank by fitting transfer pumps, sand and carbon filter system for effective pre-treatment reuse

ATFD steam condensates recovered and flash steam reused in MEE stripper

Rain water collection tanks

NACL - Zero Liquid Discharge facility

Implementing New Initiatives to Conserve Water

Prism Johnson Limited, Cement Division, Satna, Madhya Pradesh

Manish Singh
T : +91 7024361144
manish.singh@prismjohnson.in
www.prismjohnson.in

OBJECTIVE

- To conserve water, both within and beyond the fence, through rainwater reuse, waste heat recovery system installation, wastewater recycling and ground water recharge

RESULTS

- Specific water consumption reduced by 4% – from 0.154m^3/tonne of cement (FY 2019-20) to 0.148m^3/tonne of cement (FY 2020-21)
- Plant's total water consumption met through harvested rainwater from abandoned mine pits – 38%
- Zero Liquid Discharge status maintained inside the plant by recycling 149,910m^3/annum sewage through mechanized and natural STP in FY 2020-21
- Ground water table improved through artificial rainwater harvesting structures in plant, colony, and under CSR projects – 1.93m from FY 2019-20 to 2020-21

HOW ACHIEVED

- Heat from cooler is being used in WHRS, reducing the water usage in cooler for controlling clinker temperature
- Water sprinklers have been replaced with atomized water spray machines
- STP treated water is being used for horticulture and dust suppression
- Ground water is being recharged through 12 rooftop rainwater harvesting structures, 8 recharge pits located in the plant and colony and check dams built under CSR activities
- Other initiatives that have been undertaken include pond deepening, dug well recharge and installation of recharge shafts in mines
- Water consumption is regularly monitored with a digital water flow meter and ground water level with a digital piezometer.

Recharge Injection Well

Roof Top Rain Water Harvesting

Sewage Treatment Plant

Creating Smart Water Treatment Infrastructure to Reduce River Water Withdrawal

**Tata Steel Limited,
Jamshedpur,
East Singhbhum,
Jharkhand**

Arunava Das
T : +91 9234511599
arunava.das@tatasteel.com
www.tatasteel.com

OBJECTIVE

- To reduce river water withdrawal by replacing with ETP treated water, treated sewage from township and installation of Integrated Smart Water Management System

RESULTS

- Absolute river water withdrawal reduced
  - 76,314m^3/day in FY 2018-19
  - 65,223m^3/day in FY 2019-20
  - 43,267m^3/day till first half of FY 2020-21
- Specific freshwater usage reduced
  - 3.27m^3/tcs in FY 2018-19
  - 2.8m^3/tcs in FY 2019-20
  - 2.25m^3/tcs till H1 of FY 2020-21
- Zero sewage discharge from the Bara STP
- Environment compliance improved through reduction in freshwater withdrawal from the river and water discharged from the plant

HOW ACHIEVED

- A 25,362m^3/day ultrafiltration unit has been built to reclaim effluent from Jamshedpur's Bara sewage treatment plant and reuse for Tata Steel industrial applications
- A 18,927m^3/day CETP facility, having cutting-edge membrane technology, including ultrafiltration (UF) and RO membrane units has been installed to treat integrated steel industry effluent and turn it into process-usable clarifier grade water
- An integrated water management station developed, with inputs from more than 60 flow meters spread across the plant, is capable of real-time monitoring of all water-related indicators
- Online data outputs have enabled a deep drive analysis of the process, provided potential leads for target setting and benchmarking, allowing identification of water losses, excess consumption, and leaks from the operational unit as well as the complete water network.

45MLD, Bara STP, Jamshedpur

Water Management Central Station, Jamshedpur Steel Works

30 MLD Town Sewage TTP

40 MLD Common Effluent Treatment Plant (Largest in India)

Reducing River Water Intake by Maximizing Rainwater Utilization

Tata Steel Utilities and Infrastructure Services Limited, Jamshedpur, Jharkhand

OBJECTIVE

- To reduce river water intake for both industrial and domestic circuit through source diversification

RESULTS

- River water withdrawal for domestic purposes reduced by
  - 10% from 178,000m^3/day in 2019-20 to 161,000m^3/day in FY 2020-21
  - 25% in FY 2021-22
- Increase in water utilization from Dimna Lake
  - 41,700m^3/day in FY 2019-20
  - 63,000m^3/day in FY 2020-21
  - more than 100,000m^3/day in FY 2021-22
- Monetary benefits from reduction in river water withdrawal
  - INR 68 million in FY 2020-21
  - INR 80 million in FY 2021-22
- Treated sewage reused for industrial purposes - 36,000m^3/day

HOW ACHIEVED

- For maximizing water utilization from Dimna Lake, the data of withdrawal from the lake and rainfall trends were analysed and time-based forecasting was carried out
- Post analysis and model development an operating model was agreed upon
- Based on lake level and rainfall, water level was monitored and water intake control to water works was managed
- After collecting information on water connections, illegal connections were disconnected
- Zone wise district metered areas were monitored, and action taken to reduce losses by arresting leakages
- Treated sewage from 2 STPs at Bara and Kharkai is being used for industrial purposes

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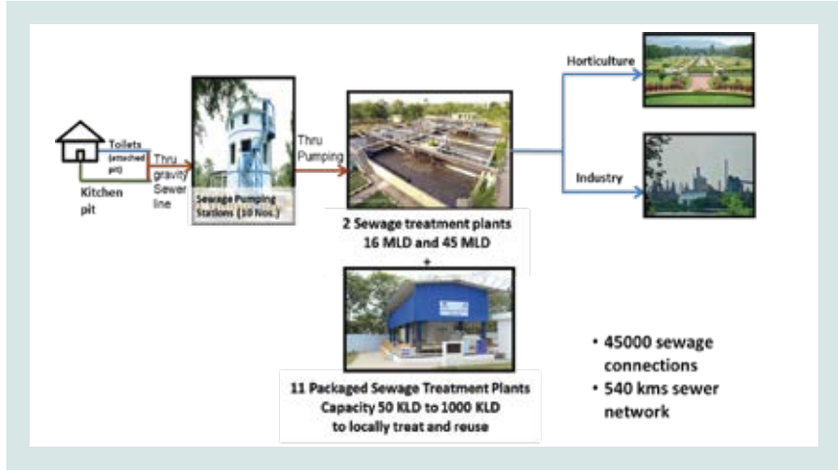
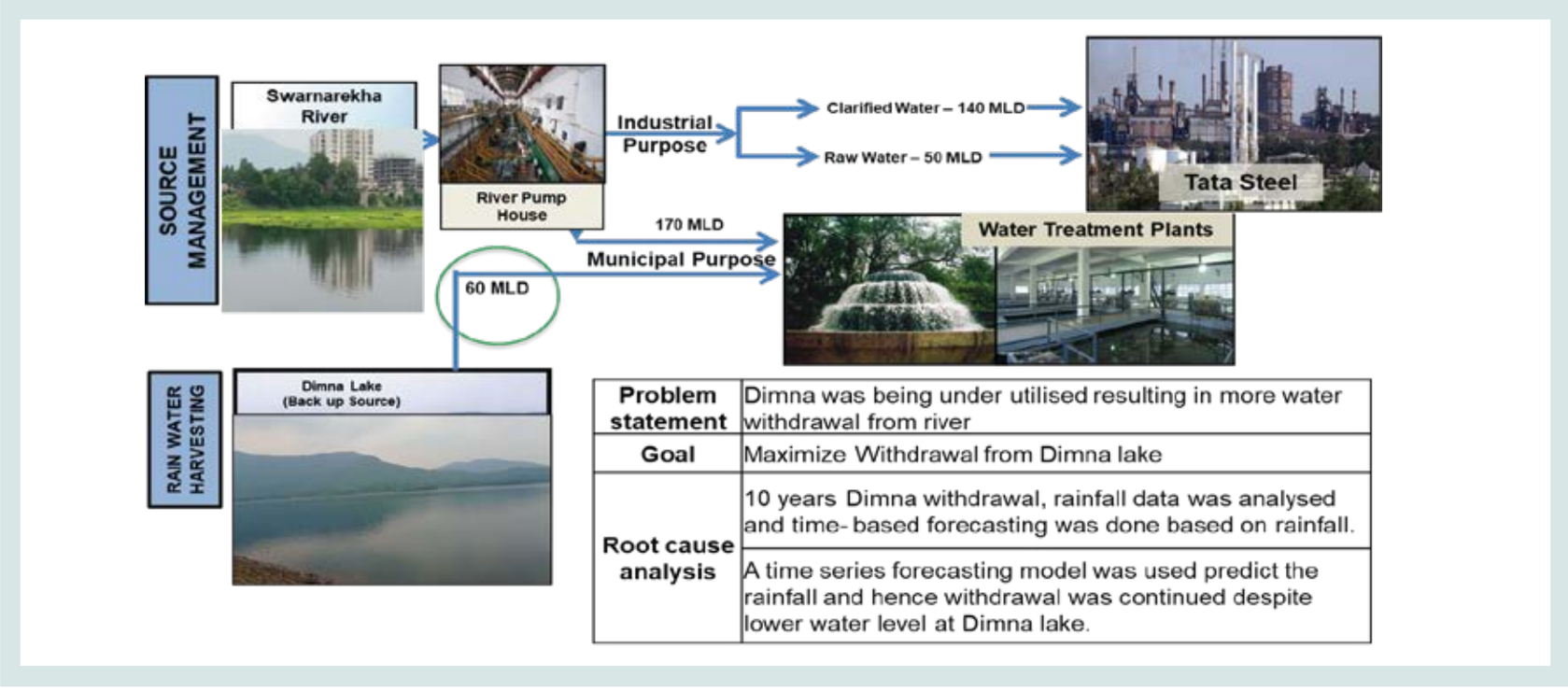
Loss management



Sewage recycle process



Problem statement	Dimna was being under utilised resulting in more water withdrawal from river
Goal	Maximize Withdrawal from Dimna lake
Root cause analysis	10 years Dimna withdrawal, rainfall data was analysed and time- based forecasting was done based on rainfall.
	A time series forecasting model was used predict the rainfall and hence withdrawal was continued despite lower water level at Dimna lake.

Rainwater harvesting, Dimna lake

Deploying Innovative Techniques to Reduce Water Consumption

UPL Limited, Unit-10, Tarapur, Maharashtra

Agro Chemicals

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OBJECTIVE

- To reduce load on RO plant by innovative ways to reuse the ETP treated water
- To expand the plant capacity by debottlenecking the RO
- To explore new ways of reducing excessive scaling in Multiple Effect Evaporator (MEE) and Agitated Thin Film Dryer (ATFD) condenser to enhance overall productivity

RESULTS

- Freshwater saved approximately 2480m^3/ annum
- RO load reduced by 30%
- Specific water consumption reduced by 17.7% from year 2020 to 2021
- Financial savings from commissioning of Colloid-A-tron INR 0.153 million/annum
- Scaling in MEE condenser and fouling in cooling tower reduced by 100%

HOW ACHIEVED

- Challenges with the existing RO plant
  - running at maximum capacity becoming a bottleneck
  - reject water being high in TDS had to be processed further, increasing the load on the MEE plant and the steam consumption
  - persistent problem of scaling in MEE and ATFD cooling tower
- To address these issues a Colloid A-tron was installed on a trial basis and after a successful run, 2 more units have been installed
- Colloid-A-tron works on metallurgical technology where certain metals break down the high TDS of water into anions and cations which then settle at the bottom of cooling tower and are removed as blowdown
- The flow of water gets altered in the Colloid A-tron which helps in reducing scaling in condensers
- The treated ETP water becomes fit for use in MEE and ATFD cooling tower
- This technology has helped reduce the load on RO as well as the MEE steam consumption

Colloid A-tron

Scaling free condensor

Colloid A-tron outside

Reducing Ground Water Dependence by Using Treated Sewage and Rainwater

Yara Fertilisers India Private Limited, Babrala, Uttar Pradesh

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OBJECTIVE

- To reduce ground water abstraction by
  - installing a new STP for re-using treated sewage and sullage wastewater in cooling tower
  - collecting rooftop drain water for use in cooling tower after treatment
  - collecting storm water from plant catchment area for use in cooling tower after treatment

RESULTS

- Use of treated effluent (sewage) to save 182,500m^3/annum
- Use of rooftop rainwater run-off to save 5000m^3/annum

HOW ACHIEVED

- Before the project was initiated the premises had two conventional STPs for treating sewage and sullage wastewater
- Treated water, meeting the STP outlet standard, was being used for irrigating 238ha of green belt within premises
- As an initiative, to use this water for high end applications and reduce ground water abstraction, a new MBR based automatic STP plant has been installed at a cost of INR 50 million
- This was followed by installation of distinction and softener units with continuous digital monitoring of all treated parameters such as pH, BOD, COD, and TSS
- Infrastructure to trap rooftop rainwater and a treatment unit were installed at a cost of about INR 4.5 million to allow the use of water in ammonia cooling water as makeup
- Infrastructure to collect and treat the plant catchment area rainwater, for use in urea cooling tower as makeup, was developed at a cost of about INR 10 million

Roof top rainwater harvesting

MBR based Sewage Treatment Plant with a capacity of 600m³/ day

Plant catchment area project with rainwater harvesting potential of 128,500m³/annum

Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering Industry, Government, and civil society through working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for Industry.

For more than 125 years, CII has been engaged in shaping India's development journey and works proactively on transforming Indian Industry's engagement in national development. The premier business association has around 9000 members, from the private as well as public sectors, and an indirect membership of over 300,000 enterprises from around 286 national and regional sectoral industry bodies.

With 62 offices, including 10 Centres of Excellence in India, and 8 overseas offices in Australia, Egypt, Germany, Indonesia, Singapore, UAE, UK, and USA, as well as institutional partnerships with 350 counterpart organizations in 133 countries, CII serves as a reference point for Indian Industry and the international business community.

Confederation of Indian Industry

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CII-TRIVENI WATER INSTITUTE

About CII-Water Institute

One among CII's 10 acclaimed Centers of Excellence, CII-Triveni Water Institute, (CII-TWI), is a unique institution established in 2012, where government, industry and civil society have partnered to address water related issues in a holistic manner. The Institute works exclusively on water and wastewater management. CII-TWI, is a unique institution, with its headquarters in New Delhi. It works closely with the government, industry and civil society on providing integrated solutions to various water related challenges. Key services rendered by the Institute include, comprehensive water audits, hydrological evaluations for watershed level planning using state-of-the-art tools and techniques, trainings, capacity building and outreach activities.

Vision

To enable India make substantial progress towards achieving water security.

Core Purpose

The purpose is to transform water conservation and management practices in India by changing the mind-set and behaviour of stakeholders resulting in more effective and sustainable water management practices at the grassroots level.

Services

- Advisory Services: Water Audits for industry, buildings, irrigation; Water Pinch analysis
- Projects & Policy: Water Resource Evaluation using WATSCAN Hydrological evaluation, Water Use Efficiency, Wastewater Management, Rainwater Harvesting
- Training, Education and Capacity Building: Wastewater operator training programs, water resources evaluation for planners
- Events & Conferences: Water Innovation Summit; National Awards for Excellence in Water Management.

CII-Triveni Water Institute (CII-TWI)

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