# WATER AUDITS FOR ACHIEVING WATER NEUTRALITY AND COST OPTIMIZATION IN INDUSTRIES

**Karishma Bist, Director**
**FICCI - Resource Conservation & Management**
**Email: Karishma.bist@ficci.com**

# Presentation coverage

## About FICCI

## Water Availability

## Introduction to Water Neutrality

## Water Audit – Benefits and Scope

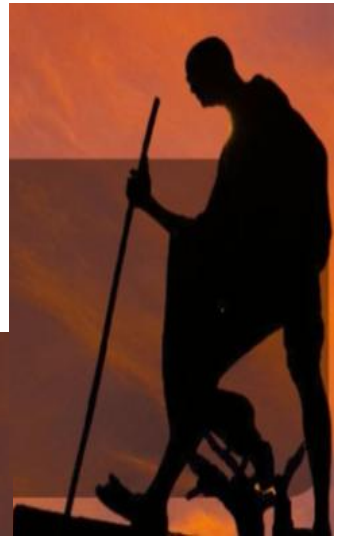
## Water Conservation Methods

## Case Studies

# About FICCI

- Established in **1927, largest and oldest** apex business organization in India
- **Non-government, not-for-profit** organization
- Serves members from **Indian private and public corporate sectors**, as well as multinational companies and draws strength from **diverse regional chambers of commerce and industry** across states
- Engages with over **250,000 companies**
- Provides **platform for networking and consensus building** within and across sectors
- Primary **liaison** for Indian industry, policymakers, and international business community



# About RCM

The **RCM (Resource Conservation & Management) is a technical wing of FICCI** which provides integrated technical consultancy services to industries to enhance their competitiveness, particularly through sustainable use of the resources (Energy, Water etc.), energy transition, decarbonisation, water neutrality, cleaner production and waste minimisation and improving Occupational Safety & Health etc.

RCM OBJECTIVES



**ENHANCE RESOURCE EFFICIENCY**



**IMPROVE ENVIRONMENTAL PERFORMANCE**



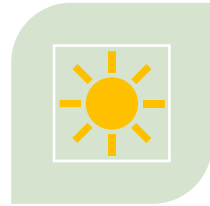
**MEET ENVIRONMENTAL COMPLIANCE**



**IMPROVE PRODUCTIVITY AND COST REDUCTION**



**PROMOTE OVERALL SUSTAINABILITY AND ACHIEVE SDG GOALS**



**DECARBONIZE THROUGH ENERGY TRANSITION**

# FICCI Government Accreditations

- An ***Empaneled Accredited Energy Auditing Organization*** with Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India for Conducting Mandatory Energy Audits and M&V Audits under Energy Conservation Act 2001
- ***Accredited Carbon Verifier (ACV)**** under Carbon Credit Trading Scheme (CCTS) with BEE, MoP
- ***Empanelled Auditor for Renewable Consumption Obligation (RCO)*** Verification & Reporting in Designated Consumer Industries, with BEE, MoP
- An ***Empaneled Accredited Water Auditing Organization*** by Central Ground Water Authority (CGWA), Ministry of Jal Shakti, Government of India
- FICCI has been Empaneled by Ministry of Steel, Government of India for **Green Steel Certification**
- FICCI has been Empaneled by CPCB for Conducting Audit under **Extended Producers Responsibility (EPR) for Various Types of Wastes** like Plastic Waste, E-Waste, Waste Tyre Management etc.

# Services Offered

| AREA / SERVICES | AUDITING/ASSESSMENT | ROADMAP PREPARATION | CERTIFICATION | LEARNING |
|---|---|---|---|---|
| **CARBON MARKET & SUSTAINABILITY** | GHG Inventory Accounting, Product Carbon Footprint (PCF), LCA, Air Pollution Control & Monitoring | Sustainability/ESG Disclosure, Environmental Performance improvement | Validation & Verification under Carbon Credit Trading Scheme (CCTS) | **Training and Capacity Building** |
| **ENERGY EFFICIENCY** | Energy Audit, M&V Audits, RCO Verification & Reporting | Roadmap for Decarbonization | **Green Steel Certification** | |
| **WATER SUSTAINABILITY** | Comprehensive Water Audit, CGWA Audits for Groundwater NOC | Roadmap for Water Positive / Neutrality | **Water Positive Certification** | |
| **WASTE MANAGEMENT** | Waste Audits, Circular Economy Solutions | Roadmap for Zero Waste to Landfill | **Zero Waste Certification** | |

# Sectors served

The team has successfully accomplished energy and water conservation studies for more than 1300 industrial units covering following sectors

| | |
|---|---|
| • Beverage | • Oil & Gas Exploration |
| • Building Complex | • Oil Refinery |
| • Cement | • Petrochemical |
| • Chemical | • Pharmaceuticals |
| • Fertilizers | • Power plants |
| • Iron & Steel | • Pulp & Paper |
| • Mining | • Textile |
| • Ports | • Zinc |
| • MSME sector industries | • Aluminium etc. |



# Training & Capacity Building

## FOCUS AREAS

| | |
|---|---|
| Advanced Technologies in Air Pollution Control & Monitoring | Plant Maintenance summit |
| Advanced Air handling Systems | Reliability of Electrical Systems |
| Cleaner Production/Technologies and Waste Management | Safety Management in Industries etc. |
| Corrosion Management | Thermal Insulation |
| Desalination and Membrane Technologies | Total Power Quality Management |
| Rainwater Harvesting & Groundwater Recharge | Water & Wastewater Management, ZLD etc. |
| Recent Advancements in Combustion technology | |

- ***More Than 20,000 Professionals*** *Across Industry Sectors, Government & Regulatory Authorities Trained in Energy, Water, Environment, Occupational Health & Industrial Safety since 1999*
- *Around 450 international delegates trained*

# Upcoming Capacity Building Programs – on Zero Liquid Discharge

- **Key Technical Sessions:**
  - Regulatory Framework on ZLD
  - Importance of Primary Treatment System in ZLD Operations
  - Selection criteria of ETP and ZLD Systems
  - Role of RO Technologies in ZLD Operations
  - Common Operational Challenges and Troubleshooting,
  - Latest wastewater Treatment and ZLD Technologies with CAPEX/OPEX
  - Digital Technologies for wastewater management, industrial case studies etc.

| Sl. No | Date | Location | Venue Details | Online Registration Link |
|---|---|---|---|---|
| 1 | **May 18 -19,2026** 9.30 am – 5.30 pm both days | **Pune** | Hotel Pride, Shivajinagar, Pune Maharashtra | https://registrations.ficci.com/ficzdf/online-registration.asp |
| 2 | **May 21 -22, 2026** 9.30 am – 5.30 pm both days | **Visakhapatnam** | Hotel Daspalla, Suryabagh ,Visakhapatnam Andhra Pradesh | https://registrations.ficci.com/ficzap/online-registration.asp |

# Previous ZLD Technical Meets




Zero Liquid Discharge event in
**New Delhi**

4th – 5th Feb, 2026




Zero Liquid Discharge event in

**Hyderabad**

12th and 13th March, 2026

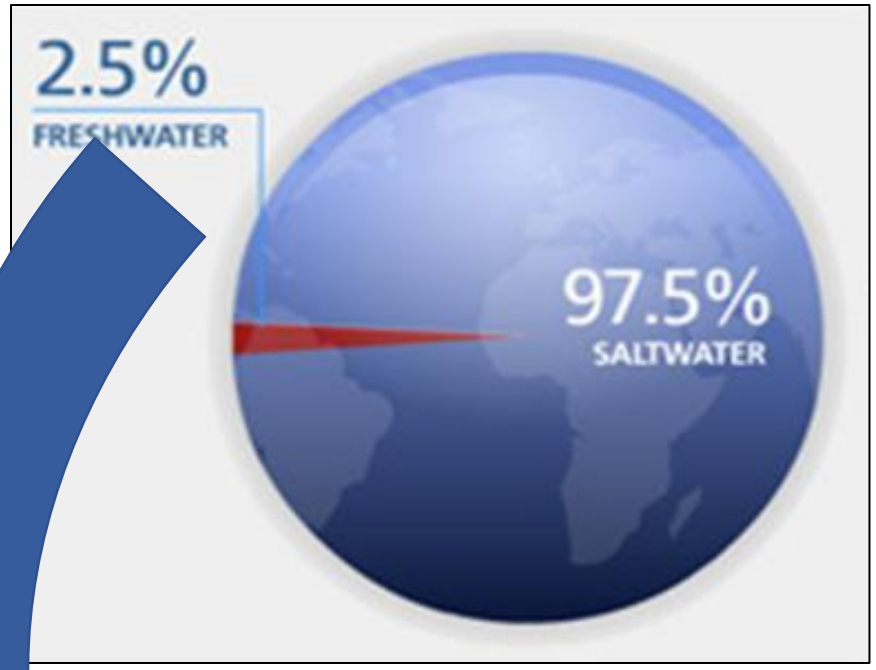


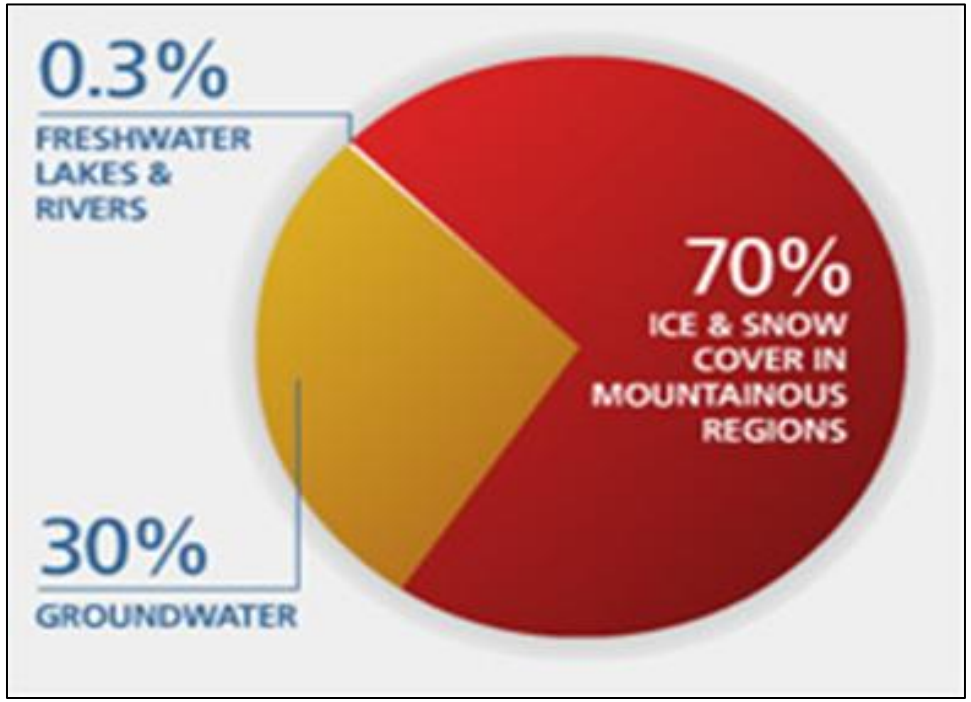
Zero Liquid Discharge event in
**Ahmedabad**

16th and 17th March 2026

# Water Availability

# The global Situation



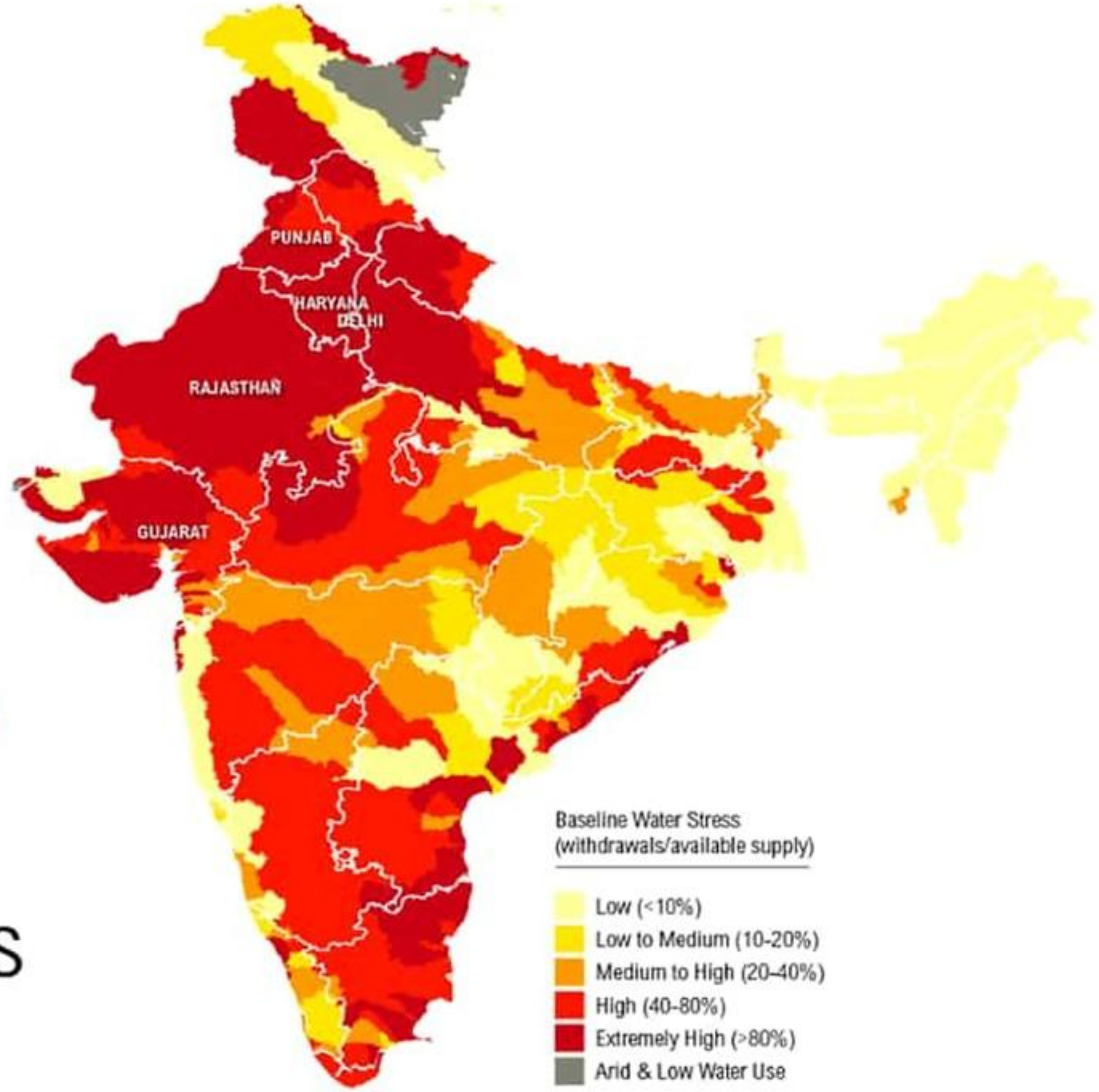



# Groundwater Significance

- **Estimates: 85% of the rural and 50% of the urban population** in India is **dependent on groundwater** for fulfilling their needs.
- **With an annual groundwater extraction** of 248.69 billion cubic meters (2017), India is among the largest users of groundwater in the world.
- **Composite Water Management Index (CWMI), 2018** by NITI Aayog: The water demand will exceed the supply by 2050. Groundwater in India depleted at 10-25 mm per year between 2002 and 2016.
  - **54 percent of India's groundwater wells** are declining.
  - It added that about 40% of India's population possibly would have no access to drinking water by 2030.
  - **High water stress:** India is one of 17 countries facing extremely high-water stress, according to a report by the World Resources Institute.

# 54%

of India Faces **High** to **Extremely High** Water Stress




www.indiawatertool.in

WORLD RESOURCES INSTITUTE









# Reasons for Groundwater Depletion

**Increased Demand due to increasing population**

**Limited Rainwater Storage Facility**

**Use of Water Intensive crops**

**Subsidies on electricity**

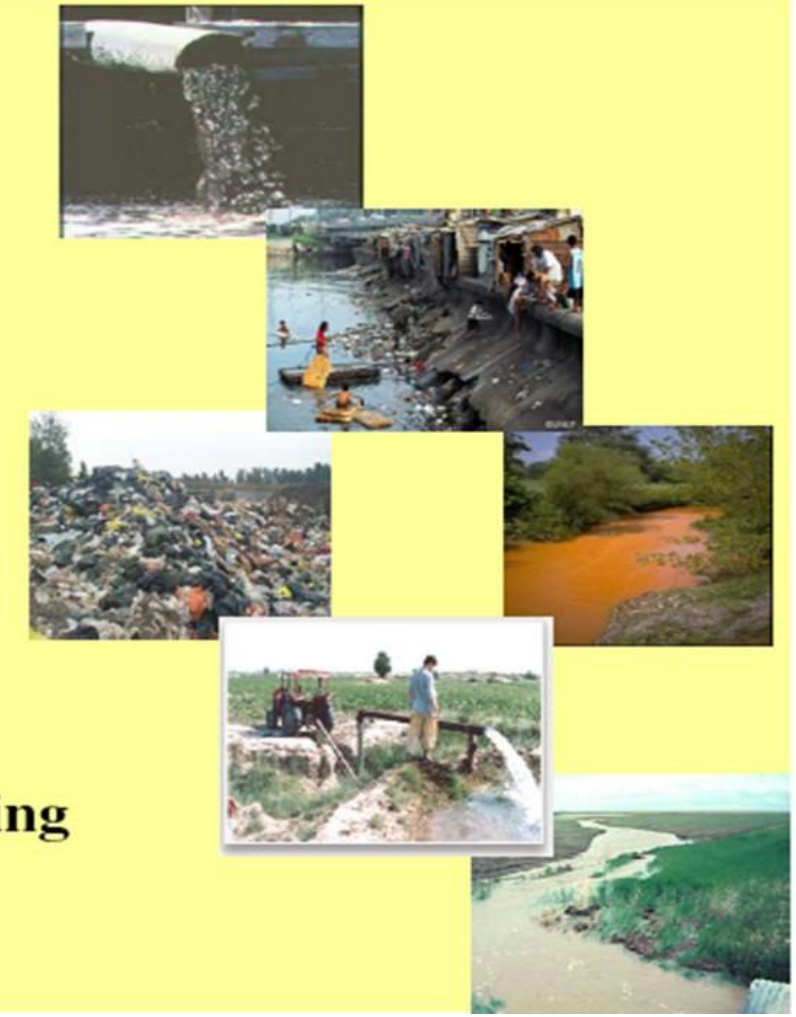
**Inadequate regulation / implementation**

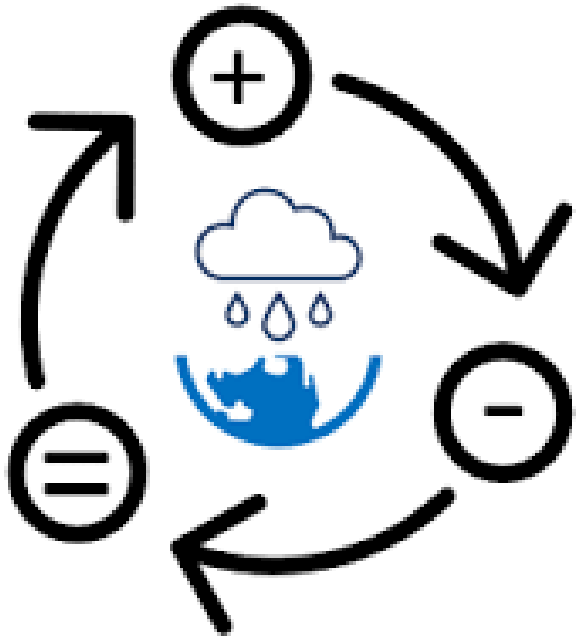
**Climate Change – Uneven rainfall**

**Limited Rainwater Harvesting and Groundwater Recharge etc.**

# Groundwater/Surface watrer Pollution: Sources/Causes

- Untreated Industrial Effluents
- Domestic & Sewage Discharge
- Leachates from indiscriminate dumping of solid and hazardous wastes
- Agricultural Run-off
- Over exploitation of Groundwater Resources – causing seawater intrusion
- Geological formations





- **LIMITED FRESH WATER** RESOURCE AVAILABIITY

- AVAILABLE RESOURCE **QUALITY IS DEGRADING**

- **EFFICIENT WATER MANAGEMENT** BY USERS INCLUDING INDUSTRIES IS IMPORTANT

**- ACHIVING 'WATER NEUTRALITY' IS THE KEY FOR WATER SUSTAINABILITY AND BUSINESS CONTINUITY**

# Introduction to Water Neutrality

- Water neutrality means that the total freshwater used by an industry—both directly and indirectly including its supply chains—is balanced by measurable water savings.
- These savings come from **improved operational efficiency, water reuse, and efforts to replenish and rejuvenate water sources** within the same watershed or those of major supply chains.
- The goal is to ensure that industries use water responsibly and contribute to replenishing the water they consume.
- ‘Water Neutral' may not only imply that freshwater use is reduced to zero, but rather that the negative economic, social, and environmental externalities are reduced to a large extent and that the remaining impacts are fully compensated.



# Significance of Water Neutrality

**Water Conservation**:

Water neutrality involves balancing the amount of water consumed with the amount that is replenished naturally. By adhering to water neutrality standards, water usage can be minimized and more efficiently managed.

**Achieving Water Goals**

By reducing overall demand and promoting responsible water usage, water neutrality plays a significant role in achieving the National Water Mission's Goal 4 which aims to enhance water use efficiency by 20%

**Environmental Sustainability** The concept of water neutrality promotes responsible and sustainable water management.

**Mitigation of Water Stress** Water scarcity is a growing concern in many parts of the world. Water neutrality initiatives can help alleviate water stress by reducing demand, enhancing water use efficiency, and minimizing competition for limited water resources.

# Benefits to Water Neutrality for Organizations



**REDUCES RISKS**

MINIMIZES DISRUPTIONS CAUSED BY WATER SHORTAGES, ENSURING CONTINUOUS OPERATIONS AND ACTIVITIES.



**ENSURES COMPLIANCE**

HELPS ORGANIZATIONS MEET REGULATORY REQUIREMENTS AND ENHANCES THEIR CORPORATE SOCIAL RESPONSIBILITY (CSR) PROFILE.



**STRENGTHENS SUPPLY CHAINS**

REDUCES WATER-RELATED RISKS ACROSS THE SUPPLY CHAIN, IMPROVING OVERALL BUSINESS RESILIENCE.

# Water Neutrality Guidelines

***NITI Aayog has released the "Guidelines on Achieving Water Neutrality for Indian Industry," offering a clear framework to help industries/organizations balance their water consumption through sustainable practices.***

*To* achieve water neutrality, industries can follow the **3M-7R approach** outlined in the guidelines

| 3M | 7R |
|---|---|
| Measure, Manage, and Mitigate water use. | Reduce, Reuse, Recycle, Recharge, Replenish, Report, and Respect water resources. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Water and Wastewater Management at Plant Level **(Within the Fence)** | + | Water conservation/ water use efficiency at Watershed scale **(Beyond the fence)** | + | Water conservation/ water use efficiency, water and wastewater management of **Supply Chain** | ≥ | Total water extraction or consumption measured and/or estimated as sum total of freshwater - all of the sources - Within the fence, Beyond the fence and as a part of Supply chains. |

General Equation for achieving water positive/neutral status

# How Organizations can go for Water Neutrality Certification

1

**Evaluating Water Use**

Identifying direct and indirect water consumption.

2

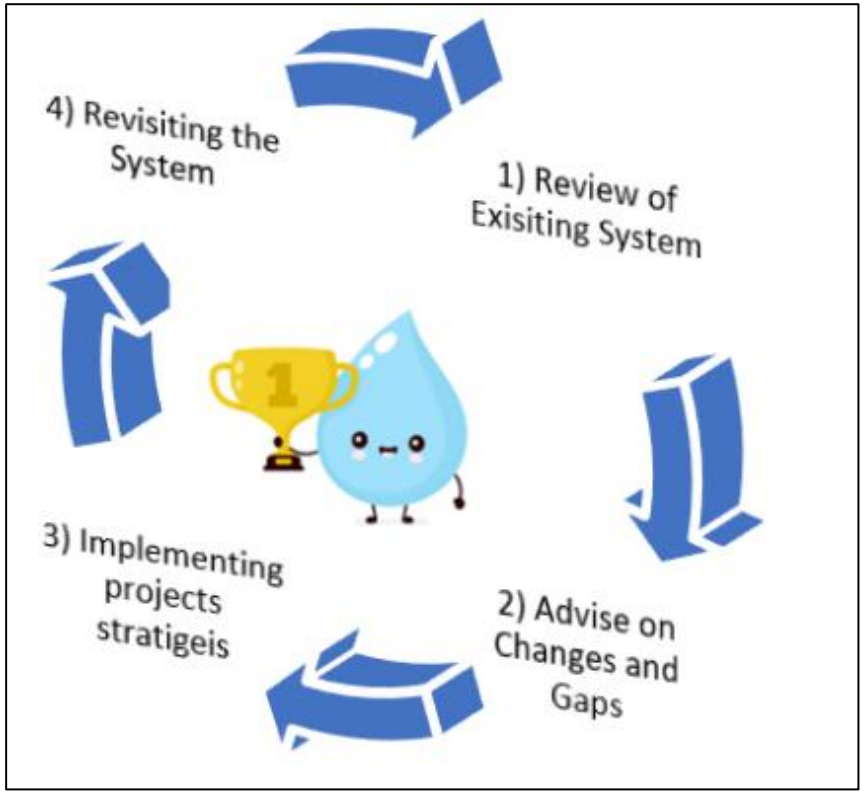
**Improving Efficiency**

Implementing technologies and processes to reduce water consumption.

3

**Offsetting Water Use**

Engaging in water conservation efforts like rainwater harvesting, lake rejuvenation, and watershed management.



# WATER NEUTRALITY CERTIFICATION PROCESS (3 LEVELS)

- **Level I - Water Neutral/Positive Aspiring Company –** Organizations undertaking the evaluation of their water status and the components mentioned under **scope I** will be certified as **Water Neutral/Positive Aspiring Company.**

- **Level II - Water (Neutral/Positive) Rising Plant Company** – Organizations completed the evaluation of components mentioned under **scope II** will be certified as **Water (Neutral/Positive) Rising Company.**

- **Level III - Water (Neutral/Positive) Achieved Company** – Organizations that complete the components mentioned under **scope III** are certified as **Water (Neutral/Positive) Achieved Company.**

# CERTIFICATION PROCESS (Contd.)

**Scope I**

1) Assessment of Water Use Efficiency
2) Plant's Watershed Delineation
   - 2(a) Mapping of Water Sources
   - 2(b) Mapping of Interventions
3) Plant's Watershed Characterization

**Scope II**

1) Recommendations to address the Gaps
2) Identifying Supply chain
3) Supply chain watershed mapping

**Scope III - Validation, Monitoring and Verification**

1) Water consumption and extraction
2) Water conservation achieved
3) Reporting systems
4) Source diversification established
5) Reduction in freshwater consumption established
6) Ecosystem health established

# CERTIFICATION PROCESS (Contd.)




Certificate - 1

Water Neutral/
Positive **Aspiring**
Company




Certificate - 2

Water Neutral/
Positive **Rising**
Company




Certificate - 3

Water Neutral/
Positive **Achieved**
company

# Key Water Neutral/Positive Certifying Agencies

| Organization | Certification | Sector |
|---|---|---|
| FICCI | Water Neutrality/Positive Roadmap Preparation and Certification | All Organizations including Industries |
| IGBC (Indian Green Building Council) | Net Zero Water Rating System | Buildings |
| TERI | GRIHA Water Positive Certification | Building Sector and other organizations |
| Corpseed | LEED Zero water Certification | Buildings |

# Organizations Achieving Water Neutrality or Water Positivity

i. Hindustan Zinc Limited
ii. Cairn India Limited
iii. Adani Green Energy Limited (AGEL) Ambuja Cement
iv. Heidelberg Cement India Limited
v. ABB, Nelamangala plant
vi. Larsen and Toubro Infotech Limited
vii. Marico Limited Jalgaon facility
viii. Dalmia Cement
ix. Tata Steel Jamshedpur
x. Mahindra Susten ITC Hotels
xi. KEC RPG Group

# Water Neutral/Positive Assessment Parameters

- **SWC and Benchmarking:** Level of adoption of technologies requiring less water per unit of production resulting in measurable reduction in water use (specific water consumption);
- **Wastewater Recycling:** Adoption of wastewater treatment for recycling wastewater (including treatment of effluents, ZLD Systems) and its use;
- **Rainwater Harvesting:** Adoption of rainwater harvesting and artificial recharge mechanism to recharge groundwater or use it in industrial processes;
- **Training & Awareness:** Awareness creation on water related issues amongst their supply chain and employees and Impact of awareness created
- **Monitoring, Documentation and Disclosures:** Transparency measures/ Water Audits and voluntary disclosures
- **Adoption of Best Practices and Latest Technologies**
- **Water Positive Index Calculation**

$$\textbf{Water Positive Index (WPI)} = \frac{\text{Water Recharged} + \text{Water Reused} + \text{Water Saved}}{\textbf{Water Withdrawn}}$$

# WATER AUDIT - A TOOL TO ACHIEVE WATER NEUTRALITY

# FICCI WATER AUDIT STUDIES- ESTIMATED BENEFITS

**It is estimated that by implementing FICCI suggestions, the studied units improved their water use efficiency by 10-50 % with a discounted payback period < 2 years.**

**In addition to water savings, the unit also saved associated water & wastewater management costs (like energy, chemical consumption) by 5-20%.**

# What is water audit?

- Water Audit study is a **qualitative** and **quantitative** analysis of water consumption which helps **efficient water utilization & conservation and wastewater management**.
- *Water Audit determines the amount of water lost from a distribution system and the cost of this loss to the utility.*
- *Comprehensive water audit envisages a detailed profile of the distribution system and water users, thereby facilitating easier and effective management of water resources and improved reliability.*

# Why to conduct water audit?

- Poor Availability or Non-Availability of Fresh Water
- Higher Specific Water Consumption
- High Water Bills
- Inconsistent Product Quality
- High Effluent Discharge
- Restriction on effluent Disposal to any Recipient Media
- Breakdowns, Leakages & Spillages
- Plan for future expansion
- Compliance Requirement
- Corporate Image
- Preparing Water Neutrality Roadmap

# Benefits of conducting water audit

- Development of a comprehensive Water circuit diagram for the entire complex
- Identification of areas of excess water usage, major water losses etc.
- Possible Reduction in existing water consumption, there by saving of money
- Availability of saved water for other activities or future project expansion etc.
- Saving on electricity in terms of reduced pumping power through optimization, balancing of pump operations or adoption of higher efficiency pumps.

# Benefits of conducting water audit (contd.)

- **Opportunity to save natural resources (ground water) as a responsible corporate**
- **Preparedness to face any future water crisis scenario**
- **Feeling of fulfilling social responsibility by reducing wastage of water**
- **Reduced load on ETP – lower treatment costs**
- **Meeting Regulatory Requirement**

**Ex of Monetary savings-** Typically for any Industry with about 5000 m3/day freshwater consumption and a water cost of about 10 Rs/m3; a 10 % saving in water quantity alone, amounts to about 2 million Rs per year (the savings are much more on account of electricity savings & treatment cost savings).

# Water Audit Applicability - CGWA GUIDELINES

- All Industries **abstracting Groundwater >100 m3/day**.
- Water Audits shall be undertaken **Biennial (Once in 2 years)**
- Industries are required to **reduce Groundwater use by at least 20% in 3 years through appropriate means**
- Water Audit to be conducted through certified auditors of agencies as approved by **CGWA (Ex: FICCI/CII/NPC/PHDCCI** etc.) certified auditors – List available on CGWA Website

**https://www.cgwa-noc.gov.in/LandingPage/UserAssistance/AccreditedWaterAuditors.pdf**

- Water Audit Report to be prepared as per **CGWA SOP**

ApprovedSOPSG.pdf - Scope of work and report Format

- Water Audit report to be **submitted online** to CGWA - NOC requirement

# Format of Water Audit Report as per CGWA SOP

ApprovedSOPSG.pdf (cgwa-noc.gov.in)

1. **Title Page-** (CGWA Application no., Name of Firm, Year, water audit period)
2. **Table of Contents**
3. **List of Figures/Graphs**
4. **List of Tables**
5. **List of Annexure (Measured Data and Data Provided by Industry)**
6. **Executive Summary**

# Format of Water Audit Report as per CGWA SOP (Contd.)

**CHAPTERS**

1. Background and Introduction (1-2 page)
2. Scope of Work and Objectives(1 page)
3. Methodology of the Study (1 page)
4. Industry Process Study (Products, Process and Process Flow Diagram including Utilities) (1 page)
5. Assessment of Present Water Usage including Recycling (1 page)
6. Assessing Use of Technologies and Best Practices (1 page)
7. Waste Water Treatment and Discharge (1-2page)
8. Data/Information Analysis and Interpretation (1-2page)
9. Water Conservation Measures, Feasibility and Management Plan (1 page)
10. Conclusion and Recommendations (1 page)

**References** (List of information and data sources)

**Annexure** - Measured data, Data provided by the industry, Copy of other statutory clearances

**Annexure** (Note of agreement by the industry on water audit report)

# Evaluation Sheet and Summary of Water Audit Report

Annexure II

**Evaluation sheet and Summary of Water Audit Report**

*(to be submitted by the Water Auditor along with Report)*

| S.No | Particular | To be Filled by Water Auditor | | Remarks of Water auditor | Remarks of Project Proponent |
|---|---|---|---|---|---|
| 1 | Name of the Project Proponent | | | (YES/NO) | (YES/NO) |
| 2 | NOC validity period | | | (YES/NO) | (YES/NO) |
| 3 | GW requirement as per NOC (KLD and Annual) | | | (YES/NO) | (YES/NO) |
| 4 | Name of Certified Water Auditor | | | (YES/NO) | (YES/NO) |
| a | Certificate Number | | | (YES/NO) | (YES/NO) |
| b | Water audit period | | | (YES/NO) | (YES/NO) |
| 5 | Is Water Audit Report as per format(**Yes/No**) | | | (YES/NO) | (YES/NO) |
| 6 | Total water consumption **(KLD and KLY) at present** | | | Mentioned quantum (KLD/KLY) | Mentioned quantum (KLD/KLY) |
| 7 | Water Balance Chart- I and II developed and are part of report? **(Yes/No)** | | | (YES/NO) | (YES/NO) |
| a | Water usage in industrial process (KLD) | | | (YES/NO) | (YES/NO) |
| b | Other water usages in KLD<br>• Utilities<br>• Domestic use<br>• Green Belt<br>• Dust suppression.<br>• Washing<br>• Other usages (Pl. specify) | | | (YES/NO) | (YES/NO) |
| c | Unaccounted water/water losses if any in KLD | | | (YES/NO) | (YES/NO) |
| 8 | Water Usage per Unit Of Production (**KLD**) - Specific Water Consumption | Indicative with respect to CPCB charter/ other standard technology | Indicative with respect to CPCB charter/ other standard technology | (YES/NO) | (YES/NO) |
| 9 | Process/stage in which maximum water is used and its quantity (**KLD**) | | | (YES/NO) | (YES/NO) |
| 10 | Reduction recommended in Industrial process (**KLD/KLY** and **Percentage**) | Industrial | Other usage | (YES/NO) | (YES/NO) |

# Evaluation Sheet and Summary of Water Audit Report (Contd.)

| S.No | Particular | To be Filled by Water Auditor | | Remarks of Water auditor | Remarks of Project Proponent |
|---|---|---|---|---|---|
| 11 | Whether industrial process/technology/utilities water efficient? **(Yes/No)**<br><br>If no, identify water efficient technologies for industrial process based on secondary data and discussion with sectoral experts. | Brief about advanced technology | | (YES/NO) | (YES/NO) |
| 12 | Major water saving measures other than included in No. 13 above (Water Conservation/reuse/recycling/ Leakage plugging etc.) | | | (YES/NO) | (YES/NO) |
| 13 | Treated water quality through ETP and STP (Recommendation with its usages in industry/domestic etc) | Provide options for use/recycling of treated water in industry, infrastructure and domestic purpose based on similar practices in other industries and best practices.<br>1.<br>2.<br>3. | | (YES/NO) | (YES/NO) |
| 14 | Is recommended reduction in industrial process/other process 20% or more **(Y/N)** | Percentage reduction in Industrial process (quantify) | Percentage reduction in other usages (quantify)<br>1.<br>2,<br>3. | Final Quantum recommended (KLD/KLY) | Final Quantum recommended (KLD/KLY) |
| 15 | Whether the Project Proponent has accepted the water audit findings? **(Yes/No)** | | | | |

**Signature and seal of Water auditor**

**Signature and seal of Project Proponent**

# FICCI water audit – Scope of Work

- Evolving a **line diagram of 'Water Circuit'** from source to major end use locations, up to discharge for the plant
  - **Level 1 Diagram** – Water Circuit
  - **Level 2 Diagram** – Water Circuit with water balance
  - **Level 3 Diagram** - Water Circuit with water balance and water cost
- Measure water **flow rates** at various locations (primarily at outlets of all major water pumps) from source to end use up to discharge
- Measurement & **efficiency** of all major water pumps & identifying inefficient pumps
- Preparation of **'water balance diagram'** for entire complex

# FICCI water audit – Scope of Work (Contd.)

- **Identification of leakages** and major water loss areas in the water distribution system
- Study of existing **"logistics"** of water circuit & suggest improvements for cost savings & water conservation
- Evolving **value added "cost of water"** at various water use locations
- Estimating **Specific water use** and conservation potential
- Assessment of **productive and unproductive** usage of water
- Identify possibilities of **water recycling, reuse** etc. depending on water quantity & quality requirements

# FICCI water audit – Scope of Work (Contd.)

- Strategies for **water treatment** and reuse or direct use
- Calculation of **Rainwater Harvesting Potential** for the site
- Evolving **recommendations/schemes** for improvement in water and wastewater management system with **Cost Benefit Analysis** towards:
  - Water conservation opportunities
  - Energy saving opportunities
  - Reduced treatment cost opportunities
- Submission of consolidated **water audit report**

# Water Audit- Methodology

**Step 1: Water Audit Team Formation and Planning**

**Step 1: Opening Meeting**

- Introduction to the Audit team and Auditee Team
- Objective of the Audit and Discussing audit Plan
- Introduction to the organization process & main water facilities



**Step 2: Walk through survey**

- Understanding of existing water sourcing, storage and distribution facility
- Assessing the water demand and water consumption areas/processes
- Preparation of detailed water circuit diagram

# Water Audit- Methodology (Contd.)

**Step 3: Secondary Data Collection through the Discussion with plant executives, past records, Available technical literature/specifications, water audit questionnaire**

- Analyze historic water use and wastewater generation
- Data on current water use
- Metered & unmetered supplies
- understanding of “base” flow and usage trend at site
- Past Water Bills
- Wastewater Treatment scheme & costs etc.
- Data collection as per the ‘Water Audit Questionnaire’ shared

**Step 4: Site Water Audit Planning (based on site operations and practices)**

- Preparation of water flow measurement plan to quantify water use at various locations
- Wastewater flow measurement and sampling plan
- Instruments availability like Ultrasonic Water Flow Meter, Doppler type Flow meter, Stop Watch, measuring cylinders, Power Analyzer etc.

# Water Audit- Methodology (Contd.)

**Step 5: Conduction of Detailed Water Audit & Measurements**

- Conduction of field measurements to Quantify water/wastewater streams
- Power Measurement of Pumps/Motors
- Measurement of suction & discharge pressure at various pumps
- Wastewater sampling & analysis
- Preparation of Water Balance Diagram
- Establishing Water Consumption Pattern
- Evolving value added “cost of water” at various locations
- Detection of potential leaks & water losses in the system
- Assessment of productive and unproductive usage of water
- Determine key opportunities for water consumption reduction, reuse & recycle with paybacks

# Water Audit- Methodology (Contd.)

**Step 6: Preparation of Water Audit Report with Sustainable Water Management Plan**

- Documentation of collected & analyzed Water Balancing and Measurement details
- Projects and procedures to maximize water savings and minimize/eliminate water losses
- Continuous Water Metering and Accounting System
- Opportunities for Water Conservation based on Reduce/Recycle/Reuse/ Regeneration / Recharge options with Cost Benefit Analysis, IRR, ROI etc.

**Step 7: Water Audit Report Finalization and Submission**

- Incorporation of required changes based on discussions with plant executives
- Preparation & submission of final report

# Implementation Plan – Water Conservation Measures with Time Frame

| Section/Area | Key Observations | Suggested Best Practices/ Recommendations | Annual water savings ($m^3$)/ Energy saving | Annual monetary savings (Rs. lakhs) | Investment (Rs. Lakhs) | Pay-back period (Years) | Implement ation time frame |
|---|---|---|---|---|---|---|---|
| **Short term: Immediate implementation within 6 month** | | | | | | | |
| Steam & Water Leakages | At few locations steam traps are faulty, the steam was passing through it. At DM plant and RO plant water leakage of about 15 m3/day were identified and measured. | It is suggested to replace the faulty steam traps and arrest Water Leakages in the plant immediately which will save 15 m3/day of water | 5475 | 1.18 | 1 | 0.8 | 1 month |
| **Medium term: 6 months to 12 months** | | | | | | | |
| | | | | | | | |
| **Long term: 12 to 24 months** | | | | | | | |
| | | | | | | | |

# WATER AUDIT INSTRUMENTS

| Name of Instruments | Measuring Parameters | Model & Make |
|---|---|---|
| Ultrasonic Water Flow meter | Liquid Flow rate, Flow Velocity | Fluxus ADM 6725 |
| Portable Ultrasonic Flow meter (Doppler Type) | Liquid Flow rate, Flow Velocity | Model DUFX1-F1<br>Make: Dynasonics |
| pH meter | Measurement of pH of liquids/effluents | Make-Extech- PH100 |
| TDS Meter | Total dissolved solids in liquids/effluents | Make- Vortex |
| Pressure gauges (0- 10 kg/cm2) & (0-14 kg/cm2) | Measurement of liquid Pressure in Pipelines (kg/cm2) | |
| Infrared Thermopointer | Surface Temperature | CE INF100 |
| Anemometer | Air velocity | Prova AVM-03 |
| Sling Psychrometer | WBT, DBT | ZEAL |
| Clamp Meter | V, A, kW, kVAr, PF, Hz | KUSAM Meco |
| Temperature Indicators with Thermocouples | Temperature | Anadig / PDT-015/PDT-002 |
| Digital Thermal Imager | IR images & Digital Images | Fluke: Ti25 |
| Instantaneous Power Analyser | V, A, kW, kVAr, PF, Hz with harmonics | Nanovip (Krycard) |
| 1 Phase Continuous & instantaneous Power Analyser | V, A, kW, kVAr, PF, Hz with harmonics | ALM 10 (Krycard) |
| 3 Phase Continuous & instantaneous Power Analyser | V, A, kW, kVAr, PF, Hz with harmonics | ALM-30 (Krycard) |
| 1 Phase Continuous & instantaneous Power Quality Analyser | V, A, kW, kVAr, PF, Hz with harmonics | Fluke 345 |
| Portable Water Quality testing kit | Water quality testing of liquids/effluents | Prerana Labs, Master Kit |

# FICCI Water Audit Process And Timeline

1. Send Water Audit Request email to FICCI **(**rcm@ficci.com **,** ieshu.ghai@ficci.com**)**
2. On receiving request, we will share basic **Water Audit questionnaire** – Water source, KLD consumption, water sourcing cost (Rs/m3), no. of borewells, location, contact details etc.
3. After receiving basic information – FICCI will submit **Customized Water Audit Proposal** with scope, methodology, cost, timeframe and other T&C.
4. After receiving **Work Oder**, Generally the Water audit study completion takes about **4-6 weeks** time –

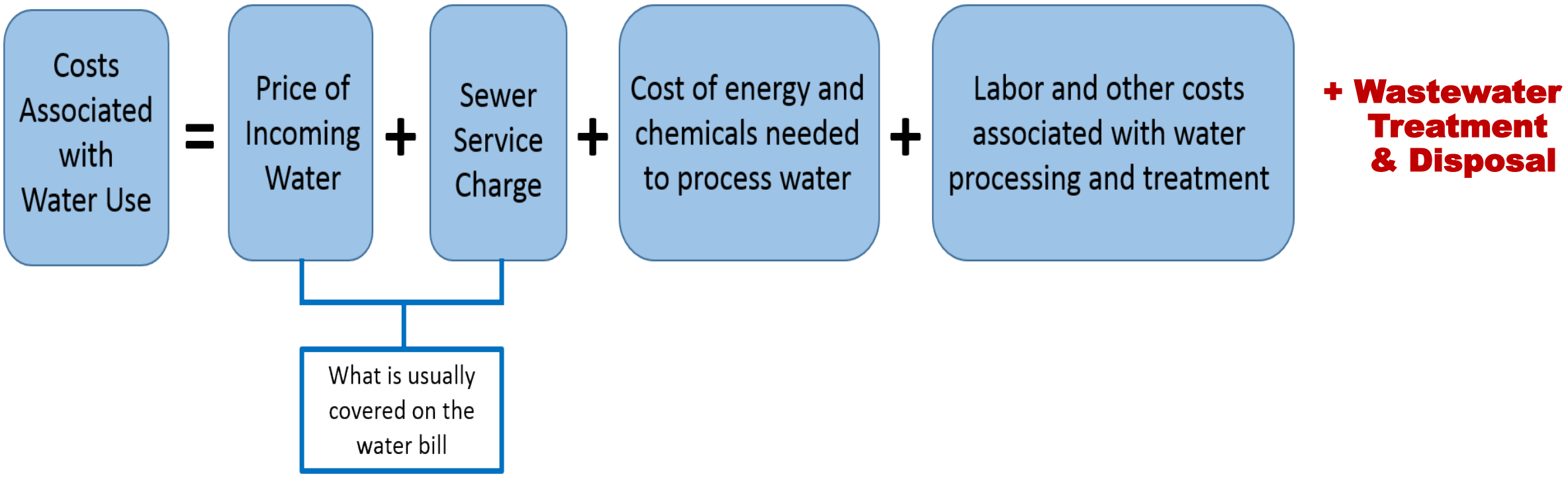
   - Team mobilization (1 week)

   - Field studies (1 week)

   - Report preparation(3-4 weeks)

5. **Cost** depends on type of plant, size, water consumption, types of utilities, scope of work and urgency of activity etc.
6. **FICCI members** are eligible for special discount (up to 15%).

# Costs Associated with Water Use



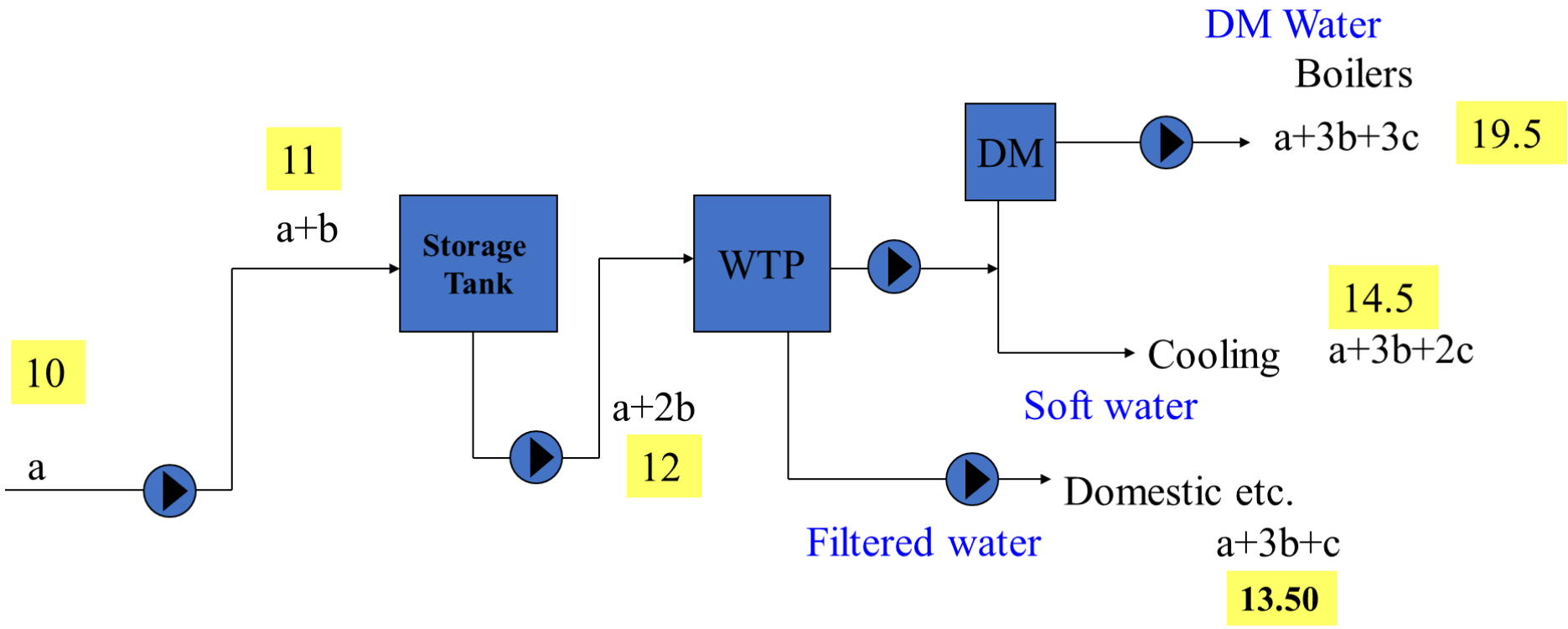

**+ Wastewater Treatment & Disposal**

# Value added cost of water

- **Value added cost of a water are the costs which are directly associated with water to improve its quality and availability.**
- It includes the costs associated with water from ‘sourcing till its disposal from the plant premises’. For example:
  - Water Sourcing cost
  - Pumping (Energy Cost)
  - Treatment (Chemical & Energy Cost)
  - Maintenance (spare parts, consumables/replacement cost), labour costs etc.
  - Wastewater and waste Disposal

***As water travels in our system, its cost keeps on increasing; therefore, it is important to know the cost of water at use location.***

# Value Added Cost




For Example:

a – cost of raw water (Rs 10/m3)

b- pumping cost (Rs 1/m3)

c- treatment cost (Rs/m3)- Filtration 0.5; Softening 1; DM 5

# EXCESS WATER IN A ‘SYSTEM’ IS A ‘BURDEN’

- Excess water pumping-increased energy Cost
- Excess water for treatment – increased energy and chemical cost
- Excess water discharge – increased wastewater treatment cost
- Excess wastewater disposal – increased disposal costs

# Water Conservation – Common Low Cost Methods and Technologies

# STOP LEAKAGES AND OVERFLOWS





# 1. Float Valves

**Floating Ball Valves:** A floating ball valve is used to regulate or shut off the flow of liquid. The purpose of the float valve is to control the flow and fill the level of the tanks and stop overflow or overfilling





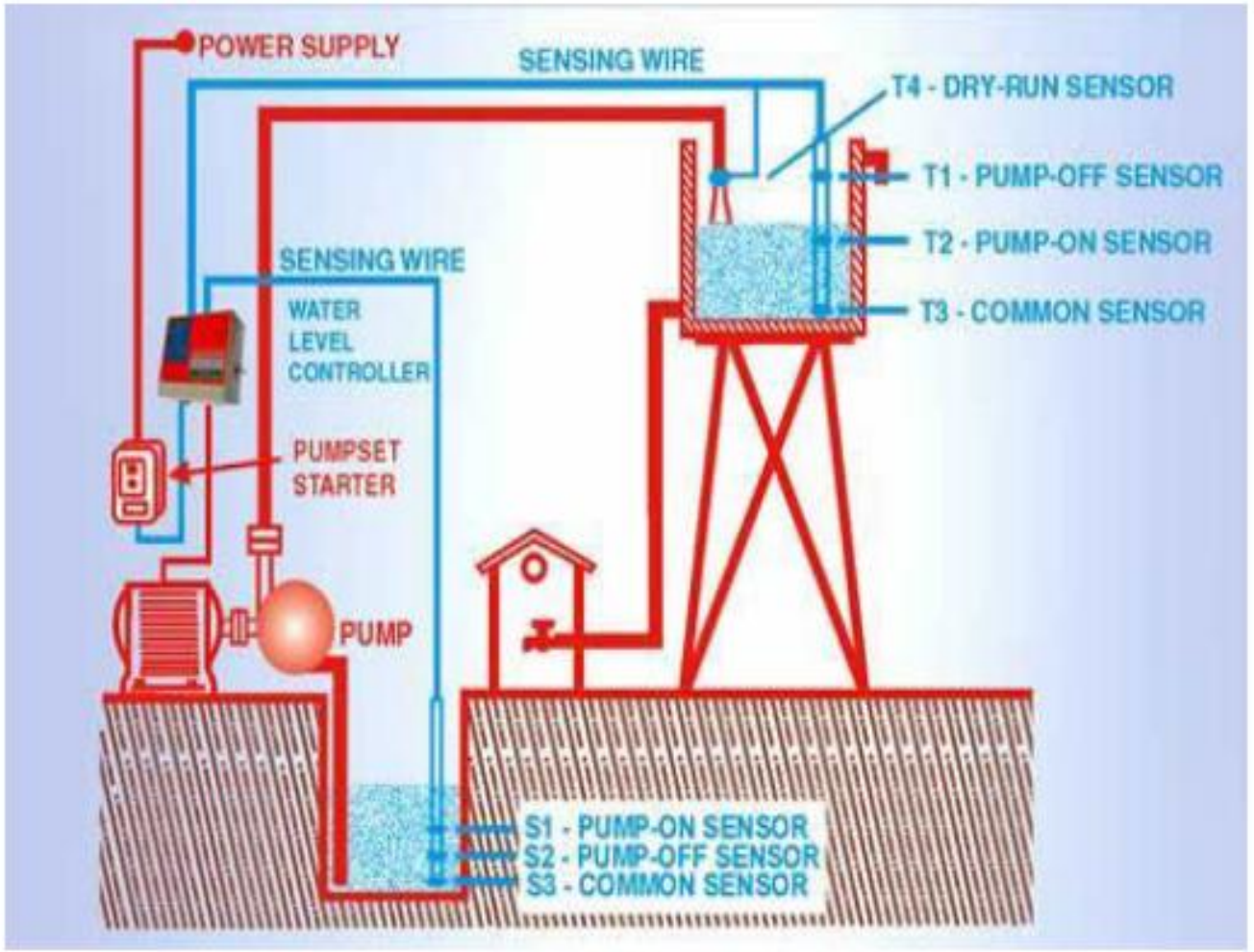
**Install and maintain Float valves in OHTs to control overflows**

# 2. Automatic WATER level controller (AWLC)

If the pump operation and closing of valves during filling of OHT is done manually, it leads to substantial overflow from OHT's.

This overflow can be eliminated by using AWLC and Float valves.

The AWLC are ideal for difficult to access overhead tanks, they consume very little energy and best for continuous operation.



# 3. WATER METERS

- Replacement of conventional water meters with more accurate water meters like electromagnetic flow meters for better operating controls.
- **Water Meters-** helps in accounting of water- use.
- It's vital to know your start point and find out how much water you are currently using.






Integral type
Electromagnetic flow meter

# 4. Water Efficient Taps –Push Taps

1. **Push Tap:** A push tap or non-concussive tap is a type of faucet that is operated by pushing a button on the top or front of the tap in order to activate the water flow. It's a self-closing faucet which if once activated.



**Benefits**

- Suitable for both domestic and commercial applications
- Save up to 75% of water & related energy costs.
- Push taps with automatic shut off after approximately 8-10 seconds.

**Cost**

- Push Tap product price in India ranges from 100 to 5,000 INR and above

# 5. Water Efficient Taps – Install Aerators

**a) Tap Aerator**

Tap Aerator is a small attachment fitted at the end of the water taps mouth or inserted inside the spout and can act as a water saving aerator for the tap.




Water Aerators for taps come in the form of mesh screens that divide the water flow into multiple small streams by adding air in between. The volume of water flowing from the tap gets reduced as the water stream is diluted with air. This results in water savings on faucets and water aerators also minimize splashing in sinks.

**Benefits**

- Conserve up to 75% water with our True aerators without losing the tap functionality. Water saving aerator starts from 2 LPM, 3 LPM, and 4 LPM.

**Cost**

- The range of Tap aerators are between Rs 50 to 300 and above.

# HAND WASHING TAPS



# 6. Water Efficient Showers






**Low flow showers uses 30-70% less water than conventional showers, leading in water saving.**

25

# 7. Water Efficient Flushes: Tank Banks

**Tank Bank:** This will save about 20% of flush water in toilets. Toilet flush tank banks are simple bags and can reduce almost 25-30% of total flush water usage. By placing the Tank Bank (filled with water) inside the flush tank, we displace an amount of water equal to the water in the Tank Bank for every flush.







**Benefits**

- Saves about 2 liters of water on every flush.
- No compromise on the performance of each flush
- It gives flexibility and testing flushing efficiency at different volume water levels by filling of bags as required.
- It can be fitted at the corner of the tank without disturbing flushing mechanism inside.

**Cost**

- It cost around Rs 360 – 1000 per piece

# 8. Install Dual Flush System

**Table: Potential water savings per person per day by replacing Conventional Cistern with Slim dual flush Cistern / Using Flush Tank Bank**

| Estimated Flush usage per person per day | Conventional Cistern | Slim Dual Flush Cistern | | Using Flush Tank Bank |
|---|---|---|---|---|
| Handle Type | Conventional | Small | Large | |
| Usage per day per person (Numbers) | 5 | 4 | 1 | 5 |
| Cistern Capacity (Litres) | 10 | 3 | 6 | 7 |
| Water Consumption (Litres) | 50 | 12 | 6 | 35 |
| Total Water Consumption (Litres/Person/day) | 50 | 18 | | 35 |
| Water Saving (Litres/person/day) | | 50-18 =32 | | 50-35=15 |
| | | Reduction in 64% of water use in flushing activity | | Reduction in 30% of water use in flushing activity |

# 9. Water Efficient/Water less Urinals

❑ **Water Efficient Urinals/Waterless Urinals:**

- A significant way to save water in urinals is to replace inefficient existing urinals with 'Low water use urinals' which uses 0.8 litres per flush only or sensor based urinals which flushes automatically after sensing the use.
- The cost of low flow urinals and sensor based urinals is about Rs 5000/piece.
- Conventional urinals can also be replaced with 'Aquafree Waterless Urinals'.
- The cost of Waterless Urinal with Cartridge is about Rs 11,754/piece.

| S.No | Conventional Urinals | Water Efficient Urinals | Water less urinals |
|---|---|---|---|
| 1 | 3-6 lpm | 0.8 lpm | No water reqd. |

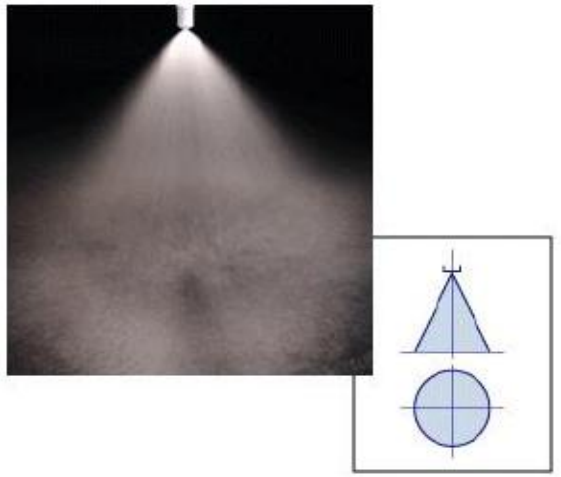


Aquafree Waterless Urinal

# 10. Use of water saving nozzles for cleaning

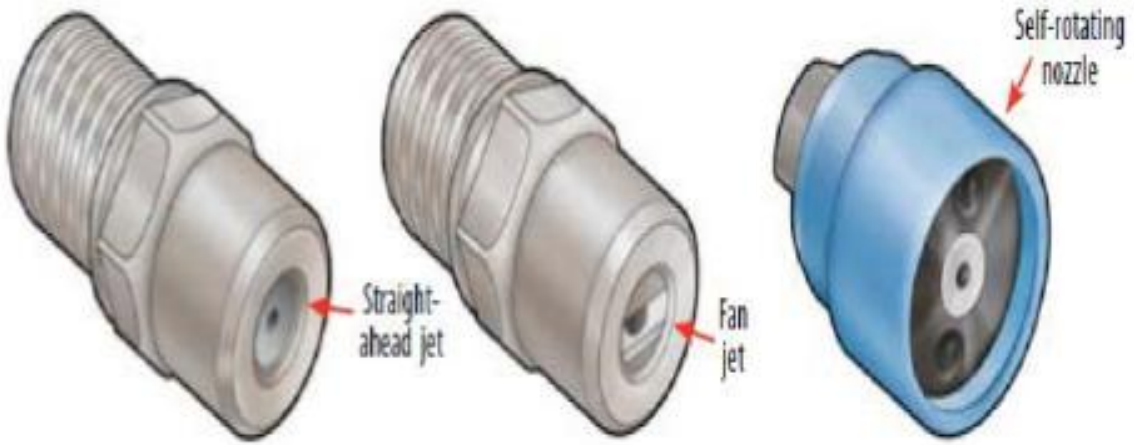
❖ **Efficient spray nozzle in utensil washing taps:**





**Full Cone Spray Nozzles**

**Jetting gun nozzles:** Jetting gun nozzles are configured to provide a straight-ahead jet or fan jet pattern. Each type will provide efficiencies for conducting different types of cleaning tasks.




**Different types of jetting gun nozzles**

# Water efficient hand controlled spray nozzles





# 11. Use of steam vacuum for floor cleaning





# 12. Water Efficient Washing Machines

| Water Consumption Volume per wash load | Symbol on Label & Water Efficiency Grade | Rating |
|---|---|---|
| Between 12 to 15 litres/kg | ★ Efficient | 1 |
| Between 9 to 12 litres/kg | ★★ Highly Efficient | 2 |
| Less than 9 litres/kg | ★★★ Most Efficient | 3 |



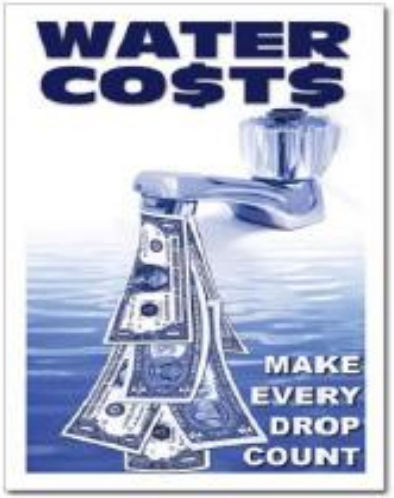
# 13. Water saving posters















Resource Conservation & Management Group

# HOW THE WASTAGE CAN BE REDUCED






Water your yard and outdoor plants early or late in the day to reduce evaporation.

Use a shut-off nozzle on your hose.



Use plants that require less water.





Mulch around plants to hold water in the soil.




Get an Energy Star labeled washing machine.

Wash only full loads.

Use a low flow showerhead.






Take shorter showers — five minutes or less is best.

Turn off the water while soaping hands and brushing teeth.




Turn off sink faucet while scrubbing dishes and pots.







Install new toilets that use less than 1.6 gallons per flush.



Put faucet aerators on sink faucets.

Us a broom, not a hose, to clean driveways and walkways.



# 14. AWARENESS & TRAINING ON WATER CONSERVATION AND MANAGEMENT






# 15. Landscaping

- Use of Sprinklers and Drip Irrigation



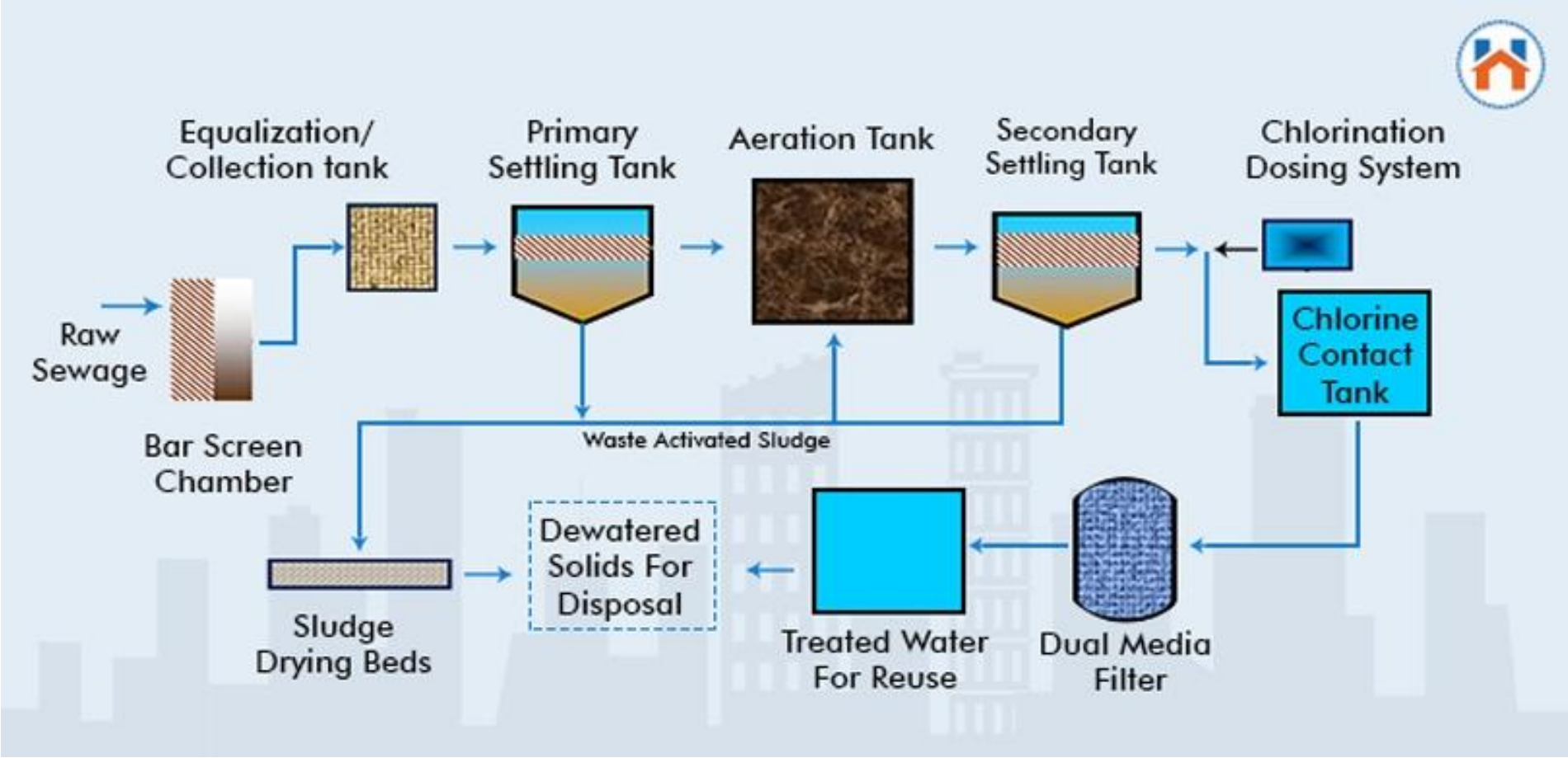


- Use of Soil Moisture Meter



# 16. Recycle and reuse of Wastewater

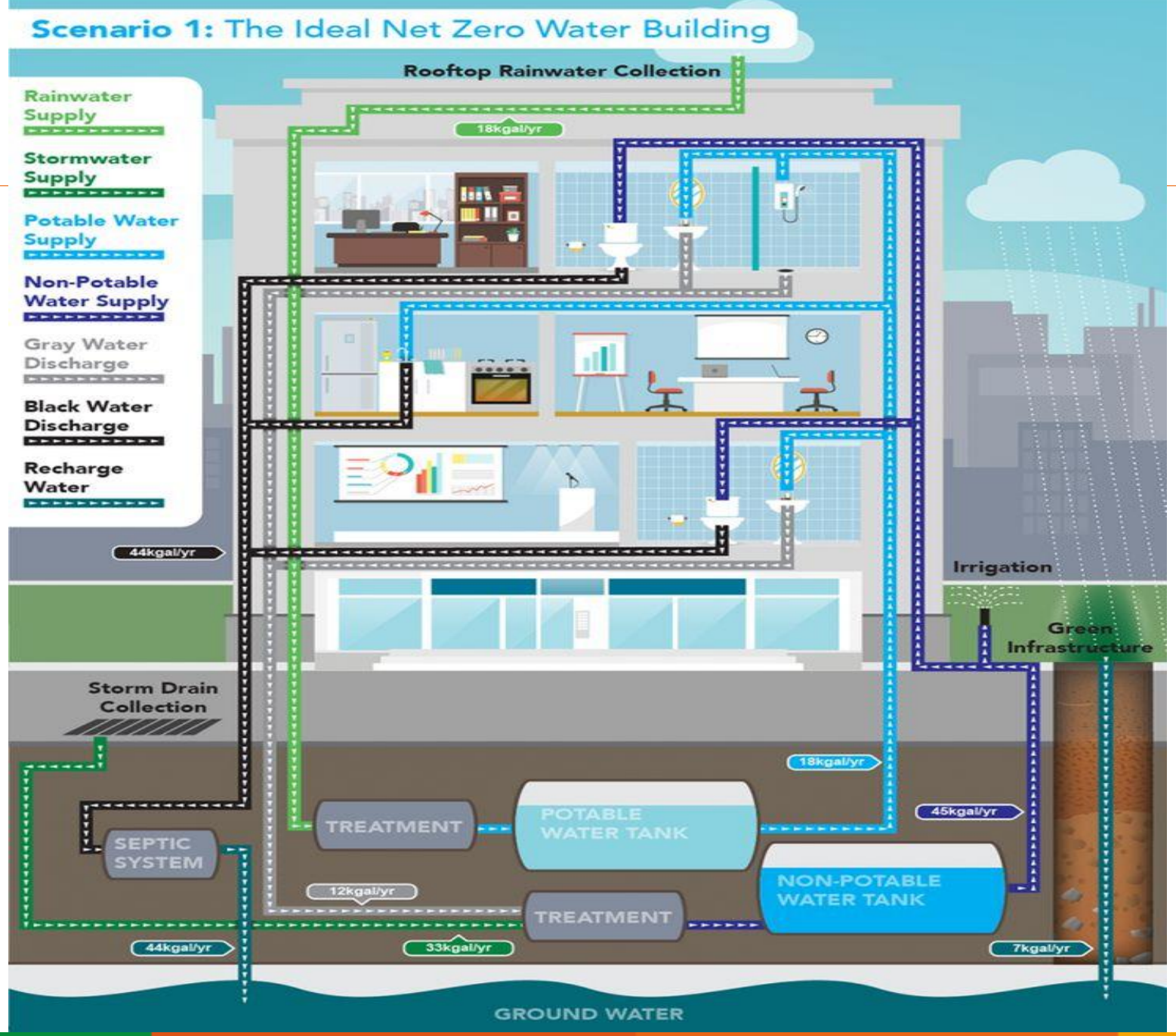
Install Sewage Treatment Plant (STP) for recycle and reuse of water for Flushing and Gardening. Or Cooling Tower Applications



# STP Technologies and suppliers

| Company | STP Type | Technology | Feed water BOD mg/l | Post Treatment BOD mg/l |
|---|---|---|---|---|
| **Flosys Water Solutions Pvt. Ltd.** | Packaged STP | MBR | 250-350 | <10 |
| **Hydroflux** | STP | MBBR with MGF, ACF and ULTRA FILTRATION | 250-350 | <20 |
| **KELVIN WATER TECHNOLOGIES PVT. LTD.** | STP | MBBR with Tube Settler media, MGF, ACF and Ultra Filtration | 10-200 | <10 |
| **Kpack Systems Pvt. Limited** | STP | Bioflocs MBR Module | 350 | 10 |
| **TR Aqua Private Limited** | STP | MBBR with Tube Settler | 300 | <10 |
| **ZWC** | Green STP | Centrifuge Separator, biofilter, MGF and ACF | 200-500 | <10 |
| **ECOSTP Technologies (P) Limited.** | STP | Anaerobic Digestion | 350 | <10 |
| **ANUJ ENTERPRISES** | Package type skid mounted | MBBR technology, FAB Media, ACF | 200-250 | <30 |
| **Daiki Axis India Pvt. Ltd.** | Packaged STP | Moving Bed Bio Reactor (MBBR) along with Anaerobic contact media treatment | 300 | <20 |

Segregation of Grey and Black water, treatment and reuse



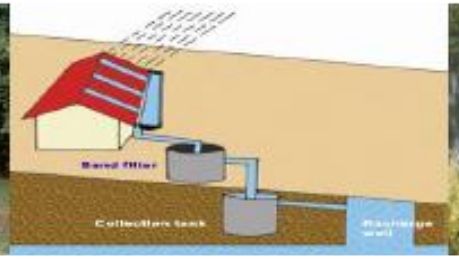
# 17. Rainwater harvesting

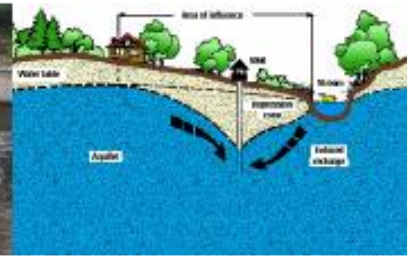
## *Definition:*

Rainwater Harvesting is a technique to capture the rainwater when it precipitates, store that water for direct use or recharge the groundwater and use it later.

## *Techniques of Rainwater Harvesting:*

- Storage of rainwater for direct use
- Artificial recharge of groundwater



# From where to Harvest the Rain

- Rooftops (Flat or Sloping)




- Water bodies




- Paved and unpaved areas



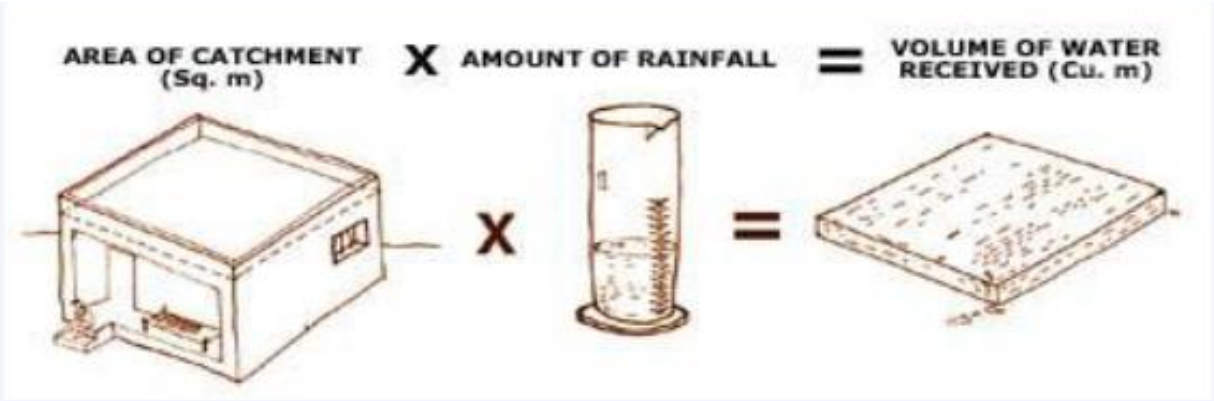

- Storm-water drains




# Runoff Coefficient for various Surfaces

| Type of Catchments (Area sq m) | Collection Coefficients |
|---|---|
| **Roof Catchments** | |
| - Tiles | 0.8- 0.9 |
| - Corrugated metal sheets | 0.7- 0.9 |
| **Ground surface coverings** | |
| - Concrete | 0.6- 0.8 |
| - Brick pavement | 0.5- 0.6 |
| **Untreated ground catchments** | |
| - Soil on slopes less than 10 percent | 0.1 - 0.3 |
| - Rocky natural catchments | 0.2 - 0.5 |

# RWH Potential




RWH Potential ($m^3$) = Area of catchment ($m^2$) x Rainfall (m) x Runoff coefficient

**For Example:**

**Area = 100 square meter**

**Rainfall = 611 mm = 0.611 m**

**Runoff Coefficient = 0.85**

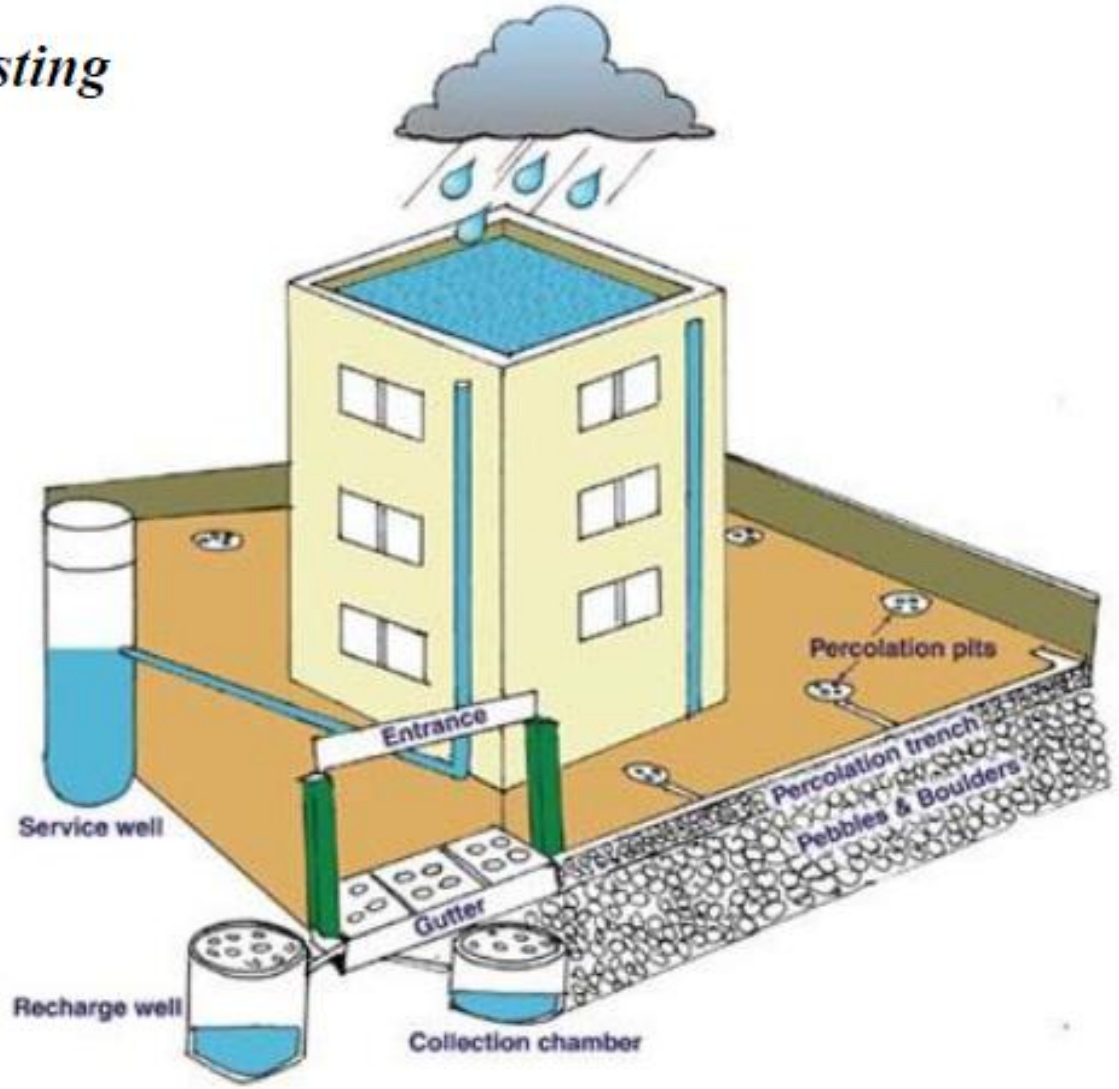
**Rainwater Harvesting Potential = 100 x 0.611 x 0.85 = 51.9 35 cubic meter**

**or 51,935 liters**

# Techniques of RWH

*Urban Rainwater Harvesting through*

- *Recharge Pit*
- *Recharge Trench*
- *Existing Tube wells*
- *Trench with Recharge well*



# Water Quality of Harvested Water

- **Cleanliness of catchment area** and avoiding contaminated areas
- **Don't allow polluted water** to flow into the system
- Regularly **monitor the water quality**
- **Disinfection** of harvested water before consumption
- **Change or clean the filter media** every year
- **First flushing**
- Regular **cleaning of storage tank**
- Maintenance and **monitoring of Recharge Structure**

# INITIATIVES BY INDUSTRIES TO IMPROVE WATER USE EFFICIENCY

***Supported by FICCI Water Audit Studies***

# 1. Pulp & paper

**RESULTS ACHIEVED**

***50% reduction in freshwater Consumption in one of the Pulp & Paper unit and reduction in effluent generation by 22% with discounted pay-back period of <2 years***

***Type: Recycled Paper based Unit***

***Water Consumption: 6000 KLD***

***Water Source: Borewell***

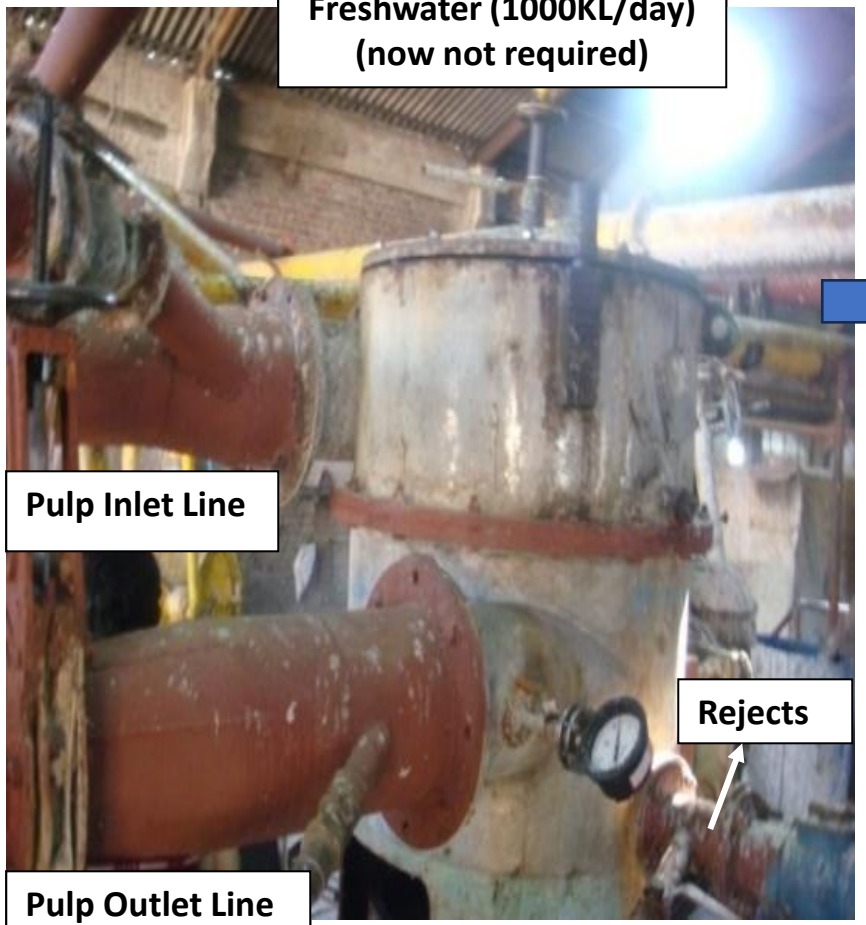
***Location: UP***

# *PULP & PAPER UNIT-1*

***Key Water saving opportunities implemented by RCM-FICCI:***

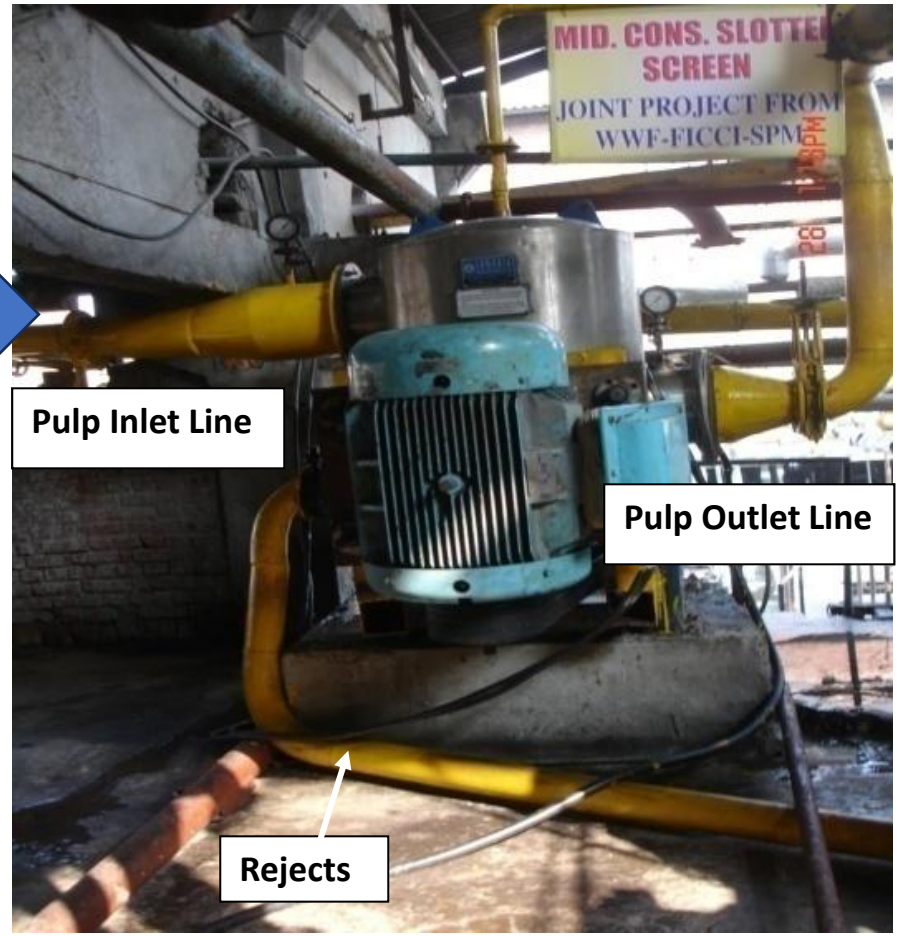
- *Replacing low consistency screening technology (1%) with medium consistency (2.5%) pulp screening technology*
- *Installation of Water Efficient Showers at Paper Machines*
- *Implementation of Scheme for Segregation & Treatment of Colored Effluent for reuse in pulping*
- *Training and awareness generation*

## Before Implementation




Low Consistency Pulp Screen consuming more water

## After Implementation




Medium Consistency Pulp Screen consuming less water.

*INSTALLATION OF MODERN MEDIUM CONSISTENCY PULP SCREENING EQUIPMENT*

| Water & Energy Savings by Modern Pulp Screen Installation | | | |
|---|---|---|---|
| | **Water Consumption (KL/day)** | **Energy Consumption** | |
| **Details** | | **Borewell (H.P./day)** | **Modern Pulping Screen KWh/day** |
| Before Installation | 3000 | 720 | 990 (60 HP) |
| After Installation | 2000 | 480 | 490 (32.8 HP) |
| **Savings** | **1000** | **240** | **500 (33.5 HP)** |

# WATER & ENERGY SAVINGS BY MODERN PULP SCREEN

# *Installation of Water Efficient Showers at Paper Machines*

**Before Implementation**



Fig 3: Inefficient Hole Showers consuming more water

**After Implementation**




Fig 4: Water Efficient Wide Angle Spray Showers

| Water Savings & Reduction in Effluent Generation by Modern Water Efficient Showers | | |
|---|---|---|
| **Details** | **Water Consumption (KL/day)** | **Effluent Generation (KL/day)** |
| Before Installation | 1200 | 600 |
| After Installation | 720 | 360 |
| **Savings** | **480** | **240** |

# WATER SAVINGS & REDUCTION IN EFFLUENT GENERATION BY MODERN WATER EFFICIENT SHOWERS

# Before Segregation and Treatment of Colored Effluent











# COLORED DRAIN SAMPLES TESTED FOR HYPO-DOSING







Colored Wastewater Samples from different drains

Bleaching with addition of Hypo Solution

# After Segregation and Treatment of Colored Effluent



Newly Constructed Channels & Pits for segregation & treatment



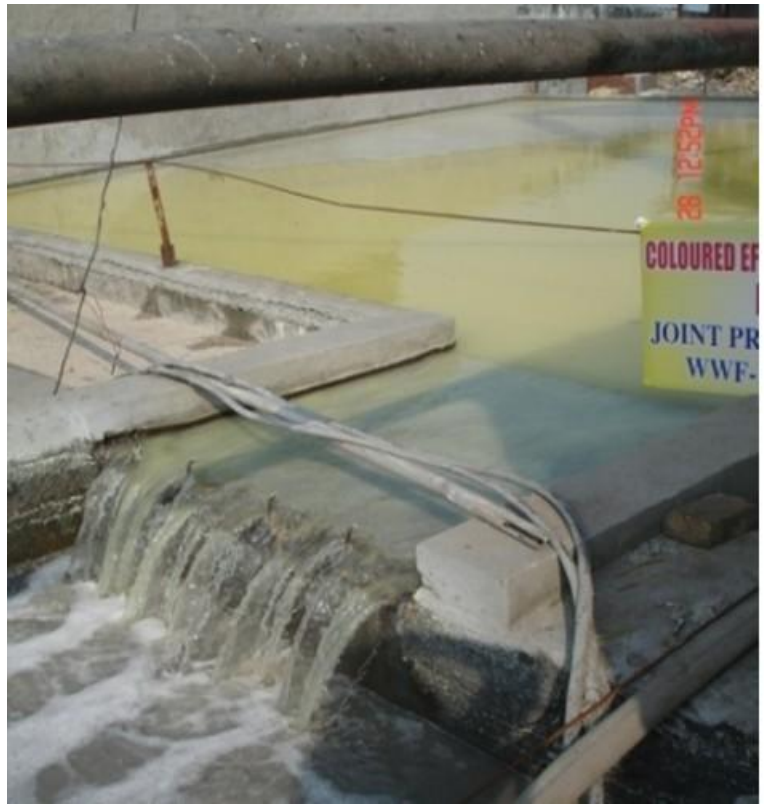


Hypo-dosing for colour removal



Treated Colored Effluent after Hypo-dosing

# After Segregation and Treatment of Colored Effluent




New Storage Tank to provide Retention Time to treated colored effluent




Treated Effluent Discharged to common pit



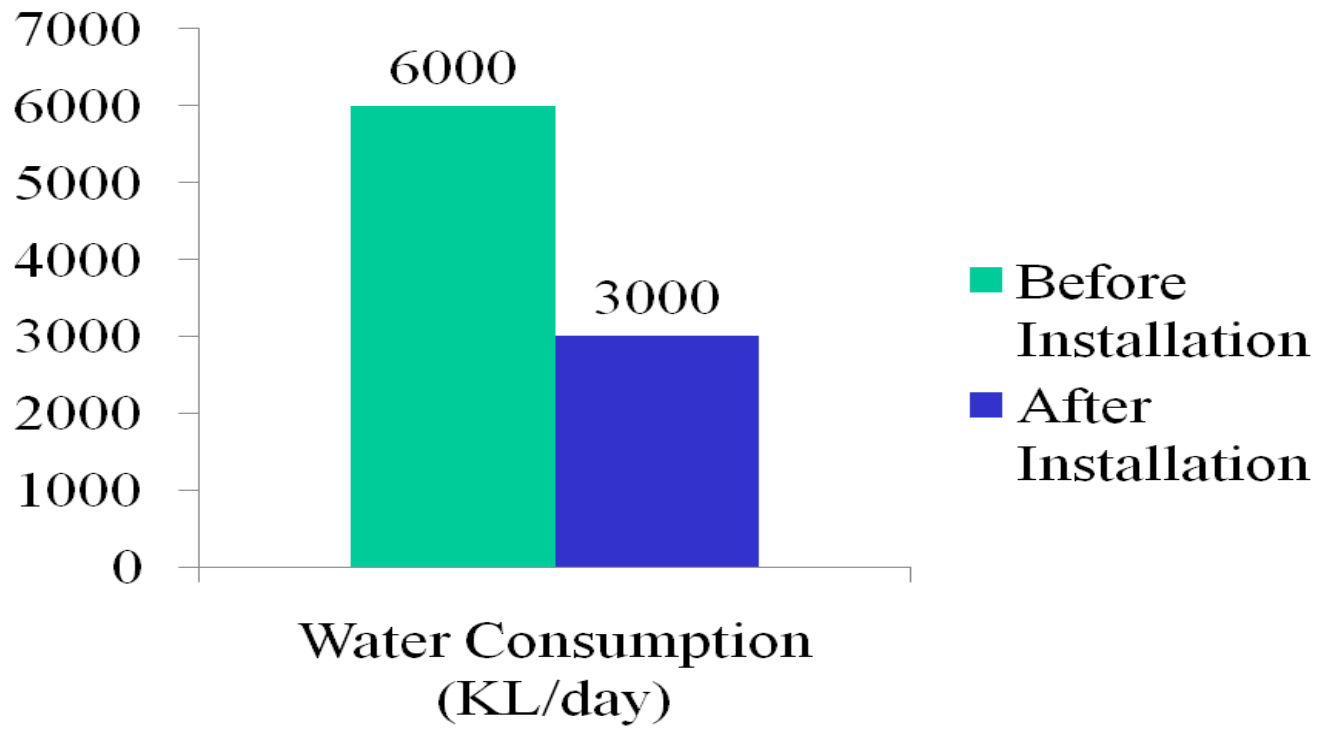

## *Training to Staff at Pulp and Paper Unit*



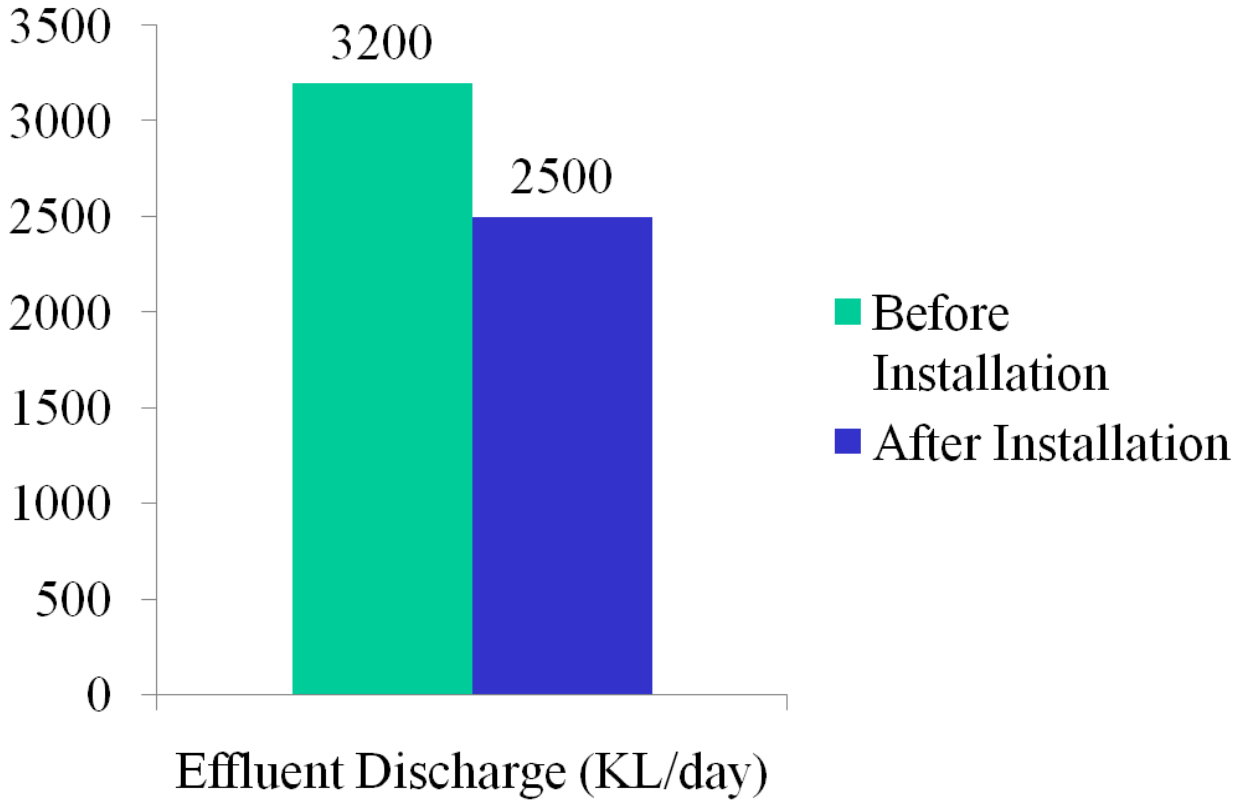
# COST BENEFIT ANALYSIS OF IMPLEMENTED BEST PRACTICES

| S.No. | Best Management Practices | Operational & Environmental benefits | Annual Resource Savings | Investment (Rs. In lakhs) | Annual Monetary Savings (Rs. In lakhs) | Simple Payback Period (Years) |
|---|---|---|---|---|---|---|
| 1 | Replacement of Conventional Pulp Screen with Modern Pulp Screening Equipment having consistency 2.5% | Uses less fresh water and energy and also, less energy would be required to pump the fresh water from the borewells | -Water Savings 3,000,00 KL | 9.5 | 12 | 0.8 |
| | | | -Energy Savings 226050 HP | | | |
| 2 | Replacement of conventional hole showers with modern wide angle & fan jet spray Showers at Paper Machines | Uses less water and enable backwater recycling leading to less effluent generation & savings in effluent treatment | -Water Saving | 1.4 | 1.7 | 0.8 |
| | | | 1,440,00 KL | | | |
| | | | -Reduction in backwater generation | | | |
| | | | 720,00 KL | | | |
| SUB-TOTAL | | | | 15.4 | 18.9 | 0.8 |
| 3 | Segregation of colored effluents for colour removal before treatment & reuse | Increased efficiency of existing ETP and improved quality of final Effluent. | | 4.1 | Operating Cost | -- |
| | | | | | (-7.5) | |
| **TOTAL** | | | | **19.5** | **11.4** | **1.7** |

# REDUCTION IN FRESHWATER CONSUMPTION UPTO 50%

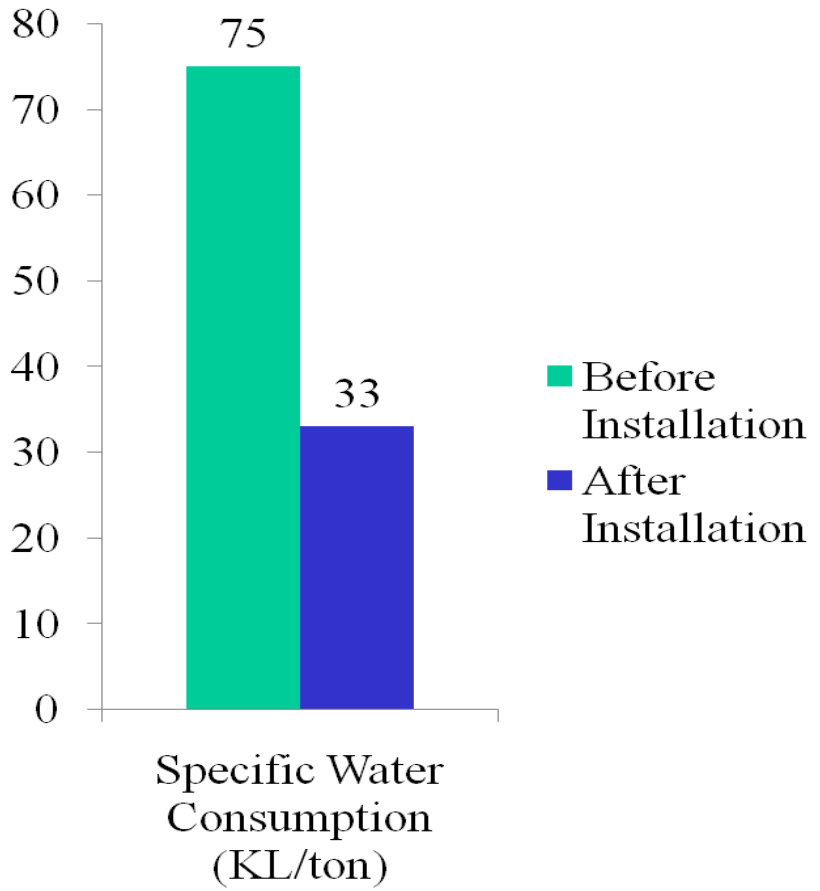


# REDUCTION IN EFFLUENT GENERATION UPTO 22%



# REDUCTION IN SPECIFIC WATER CONSUMPTION UPTO 56%

- The mill was consuming around 6000 KL/day of Freshwater and was producing 80 TPD of paper.
- SWC of the mill was 75 KL/Ton before FICCI Intervention.
- After intervention SWC is 33 KL/Ton (Mill consuming around 3000 KL/day of Freshwater and has also increased its production capacity to around 90 TPD).



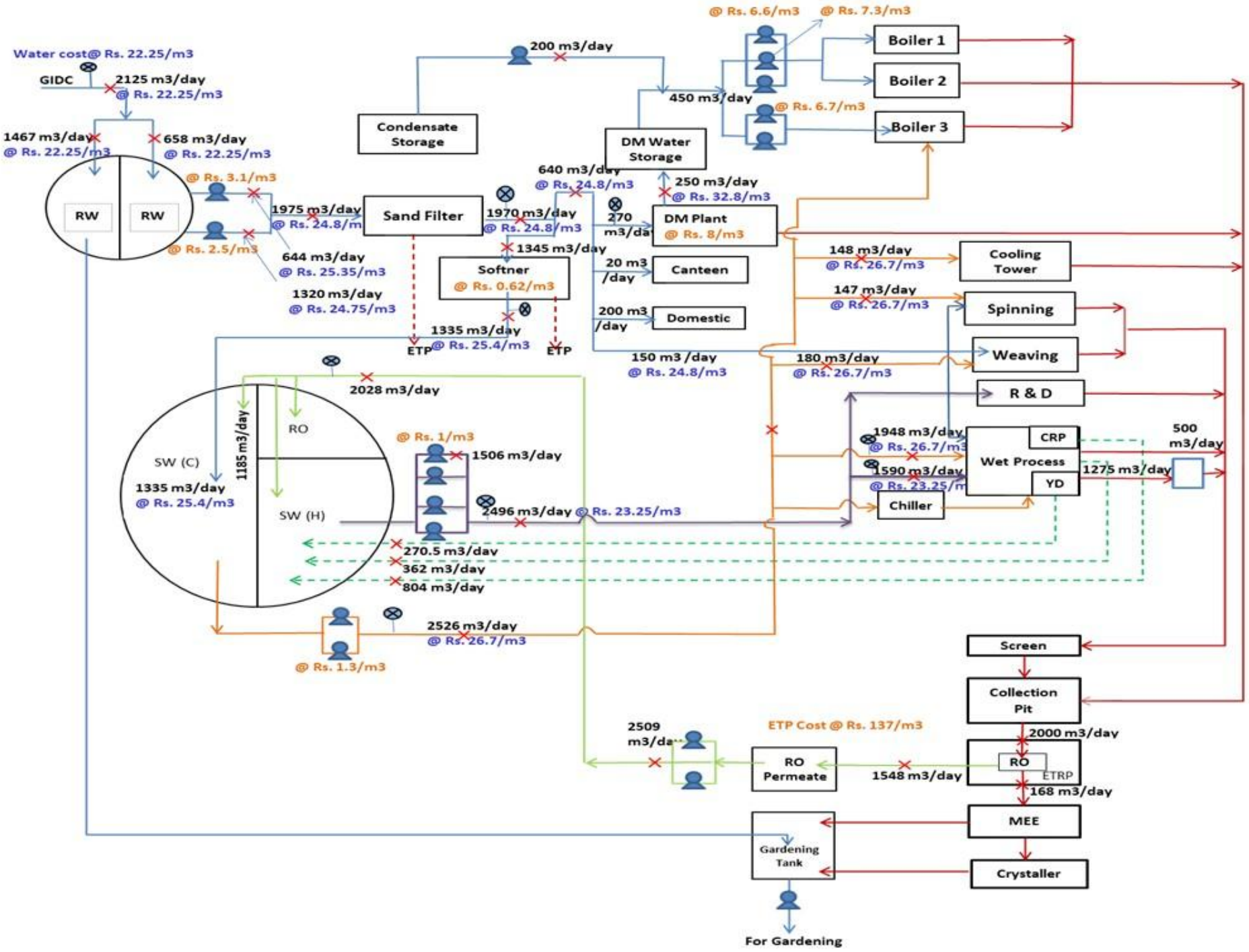
# 2. TEXTILE (ZLD UNIT)

***10% Water Saving in one of the ZLD Textile Plant with pay-back period of <2 years, it accounted to saving of water management and associated treatment costs by 7%***

***Key Water saving opportunities identified by RCM-FICCI:***

- ✓Use of high value water for high end applications by replacing use of soft water with filter water/raw water for activities like machine washing and floor washing mainly in the process area
- ✓Optimize freshwater use by putting water efficient nozzles on hose pipes used for cleaning & washing purposes in the process and other parts of the plant area
- ✓**Collection of leftover colour & salt solution separately from colour kitchen & machine turf and evaporating it directly in MEE/Solar Evaporation and send to TSDF**
- ✓Use of MEE condensate to boiler with online TDS sensor with 2-way diversion valve
- ✓Modifications in the “RO Plant circuit” (from parallel to series) to increase yield from 88.5% to >90%

# Water Balance



# Water Sourcing and Costing

**Fig 1- Percentage Share of Total intake Water (5155 m3/day)**

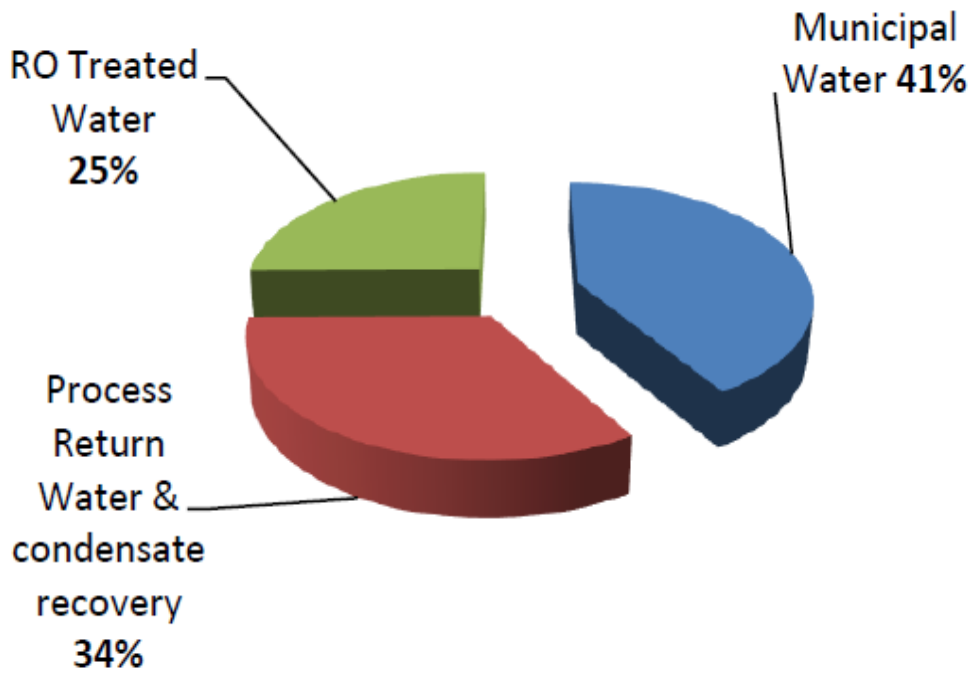
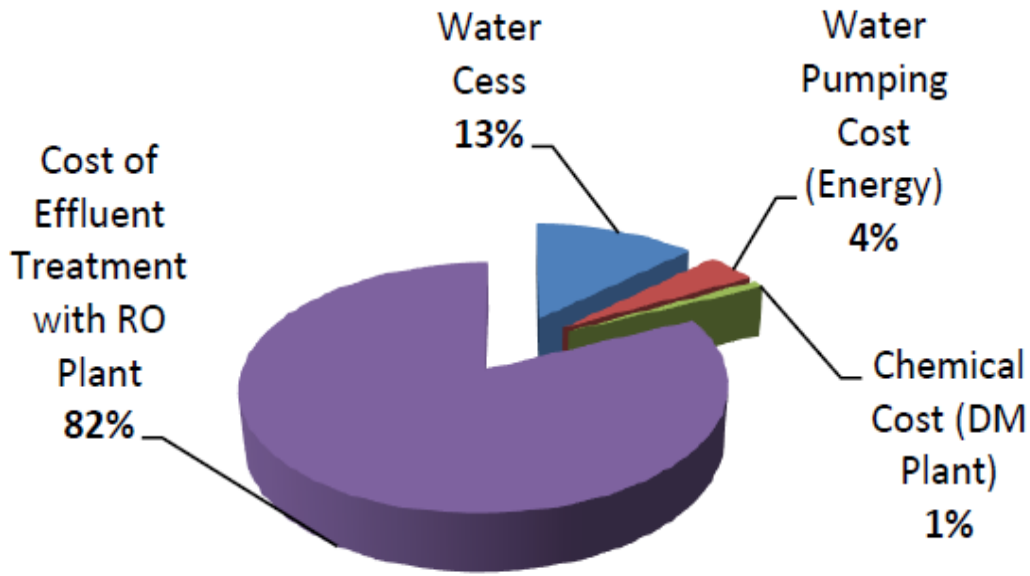



**Fig 2 - Percentage Share of Annual Water & Wastewater Management Costs (Rs 10 Crore/Year)**



# Water Use and Effluent Generation Pattern

Fig 3- Water Usage Pattern in the studied Textile Unit

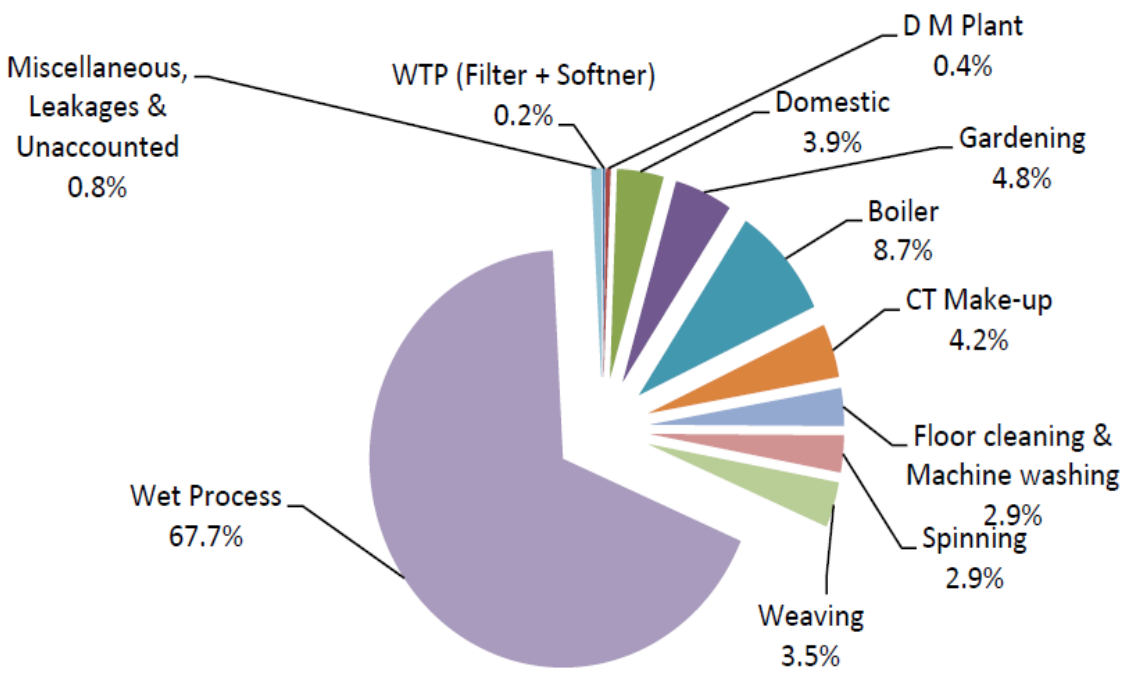
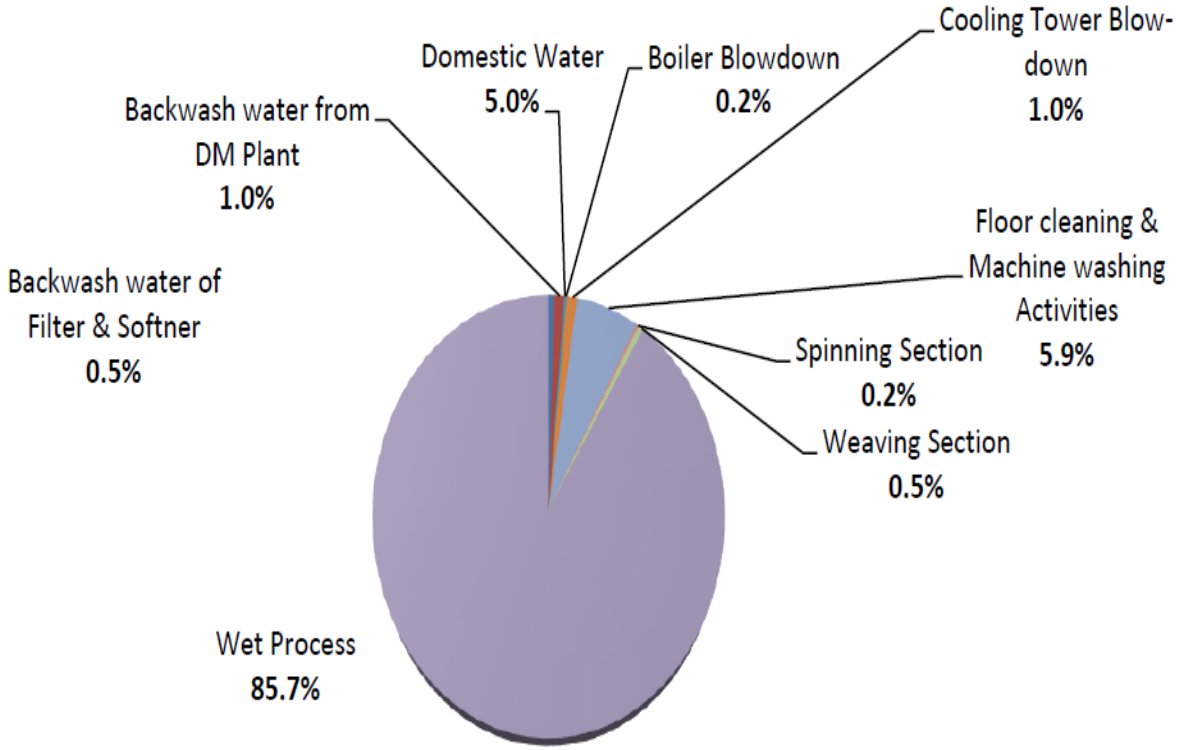
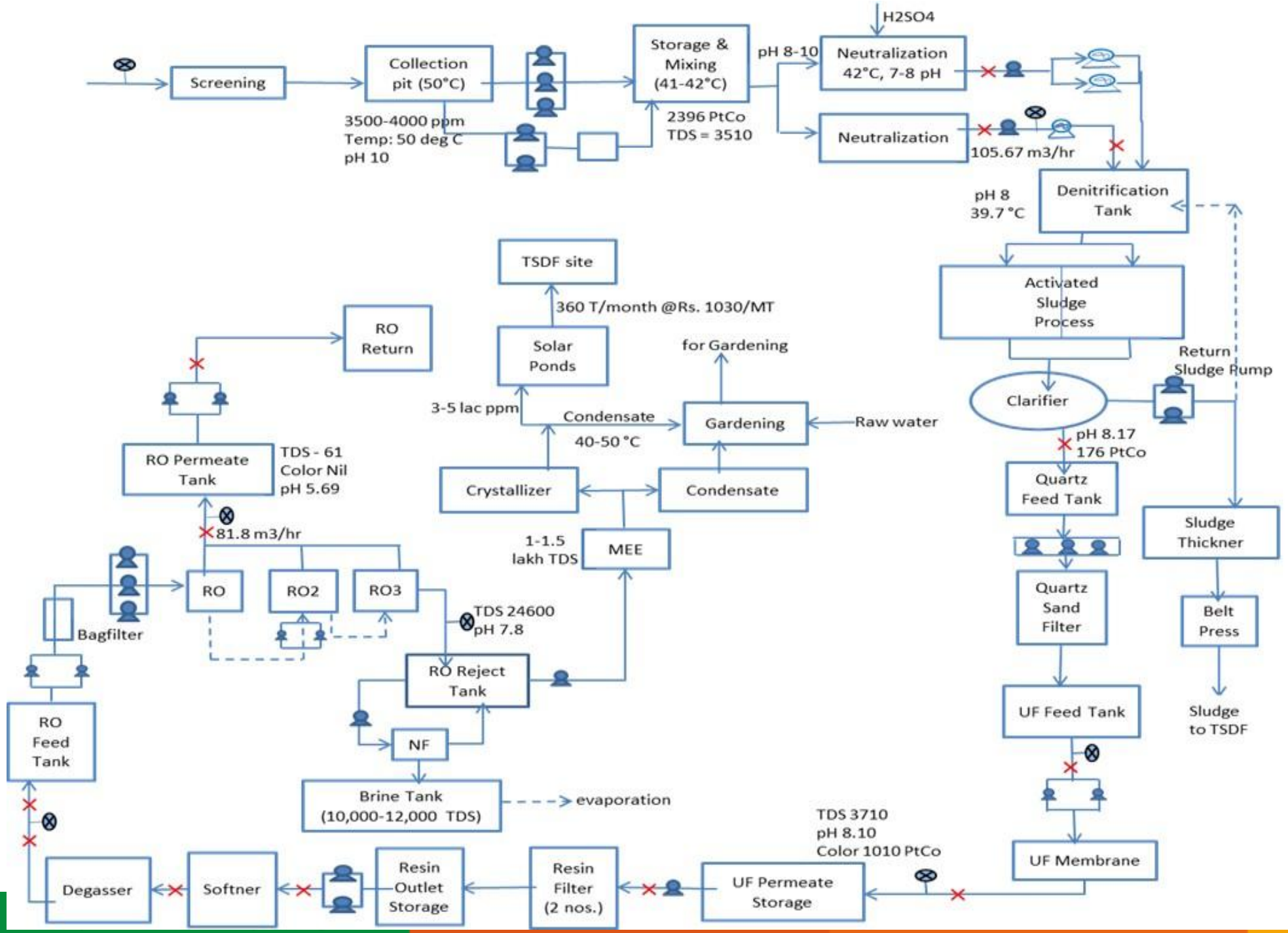



Fig 4 - Effluent Generation Pattern in the studied Textile unit






# ZLD Scheme of the Unit

# 3. FERTILIZER UNIT

***27% Water Saving in one of the Urea Plant with pay-back period of <1 years, it accounted to saving of water management and associated Energy costs by 24%***

***Key Water saving opportunities identified by RCM-FICCI:***

- **IMMEDIATE ATTENTION / LOW-COST INVESTMENT SCHEMES**
  - ✓Plug leakages at various locations in plant
  - ✓Reduce Water Consumption in Plant Domestic Use – By installing water efficient fixtures like sensor-based urinals, water efficient taps with 3-5 lpm flow, tank banks in flush tanks to reduce water per flush etc.
  - ✓Restrict use of fire hydrant for other purposes like coal handing area, floor cleaning etc. The fire hydrant to be used for routine testing and for fire emergencies only.

# *FERTILIZER UNIT (Contd.)*

## *Key Water saving opportunities identified by RCM-FICCI:*

- **MEDIUM & HIGH-COST INVESTMENT SCHEMES**
  - ✓Install a separate STP with Ultrafiltration for reuse of treated water especially for CT makeup
  - ✓To collect and Treat Filter Backwash (ACF & SF) and CT Blowdown for reuse as service water, fire water make up etc.
  - ✓**ZLD scheme to treat ETP final pond water through RO Plant for reuse of permeate as Boiler feed water through condensate polishing unit and rejects to be used for deashing.**

# 4. DAIRY UNIT

## *16% Water Saving in one of the Largest Dairy Unit with discounted pay-back period of <1.5 years*

***Key Water saving opportunities identified by RCM-FICCI:***

- Immediate repairing of Faulty valves in Sterilizers leading to chilled water leakages
- Recovering Caustic final Rinse water for reuse in Pre-rinsing during CIP in Fresh Milk Processing Section
- Install Water Efficient Nozzles in the hose pipes used for cleaning & washing
- *Optimizing CIP water for small & Large Tankers of 6000 & 30,000 liters capacity*

# 5. IRON & STEEL UNIT

***15% Water Saving in one of the Iron & Steel Plant with pay-back period of <1 years, it accounted to saving of water management and associated Energy management costs by 17%***

***Key Water saving opportunities identified by RCM-FICCI:***

- Optimization of Cooling Tower Blowdown by Maintaining Desired COC and Improve in Practices for Chemical Treatment of Circulating water
- Reduce Evaporation losses from the open Water Reservoirs
- **Operation and Maintenance of non-working RO plant/ZLD plant and other wastewater recovery plants in the various shops**
- Stop leakages and water losses in the settling tanks at WTP
- Implementation of Rainwater Harvesting

# WATER CONSERVATION STEPS

**ELIMINATE** – Ex: Conventional Dying to Waterless Dying

**REDUCE –** Ex: Water efficient Fixtures/ Nozzles for machine washing

**SEFREGATION:** High TDS & COD water from low TDS & COD water

**RECYCLE: Ex:** Counter Current Washing- Final Rinse to be used as Initial Rinse

**TREATMENT – Ex:** Physiochemical, Biological, Tertiary (ZLD)

**REUSE –** Ex: Process wastewater can be used for dust suppression in coal/ash handling

**RECHARGE –** Rainwater Harvesting & Groundwater Recharge

# RCM Services: Benefits

- Reducing Production Costs, by reducing energy & water bills, saving resources
- Reducing water footprint, by conserving water, increased recycling of water, achieving ZLD
- Achieving Sustainable growth through optimum use of resources and waste minimisation
- Reducing greenhouse gas emissions by improving energy, water & resource use efficiency
- Improving Occupational Health & Safety

# Contact Details


- **MN Girish**

  Senior Director- RCM Department

  M: +91-9810082612

  T: +91-11-23487382

  Email: mn.girish@ficci.com

- **Karishma Bist**

  Director- RCM Department

  M: +91- 9818260682

  T: +91-11- 23487510

  Email: karishma.bist@ficci.com

**Federation of Indian Chambers of Commerce and Industry**

Federation House, 1, Tansen Marg, New Delhi 110001, INDIA

**Web**: www.ficci.in

FB: www.facebook.com/ficciindia | Twitter: www.twitter.com/ficci_india |

Blog: blog.ficci.come

# Thank you for your attention.

*Together, let's pave the way for a greener and more sustainable future!*

# Water Consumption Benchmarks for domestic use

**Water Requirements for Buildings Other than Residences**

| Sl No. | Type of Building | Domestic litres per head/ day | Flushing Litres per head/ day | Total Consumption Litres per head/ day |
|---|---|---|---|---|
| 1. | Factories including canteen where bath rooms are required to be provided | 30 | 15 | 45 |
| 2. | Factories including canteen where no bath rooms are required to be provided | 20 | 10 | 30 |
| 3. | Hospital (excluding laundry and kitchen): | | | |
| | a) Number of beds not exceeding 100 | 230 | 110 | 340 |
| | b) Number of beds exceeding 100 | 300 | 150 | 450 |
| | c) Out Patient Department (OPD) | 10 | 5 | 15 |
| 4. | Nurses' homes and medical quarters | 90 | 45 | 135 |
| 5. | Hostels | 90 | 45 | 135 |
| 6. | Hotels (up to 3 star) excluding laundry, kitchen, staff and water bodies | 120 | 60 | 180 |
| 7. | Hotels (4 star and above) excluding laundry, kitchen, staff and water bodies | 260 | 60 | 320 |
| 8. | Offices (including canteen) | 25 | 20 | 45 |

# Water Consumption Benchmarks in Buildings (contd.)

| Sl No. | Type of Building | Domestic Per Day | Flushing Per Day | Total Consumption Per Day |
|---|---|---|---|---|
| 9. | Restaurants and food court including water requirement for kitchen: | | | |
| | a) Restaurants | 55 per seat | 15 per seat | 70 per seat |
| | b) Food Court | 25 per seat | 10 per seat | 35 per seat |
| 10. | Clubhouse | 25 | 20 | 45 |
| 11. | Stadiums | 4 | 6 | 10 |
| 12. | Cinemas, concert halls and theatres and multiplex | 5 per seat | 10 per seat | 15 per seat |
| 13. | Schools/Educational institutions: | | | |
| | a) Without boarding facilities | 25 | 20 | 45 |
| | b) With boarding facilities | 90 | 45 | 135 |
| 14. | Shopping and retail (mall) | | | |
| | a) Staff | 25 | 20 | 45 |
| | b) Visitors | 5 | 10 | 15 |

# Water Consumption Benchmarks in Buildings (contd.)

| Sl No. | Type of Building | Domestic Per Day | Flushing Per Day | Total Consumption Per Day |
|---|---|---|---|---|
| 15. | Traffic Terminal stations<br>a) Airports | 40 | 30 | 70 |
| | b) Railway stations (Junction) with bathing facility | 40 | 30 | 70 |
| | c) Railway stations (Junction) without bathing facility | 30 | 15 | 45 |
| | d) Railway stations (Intermediate) with bathing facility | 25 | 20 | 45 |
| | e) Railway stations (Intermediate) without bathing facility | 15 | 10 | 25 |
| | f) Interstate bus terminals | 25 | 20 | 45 |
| | g) Intrastate Bus Terminals/Metro Stations | 10 | 5 | 15 |