

# **WATER AUDIT – A TOOL FOR WATER CONSERVATION AND MANAGEMENT**

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# Presentation coverage

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## About FICCI and RCM Services

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### Water Availability

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### Water Audit – Benefits, Scope and Methodology

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### Water Audit – Report Format

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### Water Audit – 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

***I do not for a moment believe that commercial prosperity is incompatible with strict honesty.***

*Mahatma Gandhi at FICCI's 4th AGM, 1931*



# About RCM

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- 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 Group has inhouse experts and consultants including Accredited Energy and Water Auditors. It also has portable & latest Instruments to conduct Resource Conservation & Environmental Projects.

# Government Accreditations

- An ***Empanelled 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 Water Auditing Organization*** by Central Ground Water Authority (CGWA), Ministry of Jal Shakti, Government of India



# RCM Team Strength

Qualified & experienced experts in environment management , energy efficiency, water conservation, and sustainability

Accredited energy & certified water auditors by Government of India

ISO certified environment, energy & safety professionals

Pool of empanelled experts from different industry sectors

# Services Offered



**Energy Efficiency & Demand Side Management**



**Water & Wastewater Audits**



**Environment Management, Health & Safety**



**National Level Studies & Policy Development**



**Road map for Zero Waste to Landfill**



**Training & Capacity Building**

# 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
• MSME sector industries	• Zinc, Aluminium



# FICCI Clients (Member Organizations)



# FICCI Clients (Member Organizations)



हिन्दुस्तान पेट्रोलियम कॉर्पोरेशन लिमिटेड  
Hindustan Petroleum Corporation Limited  
(A Maharatna Company)



# FICCI Key Clients



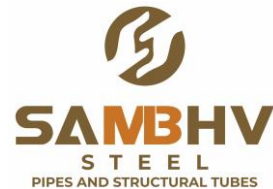
BHARAT FORGE



*DENSO*  
Crafting the Core



**PRISM JOHNSON LIMITED**



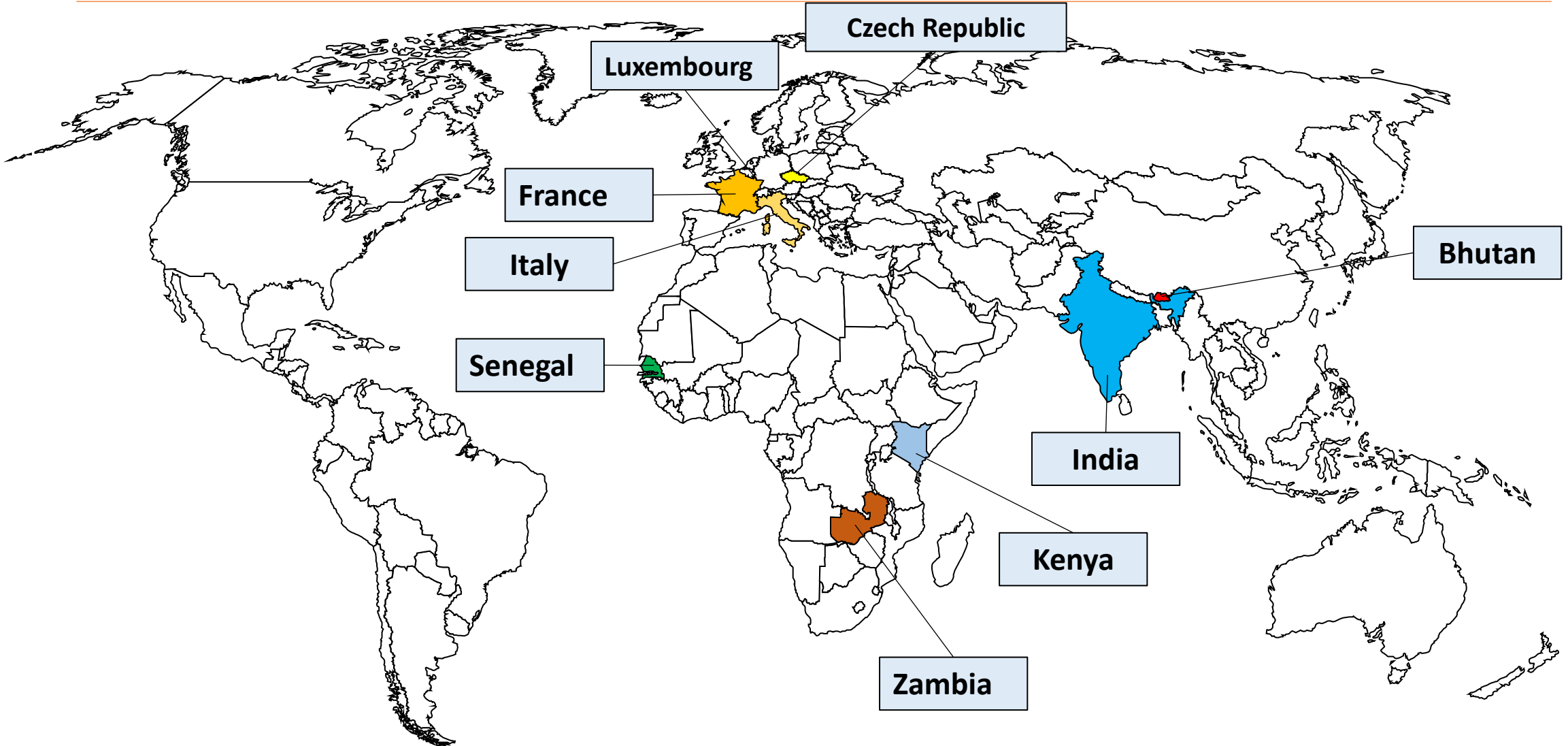
# Government & International Agencies



Canadian International  
Development Agency



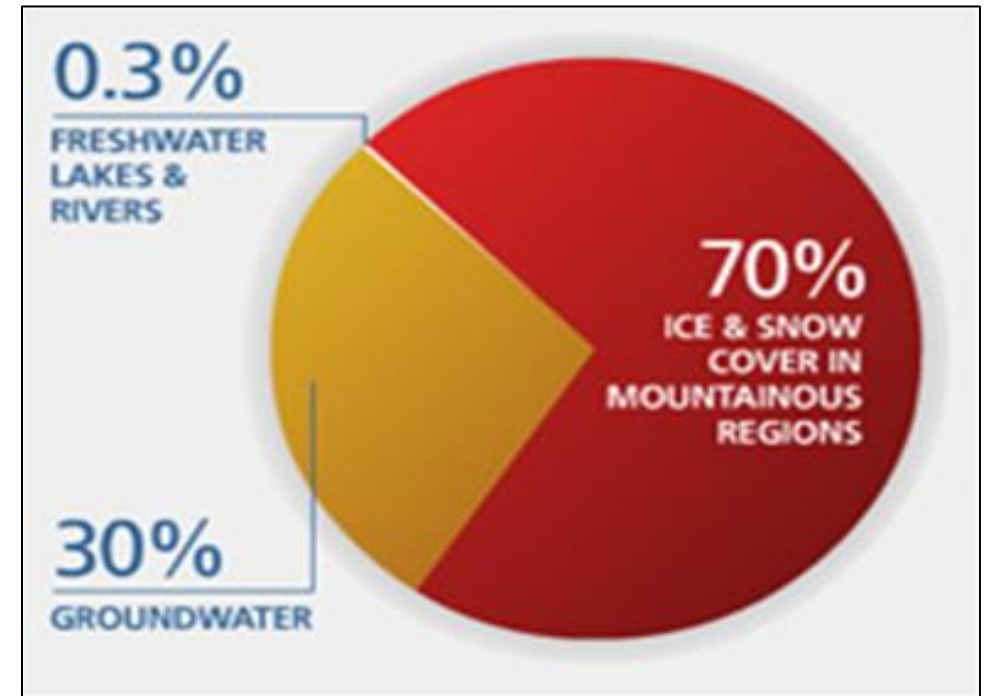
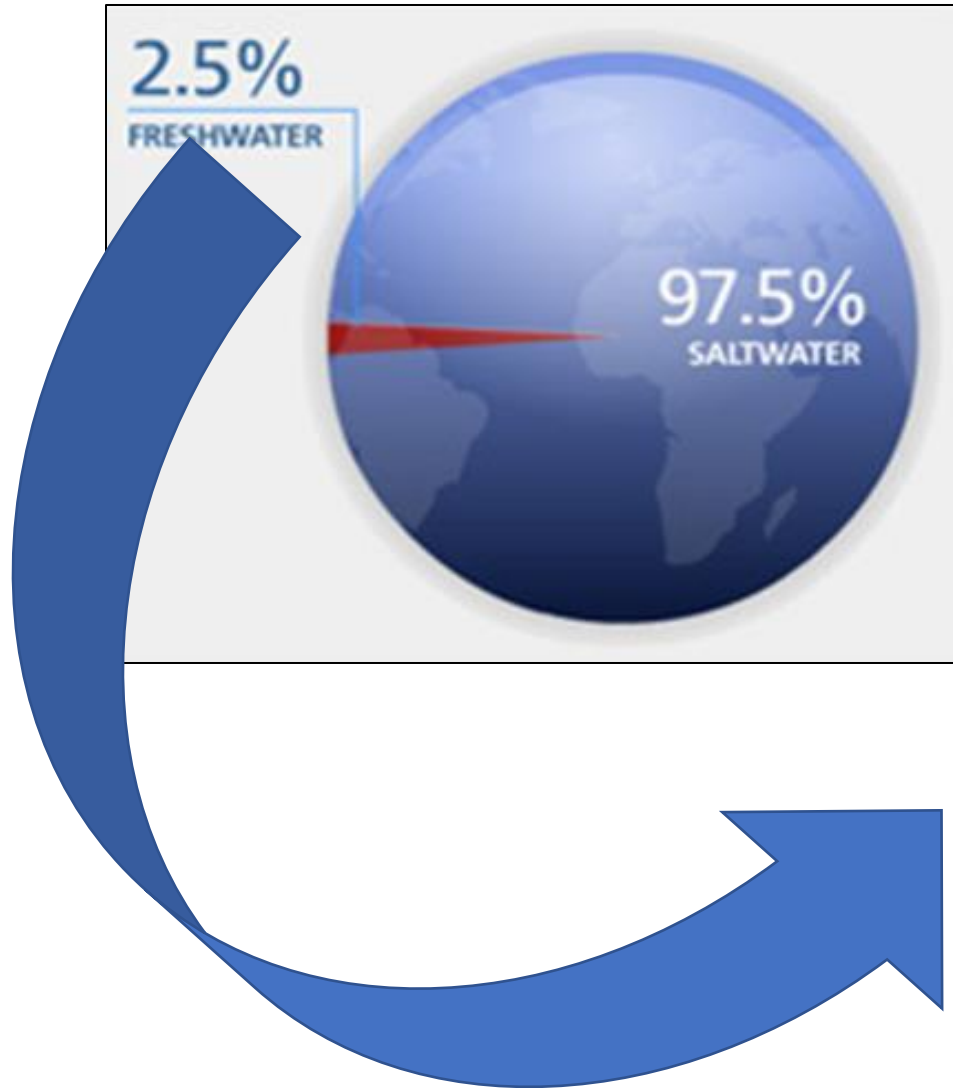
# RCM Services- Global Footprint



# Water Availability

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# The global Situation



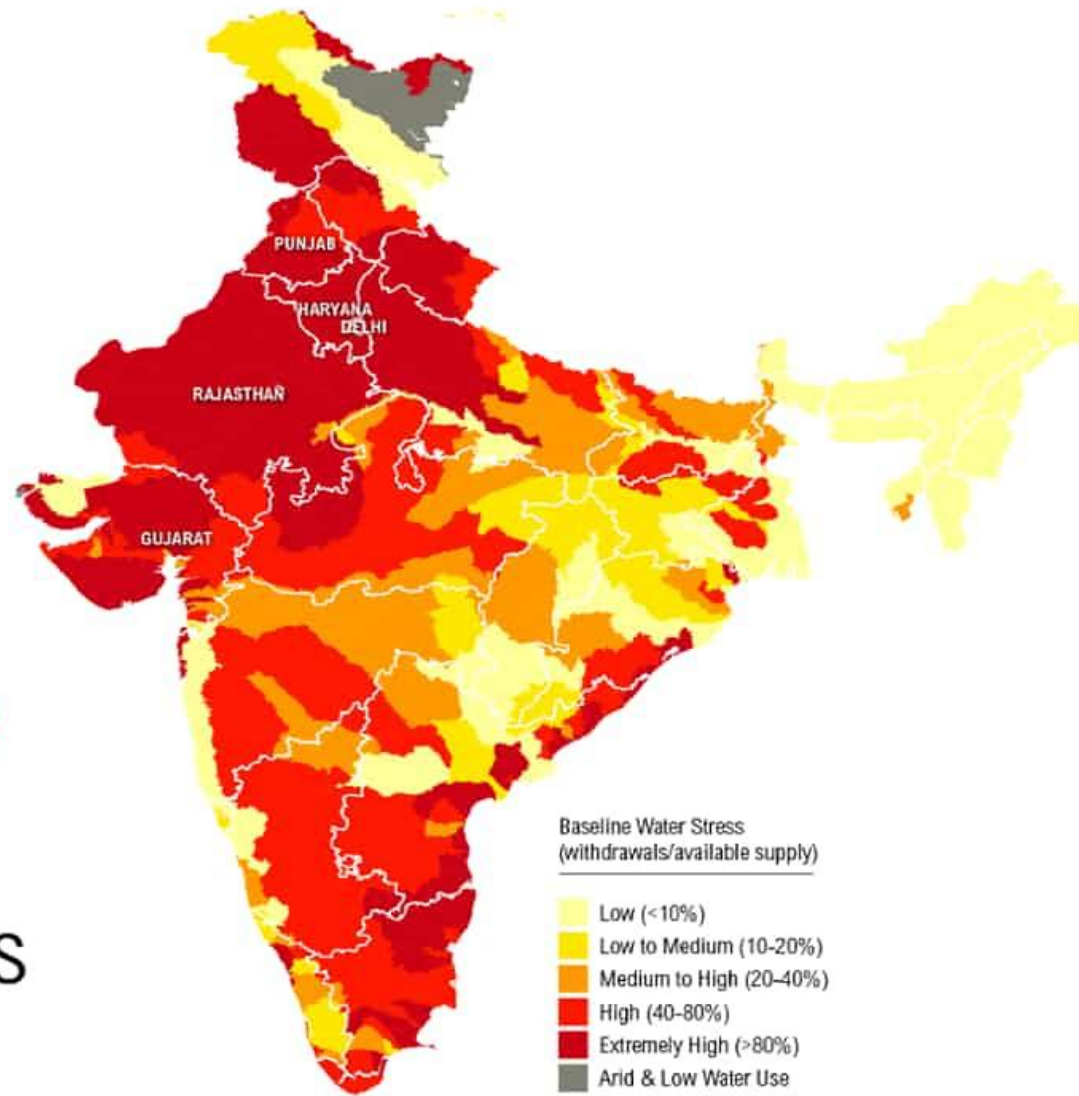
# Groundwater Significance

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- **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](http://www.indiawatertool.in)

 WORLD RESOURCES INSTITUTE





# Reasons for Groundwater Depletion

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**Increased Demand due to increasing population**

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**Limited Rainwater Storage Facility**

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**Use of Water Intensive crops**

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**Subsidies on electricity**

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**Inadequate regulation / implementation**

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**Climate Change – Uneven rainfall**

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

# Groundwater 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 AVAILABILITY**
- AVAILABLE RESOURCE QUALITY IS DEGRADING**
- EFFICIENT WATER MANAGEMENT BY USERS INCLUDING INDUSTRIES IS IMPORTANT**
- WATER AUDITING IS AN IMPORTANT TOOL FOR THE SAME**

## FICCI WATER AUDIT - ESTIMATED SAVING POTENTIAL

**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.*



# Water Audit – Core Element of Water & Wastewater Management Program

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**A Water Audit is a “Systematic Approach of Identifying, Measuring, Monitoring and Reducing the Water Consumption and Wastewater Generation by appropriate means/activities in an Industry or any Organization”**

# 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 etc.**

# Water Audit Applicability - CGWA GUIDELINES

- All Industries **abstracting Groundwater >100 m<sup>3</sup>/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 Format**
- Water Audit report to be **submitted online** to CGWA - NOC requirement

# Benefits of conducting water audit

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- ❖ **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.)

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- **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 m<sup>3</sup>/day freshwater consumption and a water cost of about 10 Rs/m<sup>3</sup>; 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).

## Scope of work as per CGWA Notification

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- On site training and discussion with facility manager and personnel
- Water system analysis
- Quantification of baseline water map
- Monitoring and measurements using pressure and flow meters and various other devices
- Quantification of inefficiencies and leaks
- Quantification of water quality loads and discharges
- Quantification of variability in flows and quality parameters

## Scope of work as per CGWA Notification (Contd.)

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- Strategies for water treatment and reuse or direct use
- Complete water balance of the facility
- Developing 'recycle' and 'reuse' opportunities.
- Water consumption and wastewater generation pattern
- Specific water use and conservation
- Water saving opportunities with
  - Method of implementing the proposals
  - Full description and figures
  - Investment required

# FICCI water audit – Scope of Work

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- 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.)

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- **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.)

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- 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**

## 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.

## 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

## **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

# 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 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/cm <sup>2</sup> ) & (0-14 kg/cm <sup>2</sup> )	Measurement of liquid Pressure in Pipelines (kg/cm <sup>2</sup> )	
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



# Format of Water Audit Report as per CGWA New SOP

[ApprovedSOPSG.pdf \(cgwa-noc.gov.in\)](http://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**



## 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)

# Implementation Plan – Water Conservation Measures with Time Frame

Section/Area	Key Observations	Suggested Best Practices/ Recommendations	Annual water savings (m <sup>3</sup> )/ Energy saving	Annual monetary savings (Rs. lakhs)	Investment (Rs. Lakhs)	Pay-back period (Years)	Implementation time frame
<b>Short term: Immediate implementation within 6 month</b>							
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 m <sup>3</sup> /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 m <sup>3</sup> /day of water	5475	1.18	1	0.8	1 month
<b>Medium term: 6 months to 12 months</b>							
<b>Long term: 12 to 24 months</b>							

# FICCI Water Audit Process And Timeline

1. Send Water Audit Request to FICCI ([ficci@ficci.com](mailto:ficci@ficci.com) , [ieshu.ghai@ficci.com](mailto:ieshu.ghai@ficci.com))
2. On receiving request, we will share basic Water Audit questionnaire – Water source, KLD consumption, water sourcing cost (Rs/m<sup>3</sup>), 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 6-8 weeks time –
  - Team mobilization (1-2 weeks)
  - 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%).

# INITIATIVES BY INDUSTRIES TO IMPROVE WATER USE EFFICIENCY

*Supported by FICCI Water Audit Studies*

# 1. Pulp & Paper

***20% Water Saving in one of the Pulp & Paper Plant with pay-back period of <1 years, it accounted to saving of water management and associated Energy management costs by 15%***

***Type: Integrated Pulp & Paper Unit***

***Water Consumption: 20000 KLD***

***Water Source: Borewell and Municipal***

***Location: Surat***

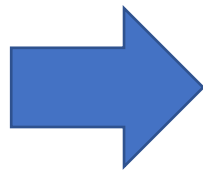
## 1. Adopt 'no freshwater policy' for floor cleaning, drain cleaning & other washing activities and stop overflow from water recovery sump

Freshwater was used through open ended hose pipes for floor cleaning and drain cleaning and various washing activities. About 400-500 m<sup>3</sup>/day of water was being used in washing & cleaning activities.

Therefore, it is suggested to provide super clear water or recycled water for floor cleaning and drain cleaning activities in the plant instead of freshwater and install water efficient nozzles in these hose pipes.



**Before- Use of water for floor cleaning through open ended hose pipes**



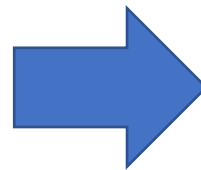
**Suggested - Curtain type spray nozzle with pressurize water hand control lever for effective floor cleaning**

## 2. Recycling/Recirculation of Pump Seal, Gland Cooling & Vacuum Pump Water

The average seal cooling water uses was about 10-14 m<sup>3</sup>/day/pump, (the water use is higher in vacuum and mechanical pumps for seal cooling) which is wasted to drain. This water can be collected and reused in paper machines.



**Before- Seal cooling water going to drain**



**After - Pump Seal Cooling Water Collection system**

### 3. Replace freshwater use in Paper Machine showers (like Low Pressure Showers, Lubricating showers, wire cleaning, head box) with Super Clear Water (SCW)

It was suggested to replace freshwater use in showers (like Low Pressure Showers, Lubricating showers, wire cleaning, head box) by Super Clear Water (SCW) in the Board plant and in the PM 1 & 2 which will save about 45 m<sup>3</sup>/hr of freshwater.

**Table: Replacement of FW with SCW**

Showers	Nos.	Pressure (Bar)	Water Quality	Remarks
High pressure Showers	15	20-30	FW	
Low Pressure showers			FW	Can be replaced with SCW
Lubricating Shower	5	3	FW	Can be replaced with SCW
Top layer-Edge circular shower	2		FW	Can be replaced with SCW
PD Tank	3		FW	Can be replaced with SCW
Wire Part			SCW	



### **4. RECOVER SECONDARY CONDENSATE FROM EVAPORATORS OF RECOVERY SECTION**

- It was suggested not to throw secondary condensate (20 m<sup>3</sup>/hr) from evaporator of recovery section to drain. It can be diverted to recovery sump for possible other uses or to the 'CPU' unit so that the hot condensate could be reused in boilers.

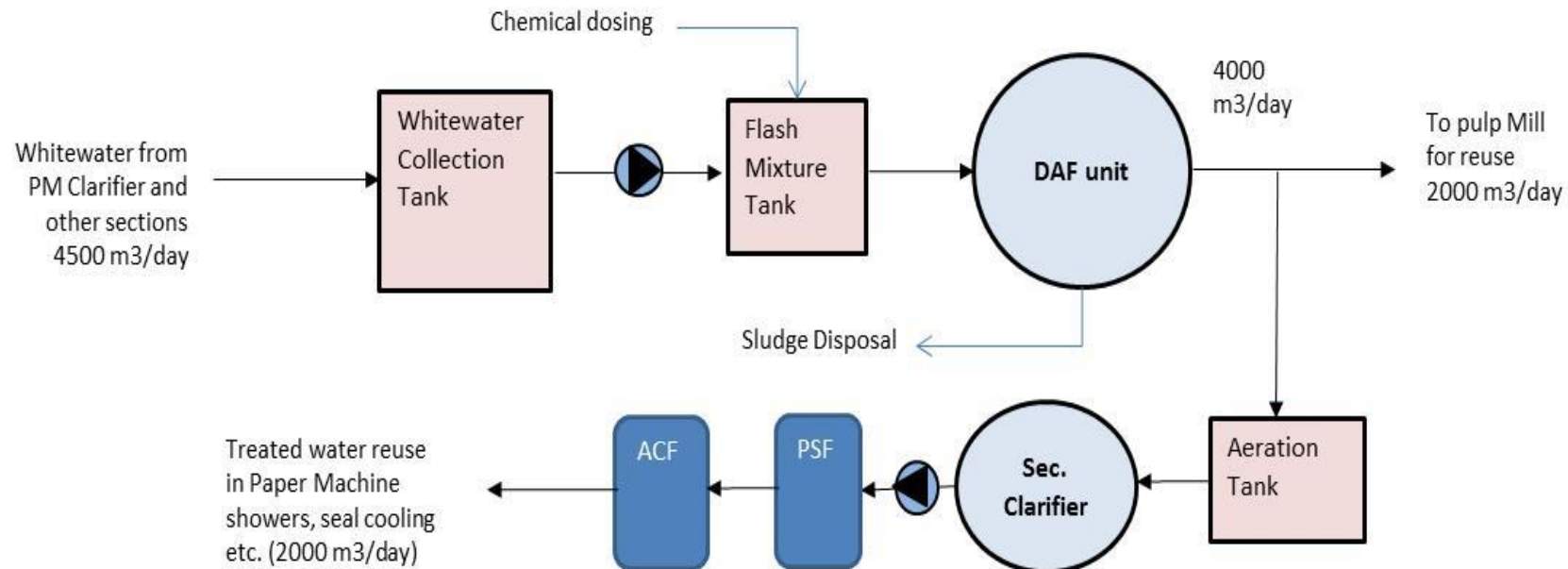


**Secondary Condensate drained from Evaporator Section to ETP**

## 5. INSTALLATION OF SEPARATE ETP FOR PAPER CLARIFIER DISCHARGE AND NON-CONTAMINATED EFFLUENT STREAMS FOR APPROPRIATE TREATMENT AND REUSE

It was suggested to install a separate ETP of about 200 m<sup>3</sup>/hr capacity for treating unused white-water and low-contaminated wastewater streams for reuse in the plant. The treatment scheme is given below.

### Suggested Treatment Scheme for Whitewater



## **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***

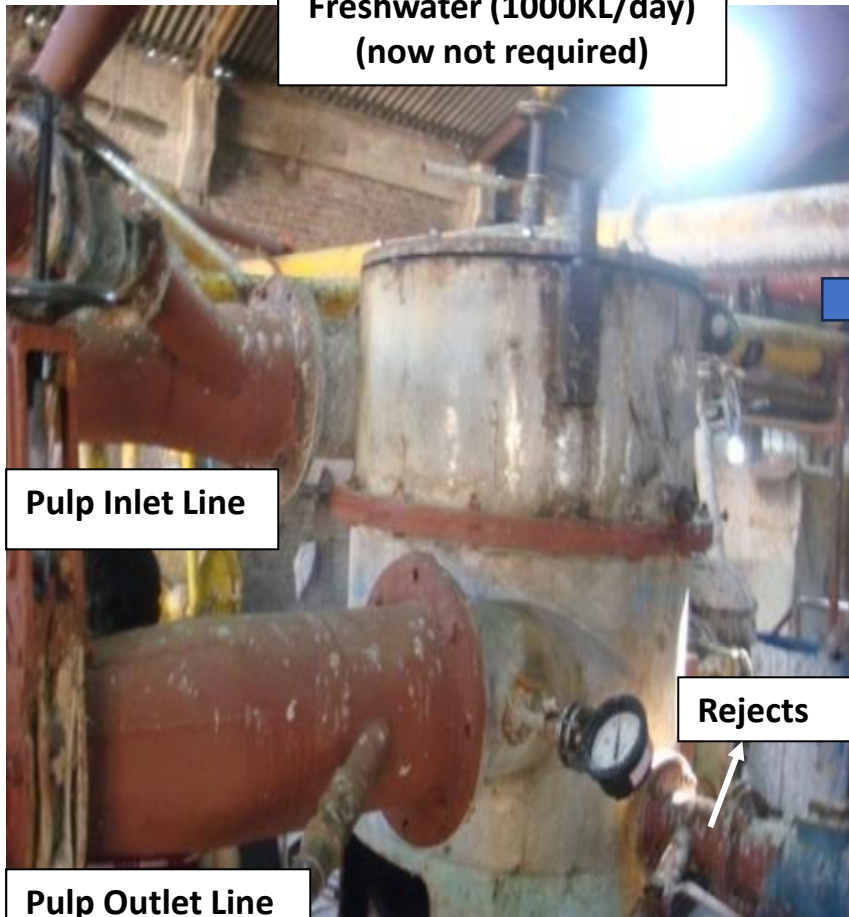
***Location: UP***

## ***PULP & PAPER UNIT-2***

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

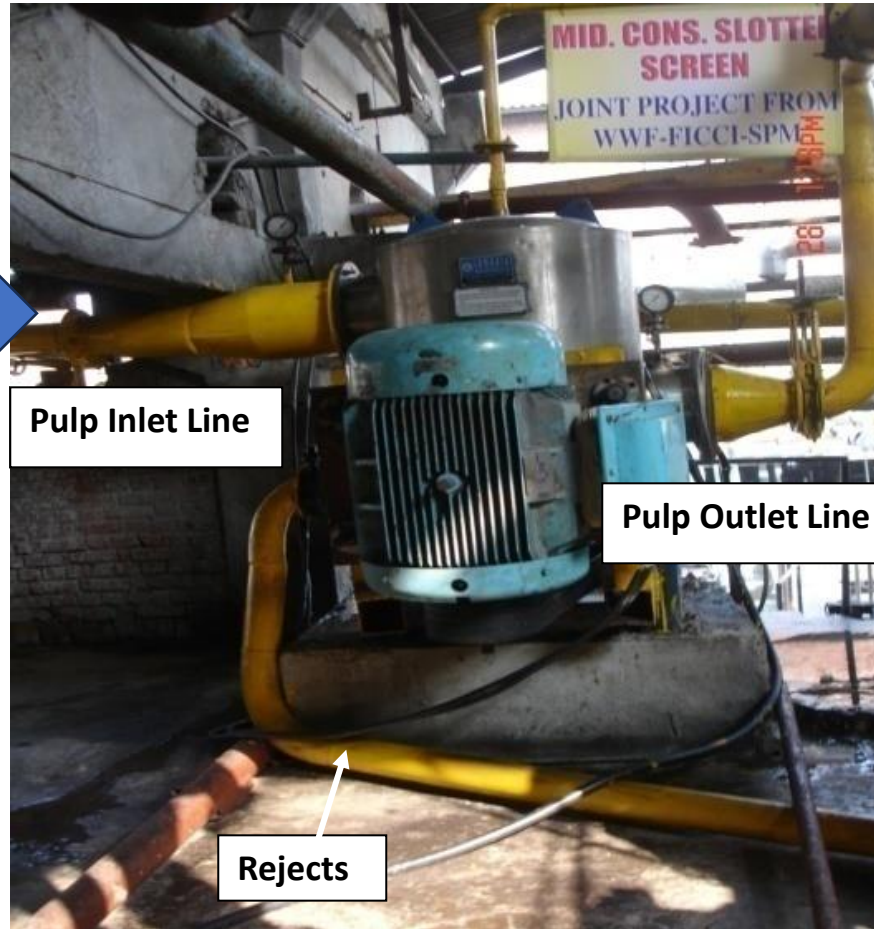
- *Replacing low consistency screening technology (1%) with medium consistency (2.5%) pulp screening technology*
- *Installation of Water Efficient Showers at Paper Machines*
- *Implementation of Scheme for Segregation & Treatment of Colored Effluent for reuse in pulping*
- *Training and awareness generation*

**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)
<b>Savings</b>	<b>1000</b>	<b>240</b>	<b>500 (33.5 HP)</b>

# 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**

<b>Water Savings &amp; Reduction in Effluent Generation by Modern Water Efficient Showers</b>		
<b>Details</b>	<b>Water Consumption (KL/day)</b>	<b>Effluent Generation (KL/day)</b>
Before Installation	1200	600
After Installation	720	360
<b>Savings</b>	<b>480</b>	<b>240</b>

## 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**

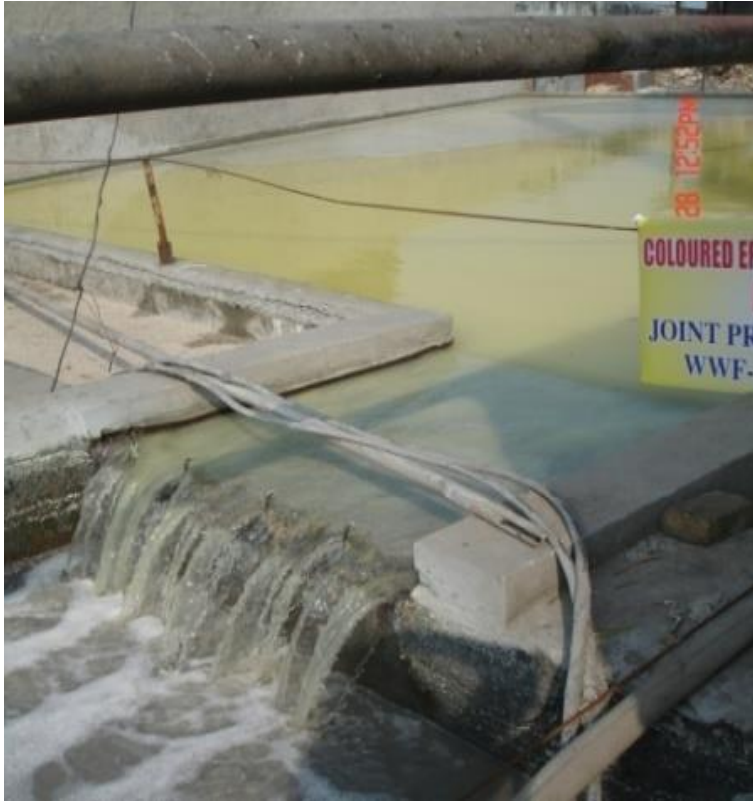


**Hypo-dosing for colour removal**



**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**



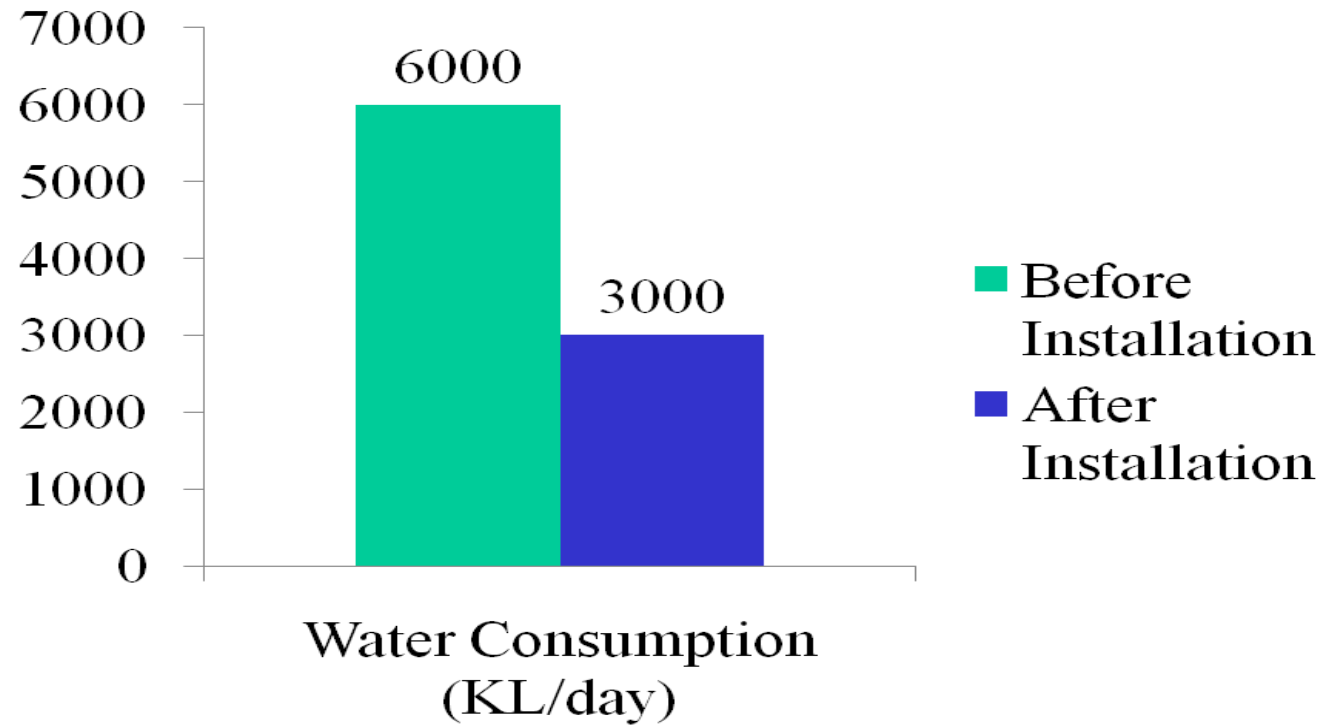
## *Training to Staff at Pulp and Paper Unit*



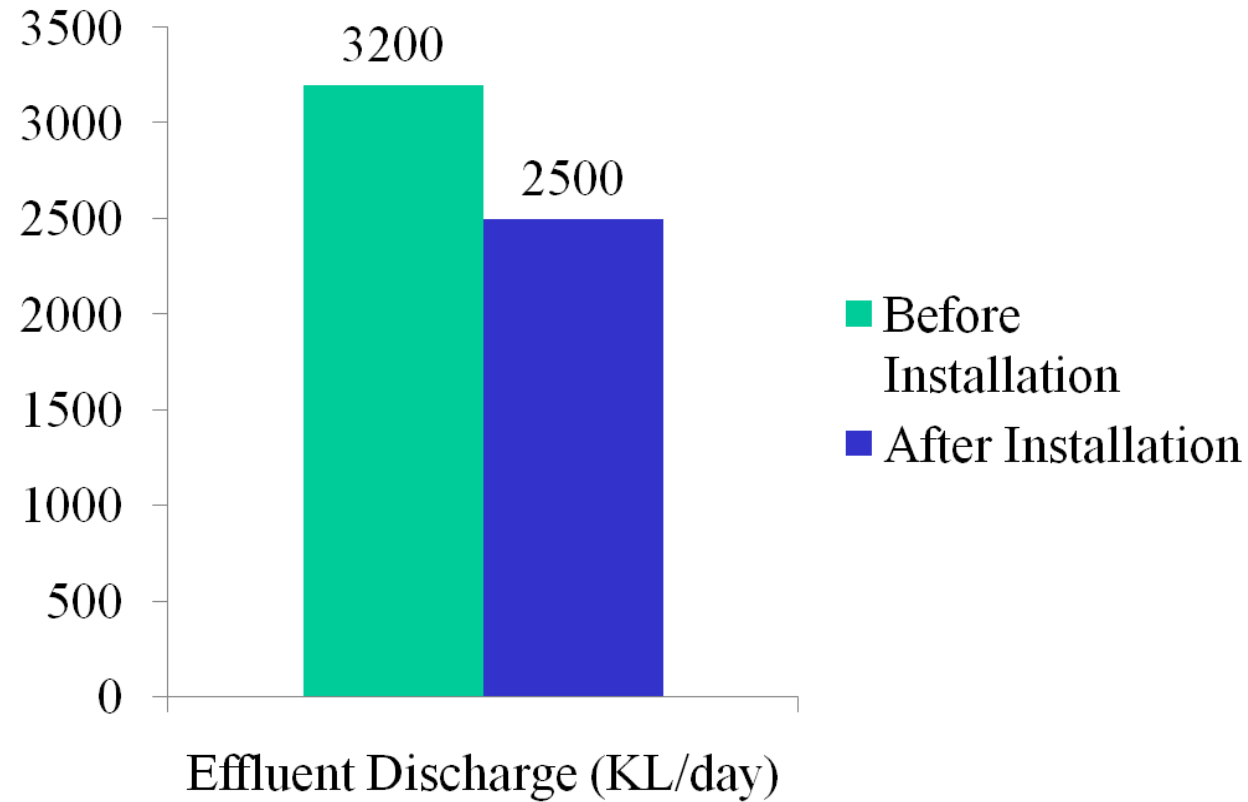
# COST BENEFIT ANALYSIS OF IMPLEMENTED BEST PRACTICES

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 1,440,00 KL	1.4	1.7	0.8
			-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)	
<b>TOTAL</b>				<b>19.5</b>	<b>11.4</b>	<b>1.7</b>

# REDUCTION IN FRESHWATER CONSUMPTION UPTO 50%



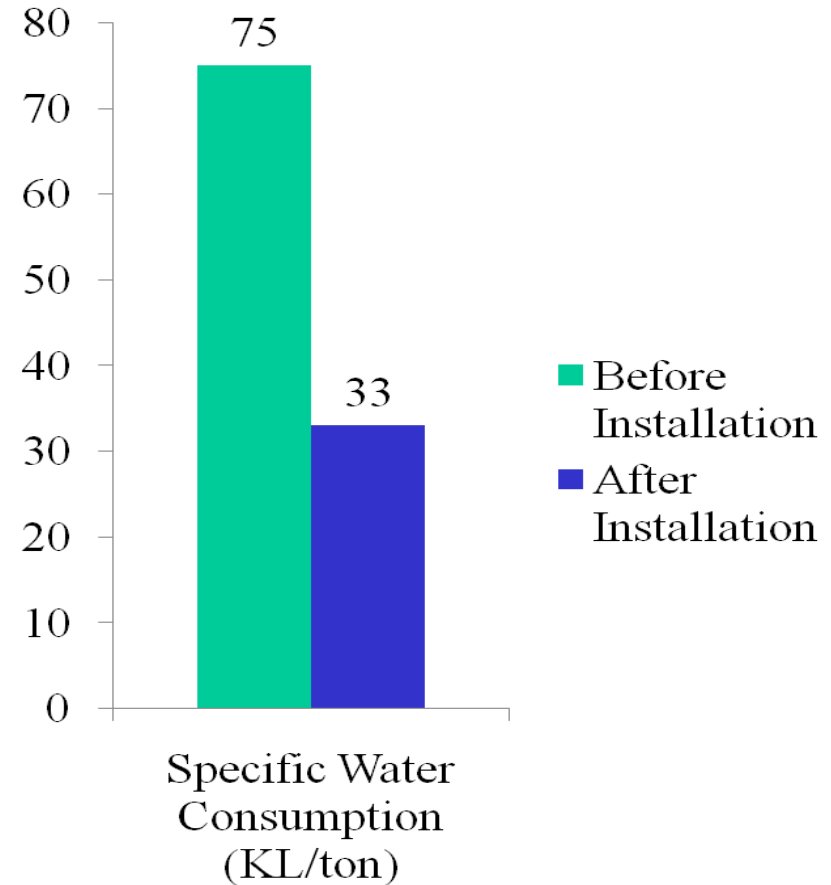
## REDUCTION IN EFFLUENT GENERATION UPTO 22%





# 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. 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.)*

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### ***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.

### 3. 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*

## 4. IRON & STEEL UNIT

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***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

## 5. 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 CONSERVATION STEPS

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

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

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

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

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

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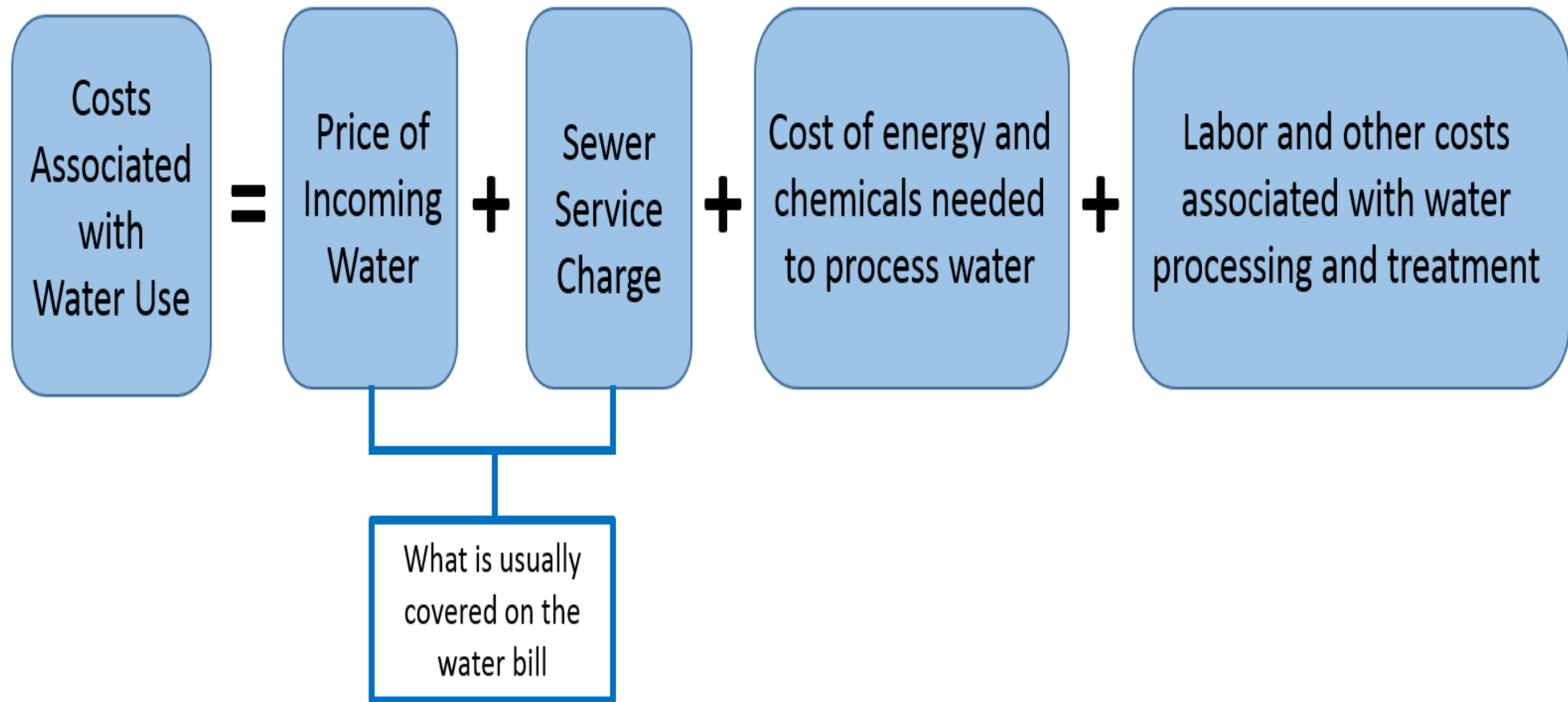
**REUSE** – Ex: Process wastewater can be used for dust suppression in coal/ash handling

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**RECHARGE** – Rainwater Harvesting & Groundwater Recharge

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# Costs Associated with Water Use



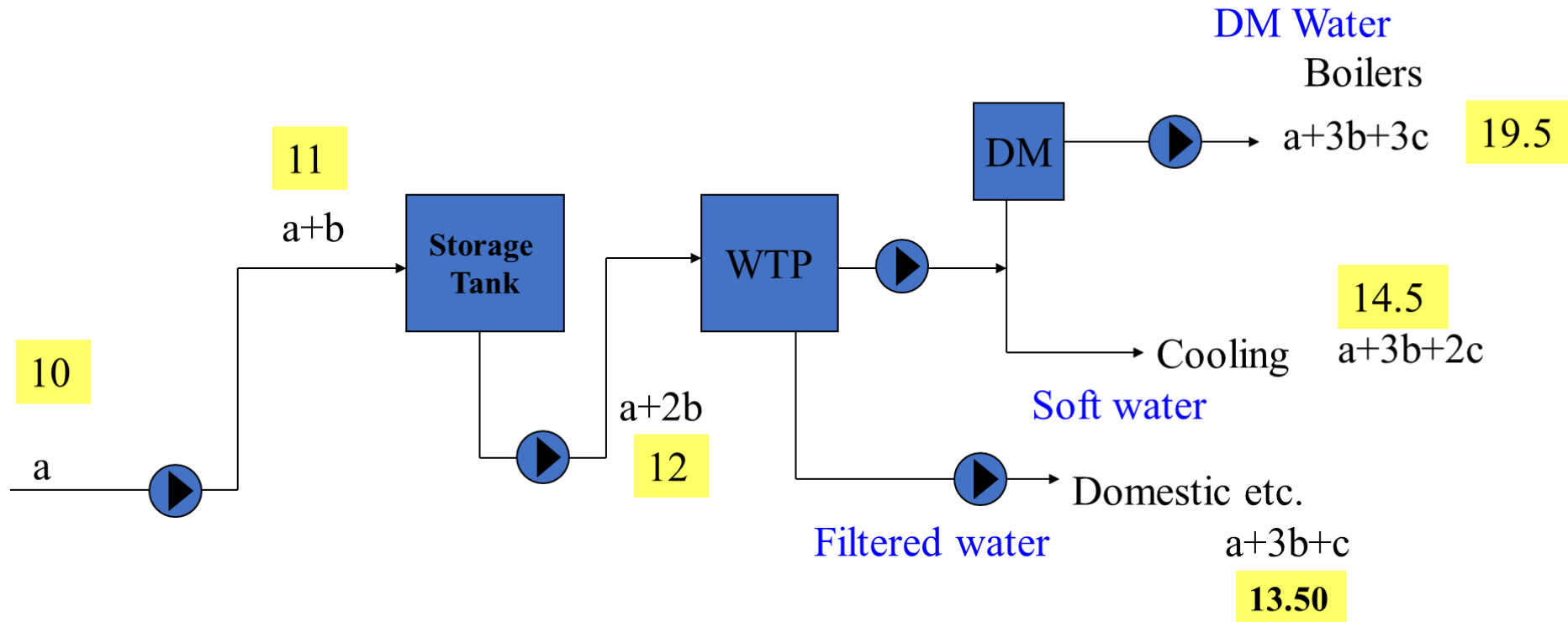


## Value added cost of water

- **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.

***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



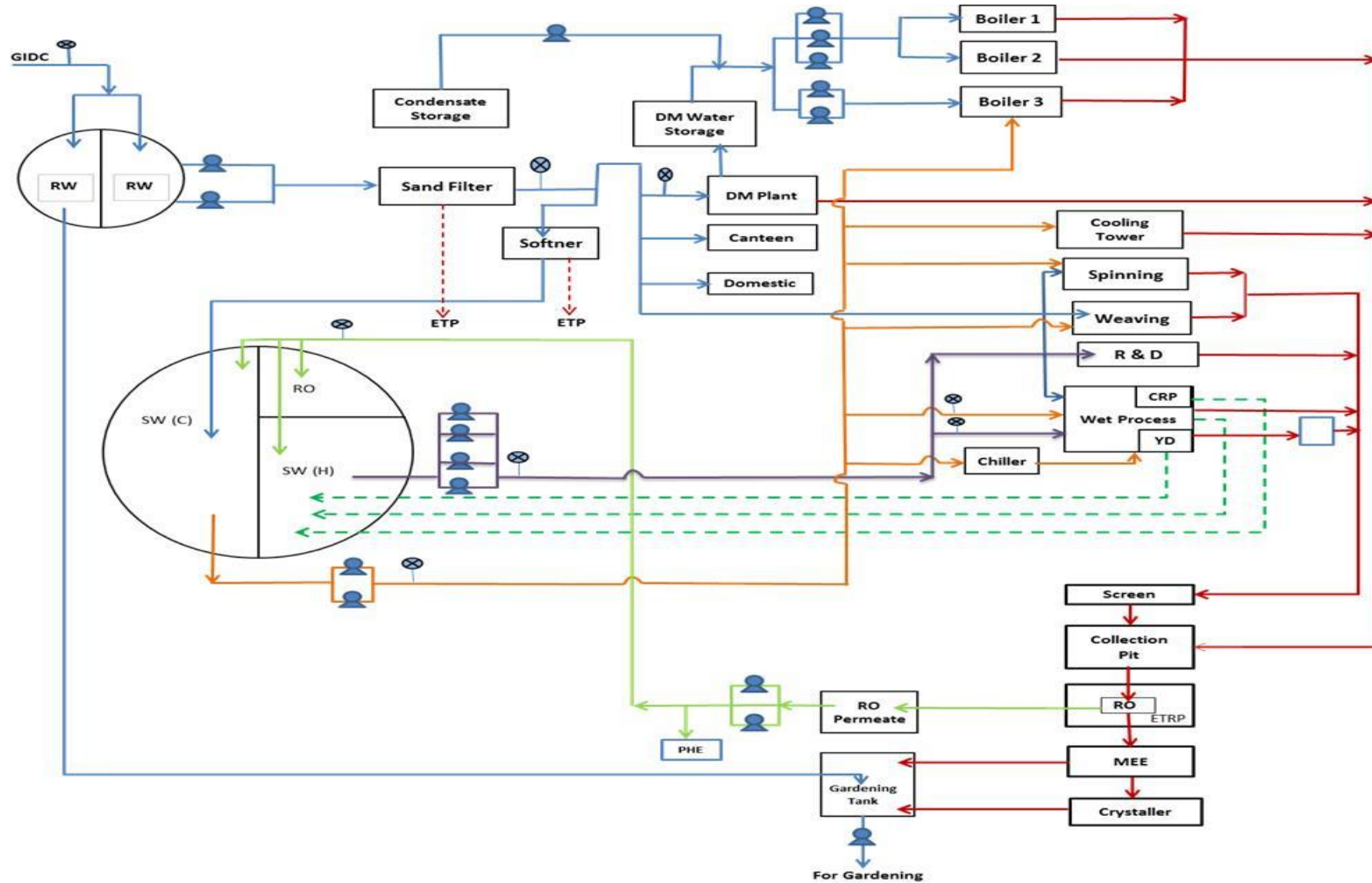
For Example:

$a$  – cost of raw water (Rs 10/m<sup>3</sup>)

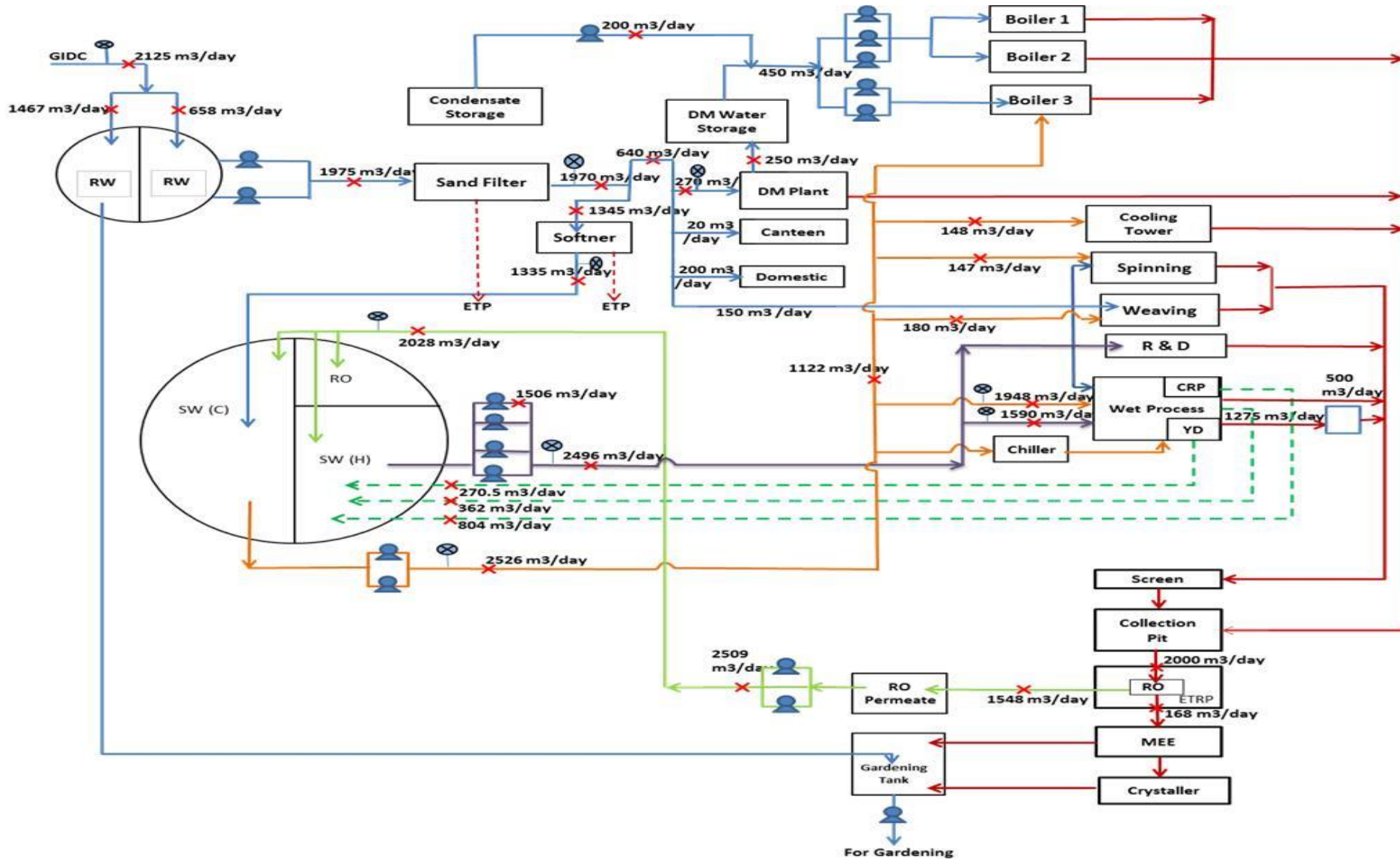
$b$ - pumping cost (Rs 1/m<sup>3</sup>)

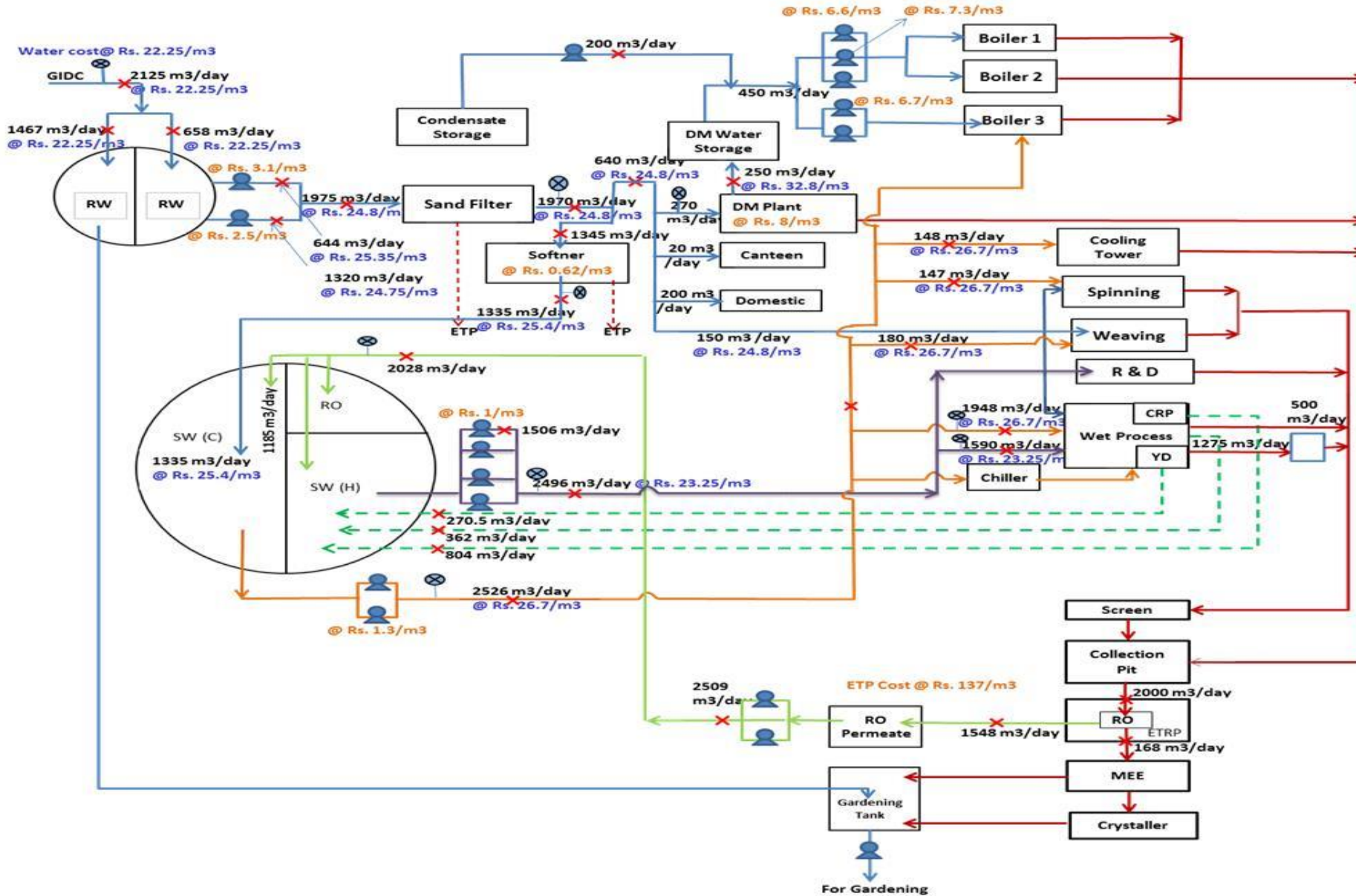
$c$ - treatment cost (Rs/m<sup>3</sup>)- Filtration 0.5; Softening 1; DM 5

# Water Circuit – L1



# Water Balance – L2





## VALUE ADDED WATER COSTING – L3

## 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

# 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

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**Thank you for your attention.**

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