UWR Rainwater Offset Unit Standard

(UWR RoU Standard)

Concept & Design: Universal Water Registry

www.uwaterregistry.io

Project Concept Note & Monitoring Report

(PCNMR)

Project Name: **Wastewater Recycling & Reuse Project by Veerapandi CETP, Tirupur**

UWR RoU Scope:5

Monitoring Period: 01/01/15- 31/12/2024

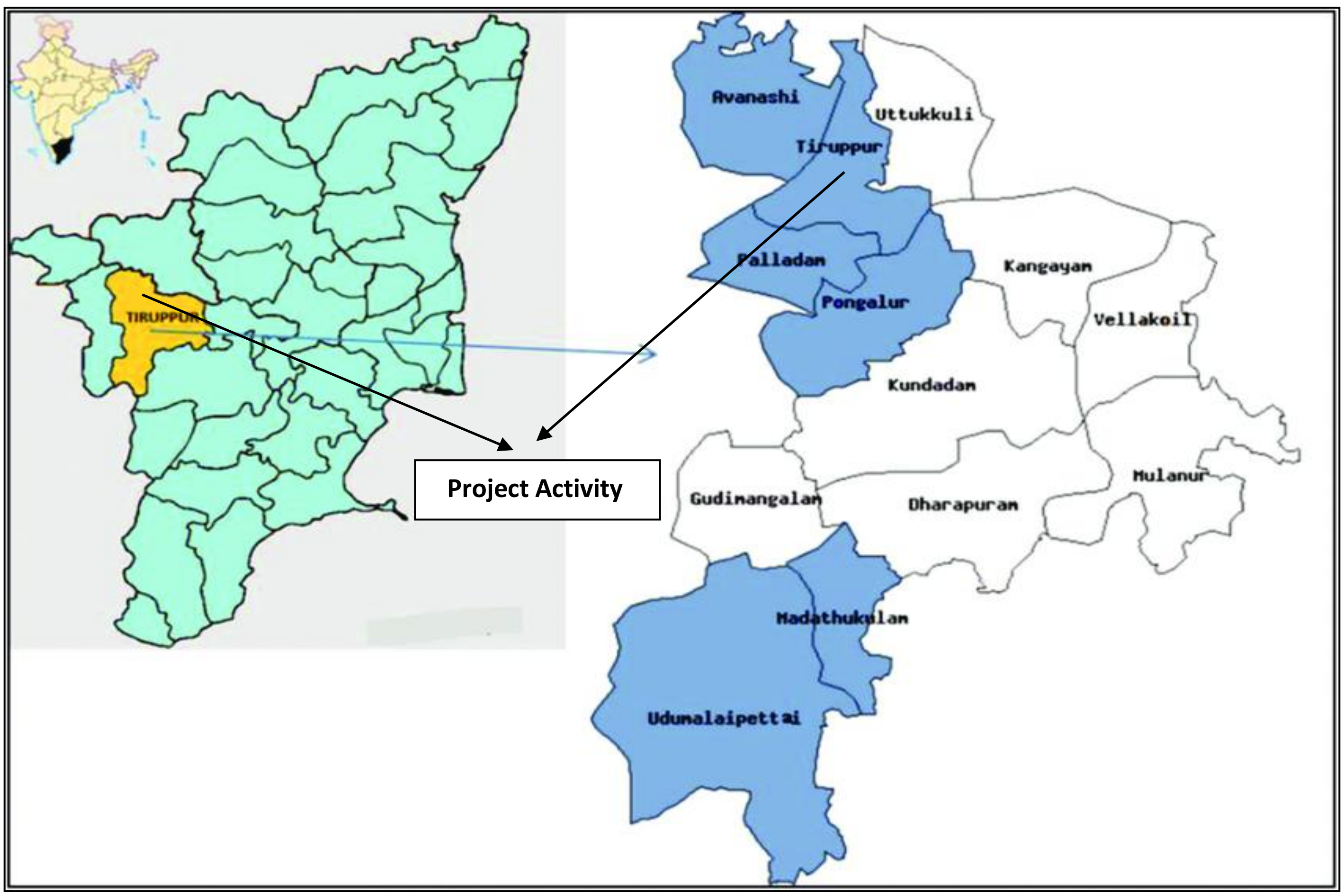
Crediting Period: 2015- 2024

UNDP Human Development Indicator:0.644[1]

[1] https://www.undp.org/

A.1 Location of Project Activity

Address of the Project Activity	S.F.NO.548/1A, Veerapandi Village, Tirupur South Taluk, Tirupur, Tirupur District., 641604.
State	Tamil Nadu
District	Tirupur
Block Basin/Sub Basin/Watershed	Noyyal river basin http://cgwb.gov.in/watershed/basinsindia.html
Lat. & Longitude	11.072916, 77.346015
Area Extent	Textile Industry
No. of Villages/Towns	Veerapandi Village



Purpose of the project activity:

The Veerapandi Effluent Treatment Plant, with an installed capacity of 12 MLD and an operational capacity of 10.75MLD, was commissioned from March 5th, 2008 onwards and the CETP located at S.F.NO.548/1A,, Veerapandi Village, Tirupur South Taluk, Tirupur, Tirupur District., 641604, treats the raw effluent by Lime and Ferrous Sulphate (one stage chemical treatment resulting in sludge) before discharging the treated effluent into the Noyyal river basin. Subsequently the CETP planned ZLD scheme & got approval of the scheme with details given in September 2006 and amendment on 19" June 2007. The members changing the use of sodium sulphate instead of common salt with the plan to recover sodium sulphate salt for reuse.

Category of the Industry :

RED

LiFE Lifestyle for Environment

CONSENT ORDER NO. 2408157840331 **DATED: 27/03/2024.**

PROCEEDINGS NO.T5/TNPCB/F.0482TPN/RL/TPN/W/2024 **DATED: 27/03/2024**

SUB: Tamil Nadu Pollution Control Board - RENEWAL OF CONSENT – M/s. VEERAPANDI COMMON EFFLUENT TREATMENT PLANT PRIVATE LIMITED , S.F.No. R.S.No. 548/1,548/8A,548/7A,548/3A1,3A2,548/5B,8A1,8A2,8B,1,2,549,550/5, VEERAPANDI village, Tiruppur south Taluk and Tiruppur District - Renewal of Consent for the operation of the plant and discharge of sewage and/or trade effluent under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act 6 of 1974) – Issued- Reg.

REF: 1) Board Proc. No.T5/TNPCB/F.0482TPN/RL/TPN/W & A/2023 dated: 24.03.2023

2) DEE/TPR(N), IR.No : F.0482TPN/RL/AEE/TPN/2024 dated 03.03.2024

RENEWAL OF CONSENT is hereby granted under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act, 6 of 1974) (hereinafter referred to as "The Act") and the rules and orders made there under to

The Managing Director
M/s . VEERAPANDI COMMON EFFLUENT TREATMENT PLANT PRIVATE LIMITED
S.F No. R.S.No. 548/1,548/8A,548/7A,548/3A1,3A2,548/5B,8A1,8A2,8B,1,2,549,550/5
VEERAPANDI Village
Tiruppur south Taluk
Tiruppur District.

Authorising the occupier to make discharge of sewage and /or trade effluent.

This is subject to the provisions of the Act, the rules and the orders made there under and the terms and conditions incorporated under the Special and General conditions stipulated in the Consent Order issued earlier and subject to the special conditions annexed.

This RENEWAL OF CONSENT is valid for the period ending **March 31, 2026**

S RAGUPATHI Digitally signed by S RAGUPATHI
Date: 2024.03.27 19:37:06 +05'30'

For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai

NOC For Safe Discharge of Effluent dated- 27/03/2024

RAW EFFLUENT RECEIVING SUMP

AERATION TANK & SECONDARY CLARIFIER

MF FILTRATION UNITS

R.O –III STAGES

MECHANICAL EVAPORATOR

R.O – V TH STAGE

MULTIPLE EFFECT EVAPORATOR

CHLORINATION SYSTEM

VCETP Units

B-1 Biological treatment (Extended aeration process) with mechanical sludge dewatering.

B-2 Oxidation (0 R) in HDPE reactor with Chlorine gas as the oxidant.

B-3 Its subsequent reduction by Sodium Meta Bi Sulphate (SMBS) before leaving the reactor

B-4 Coagulation & settlement of the residues of the oxidation-reduction reaction & Hardness removal.

B-5 Interface treatment by dual media filter, ultrafiltration membrane & activated carbon filter.

B-6 Sequential 3 stage R.O membranes to recover 90% of the raw effluent as permeate.

B-7 Hardness removal from R.O rejects

B-8 Accelerated evaporation of R.0 reject by Multistage falling and two stage forced film Mechanical Evaporator followed by crystallizer, centrifuge and a salt drier for mixed salt and recovering sodium sulphate salt for reuse.

B-9 Disposing the sludge in upcoming landfill being put up by the Federation of CETPs, Tirupur

The Technical Appraisal of Pre-Treatment.

The pre-treatment has been conceived to ensure 100 % reliability in the "plant availability" factor. Biological treatment system followed by Oxidation Reduction (0.R) process, involving oxidation with Chlorine gas and its reduction with SMBS for color and COD removal and settling out the residues of the reaction by d/s coagulation & precipitation in a flash mixer, flocculator & clarifier using lime soda process to also perform hardness reduction.

The design is based on data obtained by the actual operation of the plant by CETP and the project consultant. This process removes color and reduces hardness as per operating parameters submitted to us and makes the treated water fit to feed R.O. Chlorine treatment is essential for color removal, therefore in case of shortage of chlorine the plant will either use alternate coagulant and remove color or stop the discharge of effluent temporarily, as for recovery of sodium sulphate salts from reject, color removal before feeding R.O is a critical operation.

The Technical appraisal of R.O

The pre-treated effluent undergoes a polishing treatment before entering the reverse osmosis (RO) membranes. This polishing process involves a series of filtration steps, beginning with dual media filters composed of anthracite, followed by ultrafiltration (UF) membranes, activated carbon filters, and finally, cartridge filters. Both the UF and RO membrane systems are configured according to the manufacturers specifications.

The Technical Appraisal of Evaporation of R.O Rejects

The RO reject stream will undergo treatment to remove hardness using a conventional lime soda process. The resulting water will then be partially evaporated in a Mechanical Vapor Recompression (MVR) unit. The concentrated output from the MVR will be further processed in a new multi-stage falling film evaporator and a two-stage forced film mechanical evaporator, which will include a crystallizer and centrifuge. This system will also incorporate an additional boiler and cooling tower. The recovered salt will be dried and bagged for reuse by member industries. The remaining reject stream will be dried in an agitated thin film dryer and disposed of as mixed salt in a landfill, after receiving approval from the Tamil Nadu Pollution Control Board (TNPCB).

The Technical Appraisal of Solid Wastes Disposal

Tamil Nadu Pollution Control Board (TNPCB) has given permission (consent number 3128, dated 12-12-2005) for a special landfill in Tirupur. This landfill is only for safe disposal of solid waste from Common Effluent Treatment Plants (CETPs) in the area.

A.2. Project owner information, key roles and responsibilities

Project Proponent (PP):	Veerapandi Effluent Treatment Plant Private Limited
UCR Project Aggregator	Viviid Emissions Reductions Universal Private Limited
Contact Information:	lokesh.jain@viviidgreen.com

The Project Proponent (PP) affirms that they meet all the requirements outlined in the management plan regarding ownership, legal rights, permits, and cost details for the successful implementation of the project. Specifically.

Water User Rights: The PP holds the necessary water user rights for the area within the project's boundary. These rights are legally secured and ensure that the PP has full entitlement to use the water resources required for the project’s operations accredited By TNPCB.

Legal Land Title: The PP holds an uncontested legal land title for the entire project area within the project’s boundary. The title is fully documented and free of any disputes, confirming the PP’s legal right to utilize the land for project purposes.

Necessary Permits: The PP has obtained all the required permits for the implementation of the project. In cases where certain permits are pending, the PP has already applied for the necessary approval and is working in full compliance with the relevant regulatory requirements to ensure the timely commencement of the project.

Cost Details: The PP has thoroughly assessed and documented the cost details for project implementation. A detailed cost breakdown is available in the DPR, Capital Cost of project was RS. 31.29 Crores. covering all aspects of project development, including infrastructure, permits, equipment, and operational costs.

By meeting these criteria, the PP ensures that all legal and regulatory requirements for the project are satisfied, enabling the project to proceed without hindrance.

A.2.1 Project RoU Scope

PROJECT NAME	Wastewater Recycling & Reuse Project by Veerapandi CETP, Tirupur
UWR Scope:	Scope 5: Conservation measures taken to recycle and/or reuse water, spent washing wastewater etc. across or within specific industrial processes and systems, including wastewater recycled/ reused in a different process, but within the same site or location of the project activity. Recycled wastewater used in off-site landscaping, gardening or tree plantations/forests activity are also eligible under this Scope.
Date PCNMR Prepared	24-02-2025

A.3. Land use and Drainage Pattern

Not Applicable.

This Project activity involves treating and reusing wastewater. It doesn’t include any land-use practices. Also, this is an industrial process designed with technical requirements and following the specified norms of the local pollution control board. Hence, the project activity does not harm any land and Drainage system**.**

A.4. Climate

The project activity does not rely on the climatic conditions of the area as it treats and reuses only the wastewater from the dying & textile without letting the water be exposed to any climatic condition.

A.5. Rainfall

The project activity is not dependent on the rainfall pattern of the area as it treats and reuses the wastewater from the dying Industry.

A.6. Ground Water

NA

A.7. Alternate methods

All Textile Plant in Tamil Nadu, They have a mandate to maintain the TDS below 1500 mg/L from the state government; however, they have installed Mechanical Vapor Recompression (MVR) and Mechanical Evaporation (MEE), which serve as alternative solutions for the Effluent Treatment Plant (ETP). RO is used to remove dissolved solids, and MEE helps in evaporating water to concentrate the dissolved salts. These systems are designed to reduce the TDS levels in the effluent.

Despite the installation of RO and MVR systems, the TDS level in the treated effluent remains much higher than the standards set by the Pollution Control Board (PCB). As a result, the PP has installed a Zero Liquid Discharge (ZLD) system as an alternative method to ensure compliance with the regulatory requirements. The ZLD system helps in eliminating the discharge of liquid waste by treating all effluent and recovering water for reuse, thus effectively reducing the TDS concentration and achieving the desired standards.

The RoU program promotes wastewater treatment and reuse initiatives, thereby offering an alternative to the release of wastewater through surface Discharge which could have an adverse impact on soil Health.

A.8. Design Specifications

The (EIP will complete installation of centralized control of pumping Raw Effluent from all the Individual members and provide flow meters as recommended by INPCB and the committee. The CEP will monitor the conductivity, Sulphate levels of each member Units to ensure Sodium Sulphate Salt is only used The Treatment Scheme Planned for I00% ZLD is described below.

The Raw Eluent Characteristics are also described below. The Raw Element will be collected in receiving sump, a flow meter for each delivery line will be provided with Totalizer for all the pumps from receiving sump to Equalization Tank. Concentration Sulphuric Acid will be dosed in Equalization Tank and pH maintained around 6.5, The dosing pumps will be controlled automatically for operation based on pH.

The Equalization Tank has diffusers and ejectors for mixing, this effluent will be pumped to Aeration Tank, The Tank has 5 blowers, considering the D.0 3 |4 no's will be operated continuously. The overflow will enter an overflow sump. The existing Tube Settler is adequate for hydraulic load, hence a new secondary clarifier to take 50% of the flow will be provided and the Aeration Tank overflow will be transferred equally to the clarifier and Tube Settler.

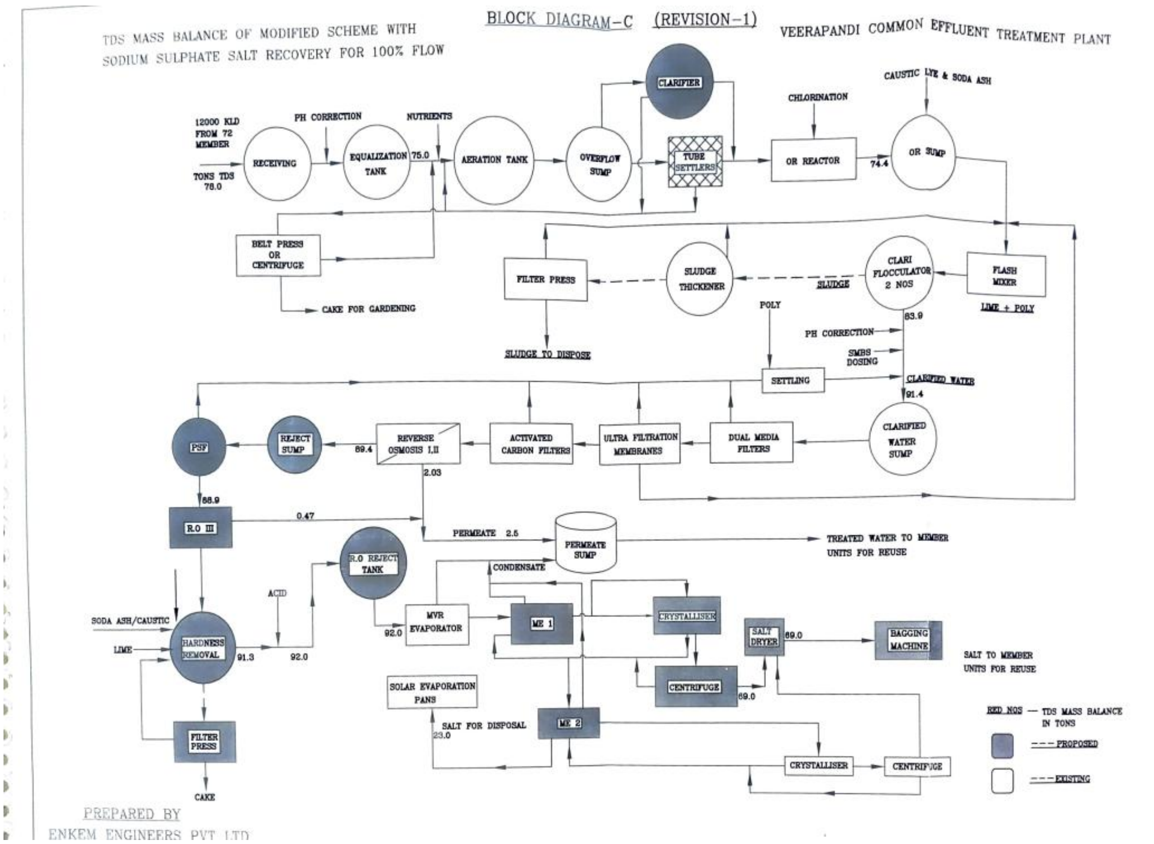
The settled Sludge from both Settling Tanks shall be collected in a sump and sludge recirculated to Aeration Tank. The excess Sludge will be continuously drained to new dewatering unit (Solid bowl centrifuge or Belt Press). The overflow will be sent to OR Reactor for color removal.

Excess digested biological sludge will be collected and dewatered using pumps and screw pumps into solid bowl centrifuges designed for low concentration sludge. This purely organic cake, approximately 6.0 tons of dry matter, will be used for in-house gardening or suitable external applications.

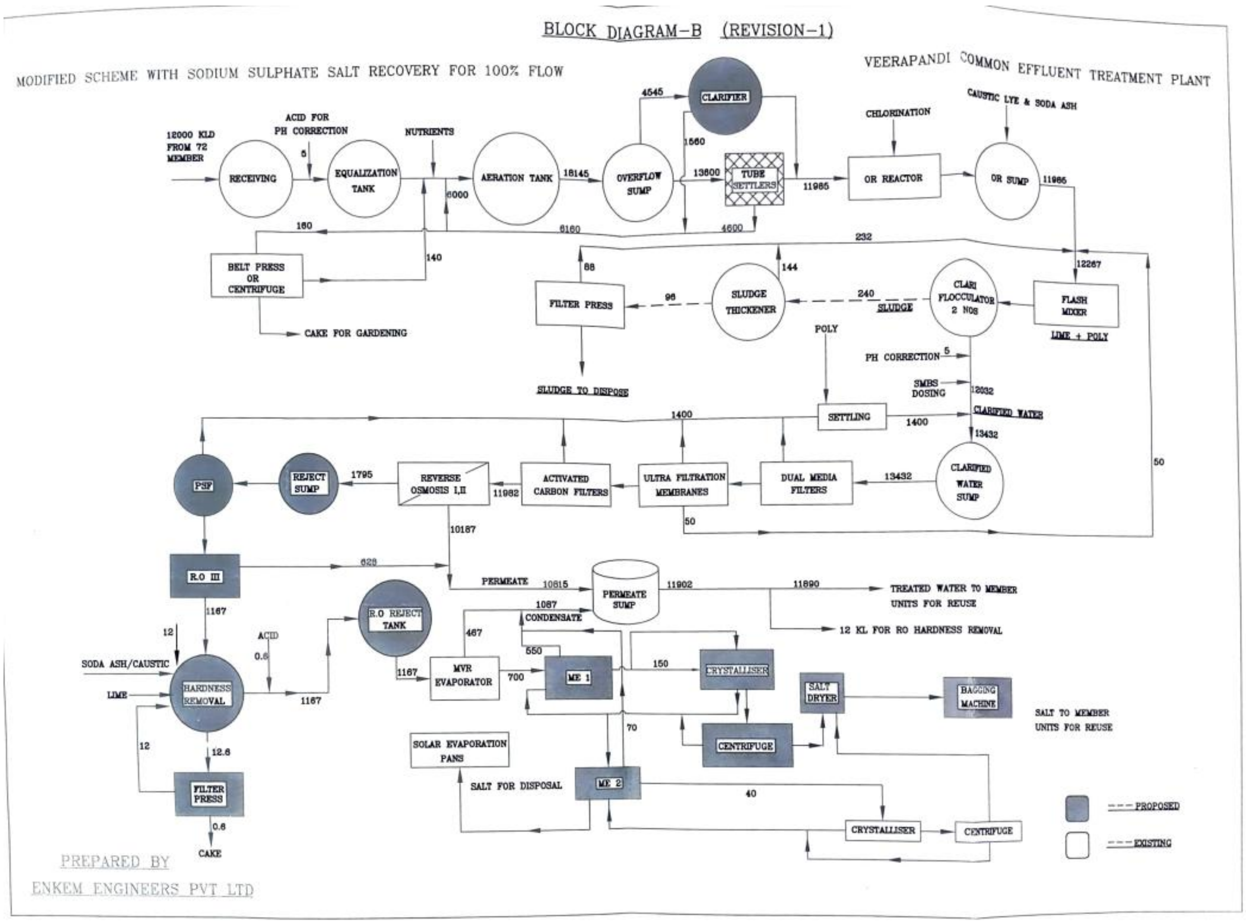
The purely inorganic mixed salt sludge, with 40-50% moisture content upon exiting the M.E., will be disposed of according to TNPCB guidelines. The CETP will investigate potential beneficial reuse by the chemical industry for economical and safe disposal. Detailed records and online data of sludge generation will be maintained. This salt will be solar dried, bagged, and then disposed to Cement Industries for Production of Cement blocks, with a daily quantity of approximately 13-15 tons.

The Chlorination is in Auto and the required chlorine added to maintain an ORP level required for colour removal. As already explained the COD of effluent after Biological is 160 mg /Itr and BOD is 10mg / Itr, most of the COD is refractive in nature and the COD after color removal is around 140 mg / ltr and BOD remain 10 mg / ltr, next stage hardness is removed using Lime Soda Process, Caustic / Soda ash will be added in the OR Reactor outlet and pumped to Flash mixer, Lime Solution is added to raise pH to 10.5 and Precipitate most hardness and Silica.

This overflow will collect in a sump, where Sulphuric Acid is added for pH correction and SMBS for free Chlorine correction, the Sump will have free Chlorine Sensors to automatically stop/ start.



TDS MASS BALANCE OF MODIFIED SCHEME WITH SODIUM



MODIFIED SCHEME WITH SODIUM SULPHATE SALT RECOVERY FOR 100% FLOW

The clarified effluent undergoes further treatment before the Reverse Osmosis (RO) process. SMBS dosing and pH sensors automatically control acid dosing within the system. This treated effluent is then transferred to the clarified water sump, ready for the next treatment stage.

Within the RO section, the effluent passes through Dual Media Filters (DMF), Ultrafiltration (UF), and Activated Carbon Filters (ACF) as pre-treatment before entering RO units I and II. A new RO unit (RO III) will be added to treat the reject water from RO II. The reject water from this new RO III unit will also be treated. The combined permeate from all RO units will be collected in the permeate sump.

Backwash water from the DMF, UF, and ACF units will be collected in a sump and transferred to a new tube settler/clarifier. Polymer will be dosed in the clarifier to facilitate settling of residues. The overflow from the clarifier will be routed back to the clarified water sump, while the settled sludge will be sent to a thickener.

RO Reject Treatment

The RO reject water, which has a hardness of approximately 900-1000 ppm, will be collected in a dedicated sump. This reject stream will be treated to reduce hardness, using either a pellet reactor or a lime soda process, before being fed to a Mechanical Vapor Recompression (MVR) unit.

MVR(Mechanical Vapor Recompression)

The concentrate from the MVR, with a TDS of approximately 100,000 ppm, will be pumped to a new Mechanical Evaporator (ME) system. This system will include a new crystallizer, boiler, and cooling tower. The ME will be designed with mother liquor return. The primary product recovered will be sodium sulfate salt.

The evaporation process occurs in two stages. The first stage involves pre-heating using process condensate, partial vapors from the first effect, and then steam. The first three effects of the evaporator will be of the enhanced falling film type, while the final effect will be a forced circulation type. Concentrated slurry from the last effect will be collected in a thickener with external chilling to facilitate crystallization. The crystals will then be processed in a pusher centrifuge to separate the crystals from the mother liquor. The mother liquor will be recycled back to the last evaporator for further concentration. The ME system will consist of one 600 KL unit and one 100 KL unit.

The entire evaporation system will operate under vacuum, with provisions for returning mother liquor and separately extracting the mixed salts concentrate for evaporation. The design is optimized to recover sodium sulfate salt while minimizing the volume of salt requiring disposal. Specifically, after the sodium sulfate salt is recovered, the remaining waste liquor will be concentrated to produce mixed salts in powder form, thereby eliminating the need for solar evaporation of the reject stream.

The recovered sodium sulfate will be dried and bagged for reuse by member industries. This system will ensure minimal salt volume for disposal and maximize the recovery of both sodium sulfate and permeate water.

Design Basis

Design Flow 12000 m3/day. he CETP has control of pumping and based on characteristics of effluent being in line especially sulphates and chlorides , the CTEP will pump the effuent, once quantity allowed for the member unit is reached the pump will automatically stop, this way the total quantity of effluent handled in the CETP will be controlled.

1. **Equalisation Tank**

2. Numbers - 1 no
3. Dia - 31.0 m dia
4. Liquid depth - 5.0 m
5. Volume - 3800 m^3
6. Incoming effluent - 12000 m^3/day
7. Detention time - 7.6 hours

- **Volume:** 3800 m³
- **Mixing:** Equipped with diffusers and ejectors for effective mixing.
- **Retention Time:** 7.5 hours (adequate for full flow)

2. Aeration Tank

The Transfer pumps are submersible pumps 2 Nos [1 W+1S] each of capacity 500m3 per hour. Head Provided is to emnpty the designed capacity of 500 m3 per hour at low level, The total head provided is 10.0 m with all losses, A constant head 14 chamber is provided which will regulate and ensure that only 500 m3/hr of effluent is entering Acration tank. The rcason for providing the same is that at different water levels the head of pump will vary and discharge to Aeration tank will increase crcating hydraulic and organic shock loads. By providing constant head chamber the fluctuation is taken care and flow above 500 m3 / hr will flow back to Equalisation Tank. Thus a uniform flow will enter Aeration Tank irrespective of level in the Equalisation Tank (E.T).

- **Volume:** 8000 m³
- **Diffusers & Blowers:** 3 Working + 2 Standby (3W+2S) - This indicates a redundant system for aeration, ensuring continuous operation.
- **Retention Time:** 16 hours (adequate for full flow)

3. Settling Tanks (2 Nos)

- **a. New Clarifier:**
    - Dimensions: 16.0 m diameter x 2.5 m Side Water Depth (SWD)
    - Capacity: 4000 m³
- **b. Existing Tube Settler:**
    - Capacity: 8000 m³

4. O.R. Reactor

- **Volume:** 2300 m³

- **Retention Time:** Approximately 5 hours (Note: While the volume suggests a 5-hour retention time, the text states that 20-30 minutes is typically adequate for chlorine reaction. Therefore, the reactor is considered adequately sized.)

5. Clarifloculator for Lime Soda Process

- **Existing Tanks:** Two units, each 19m in diameter.
- **Surface Loading Rate:** 35 $m^3/m^2/day$ required (total 400 m^2).
- **Existing Unit Area:** 560 m^2 (total).
- **Outlet:** Equipped with automatic pH sensor and auto free chlorine correction for hardness removal.
- **Sludge Dewatering:** Existing two filter presses will be used.
- **Conclusion:** Adequate.

6. RO (Reverse Osmosis)

The polishing treatment of the pre-treated effluent before it enters the Reverse Osmosis (RO) membranes involves a multi-stage filtration process. This includes dual media filters with anthracite, followed by ultrafiltration membranes, activated carbon filters, and cartridge filters. The specific configuration of the ultrafiltration and RO membrane systems adheres to the guidelines provided by their respective manufacturers. Furthermore, the overall design and arrangement of these unit operations are based on established criteria and operational data supplied by the CETP, consultants, and suppliers.

7. DMF/UF/RO I & II

- **Capacity:** 230 m^3/hr up to UF, 200 m^3/hr for RO.
- **Feed:** Up to 13,500 m^3 to UF (including backwash), less than 12,000 m^3 to RO.
- **Operation:** 20 hours operation considered adequate for both UF and RO.
- **Configuration:** Existing three banks will continue for RO I & II. A new RO II will be added to treat RO reject.

8. Third Stage RO (RO III)

- **Purpose:** Treats reject from RO II (all three banks).
- **Recovery:** Planned for at least 40-50% recovery to further reduce reject volume.

- **Capacity:** 110 m^3/hr for 20 hours operation.
- **Conclusion:** Adequate.

9. Reject Management

- **Total RO Reject:** Approximately 1100-1300 m^3 with specified TDS.

a. Hardness Removal:

i. Lime Soda Process: A new reactor clarifier (10.0m diameter x 4.0m deep, suitable for 1500 m^3 of reject) will be provided. Soda ash, lime, and caustic will be dosed to reduce hardness to less than 150-160 ppm.

ii. Separate filter press will be added, and the centrate will be returned to the new reactor clarifier.

- **b. MVR:** Can handle 1400 m^3/day of reject (reduced from original 1800 m^3). The current volume (1300 m^3) will be processed by the MVR for concentration. Due to the higher TDS from the three RO units, the reject TDS is expected to be higher than the previously observed 80,000 ppm.
- **c. Mechanical Evaporation + Crystallizer + Cooling Tower + Boiler:** Required capacity of 700 KL/day (including mother liquor). A new mechanical evaporator (100 KL + 600 KL) will be used to reduce reject volume and maximize sulfate recovery. The reject waste (mixed salt) will be concentrated to 45-50% dryness to minimize volume and avoid solar evaporation.
- **d. Salt Drying:** Recovered salt will be dried and distributed to member units.

OR Sump (receiving sump for Oxidation reduction effluent)

The OR (Oxidation-Reduction) sump acts as a transfer tank for effluent, with dimensions of 11.0 m diameter and 5.25 m liquid depth. A 12.5 hp ejector provides mixing within the sump. Overflow from the OR sump is directed to the hardness removal process via Lime-Soda Softening. A lifting pump transfers the effluent from the OR sump to the flash mixer at a flow rate of 500 m^3/hr, overcoming a calculated head loss of 15.0 m.

Due to the implementation of a Sulphate process, it is crucial to mitigate calcium scaling in the subsequent Reverse Osmosis (RO) system. The target calcium concentration is below 120 mg/L (expressed as $CaCO_3$) to prevent calcium salt scaling throughout all RO stages.

The existing infrastructure, consisting of a flash mixer and two clariflocculators, is deemed sufficient for the high Lime-Soda Softening process. This process effectively removes hardness, color, silica, and further reduces Chemical Oxygen Demand (COD). The expected COD after the Lime-Soda Softening process is approximately 100 mg/L.

Sump for back wash to UF & feed to ACF

Back wash water sump from UF / DMF / ACF a sump of 200m3 is existing. Since only sediments to be removed, This wastage is 1400m3 as per Old DPR & will be taken to proposed Clariflocculator in field for settling.

Volume of back wash - 1400m

Chemical Dosing

Plant feed	Acid -Ph correction	**pH of AT**		**Flash-Mixer-Dosage**						**Effluent Before DMF**		**Reject Treatment Dosage**			
		Outlet	OR	Caustic lye		Soda ash		Lime	Poly	Acid-pH - correction -litter	SMBS-in-Kgs	Caustic lye	so	Lime	Poly
			Chlorine Dosa in Kg	ppm	Qty-Liter	ppm	Qty-kgs	ppm	ppm			ppm	ppm	ppm	ppm
1400	660	7.98	350	400	450	600	600	400	0.5	880	150	400	2300	300	0.5
1300	650	7.84	400	400	600	600	900	400	0.5	880	200	400	2300	300	0.5
1500	690	7.98	30	400	650	600	900	400	0.5	880	200	400	2300	300	0.5
1700	700	7.98	480	400	700	600	950	400	0.5	880	200	400	2300	300	0.5
1500	680	7.9	450	400	650	600	900	400	0.5	880	200	400	2300	300	0.5
1200	635	7.88	420	400	600	600	650	400	0.5	880	200	400	2300	300	0.5

KEY WATER BALANCE CHART

1. Input - 12000 KLD

   Acid - 10.6 KLD

2. Recovery

a. Permeate - 11902 KLD

b. Loss (Bound in Sludge)

i. Biological Sludge - 20 KLD

ii. Chemical Sludge - 8.6 KLD

iii. Recovered Salt - 80 KLD

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Total 108.6

Total Inflow - 12010.6 KLD

Recovery + loss - 11902 + 108.6 = 12010.6 KLD

Effluent Quality

i. pH - 8.5 - 9.0

ii. TDS - 6000-6500 mg/ltr

iii. Sulphates - 5300-5900 mg/ltr

iv. Chlorides - 400-450 mg/ltr

v. COD - 900-1050 mg/ltr

vi. BOD - 300-325 mg/ltr

vii. Hardness - 400-450 (Initially and later 150-200)

A.9. Implementation Benefits to Water Security

Textile industry effluents contain a variety of chemicals, including hydrogen peroxide, sodium hypochlorite, sodium hydrosulfite, and sodium dithionite, along with smaller amounts of phosphates, nitrates, and salts of sodium and calcium. Additionally, the use of sodium chloride for preservation and pickling, as well as sulfate salts (primarily basic chromium sulfate) in dyeing and finishing processes, contributes significantly to the total dissolved solids (TDS) in the effluent. Further, there are various finishing operations further add to the salt load in the wastewater.

It is noted that the bulk of the hydrogen peroxide, sodium hypochlorite, sodium hydrosulfite emanates from the operations and the dying operations from semi-processed (EI/Wet blue) to finishing of washing result in effluent containing TDS, on a lower scale, mostly in the form of sulphates.

The implementation of ETPs has been crucial in safeguarding aquatic ecosystems in Noyyal River and soil health by effectively treating this harmful effluent.

Recycling wastewater from Dying and returning it to the production process after treatment is a pivotal step toward sustainability. This circular approach significantly reduces the reliance on groundwater, a precious natural resource. By minimizing the demand for fresh water, dying industries can contribute to water conservation efforts and alleviate pressure on depleting aquifers.

This project aims to inspire all Textile industries, particularly large multinational corporations, to implement sustainable water management practices. By demonstrating effective strategies for reducing captive water consumption and responsibly managing groundwater, the project hopes to foster a broader adoption of environmentally responsible approaches within the industry.

A9.1 Objectives vs Outcomes

The impact assessment or objectives of this project activity can generally be enumerated as follows:

- The project activity highlights the catalytic role that corporate India must play vital role in reducing industrial water consumption as well as water pollution per unit of industrial output.
- The PP has showcased technology that creates safe industrial grade water from an effluent source and has overcome the challenges faced by the alternate methods implemented and/or being proposed for the same.
- The PP has showcased the successful wastewater treatment of industrial effluent, thus saving millions of liters of wastewater for the production of Lether.
- The project activity showcases best-in-class wastewater treatment technology that can replace the equivalent freshwater and industrial demand in different sectors for nonportable purposes while reducing the proportion of untreated wastewater and substantially increasing recycling and safe reuse in India.

A9.2 Interventions by Project Owner / Proponent / Seller

The project aligns sustainable resource management by prioritizing the reuse of treated effluent over depleting groundwater sources. The PP has voluntarily invested in treating and reusing effluent, conserving millions of liters of potable water for the city.

As population growth and rising living standards increase water demand, groundwater, which supplies 85% of rural areas, faces increasing pressure. Overexploitation has led to declining water tables, water shortages, saltwater intrusion in coastal regions, and higher energy costs for pumping.

The PP's initiative has directly contributed to water security in the region. By avoiding excessive groundwater extraction, the project helps mitigate issues like falling water levels, water scarcity, saltwater intrusion, and increased energy consumption for pumping.

A.10. Feasibility Evaluation

The installed CETP and ZLD System by the PP are robust and smoothly adapts to variations in wastewater effluent. Before establishing the project, PP has done the feasibility test as per **DPR** (Detailed Project Report)**.**

A.11. Ecological Aspects & Sustainable Development Goals (SDGs):

This project demonstrably achieves sustainable management and efficient utilization of India's natural resources. The project proponent (PP) had the option to install borewells, potentially depleting local groundwater reserves. Alternatively, they could have continued relying on existing, potentially potable, water resources registered with the Universal Water Registry.

Recognizing the environmental impact, the PP commendably opted for a more sustainable approach. They chose to treat and reuse the effluent generated by the Common Effluent Treatment Plant (CETP), resulting in significant water savings for the dying operations, measured in millions of liters.

This project encourages the industrial sector, particularly large-scale leather processing facilities, to adopt similar sustainable practices regarding their captive water needs and overall groundwater management.

The CETP effectively treats the textile's effluent, and the use of impervious machinery within the CETP area further safeguards against potential leakage and contamination of surrounding soil.

The sustainable development attributes attached to the project activity are demonstrated below:

Sustainable Development Goals Targeted	Most relevant SDG Target/Impact	Indicator (SDG Indicator)
	13.2: Integrate climate change measures into national policies, strategies and planning	Recycling and reusing wastewater is an effective solution for climate change adaptation because it helps mitigate the impacts of droughts, floods, and other extreme weather events that are becoming increasingly common due to climate change due to water scarcity. The quantity of wastewater recycled and reused by the PP is the SDG indicator.
	3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	The PP showcases how recycling and reusing wastewater can prevent depletion of natural water reserves and prevent water scarcity during droughts. The hazardous impact of industrial wastewater is now avoided due to this project. The PP ensures

		water availability in water-scarce zones that help promote healthy lives and well-being in the region.
6 CLEAN WATER AND SANITATION	6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	The PP has shown recycling and safe reuse of 12 million liters within the industry during this monitored period, which directly correlates to this indicator 6.3.
8 DECENT WORK AND ECONOMIC GROWTH	8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	Number of jobs created and also the Number of people trained as part of this project activity.
15 LIFE ON LAND	15.2.1 Progress towards sustainable forest management.	The PP has implemented a reforestation project in the nearby area to revitalize the local ecosystem.

A.12. Recharge Aspects:

NA

A.12.1 Solving for Recharge

Water Budget Component	Typical Estimated Uncertainty (%)	Description

Surface Inflow	1%	In accordance with the RoU Standard version 7, and considering that the flow meters are calibrated, PP has accounted for a 1% uncertainty factor in both inflow and outflow volumes to maintain a conservative approach. Consequently, an uncertainty factor of 0.98 is applied to all ROUs.
Precipitation	NA	Not available
Surface Outflow	1%	In accordance with the RoU Standard version 7, and considering that the flow meters are calibrated, PP has accounted for a 1% uncertainty factor in both inflow and outflow volumes to maintain a conservative approach. Consequently, an uncertainty factor of 0.98 is applied to all ROUs.
Evapotranspiration	NA	Not available
Deep Percolation	NA	Not available

A.13. Quantification Tools

Baseline scenario:

The baseline scenario is the situation where, in the absence of the project activity, the PP would have **one or all** of the below options:

- (a) installed multiple bore wells within the project boundary which would have depleted the local groundwater resources (aquifers); **and/or**
- (b) diverted existing safe drinking water resources from the surrounding residential area; **and/or**
- (c) discharged the ETP effluent without further recycling and reusing.

Hence the following baseline scenario is applicable for this project activity:

"The net quantity of treated ETP effluent / wastewater that would be discharged directly into the local drain/sewer without further being recycled and/or reused daily post treatment per year"

The net quantity of treated water used is measured via flow meters installed at the site. The primary set of data records are kept at plant level, managed by Tirupur CETP team which is Mentioned in Appendix. Also, for conservative purposes, the working days or operational days have been assumed at 330 days in a year during the 1st monitoring period **(01/01/2015 to 31/12/2024)**. However, the number of days is not an influential parameter on RoUs calculation as RoUs are calculated based on total quantity of treated water being recycled & reused.

MONTH	RAW EFFULUENT RECIVED	RO PERMEATE	BRINE	RoUs with Uncertainity Factor ([Ro per+Brine)*0.98	Year Wise
Jan-15	37395	42914	0	42055.72	610519
Feb-15	46123	52033	0	50992.34	
Mar-15	55202	63908	0	62629.84	
Apr-15	60830	50755	0	49739.9	
May-15	55893	48223	0	47258.54	
Jun-15	66884	57510	0	56359.8	
Jul-15	62300	54364	0	53276.72	
Aug-15	57085	52016	0	50975.68	
Sep-15	64558	43433	0	42564.34	
Oct-15	70420	60130	0	58927.4	
Nov-15	36228	33089	0	32427.22	
Dec-15	70667	64604	0	63311.92	
Jan-16	37395	42914	0	42055.72	630501
Feb-16	46123	52033	0	50992.34	
Mar-16	55202	63908	1273	63877.38	
Apr-16	60830	50755	1827	51530.36	
May-16	55893	48223	1972	49191.1	
Jun-16	66884	57510	2265	58579.5	
Jul-16	62300	54364	2365	55594.42	
Aug-16	57085	52016	2256	53186.56	
Sep-16	64558	43433	2386	44902.62	
Oct-16	70420	60130	1996	60883.48	
Nov-16	36228	33089	1499	33896.24	
Dec-16	70667	64604	2550	65810.92	
Jan-17	49902	33506	1528	34333.32	944695
Feb-17	76856	73181	2698	74361.42	
Mar-17	87756	77347	3110	78847.86	
Apr-17	80005	72740	2479	73714.62	
May-17	90173	77739	3110	79232.02	

Jun-17	100002	95307	3236	96572.14	
Jul-17	87878	79089	2997	80444.28	
Aug-17	85185	72870	2981	74333.98	
Sep-17	100342	96849	3111	97960.8	
Oct-17	71044	67916	2368	68878.32	
Nov-17	95300	82271	5511	86026.36	
Dec-17	105439	101178	852	99989.4	
Jan-18	74878	63542	1872	64105.72	
Feb-18	100010	86010	2741	86975.98	
Mar-18	111364	98397	3262	99625.82	
Apr-18	102174	88883	2778	89827.78	
May-18	103929	86399	2984	87595.34	
Jun-18	103940	92346	3196	93631.16	**1075706**
Jul-18	98979	83777	2770	84816.06	
Aug-18	111299	101942	3448	103282.2	
Sep-18	100311	91297	3001	92412.04	
Oct-18	120011	108933	3514	110198.06	
Nov-18	57992	54875	1655	55399.4	
Dec-18	112031	106488	3549	107836.26	
Jan-19	85537	84235	2485	84985.6	
Feb-19	103390	90673	3384	92175.86	
Mar-19	111015	106269	3557	107629.48	
Apr-19	100916	96241	3357	97606.04	
May-19	115515	104343	4610	106773.94	
Jun-19	99884	94695	4144	96862.22	**1127172**
Jul-19	87150	65051	3490	67170.18	
Aug-19	101934	90858	3565	92534.54	
Sep-19	104304	94652	3466	96155.64	
Oct-19	88484	82780	3098	84160.44	
Nov-19	101365	96194	3363	97565.86	
Dec-19	115816	101882	3783	103551.7	
Jan-20	92557	84950	3899	87072.02	
Feb-20	112063	103520	3944	105314.72	
Mar-20	85016	81998	2653	82957.98	
Apr-20		0	1104	1081.92	
May-20	32542	70807	904	70276.78	**1121953**
Jun-20	104411	92147	3619	93850.68	
Jul-20	120016	110700	4313	112712.74	
Aug-20	111524	105429	4051	107290.4	
Sep-20	121889	118770	4434	120739.92	
Oct-20	135675	129612	4751	131675.74	

Nov-20	91442	86031	2690	86946.58	
Dec-20	136675	120085	4439	122033.52	
Jan-21	89113	74352	2349	75166.98	
Feb-21	119302	102791	4099	104752.2	
Mar-21	142686	118867	4965	121355.36	
Apr-21	115383	82926	3470	84668.08	
May-21	44879	36346	1399	36990.1	
Jun-21	57292	41851	1476	42460.46	
Jul-21	133501	117252	4730	119542.36	**1186727**
Aug-21	134545	117919	3907	119389.48	
Sep-21	147567	133277	5000	135511.46	
Oct-21	152087	139971	5398	142461.62	
Nov-21	77304	74403	2159	75030.76	
Dec-21	141240	127125	4914	129398.22	
Jan-22	95815	86523	3118	87848.18	
Feb-22	119164	109303	3928	110966.38	
Mar-22	138372	122432	4327	124223.82	
Apr-22	127511	114062	4406	116098.64	
May-22	113844	105016	3772	106612.24	
Jun-22	119590	114859	3701	116188.8	
Jul-22	108671	106881	3329	108005.8	**1301025**
Aug-22	96355	96326	2841	97183.66	
Sep-22	121145	118860	3378	119793.24	
Oct-22	85362	88612	2368	89160.4	
Nov-22	104539	106181	3701	107684.36	
Dec-22	114914	115948	3705	117259.94	
Jan-23	73247	75346	2130	75926.48	
Feb-23	100772	95824	1813	95684.26	
Mar-23	125212	112325	2234	112267.82	
Apr-23	109064	112799	5179	115618.44	
May-23	122551	121187	2689	121398.48	
Jun-23	127069	122678	3984	124128.76	
Jul-23	126304	132496	4009	133774.9	**1400293**
Aug-23	126575	133714	3962	134922.48	
Sep-23	130075	128443	3821	129618.72	
Oct-23	134831	130001	3784	131109.3	
Nov-23	85011	90147	3865	92131.76	
Dec-23	135139	134036	2404	133711.2	
Jan-24	103136	102184	2976	103056.8	
Feb-24	132542	127617	4639	129610.88	**1568948**
Mar-24	140298	137269	4041	138483.8	

Apr-24	130674	122388	3743	123608.38	
May-24	143674	142708	5070	144822.44	
Jun-24	126119	126691	2761	126862.96	
Jul-24	131063	128156	6512	131974.64	
Aug-24	141811	141224	4905	143206.42	
Sep-24	138461	131472	4494	133246.68	
Oct-24	131973	136452	3812	137458.72	
Nov-24	103537	105968	2408	106208.48	
Dec-24	142470	148837	4640	150407.46	
Total				**10967538**	**10967538**

Quantification

Year	Total ROUs (1000 liters)/yr UCR Cap (1 million RoUs/yr
2015	610519
2016	630501
2017	944695
2018	1000000
2019	1000000
2020	1000000
2021	1000000
2022	1000000
2023	1000000
2024	1000000
Total RoUs	**9185715**

In accordance with the UWR standard, RoUs are capped at 1 million per year. Therefore, adhering to the guidelines, the RoUs from 2015 to 2024 have been adjusted to comply with the annual cap of 1 million.

A.14. UWR Rainwater Offset Do No Net Harm Principles

According to the UCR RoU Standard principles, the project activity accomplishes the following:

• Increases the sustainable water yield in areas where over development has depleted the aquifer
According to the data released by the Central Groundwater Board in 2021, the total amount of groundwater that can be utilised in India in a year is 398 billion cubic meters (BCM), of which, approximately 245 BCM is currently being utilised, which is about 62 per cent of the total. But the level of exploitation of groundwater is very high in States like Punjab, Rajasthan, Haryana, Delhi and Tamil Nadu. This project was commissioned in 2008, and the PP has reduced the proportion of untreated wastewater that future generations would need to recycle and has showcased recycling and safe reuse within the industry from unutilized water resources. Revenue from the sale of UCR RoUs will enable scaling up such project activities.
• Collect unutilized water or rainwater and preserve it for future use
In India, at the district level, in 24 states/UTs, as many as 267 districts had stages of groundwater extraction more than 63 per cent, ranging from 64 per cent to 385 per cent (source: https://www.business-standard.com/article/current-affairs/from-58-to-63-india-pumped more-groundwater-between-2004-and-2017-121122101377_1.html). This project activity serves as an example to recycle and reuse wastewater and encourages companies, especially large and transnational companies in the biotechnology and biopharmaceuticals sector, to adopt similar sustainable practices in regard to captive water requirements and groundwater management.
• Conserve and store excess water for future use
The project activity decreases the dependence on groundwater, thereby preventing excessive depletion. Between 2015 to 2024, the project activity has reused 10.7 million litres of ETP effluent successfully post treatment with gainful end use of the same.

A.15. Scaling Projects-Lessons Learned-Restarting Projects

Scaling up effluent treatment in India's textile industry, exemplified by the Veerapandi CETP in Tirupur, offers a promising solution for improved water and wastewater management. This CETP, with its 10.7 m^3/day capacity and Zero Liquid Discharge (ZLD) design, demonstrates the effectiveness of centralized treatment. This successful model can be replicated in other textile hubs like Ahmedabad, Jaipur, and Surat, adapting the CETP design to their specific wastewater volumes and environmental contexts.

A cluster-based approach, where numerous small and medium-sized dyeing units share a treatment facility, offers several advantages. It reduces operational costs for individual units, ensures consistent effluent treatment quality, and minimizes the environmental risks associated with untreated wastewater discharge.

Scaling up these CETPs involves not only increasing treatment capacity but also integrating advanced technologies. Upgrading existing systems with Membrane Bioreactors (MBRs), Ultrafiltration (UF), or Nanofiltration (NF) can significantly improve the quality of treated water, making it suitable for reuse. Optimizing Reverse Osmosis (RO) systems and implementing effective brine management strategies are also crucial. Treating brine concentrates, typically high in salts, to recover valuable by-products like sodium chloride and sodium sulfate offers both economic and environmental benefits. These recovered salts can be sold or utilized in other sectors like agriculture or construction, contributing to a circular economy. However, the storage and management of these recovered salts require careful consideration.

By maximizing resource recovery and minimizing waste, scaled-up CETPs can drive the textile industry towards a zero-waste model, reducing its environmental impact while simultaneously creating economic value. This holistic approach to effluent treatment is essential for the sustainable growth of the dyeing industry in Tirupur and across India.

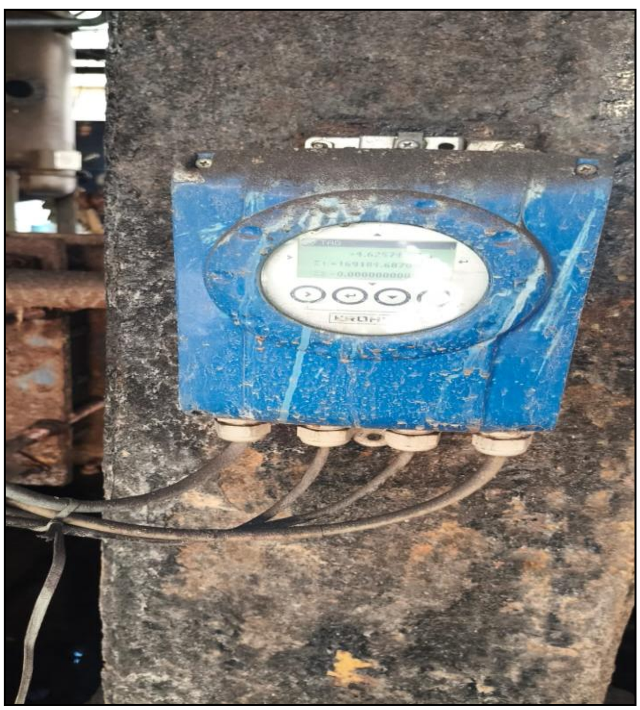
Appendix> Unit Member

S.No	Name of the Members	100 % DPR Capacity
1	Anjali Process	100
2	Andavar Textile Process	110
3	Atul Process	300
4	Brilliant Dyers	250
5	Colour Point	130
6	Colour Point Textile Process	245
7	Golden key textile Process	120
8	Frontline Exports P Ltd	96
9	Ganapathi Process	300
10	Jango Dyeing	110
11	KMS Textile Dyers	150
12	KRP Dyeing	250
13	KRP Colours	220
14	Liberty Bleaching and Dyeing	190
15	Mahaveer Colour Process	130
16	Navasakthi Textile Process	100
17	Shree Sai colours	160

18	Oskar Process	360
19	P Prime Process	20
20	Popular Process	204
21	Puma Dyeing Mills	300
22	R.M.S Dyeing	300
23	Santhi Dyeing	96
24	Senthilkumaran Process	160
25	Sharp Processing	220
26	Skywin Colours and Bleachers	300
27	Sivasakthi Dyeing Factory	150
28	Sree Vadivel Dyeing	160
29	Sri Balaji Textile Processors	300
30	Sri Amman Processors	230
31	Sri Karpagam Dyeings	230
32	Sri Santhosh Knit Process.	160
33	Sri Suriya Textile Process	80
34	Sruthi Tie N- Dye	195
35	Subam Dyeing	50
36	SVS Processing Mills	150
37	Time Process Mills	100
38	Times Dyeing	450
39	Two Win Textile Process	240
40	Will Power Process	250
41	Win Process	15
42	Shree Thangamyil Colours	150
43	Yellow Dyers	125
44	Aiswarya Textile Process	180
45	Vee.Gee.Process	50
46	Vizayalakshmi Textile Mills	60
47	Kadaieswara Process	200
48	Sivan Bleaching	110
49	Sri Udhayam Bleachings	41
50	Adhithiya Textile Process	360
51	Anurag Dyeng	93
52	Brinda Processing Mills	1100

53	M J Process (Supreme Colours)	310
54	Maheshkumar Dyeing	228
55	PMC Processing Mills	110
56	Shri Hari Processing Mills	20
57	Sri Balaji Processing Mills	300
58	Universal Dyeing	170
59	Jango Bleaching Factory	30
60	Makeshkumar Mills	1
61	SSK Bleaching	1
62	Stallion Bleaching	5
63	Tip Top Processing	100
64	Winner Process	5
65	Pantone Dyers	150
66	Confident Process	150
67	Siva Textile Process	150
68	Suruthi Colours	74

Appendix> Flow Meter



Collection well (Inlet)

Brine out (Outlet)

Appendix> Quality Test for Effluent and Treated Water

A. Pre-Treatment

PARAMETERS	RECEIVING	EQUALIZATION	AERATION	S CLARIFIER
pH	10.24	7.45	8.03	8.10
TDS	10900	10600	10800	10560
Mg Hardness	90	100	90	90
Ca Hardness	80	60	60	50
M Alkalinity	1680	1320	1440	1420
P Alkalinity	120	80	120	90
Chloride	980	1070	1180	1230
Sulphate	5200	5000	5100	5060
Silica	40	40	20	20
Colour	4700	3200	1270	1290
COD	1680	1240	256	264
BOD	520	460	400	400
TSS	196	184	5180	56
Turbidity	64	70	7.20	8.10

B. Treated Water

PARAMETERS	MEE Feed	MEE Feed II(kws)	Chiller Feed	Chiller ML
pH	6.30	9.51	9.44	9.35
TDS	103800	374000	389000	374000
Mg Hardness	160	260	200	240
Ca Hardness	90	180	160	160
M Alkalinity	1100	9550	7600	9400
P Alkalinity	240	1600	1200	1480
Chloride	18700	114000	86000	112000
Sulphate	49800	172300	182400	174600
Colour	2600	4600	4900	5600
COD	-	-	-	-
Silica	-	-	-	-

