BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, NEW DELHI (PRINCIPAL BENCH)

Original Application No. 173/2023

In the matter of

Shallabjit Singh

..... Applicant

V/s

State of Punjab and Others

.... Respondent

Submission of report received from the Thapar Institute of Engineering Technology Patiala in compliance to order dated 05.01.2024 of the Hon'ble Tribunal

RESPECTFULLY SHOWETH

1. That briefly submitted, the above mentioned case relates to letter petition dated 05.11.2022 sent by Shallabjit Singh regarding a pharmaceutical unit namely M/s Nectar Life Sciences Limited at Village Haibatpur, Tehsil DeraBassi, District SAS Nagar (Mohali). The letter petition was registered as Original Application No. 173 of 2023

titled as Shalbhjit Singh vs State of Punjab.

2. That the earlier Action Taken Report in the matter was filed by the Punjab Pollution Control Board (PPCB) before the Hon'ble National Green Tribunal on 04.01.2024.

3. That after consideration of the matter, the Hon'ble National Green Tribunal was pleased to pass an order dated 5.01.2024, the relevant extract which as contained in para no. 6 is reproduced below for kind perusal and reference:

> *"6. Learned Counsel appearing for the PPCB has submitted that sample analysis report of the samples taken from the unit is awaited. Therefore, a fresh report after obtaining sample analysis report will be filed. The PPCB is also directed to carry out water audit and submit the water audit report as also the water flow chart of the unit in question and also point out the sample analysis report of discharge of water from the unit by whatever source. The report will also disclose the manner of disposal of sludge by the unit in question and quality of groundwater around the industry. Let the report be filed within a period of six weeks by e-mail at judicialngt@gov.in preferably in the form of searchable PDF/OCR Support PDF and not in the form of Image PDF."*

4. That the Punjab Pollution Control Board has engaged School of Energy and Environment, Thapar Institute of Engineering Technology (TIET), Patiala as an Institute of Repute (IoR) to carry out water auditing, groundwater study in and around the industry, adequacy of ETP/MEE, complete material balance including generation of sludge and study as to whether unit is based on ZLD Technology or not.

5. That the Thapar Institute of Engineering Technology, Patiala has submitted Environment Audit Report of the industry namely M/s Nectar Lifesciences Ltd., Unit-2, Village Saidpura, Derabassi with the Punjab Pollution Control Board on 28.02.2024. A copy of the Environment Audit Report submitted by Thapar Institute of Engineering Technology, Patiala is enclosed herewith as **Annexure-A** for kind perusal of the Hon'ble Tribunal.

6. That the Environment Audit Report of M/s Nectar Lifesciences Ltd., Unit-2, Village Saidpura, Derabassi as submitted by the Thapar Institute of Engineering Technology, Patiala is being examined by the team of officers constituted by the Board for the purpose. The team will submit conclusive recommendations in due course of time. In this regard a time period of four weeks is requested for.

It is, therefore, requested that four weeks' time may kindly be granted to the Punjab Pollution Control Board to submit the conclusive recommendations in the case after consideration of the Environment Audit Report submitted by Thapar Institute of Engineering Technology, Patiala.

Submitted by

04/03/2024

(Er. Gursharan Dass)
Environmental Engineer
Punjab Pollution Control Board
Regional Office, Mohali

Date: 04.03.2024

Place: SAS Nagar

ENVIRONMENT

AUDIT

OF

M/S NECTAR LIFESCIENCES LTD.

UNIT II,

DERABASSI, PUNJAB

VIDE PPCB LETTER NO. 9954 DATED 04/01/2024

Conducted By

Thapar Insitute of Engineering Technology

Thapar Technology Campus, Patiala

ACKNOWLEDGEMENT

We extend our sincere appreciation to the Punjab Pollution Control Board, Punjab, for entrusting us with a stimulating assignment and providing invaluable encouragement throughout the preparation of this report.

Our gratitude is extended to the management of M/s Nectar Lifesciences Ltd. Unit II, Derabassi, Punjab, for their unwavering support in the execution of this project.

Special thanks are conveyed to the HSE Department of Nectar Lifesciences Ltd. Unit II for their unwavering cooperation and support during the field study, essential for the successful completion of this audit.

We also acknowledge, with great appreciation, the crucial role played by the entire Thapar Institute of Engineering and Technology (TIET) Management, whose permission enabled us to accomplish this task. TIET's support in sampling, analysis, and report preparation for water analysis and ETP adequacy analysis is highly valued.

Lastly, we express our gratitude to the faculty members, laboratory technicians, staff, and research scholars of the School of Energy and Environment, TIET, for their unwavering support throughout the audit's preparation.

CERTIFICATE

We certify and undertake to say the following:

1. The report is based on the data collected at the site during the Audit and information provided by M/s Nectar Lifesciences Ltd. Unit II.
2. The data collection has been carried out diligently and truthfully.
3. All data measuring devices used by the team were in good working condition and have been calibrated as per the guidelines.
4. Thorough professional approach, care, and diligence have been taken in preparing the water audit report and the contents thereof are a true representation of the facts and figures.

Dr. Anoop Verma

PREFACE

With a sense of duty and the obligation to ensure regulatory compliance, we present this Environment Audit Report for M/s Nectar Lifesciences Ltd. Unit II, a prominent entity in the bulk API manufacturing sector. This meticulous investigation, conducted by the esteemed Thapar Institute of Engineering and Technology, rigorously examines the intricacies of the water distribution system and utilization practices at M/s Nectar Lifesciences Ltd. Unit II.

Recognizing the imperative of water conservation, M/s Nectar Lifesciences Ltd. Unit II initiated this audit in collaboration with Thapar Institute of Engineering and Technology, demonstrating a commitment to sustainable practices within its operations. The vigilant efforts exerted by the audit team, under the oversight of Thapar Institute of Engineering and Technology, have yielded invaluable insights into water supply sources, consumption patterns, wastewater discharge, and potential water-saving opportunities leading to Zero Liquid Discharge (ZLD) at the Derabassi facility.

This report encompasses a detailed analysis of the water management practices at M/s Nectar Lifesciences Ltd. Unit II. The report provides a detailed breakdown of water consumption across different manufacturing sections like various parts of the process are covered like condensation, hydrolysis, solvent recovery and CIP etc and various parts of utilities are covered like Boiler, cooling towers and RO plants.

While certain processes contribute to wastewater generation, the report underscores the industry's efforts to responsible wastewater management. Wastewater generation is categorized into two TDS-based streams, namely LTDS and HTDS. The report outlines that the High TDS effluent from the process section and highly concentrated reject from RO undergoes treatment in the MEE, while all LTDS wastewater streams, along with condensate from

MEE, are collected and directed to the Effluent Treatment Plant. Notably, M/s Nectar Lifesciences Ltd. Unit-II collaborates with its sister concern, M/s Nectar Lifesciences Ltd. Unit-I, with due permissions from PPCB, channeling LTDS and HTDS streams from Unit-I to Unit-II.

The entire wastewater generated undergoes efficient treatment in the Effluent Treatment Plant (ETP), followed by a 3-stage RO process. This ensures that the treated water attains the necessary quality for reuse as cooling tower makeup water.

Furthermore, the report identifies areas for potential improvement, underscoring the necessity of enhancing environmental data management and representation systems. As the industry aligns with best practices for water efficiency, a set of stern recommendations has been outlined to guide M/s Nectar Lifesciences Ltd. Unit II on its path towards more sustainable and responsible water usage.

In conclusion, this Water Audit Report stands as a testament to M/s Nectar Lifesciences Ltd. Unit II's commitment to environmental stewardship and sustainability. The insights provided aim not only to improve water efficiency within the organization but also to contribute to the broader discourse on responsible water management in the pharmaceutical sector. We express our appreciation to M/s Nectar Lifesciences Ltd. Unit II for their collaboration and commitment to environmental responsibility, trusting that the recommendations delineated in this report will herald a more sustainable future.

Thapar Institute of Engineering and Technology Pvt Ltd

EXECUTIVE SUMMARY

In response to directives from the National Green Tribunal (NGT) and the Punjab Pollution Control Board (PPCB), a comprehensive third-party audit was conducted at M/s Nectar Lifesciences Ltd. Unit II in Derabassi. The audit, overseen by the School of Energy and Environment (SEE) at Thapar Institute of Engineering and Technology (TIET), focused on evaluating the water management practices of the facility.

M/s Nectar Lifesciences Ltd. Unit II is located in the Village Saidpura, P.O. & Tehsil-Dera Bassi, District- SAS Nagar, Punjab. The annual designed production capacity of the plant is 1064.83 tonnes of product. The industry produces 26 numbers of products given in table 2.1. A team from the School of Energy and Environment (SEE), Thapar Institute of Engineering and Technology (TIET) visited M/s Nectar Lifesciences Ltd. Unit II multiple times for data collection, document verification, sample collection and on-site performance evaluation. The first visit was carried out with PPCB officials. The data of the last six months August 2023 to January 2024 is analysed in this audit report.

The backdrop of this audit is the high stress and overexploitation conditions of the groundwater in the Derabassi Tehsil, highlighting the critical need for sustainable water management practices. Groundwater quality assessments were conducted across nine locations surrounding the facility, assessing compliance with safe drinking water standards. Additionally, an analysis of the facility's operational data, including water consumption, waste generation, and treatment processes, was conducted to gain insights into its environmental impact and sustainability practices

The data regarding regulatory permissions, water consumption, waste water generation etc. was collected from Nectar Lifesciences Ltd. Unit II and verified with the original documents.

The overall production of all the products in the previous six months data August 2023 to January 2024 was 371.8 MT. The only source of water for the production is groundwater. In the last six months, the total amount of groundwater extracted was verified to be 181540 KLD. The groundwater quality from the bore well was assessed as per the prescribed Drinking Water Standard (IS 10500:2012) and it was observed that all the physico-chemical parameters were found under permissible limits.

During the initial audit visit with PPCB officials, two solar ponds containing legacy waste were identified on the industry premises. One pond contained High Total Dissolved Solids (HTDS) waste, while the other contained Low Total Dissolved Solids (LTDS) waste. These ponds posed long-term environmental risks such as leaching. The audit team instructed the industry to take advantage of the lower capacity operation of their ETP and MEE by treating a small volume of this waste daily and gradually emptying the tanks. By the conclusion of the audit, the industry had significantly reduced the contents of the ponds by utilizing the daily capacity of their ETP and MEE. Verification of the MEE and ETP logbooks for this period revealed an increase in load and sludge generation, confirming that the waste was indeed treated within the in-house facilities. Photograph of the emptied ponds attached as Annexure VIII.

According to the peak load water balance provided by the industry, the freshwater demand amounts to 1055 KLD. Groundwater is extracted from two borewells on-site. The total groundwater extraction is allocated across five streams: Process demand (423 KL), Boiler (923 KL), Cooling towers (1296 KL), Solvent recovery plants (10 KL), and Domestic use (30 KL). RO plants are installed for freshwater treatment at the Process and Boiler sections, with rejects directed to the ETP. Wastewater generated from Boiler operation and cooling towers, in the form of blowdown, is also treated in the ETP as LTDS stream. All HTDS effluent, including RO reject from tertiary RO installed after the ETP, is treated in the Multi-Effect Evaporator (MEE). The condensate from the MEE is then directed to the ETP via the LTDS line. The water scheme is designed for operational efficiency, with RO permeate from the final RO installed after the ETP recycled for use in cooling towers, reducing overall freshwater consumption. Additionally, LTDS and HTDS streams from the sister concern unit, M/s Nectar Lifesciences Unit-I, are treated at the facility of M/s Nectar Lifesciences Ltd. Unit-2.

The industry is running below its installed capacity. The production during August 2023, September 2023, October 2023, November 2023, December 2023 and January 2024 was 29.54%, 31.03%, 45.22%, 47.64%,44.96% and 47.12% respectively against the designed capacity (4.93 T per day). Menthol based products have not been considered in this evaluation as the industry has ceased its production due to market requirements. The industry is currently operating at less than 50% of its total capacity, yet it continues to consume approximately 90% of the total water demand. This phenomenon can be attributed to the necessity of running utilities such as cooling towers and chilling units at their full capacities, regardless of variations in production levels. Additionally, during the site visit, the industry clarified that the increased frequency of Clean-in-Place (CIP) procedures, driven by the current market-oriented product mix, has resulted in higher water consumption. It is recommended that the industry undergo another water audit when operating at over 80% production to verify the aforementioned findings.

TIET team analyzed the flow measurements of water pipes at various locations and compared with the Nectar Lifesciences Ltd Unit -II data shown by meters. The flow rate of bore well pipelines and MEE outlet was found to be nearly similar to the measured values.

The treatment capacity of MEE at ETP is 350 KLD or 127750 KL per annum. The MEE is running below its installed capacity. MEE had been running at an average 75.17% of its installed capacity during the last six months. The assessment of parameters at the inlet and condensate of the Multiple Effect Evaporator (MEE) plant reveals significant changes. At the MEE inlet, pH levels indicate acidity, whereas in the condensate, pH levels are neutral. Total Dissolved Solids (TDS) decrease from 19340 mg/l at the inlet to 430 mg/l in the condensate, indicating effective removal. Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) values also decrease substantially, suggesting successful treatment during evaporation stages. Metal contaminants, including Zinc, Copper, Total Chromium, Hexavalent Chromium, Cyanide, Arsenic, Mercury, and Lead, generally meet standards in the condensate, with many not detected. Notably, Zinc levels decrease from 1.180 mg/l at the inlet to non-detectable levels in the condensate, indicating efficient removal. Ammonical Nitrogen levels decrease significantly, underscoring successful elimination during evaporation. Sodium Adsorption Ratio (SAR) levels decrease from 7897.00 mg/l at the inlet to 438.00 mg/l in the condensate, suggesting a potential reduction in adverse effects on soil structure.

Domestic waste generated from the premises was being added to the LTDS stream directed towards the effluent treatment plant. The quality analysis of Effluent Treatment Plant (ETP) showcased adequate efficiency in managing wastewater. Key observations included a significant reduction in Total Suspended Solids (TSS) from 4630 mg/l in the equalization tank to 459 mg/l at the UF Inlet, and a substantial decrease in Chemical Oxygen Demand (COD) from 3789.0 mg/l to 437.0 mg/l through the treatment stages.

Biological Oxygen Demand (BOD) also saw a remarkable reduction from 1659.0 mg/l to 120.0 mg/l. Additionally, pH levels were maintained within the standard range of 6.5-8.5 throughout the process.

The operational records from the Effluent Treatment Plant (ETP) over six months provide insights into its performance and efficiency in managing wastewater treatment. On average, the Lowl Dissolved Solids (LTDS) entering the ETP was 1057.16 kiloliters per day (KLD), with subsequent ultrafiltration reducing to an average UF Permeate of 824.77 KLD. Further purification through reverse osmosis resulted in an average RO Permeate of 740.93 KLD. Inadequate monitoring of water distribution across cooling towers at M/s Nectar Lifesciences Ltd. affected monitoring of treated water reuse. The plant aimed for zero liquid discharge, allocating water for gardening and utility purposes. Unit-II recorded total RO permeate generation, prompting the audit team to recommend water meter installations at each cooling tower inlet for better management and data transparency. Ten-day data of RO permeate reuse matched total RO permeate generated, confirming reuse. While process systems were fine on-site, improving environmental data management systems is crucial. The industry adopts a closed-loop water management system, treating all wastewater in a RO unit post ETP for reuse in cooling towers and gardening. Even RO rejects return to the MEE, ensuring waste recycling. Despite this, certain processes require monitoring; for example, cooling tower blowdown TDS levels were low at 657 mg/l, indicating inefficiency. Optimizing water consumption through a total water management system is recommended to alleviate pressure on wastewater facilities, fresh water needs, and energy usage.

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CHAPTER 1

INTRODUCTION

A water audit is a comprehensive assessment of water usage, conservation practices, and water management systems within a specific area, such as a residential, commercial, industrial, or municipal setting. The main objective of a water audit is to analyze and understand how water is being used, identify inefficiencies, and suggest measures to improve water use efficiency and conservation. Water audit determines the amount of water lost from the water network/distribution system due to seepage, evaporation/leakage, and other reasons such as theft, and unauthorized or illegal withdrawals from the systems. Water audit improves the knowledge and documentation of the distribution system and a better understanding of what is happening to the water after it leaves the source point. A comprehensive water audit gives a detailed profile of the distribution system and water users, thereby facilitating easier and more effective management of the resources with improved reliability. It helps in the correct diagnosis of the problems faced to suggest optimum solutions. This lead to reduced water losses; improved reliability of the supply system; enhanced knowledge of the distribution; efficient use of existing supplies and reduced disruption etc. It is thus an effective tool for realistic understanding and assessment of the present performance level and efficiency of the service and the adaptability of the system for future expansion and rectification of faults during modernization.

Water audit is of supreme importance in today's world, where water scarcity and environmental concerns are becoming increasingly prevalent. Water audits serve as essential tools for assessing water usage, identifying wasteful practices, and promoting efficient water management. By analyzing consumption patterns and pinpointing sources of water loss. Moreover, water audits play a crucial role in safeguarding water quality, ensuring compliance with regulations, and maintaining the integrity of water infrastructure. By fostering a deeper understanding of water usage and availability, water audits pave the way for sustainable water resource management and contribute significantly to mitigating the adverse effects of water scarcity and climate change. Ultimately, embracing the practice of water audits is vital in promoting responsible water use, securing water supplies for future generations, and safeguarding the environment.

Recognizing the imperative of water conservation and in compliance of regulatory orders, M/s Nectar Lifesciences Ltd. Unit II initiated this audit in collaboration with Thapar Institute of Engineering and Technology.

1.1 SCOPE OF THE STUDY

The primary objective of this study is to undertake a thorough water audit of M/s Nectar Lifesciences Ltd. Unit II, located in Village Saidpura, P.O. & Tehsil-Dera Bassi, District- SAS Nagar, Punjab. The purpose is to comprehensively assess and evaluate the freshwater consumption, wastewater generation, and the adequacy of the Effluent Treatment Plant (ETP) and Multi Effective Evaporator (MEE) at the site. Additionally, the study aims to provide insights and comments on the overall effectiveness of the zero liquid discharge (ZLD) scheme implemented in the industry.

The scope of this comprehensive study encompasses the following key areas:

1. Verification of Water Balance of the Industry:
    a. Detailed scrutiny of the water balance within the industrial processes to ascertain the accuracy and reliability of water usage data.
    b. Identification of potential discrepancies or losses in the water balance, ensuring a comprehensive understanding of the industry's water management practices.
2. Correlation of Water Balance and Material Balance:
    a. Analysis of the correlation between water balance and material balance to ensure a holistic understanding of resource utilization and potential areas for improvement.
    b. Identification of any inconsistencies or inefficiencies in the correlation between water and material balances.

3. Adequacy Assessment of Effluent Treatment Plant (ETP):
    a. Thorough assessment of the ETP's capacity and efficiency in treating the generated wastewater.
    b. Evaluation of the ETP's compliance with regulatory standards and its capability to handle the volume and characteristics of the effluent produced by various industrial processes.
4. Efficacy and Efficiency of Multi Effective Evaporator (MEE):
    a. Detailed analysis of the Multi Effective Evaporator (MEE) system's efficacy in concentrating and treating high Total Dissolved Solids (TDS) effluents.
    b. Assessment of the MEE's energy efficiency, operational effectiveness, and its contribution to achieving zero liquid discharge goals.
5. Assessment of Zero Liquid Discharge (ZLD) System:
    a. In-depth evaluation of the industry's ZLD system to determine its efficiency and compliance with environmental regulations.
    b. Examination of processes and technologies involved in achieving zero liquid discharge, ensuring that no liquid effluent is released into the environment.

By addressing these specific areas within the scope of the study, the objective is to provide a comprehensive and detailed analysis of M/s Nectar Lifesciences Ltd. Unit II's water management practices, wastewater treatment capabilities, and the overall effectiveness of its zero liquid discharge scheme. The findings and recommendations derived from this study will serve as valuable insights for further enhancing the industry's water sustainability and environmental compliance.

1.2. INTRODUCTION OF AUDITING AGENCY

Lead Assessor: Dr. Anoop Verma

Dr. Anoop Verma completed his B.E. (Chemical Engineering) in 2000, the M.Tech (Env. Sc. & Tech.) in 2004, and Ph.D. degree (Env. Engg.) in 2014. He has executed various R&D projects in the area of wastewater treatment using Advanced Oxidation Processes. Dr. Anoop Verma holds extensive expertise in environmental engineering, with a proven track record of conducting environmental assessments and audits for various industrial and commercial entities. With a deep understanding of regulatory frameworks and best practices, Dr. Anoop Verma brings a holistic approach to evaluating environmental impact.

Joining Dr. Anoop Verma and his team are a group of seasoned professionals from Thapar Institute's esteemed faculty and research centres, including experts in:

1. Environmental Engineering: These experts specialise in analyzing industrial processes, waste management systems, and pollution control mechanisms. Their insights will help assess the Industry compliance with environmental regulations and recommend strategies for minimizing groundwater and soil contamination.

2. Hydrogeology and Groundwater Management: This team will focus on evaluating the quality and sustainability of groundwater resources in the vicinity of M/S Nectar Lifesciences. Their expertise in hydrogeological modelling and water resource management will provide valuable insights into the extent of groundwater impact.

3. Sustainability and Green Practices: Thapar University's sustainability experts will assess the M/S Nectar Lifesciences overall environmental sustainability initiatives, including energy consumption, waste reduction, and adoption of green technologies.

4. Regulatory Compliance and Legal Advisors: This team will ensure that the study aligns with relevant environmental regulations and legal requirements. Their guidance will help M/S Nectar Lifesciences make necessary adjustments to achieve compliance.

Together, the Thapar Institute team embodies a diverse range of skills and knowledge, ensuring a thorough and unbiased assessment of M/S Nectar Lifesciences operations. By leveraging their collective expertise, the study team aims to provide actionable recommendations that will guide the industry toward environmentally responsible practices, thereby addressing concerns related to groundwater quality disruption.

1.3 ABOUT INDUSTRY

M/s Nectar Lifesciences Ltd. Unit II, Derabassi is a domestic API manufacturer to one of the most integrated manufacturers in the global cephalosporins industry within the Anti Infective Therapeutic segment. Nectar Lifesciences Ltd. (NLL) is a knowledge-driven organization that constitutes a vital part of the fast-growing Indian Pharmaceutical Industry. NLL has today emerged as the top-ranked organization amongst mid-sized Pharmaceutical companies in India as per "Fortune Next 500" 2017 & is among the top 40 forerunners of the Bio-Pharmaceutical industry in Asia-Pacific Region as per "Biospectrum Asia Pacific" 2016 besides being one of the top amongst Indian API manufacturers.

NLL has transformed itself from being a small Domestic API manufacturer to one of the most integrated manufacturers in the Global Cephalosporins Industry within the Antiinfective Therapeutic segment. NLL currently has a stronghold of API & Formulation business in almost 45 countries of the world. with 11 State-of-the-art manufacturing facilities spread across the States of Punjab and Himachal Pradesh with compliance to global standards of cGMP, Environment Health Safety (EHS) as well as a pool of thousands of highly skilled, knowledgeable, competent qualified workforce at all levels. NLL is a publicly listed company with stocks being traded on BSE and NSE.

1.4 SITE LOCATION

The present study focuses on M/s Nectar Life Sciences Ltd. (Unit-II), Village Saidpura, P.O. & Tehsil-Dera Bassi, District- SAS Nagar, Punjab. for a water audit at the plant that would help in the identification of appropriate water and hazardous waste management and conservative strategies to minimize the risks to mankind.

Table 1, explain study site detail, Figure 1 shows the plant location in India map, Figure 2 shows the buffer map of the industry, Figure 3 shows the site layout of Nectar Lifesciences Unit II, Derabassi.

Table 1 Study Site detail

<table>
<tr><th>Sr.No</th><th>Item</th><th>Description</th></tr>
<tr><td>1.</td><td>Name of the study site</td><td>M/s Nectar Life Sciences Ltd (Unit-II)
Village Saidpura, P.O. & Tehsil-Dera Bassi,
District-SAS Nagar, Punjab.</td></tr>
<tr><td>3.</td><td>Category & Activity</td><td>Category B2, Activity 5(f), as per the notification S.O. 2859(E)
Dated 16.07.2021</td></tr>
<tr><td>4.</td><td>Co-ordinates</td><td>
<table>
<tr><th>Point</th><th>Longitude</th><th>Latitude</th></tr>
<tr><td>A</td><td>76053'04.31"E</td><td>30035'22.24"N</td></tr>
<tr><td>B</td><td>76053'13.35"E</td><td>30035'27.97"N</td></tr>
<tr><td>C</td><td>76052'53.75"E</td><td>30035'48.05"N</td></tr>
<tr><td>D</td><td>76053'07.29"E</td><td>30035'43.16"N</td></tr>
</table>
</td></tr>
<tr><td>5.</td><td>Area Details</td><td>
<table>
<tr><td>1</td><td>Total Area</td><td>51.98 Acres or 852548 sqm</td></tr>
<tr><td>2</td><td>Green Area</td><td>17.15 Acres (33 of total area)</td></tr>
<tr><td>3</td><td>Covered Area</td><td>26338.78 sqm</td></tr>
<tr><td>4</td><td>Road Area</td><td>19499 sqm</td></tr>
<tr><td>5</td><td>ETP Area</td><td>8185 sqm</td></tr>
<tr><td>6</td><td>APCD Area</td><td>234 sqm</td></tr>
<tr><td>7</td><td>HW Storage Area</td><td>104 sqm</td></tr>
<tr><td>8</td><td>Parking Area</td><td>754.53</td></tr>
</table>
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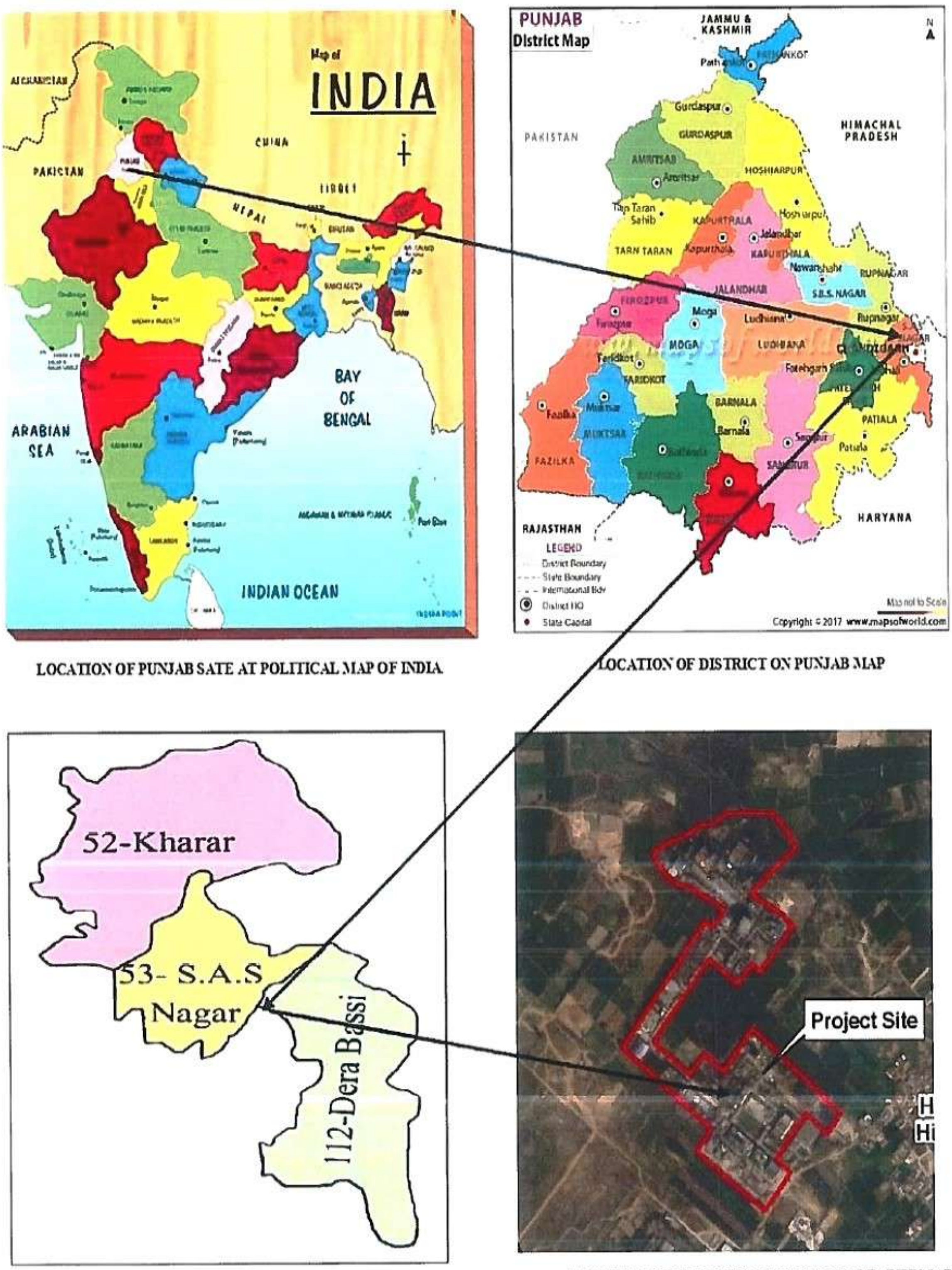


LOCATION OF PUNJAB SATE AT POLITICAL MAP OF INDIA

LOCATION OF DISTRICT ON PUNJAB MAP

LOCATION OF PROJECT SITE ON DISTRICT MAP

LOCATION OF PROJECT SITE ON GOOGLE EARTH MAP

Figure 1 Location map of Nectar Lifesciences Ltd. Unit-II

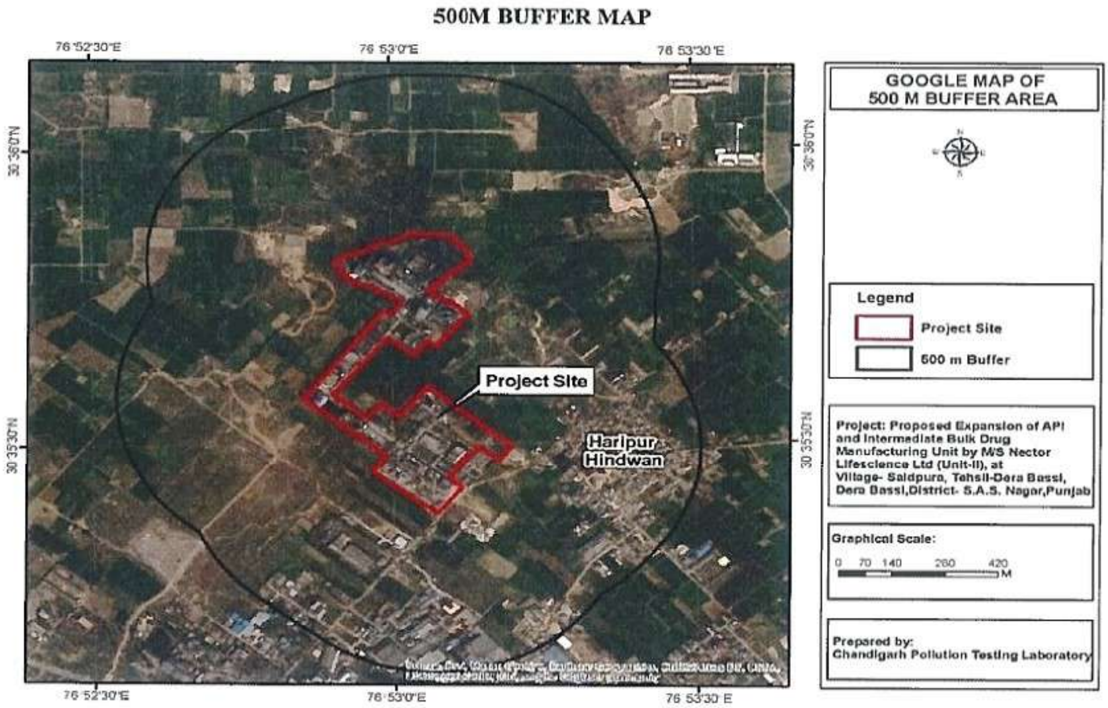


Figure 2 Buffer Map of Nectar Lifesciences Ltd. Unit II

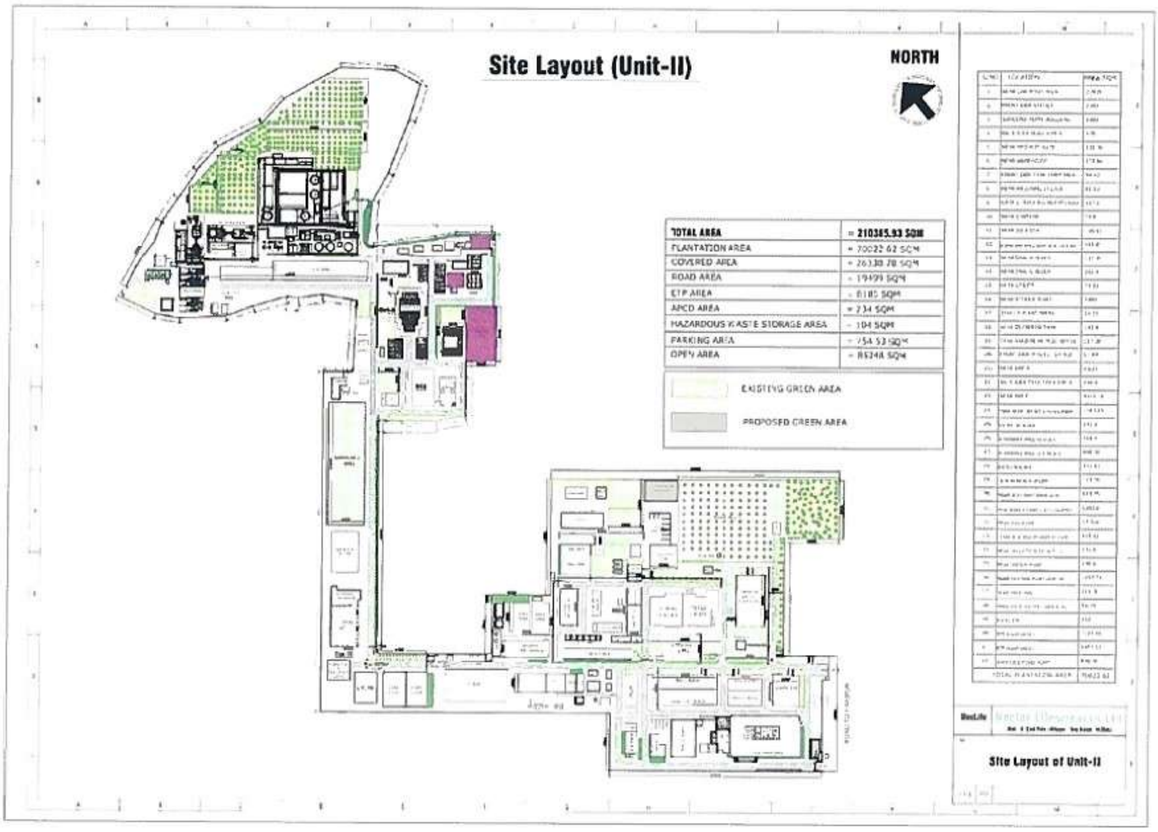


Figure 3 Site Layout of Nectar Lifesciences Ltd. Unit II

1.5 STATUS OF REGULATORY CLEARANCES

M/s Nectar Lifesciences Ltd. (Unit-II) has obtained permission of production of 26 products from Government of India, Ministry of Environment and Forests (I.A. Division) vide number F. No. SIA/PB/IND2/206890/2021 dated 21 Sep 2021. The industry has also obtained Consent to operate vide PPCB letter number CTOW/Renewal/SAS/2023/23777031 dated 01/12/2023 which is valid up to 31/01/2024 under section 25 of the Water (Prevention & Control of Pollution) Act, 1974 (Annexure II) and CTOA/Renewal/SAS/2023/23772629 dated 01/12/2023 which is valid upto 31/01/2024 under section 21 of the Air (Prevention & Control of Pollution) Act, 1981 (Annexure I). The industry is also in the process of obtaining permission for groundwater abstraction and has already applied to the Punjab water resource and development authority for the same (Annexure III).

Table 2 Regulatory permissions

Authorization	CTO Certificate Number	Date of Issue	Date of Expiry	Annexure
Air	CTOA/Renewal/SAS/ 2023/23772629	01/12/2023	31/01/2024	Annexure I
Water	CTOW/Renewal/SAS/ 2023/23777031	01/12/2023	31/01/2024	Annexure II
PWRDA	Permission has been applied for with the concerned department			Annexure III

1.6 METHODOLOGY OF STUDY

A team of experts from TIET, Patiala were involved in carrying out the study. The study methodology involved the following steps:

- Preliminary discussions with plant personnel and observations in all water consuming areas.

- Data collection of water, waste generation and disposal, STP, ETP and plantation.
- Onsite investigation of environmental conditions.
- Collection of water, wastewater and soil samples for physico-chemical quality analysis.
- Identification of water conservation options on short, medium & long terms.
- Identification of Investment grade projects in the plant for detailed analysis towards implementation.
- Assessment of ETP adequacy
- Preparation, discussion and submission of report to the management.

The study focused on improving water use efficiency and identifying water saving opportunities. The audit study made use of portable instruments for carrying out various measurements and analyses. The study also covered generation and management of hazardous waste generated from the industry. During the audit, there was continuous interaction between the audit team and facility personnel, to ensure that the suggestions made are realistic, practical and implementable to allow for possible concurrent implementation.

1.6.1 WATER AUDIT

The exercise would assess/quantify water consumed in utility points of the various major units in the manufacturing plant, in view of water conservation and reduction in freshwater consumption.

Table 3 Key task of water audit methodology (Baird, 2011)

Sr. No.	Components
1	Assessment of Water Inventory a) Study of water sources (size, capacity, quantity, quality) b) Existing water distribution system, associated losses c) Water usage for process, utilities, domestic & others d) Wastewater discharged points across the process
2	Process Mapping and Development of Water Balance across the entire system a) Identification of water consumption of each existing meter/sub-meter b) Quantification of water distribution network in each section c) Mapping of raw water, process, recirculating water, cooling & domestic, recycling & effluents (size, capacity, quality, quantity)
3	Assessment of prevailing wastewater system a) Segregation and collection of waste streams based on quality and quantity b) Study of various treatment & disposals schemes
4	Suggestion for water conservation a) Identification and Recommendations of projects based on reduce reuse & recycle on water conservation b) Presentation and discussion with the plant team on audit findings

In addition to the above the audit will also cover the following:

- Onsite 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
- Strategies for water treatment and reuse or direct use

1.6.2. AUDIT APPROACH

Figure 4 shows the schematic representation of the steps to be followed at plant level study. The audit process begins with the questionnaire survey followed by secondary data analysis from the plant/facility to understand the background information. The team's approach is to be efficient yet non-intrusive. This involves detailed analysis of water use at a given site for a certain duration and includes all sources of water intake, storages and various uses in functional process units and operations of the plant.

The approach involves a detailed examination of where and how much water enters the system, and where and how much water gets distributed in the system. This helps in assessing current water supply within the plant.

Water Audit involves two levels – Level 1: Preliminary Water Survey and Level 2: Detailed Water Audit.

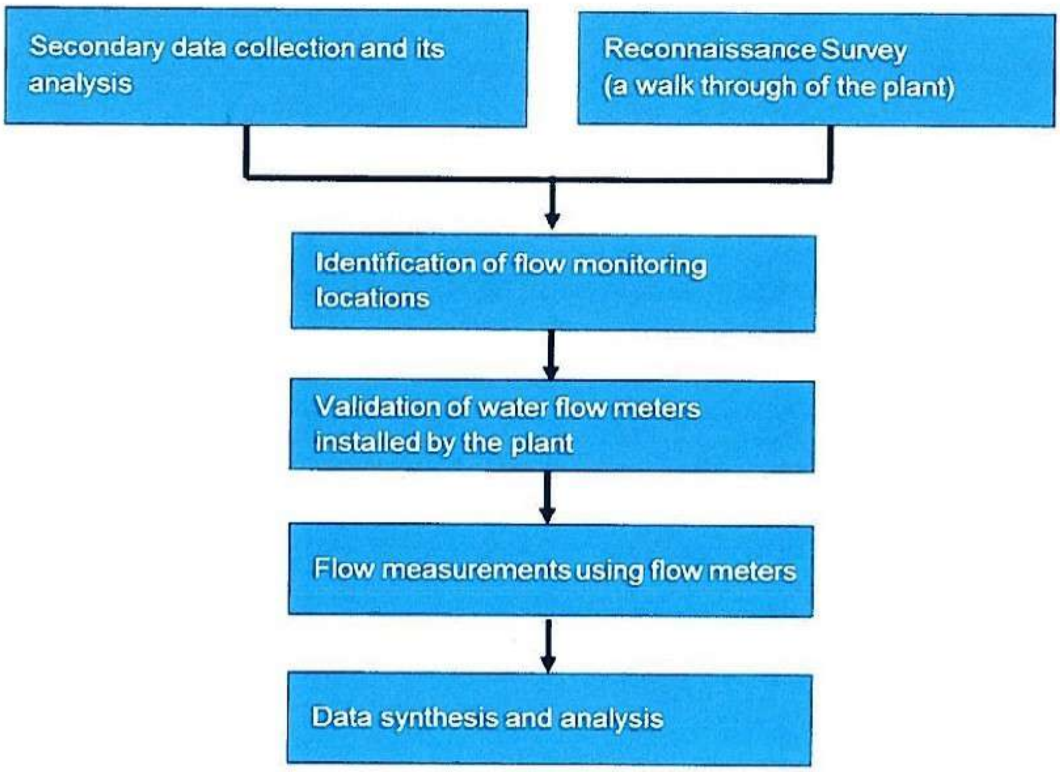


Figure 4 Flow chart for audit approach

1.6.3 QUALITY ANALYSIS

Quality of water decides if it is suitable for the desired purpose or not. It turns out to be important to check different characteristics of water so that we should be assured of its usage. Figure 5 shows digital pH meter and Figure 6 shows digital TDS meter used for onsite pH and TDS analysis.

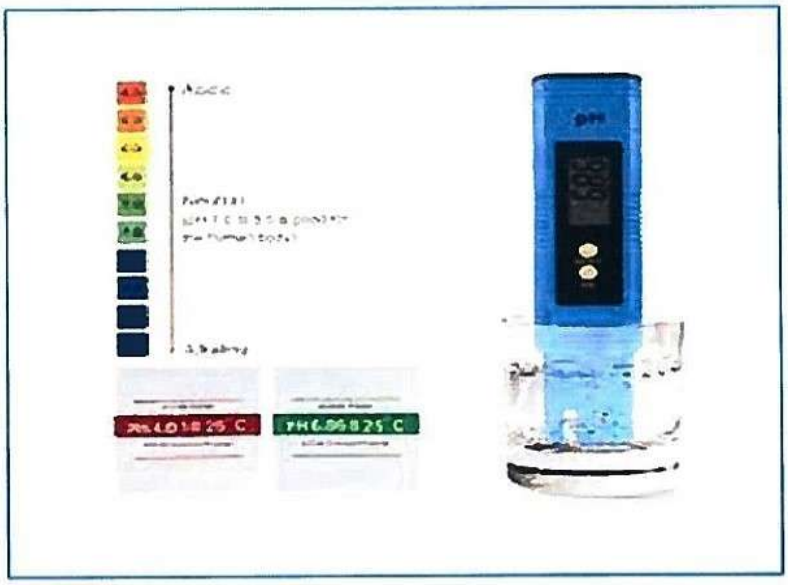


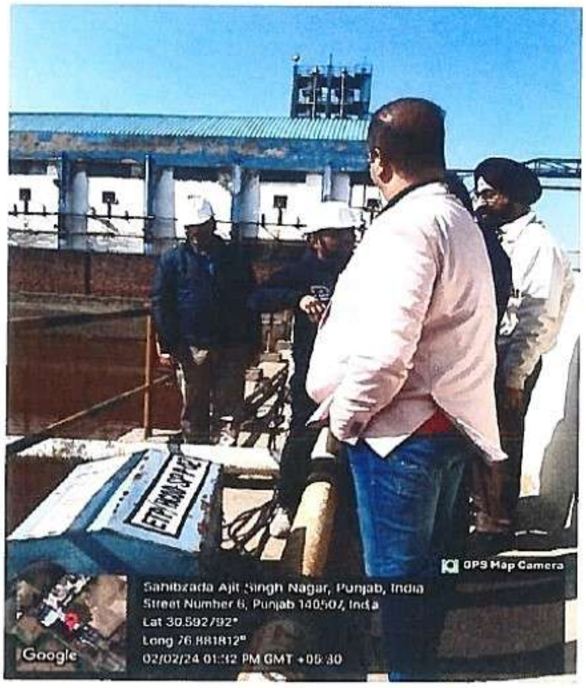
Figure 5 Digital pH meter

Figure 6 Digital TDS meter

1.6.4 SITE SURVEY

The audit process includes a detailed assessment of the water system and review of the current water system which is prevailing in the industry. The processes begin with sharing a questionnaire to ensure that management's expectations and our expectations are communicated prior to commencing the audit.

- **Secondary data collection and Reconnaissance Survey-** This led to collection of detailed set of secondary data information from the plant authorities and cover aspects related to layout of the plant and different processes, source(s) of water, storages, discharges, the supply & use schematics and available instrumentation along with technical details (such as capacity of pumps etc.); water flow diagrams and operational schedules, etc. Based on the available data, a reconnaissance survey was undertaken. Reconnaissance survey consisted of a walkthrough of the plant to understand the setup, locations and various processes, water supply scheme to each individual process, layout of pipeline network, raw and wastewater treatment system etc.



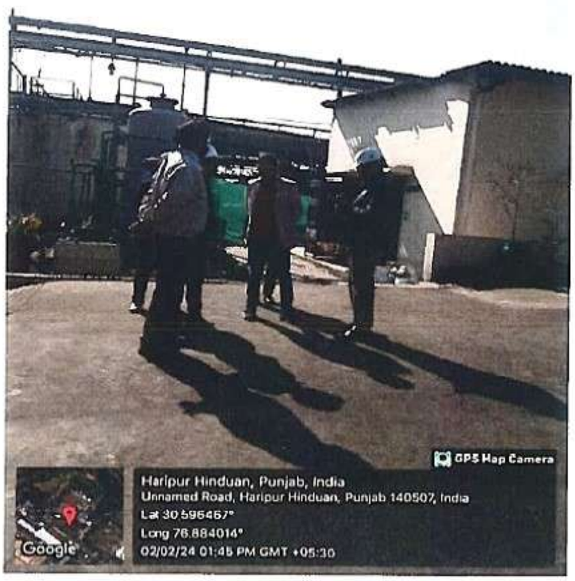


Figure 7 Audit team while doing site survey and data collection

- **Flow monitoring and establishment of water balance-** Flow monitoring and validation of existing water flow meter at intake and discharge.

- **Water Quality Monitoring & Characterization-** Analysis of water & wastewater quality for key parameters (i.e. pH, TDS, TSS, TH, BOD & COD etc.) based on secondary data.

- **Data analysis and Recommendations for water & wastewater management-** Identification of interventions for water conservation, recycle/ reuse etc. and recommendations for efficient water use & management.

1.6.5 COMPLIANCES AND REGULATIONS

During the water audit we would also like to explore the possibility of understanding plant water policy, compliance & regulations and consents applicable in the domain of water and wastewater management in the plant. This includes Consent to Operate (CtO), NOC from CGWA for ground water extraction, and effluent discharge norms by SPCB.

1.6.6 ETP & MEE ADEQUACY

The adequacy of the Effluent Treatment Plant (ETP) and Multiple Effect Evaporator (MEE) was assessed based on their performance, considering both design specifications and actual operational effectiveness. Performance evaluation involved analyzing the percentage reduction of various physico-chemical parameters in the influent and effluent streams.

CHAPTER 2

2. PROCESS ENGINEERING AND MATERIAL FLOW ANALYSIS

2.1 MANUFACTURING PROCESS

At the core of Nectar Lifesciences' manufacturing process are the sophisticated processes meticulously designed for API production. The technical intricacies involved in these processes are paramount to achieving precision, purity, and compliance with rigorous industry standards.

1. Reaction: At the inception of API manufacturing, the reaction stage serves as the foundational step where chemical reactions are orchestrated to yield the desired pharmaceutical compounds. The outcomes of this phase significantly influence the subsequent processing steps, dictating the composition and structural characteristics of the API.

2. Crystallization: Following the reaction, the process advances to crystallization - a pivotal stage aimed at inducing the formation of crystals from the reaction mixture. Crystallization plays a critical role in determining the ultimate purity and quality of the API, setting the stage for subsequent processing.

3. Separation and Purification: In the pursuit of pharmaceutical excellence, the crystallized product undergoes meticulous separation and purification techniques. Filtration or centrifugation is employed to isolate the API from impurities and by-products, laying the foundation for a purified and potent end product.

4. Filter Cake Washing: The filtered or centrifuged product, known as the filter cake, undergoes a rigorous washing process to eliminate residual impurities or unwanted substances. This step is indispensable for elevating the purity profile of the API.

5. Solvent Swapping: To enhance control over chemical properties, solvent swapping is introduced. This process entails the replacement of the initial solvent with a different solvent, facilitating the extraction of the purified API and refining its chemical characteristics.

6. Solvent Exchange: The critical solvent exchange step involves the substitution of one solvent with another to fine-tune specific chemical and physical attributes of the API. This level of precision is vital in tailoring the API to meet the stringent quality and formulation requirements demanded by the pharmaceutical industry.

2.2 RAW MATERIAL AND PRODUCTION DETAIL

M/S Nectar Lifesciences Ltd. Unit II, Derabassi uses 74 raw materials for the manufacturing of 26 products. Table 4 shows the Details of raw materials and products. Transportation of raw materials will be by roadways. Storage and handling of hazardous substances shall be within the threshold limit as per Manufacturing, Storage, and Import of Hazardous Chemical Rules,1989 (MSIHC,1989). Raw materials are stored in a well-designed scientific warehouse.

Table 4 Products and Raw material

Sr. No.	Product Name	Capacity Annum (TPA)	Intermediates	Name of Raw Material	Consumption Per Kg of Product (KG)
1	Cefixime	1786	GVNE	GCLE	1.2195
				DMF	0.85
				Formaldehyde	0.1700
				NaOH	0.1000
				MDC	2.6900
				Methanol	4.7000
				HCl	0.0630
				VGC Recovery	0.0000

				TPP	0.6657
				NaBr	0.2869
				CFXN ML	5.33
				Water IN	5.0000
			AVCA	Phenol	3.545
				GVNE	2.2720
				Butyl acetate	10.8
				Sod.Carbonate	0.4900
				Water IN	86.6400
				CFXN ML	5.00
				NaCl	0.1500
				Carbon	0.0200
				Sulfuric acid	0.4180
				Acetone	2.5000
				VGC Recovery	0.0000
				Enzyme	0.1000
				NaHCO	0.422
			Cefixime	Methanol	1.152
				Water	0.2463
				Acetic acid	0.027
				Cefixime ML	11.76
				EDTA for Final stage	0.01
				AVCA	0.4926
				MICA ESTER	0.9330
				Triethyl amine	0.2650
				Sodium hydroxide	0.2950
				EDTA for ACMV stage	0.0100
				Activated carbon	0.02000
				Hydro	0.0100
				Water for final stage	30.0000
				Hydrochloric acid	1.0150
				NaOH	0.2950
2	Cefuroxime Axetil Amorphous	1650.00		Cefuroxime axetil	1.0 2.0

				Acetone	4.86
3	Cefuroxime Axetil Coated	7.00	Hydroxy Cefuroxime	D-7-ACA	0.633
				Methanol	1.83
				NaOH	0.246
				Water	6.872
				SMIA	0.5420
				PCI5	0.6150
				MDC	3.7500
				DMAc	0.3600
				VGC Recovery	0.0000
				Conc.HCL	0.42
			Cefuroxime Acid	Hydroxy Cefuroxime	1.0
				ACN	3.544
				Carbon	0.02
				Water	5.7800
				MDC	7.76
				SMBS	0.04
				NaOH	0.10
				CSI	0.5400
			Cefuroxime	Cefuroxime acid	0.926
				DMAc	3.606
				Na CO	0. 148
				NAHCO	0.2157
			Cefuroxime Axetil	CARBON	0.02
				AEB	0.6600
				SMBS	0.0000
				EA	19.0400
				Water IN	37.0400
				NaCl	0.0000
				Cyclohexane	9.890
4	Cefpodoxime Prox	10.00	CEFPODOXIME ACID	D-7-ACA	0.8695
				Methanol	3.6850
				MSA	1.7390
				Sod. Carbonate	0.8660
				TMOF	0.8430
				Water IN	28.3000

				TEA	0.2780
				MAEM	0.9390
				Carbon	0.0020
				Acetone	1.6360
				EDTA	0.0050
				Hydro	0.0080
				Sulfuric acid	0.1250
				Ammonia	0.1890
			CEFPODOXIME ACID(PURE)	CPDA	1.06
				Water IN	4.0000
				Acetone	1.5000
				Carbon	0.0025
				Sulfuric acid	0.2000
				DMAc	3.0
			CEFPODOXIME PROXETIL	DMAc	2.9
				CPDA	0.869
				TMG	0.222
				CEIPC	0.4000
				Toluene	2.4700
				NaI	0.3720
				18-O-6	0.0220
				STS	0.1700
				Sod.Chloride	0.2500
				Ethyl acetate	5.0000
				Methanol	1.3600
				HCl	0.0460
				Ammonia	0.0230
				Carbon	0.0200
				Water In	45.5200
5	Cefditoren pivoxil	3.50	CEFDITOREN SODIUM	7-ATCA	0.617
				Acetone	12.38
				MAEM	0.7400
				TEA	0.2070
				Hydro	0.0030
				Carbon	0.0200
				Water	1.9700

				2-ethyl sod. Hexanoate	0.6300
				EDTA	0.006
			CEFDITOREN PIVOXIL	DMF	3.36
				CDPN	1.136
				TBAB	0.056
				Ethyl acetate	15.0000
				Sod. Thiosulphate	0.0720
				Sod. Chloride	0.7500
				Sod. Bicarbonate	0.0220
				Carbon	0.0100
				Methanol	1.1000
				Water IN	30.0000
				IMP	0.568
6	Cefdinir	50.00	Cefdinir	7-AVCA	0.7462
				CAEM	1.3325
				THF	6.633
				MDC	14.7700
				Pot. Carbonate	0.5900
				Ammonium chloride	0.4900
				Pot. Acetate	1.4900
				Acetone	1.1800
				Carbone	0.0100
				Water	72.0000
				Sulphuric acid	0.3160
				EDTA	0.0100
				TEA	O.388
7	Ceftriaxone Sodium	840.00	Ceftriaxone Sodium	7-ACA	0.55
				TTZ	0.32
				Hydro	0.33
				BF3 Gas	0.5220
				EDTA	0.3720
				Ammonia sol	1.5810
				HCl	0.4120
				Carbon	0.0164
				Ethyl acetate	2.9760
				THF	3.2300

				DMAc	0.9620
				Acetone	14.7950
				MAEM	0.6870
				TEA	0.2750
				Hexanaote	0.6600
				Water IN	3.0000
				Water IN SRP	0.0000
				ACN	5.18
8	Cefotaxime Sodium	400.00	Cefotaxime Acid	7-ACA	0.606
				MAEM	0.812
				TEA	0.290
				EDTA	0.003
				Sodium bi Sulphite	0.0130
				IPA	5.1140
				HCl	0.3450
				MDC	2.9220
				Water IN	0.9560
				Hydro	0.016
			Cefotaxime Sodium Sterile	CFTA	1.086
				TEA	0.1950
				2-ethyl sod. Hexanoate	0.4780
				Methanol	2.6000
				MIBK	1.0860
				Ethyl Acetate	14.9000
				Water in SRP	3.2000
				Carbon	0.0015
10	Cefuroxime SS	27.28	Cefuroxime Sodium (Sterile)	Cefuroxime acid	1.04
				WFI	1.0
				Acetone	14.8000
				Methanol	3.2000
				Sod hydroxide	0.1089
				KH2PO4	0.0290
				Carbon	0.001
11	Cephalothin SS	50.00	Cephalothin Acid	7-ACA	0.769
				TPAC	0.539

				Sodium Carbonate	0.2537
				EA	10. 38
				EDTA	0.007
				Hydro	0.0215
				Carbon	0.0079
				Sod. dihydrogen orthophosphate	0.3077
				HCl	1.2700
				Sod. Hydroxide	0.3000
				Water	36.6200
			Cephalothin Sodium (Sterile)	Cephalothin acid	0.9620
				Water	1.44
				Acetone	14.3000
				sodium -2-ethylhexanoate	0.2300
				Carbon	0.0005
12	Cefazolin Sodium	Product removed			
13	Cefprozil	0.50		7-APRA	0.7692
				TMG	0.3800
				MDC	7.7500
				Pyridine HCl	0.0090
				P-hydroxy Dane Salt	1.1155
				DMF	13.7900
				Pivaloyl chloride	0.4470
				DM Water	3.0760
				IPA	4.8269
				HCl	0.7000
				EDTA	0.0128
				Ammonia	1.3076
				Acetone	3.3461
14	Cefoxitin Sodium	1.00	Cefotiam HCL (Sterile)	Cefotiam HCL	1.219
				Formic Acid	0.1487
				EDTA	0.0049
				Sodium hydroxide	0.2769
				Sodium bicarbonate	0.0006
				Water IN	6.174

				Acetone	0.9642
			Cefprozil Monohydrate	TMG	0.38
				7-APRA	07692
				Pyridine HCI	0.009
				MDC	7.7500
				DMF	13.7900
				Pivaloyl chloride	0.4470
				DM Water	3.0760
				IPA	4.8269
				HCl	0.7000
				EDTA	0.0128
				Ammonia	1.3076
				Acetone	3.3461
				Dane Salt	1.1155
			Cefoxitin Sodium	Cefoxitin Sodium (Non-sterile)	1.1765
				2-SHE	0.494
				Acetone	52.8000
				Methanol	7.446
15	Ceftiofur	Product removed			
16	Ceftaroline	0.02		Ceftaroline Sodium (Non-sterile)	1.429
				Phosphoric acid	0.537
				Acetic acid	2.5000
				Ethanol	1.1300
				Water IN	3.2000
17	Metformine HCl	Product removed			
18	Cefcapene pivoxil	0.02	Ceftazidime PentaHydrate (Sterile)	CZMS.2HCI	1.219
				Formic Acid	0.1487
				EDTA	0.0049
				Sodium hydroxide	0.2769
				Sodium bicarbonate	0.0006
				Water IN	6.174
				Acetone	0.9642

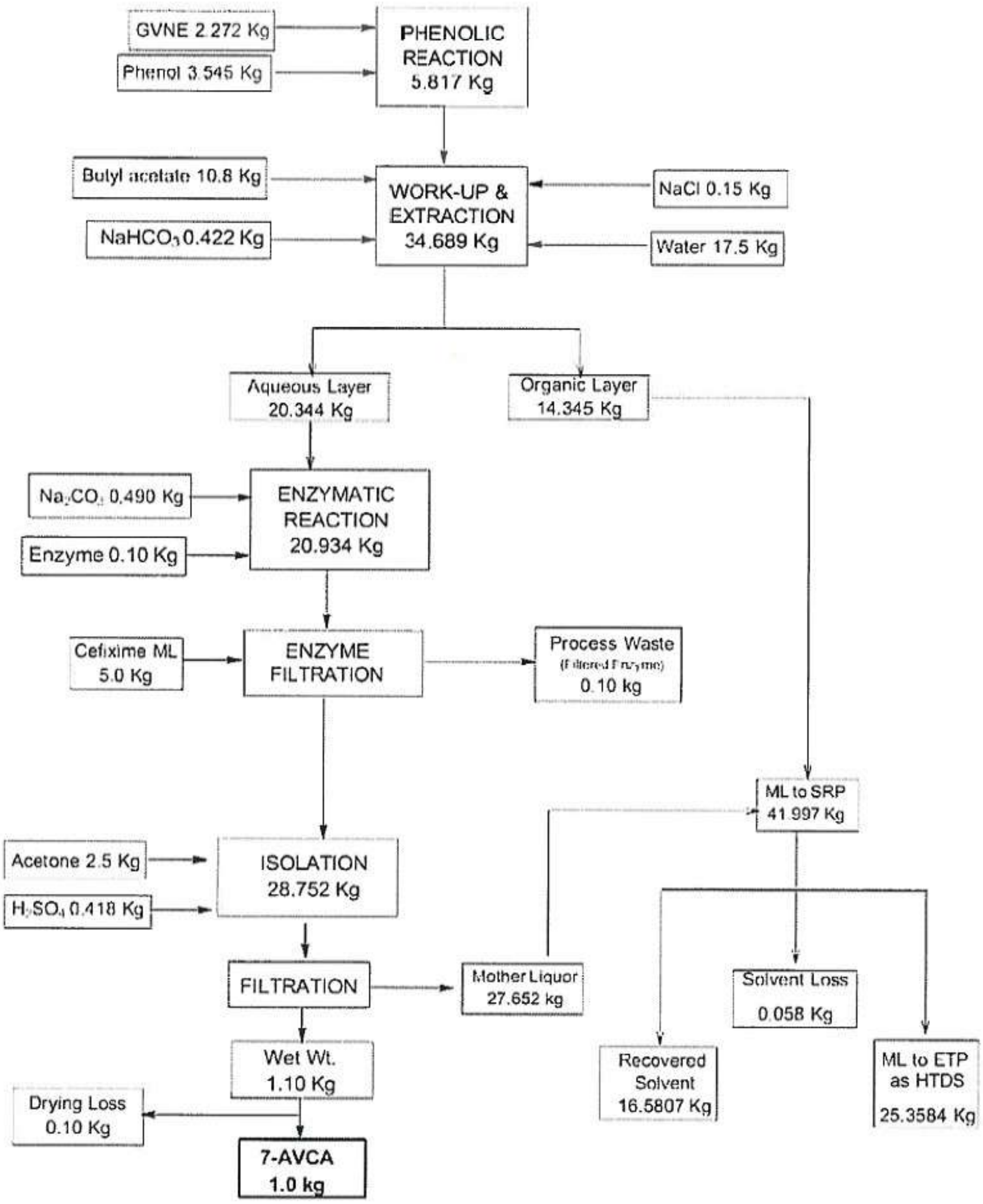
			Cefcapene Pivoxil HCL	D-7-ACA	0.926
				E.A	24.92
				DMF	0.874
				BOC.ATPAA	1.4400
				Methanesulfonyl Chloride	0.6480
				TEA	0.6480
				Chlorosulfonyl Isocyanate (CSI)	1.0000
				ACN	8.0050
				Acetone	22.3060
				sodium -2-ethyl hexanoate	1.3340
				Ammonia (Aq.)	0.2800
				Chloro Compound	0.9260
				Sodium iodide	1.3900
				MDC	18.4740
				Sodium thiosulfate	0.3700
				Sodium chloride	2.7700
				Sodium sulphate	0.0920
				TBAB	0.3700
				Water IN	20.0000
				Anisole	4.1490
				Boron trifluoride	1.6670
				MIBK	40.1000
				Sodium bicarbonate	2.9000
				Acetic acid	3.4970
				HCl	0.3540
				Methanol	5.2270
				BSA	1.64
19	Ceftazidime pentahydrate	15.00	Ceftazidime PentaHydrate (Sterile)	CZMS.2HCI	1.219
				Formic Acid	0.1487
				EDTA	0.0049
				Acetone	0.9642
20	Ceftibuten hydrate	20.00		ANCE	1.54
				PHE	1.72
				TEA	1.28
				Sulfuric Acid	2.55

				MDC	49.23
				Anisole	30.77
				POCL3	0.77
				AICI3	2.2
				Butyl Acetate	6.78
				Carbon	0.22
				Na2CO3	2.58
21	Cefotiam HCI	15.00		Cefotiam HCI	1.219
				Formic Acid	0.1487
				EDTA	0.0049
				Acetone	0.9642
22	Sodium carbonate	2.00		Sodium carbonate	1.042
				Acetone	14.0000
				WFI	2.5
23	L-arginine	2.00		L-Arginine	1.042
				Acetone	14.0000
				WFI	2.1
24	Menthol crystal	16600.00	Production closed		
25	Menthol Flex	6600.00	Production closed		
26	Menthol liquid Products/ derivatives	16600.00	Production closed		

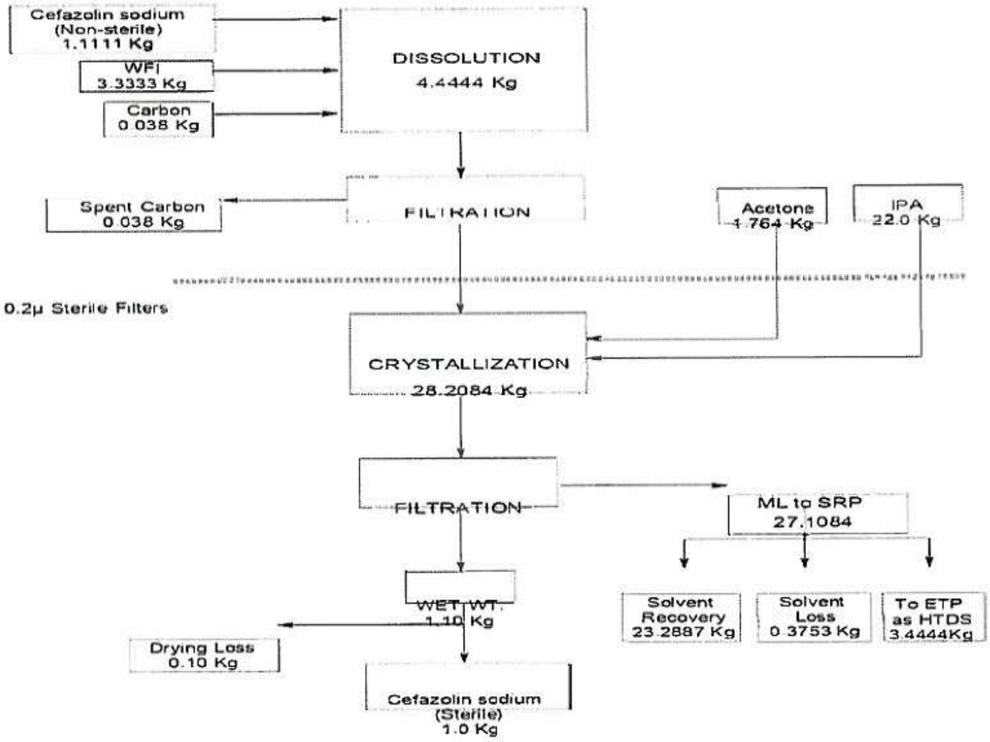
2.3 PROCESS FLOW DIAGRAMS

The audit team scrutinised the process flow diagrams of each product, focusing on raw material consumption, intermediates formed, chemical usage, and final product formation. Detailed information regarding the final products and intermediates is provided below.

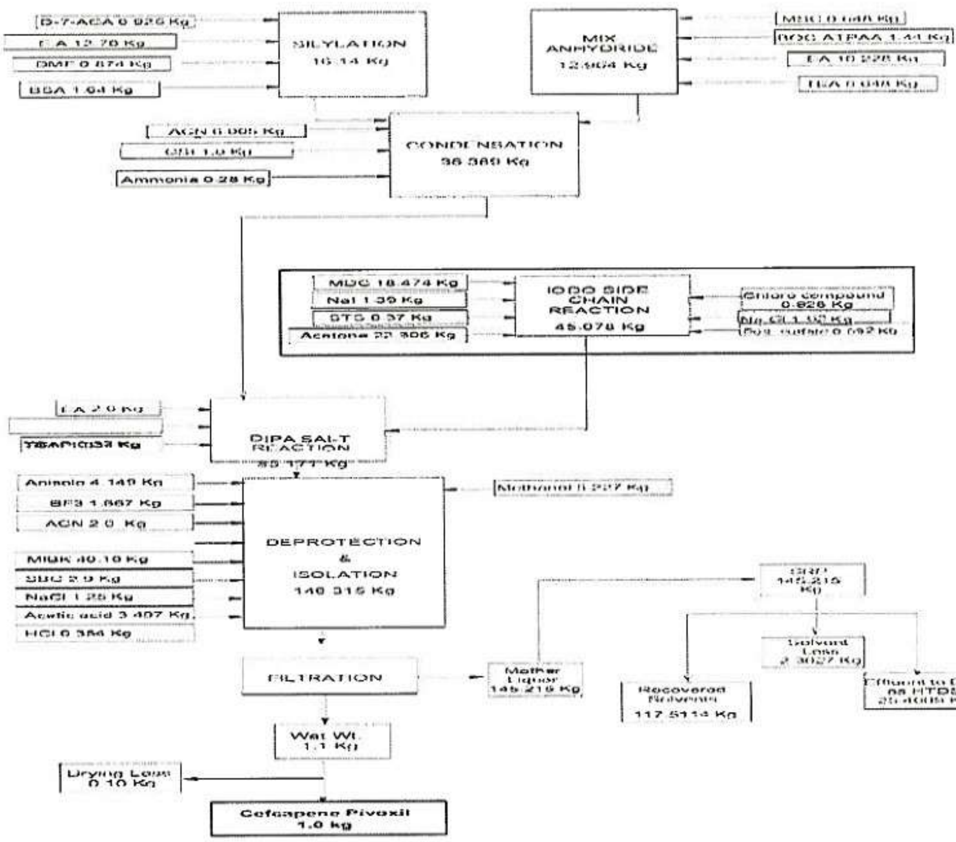
Flow chart : AVCA



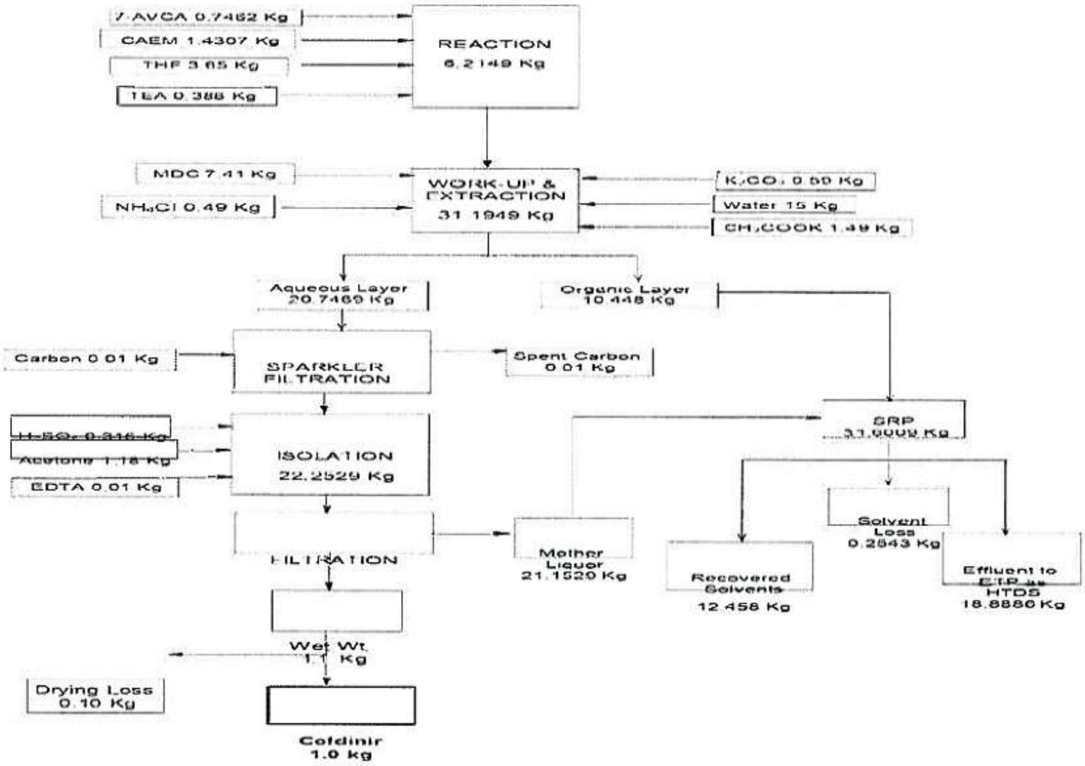
Flow chart : CEFAZOLIN SODIUM (STERILE)



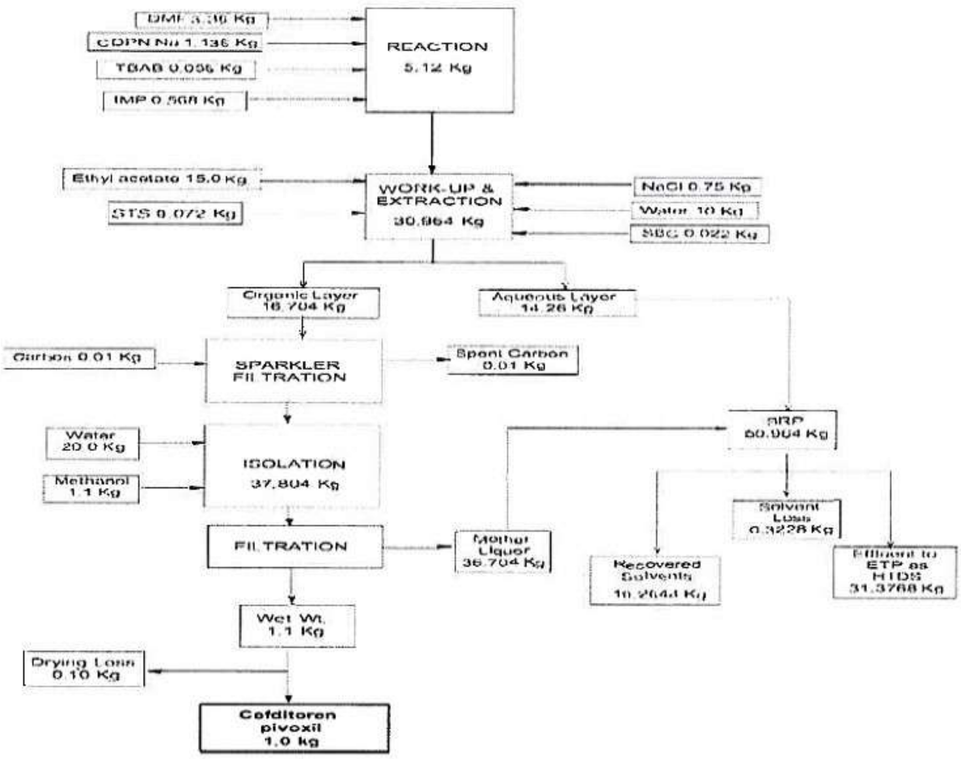
Flow chart : CEFCAPENE PIVOXIL



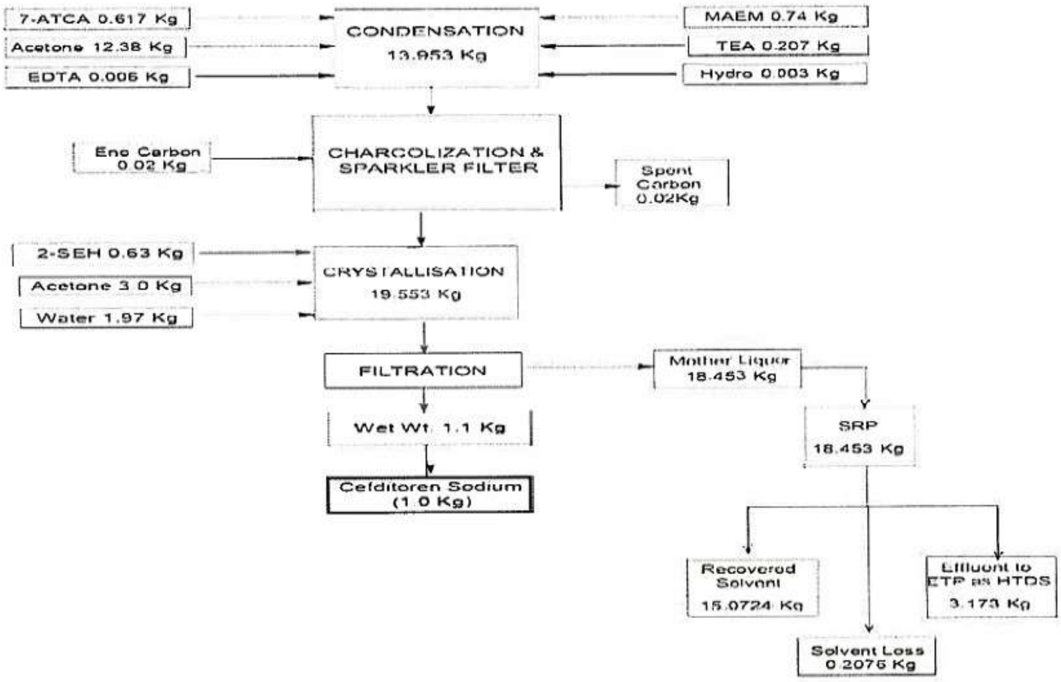
Flow chart : CEFDINIR



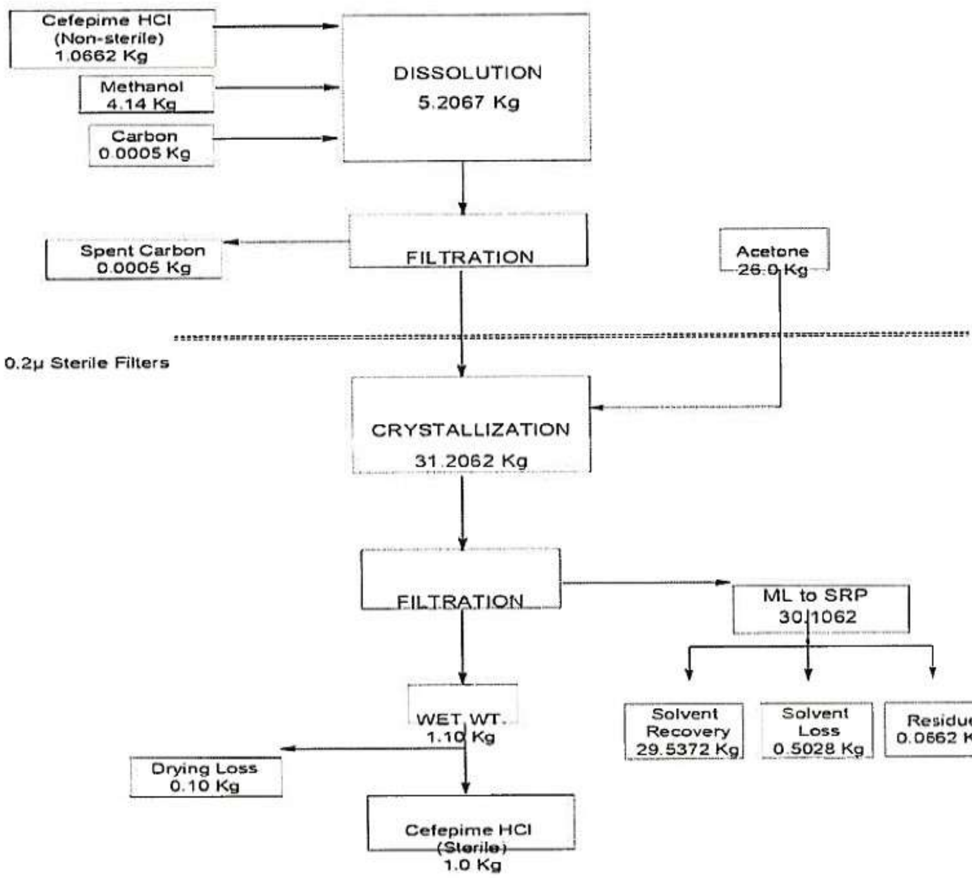
Flow chart : CEFDITOREN PIVOXIL



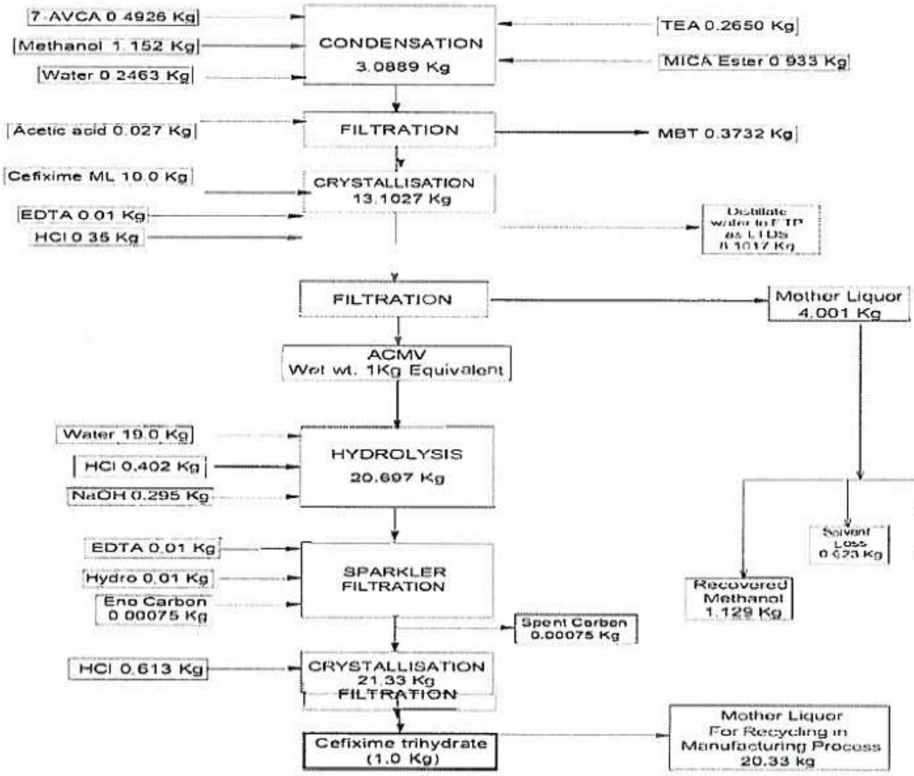
Flow chart : CEFDITOREN SODIUM



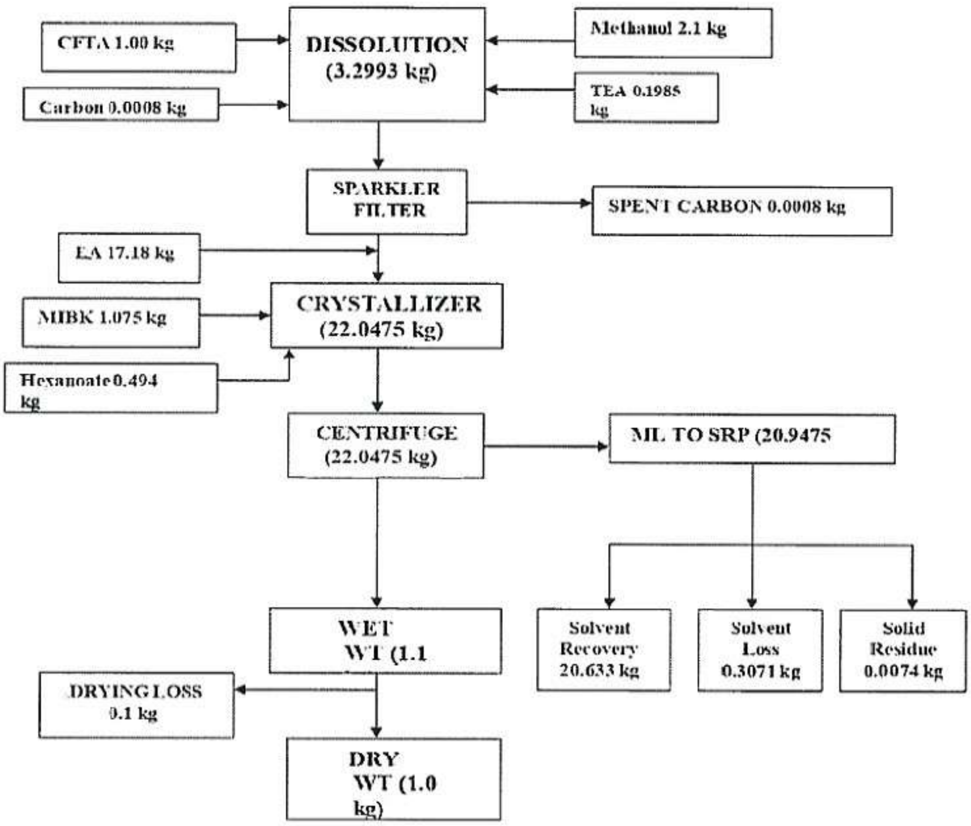
Flow chart : CEFEPIME HCl (STERILE)



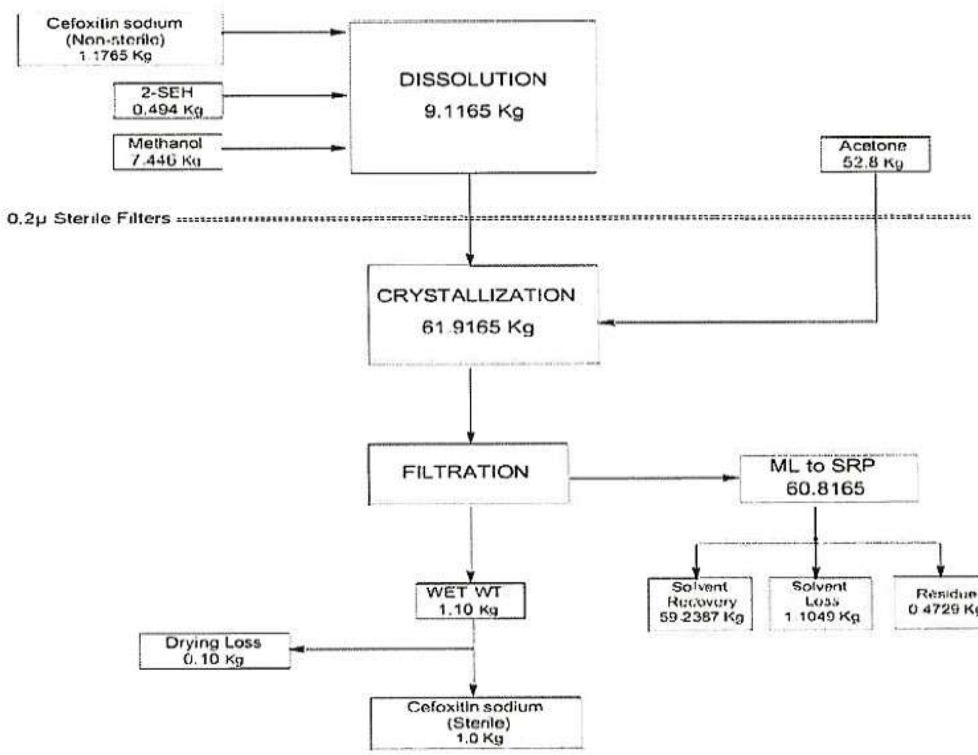
Flow chart : Cefixime trihydrate



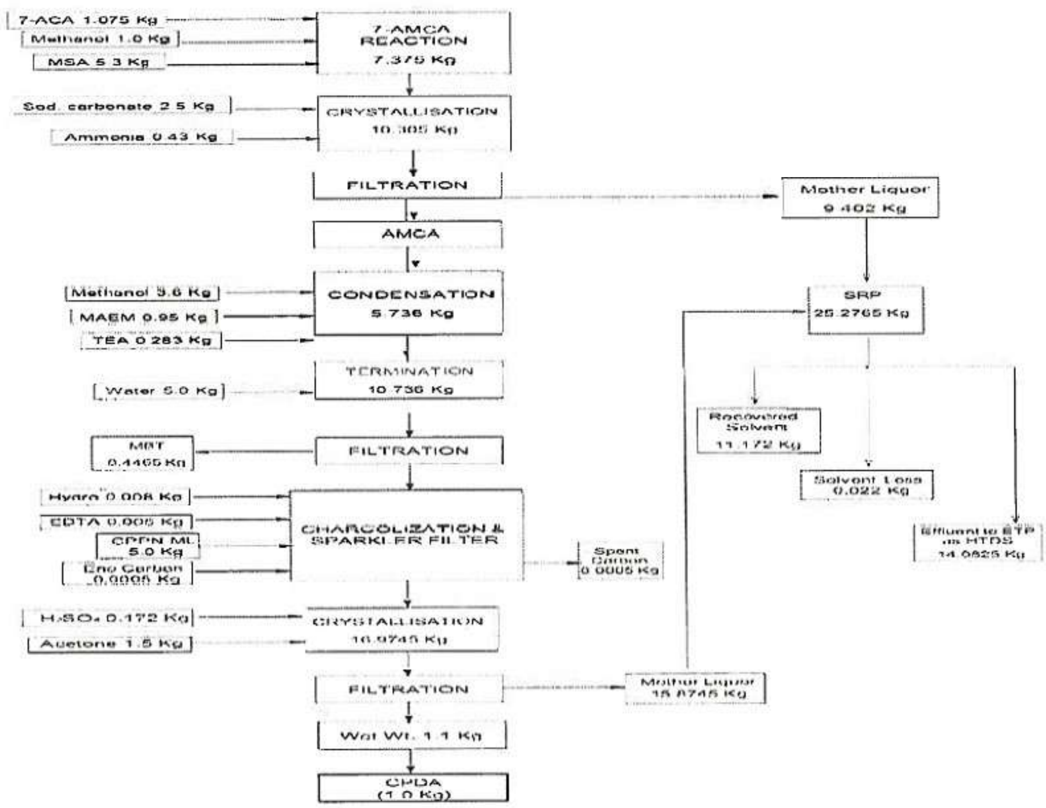
Flow chart : Cefotaxime Sodium Sterile



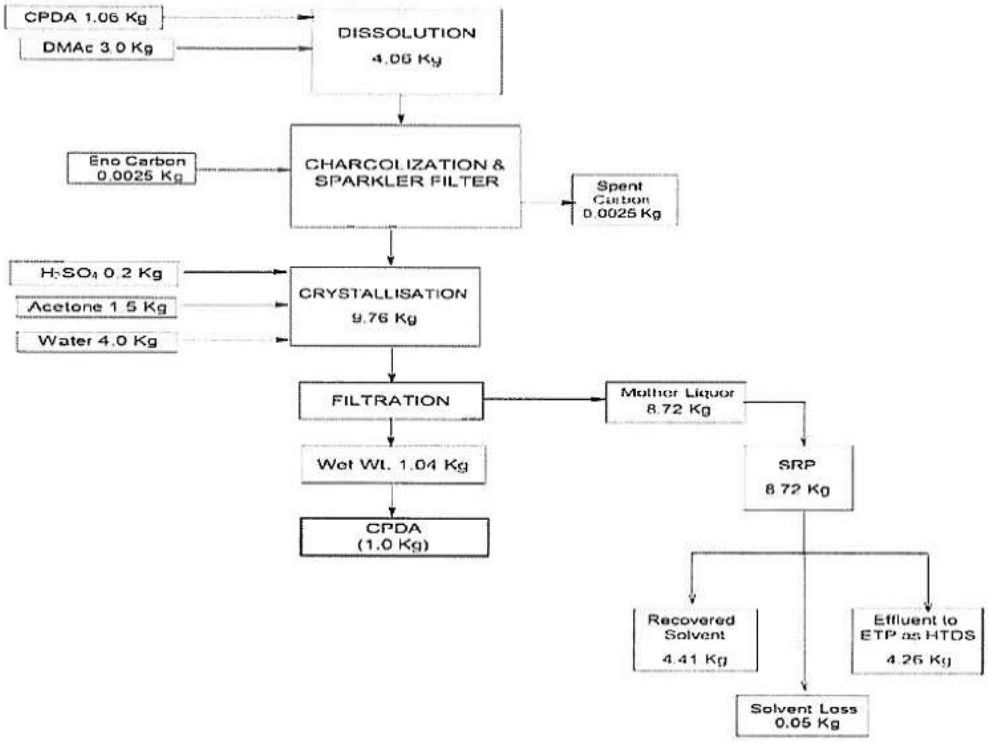
Flow chart : CEFOXITIN SODIUM (STERILE)



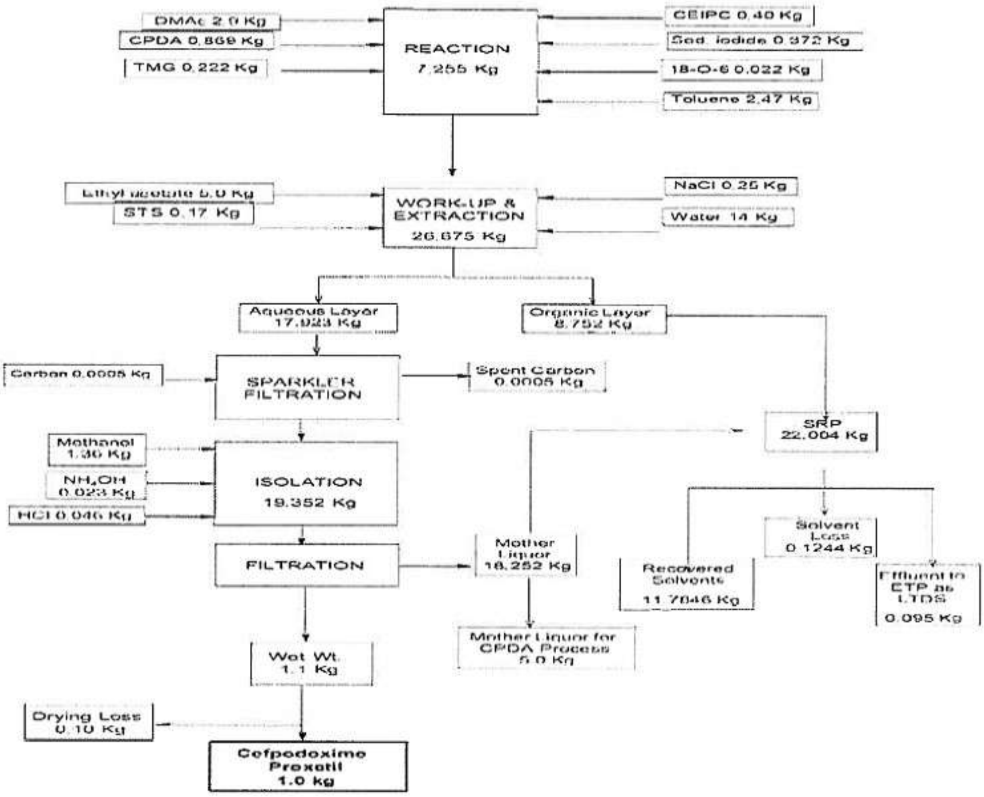
Flow chart : CEFPODOXIME ACID



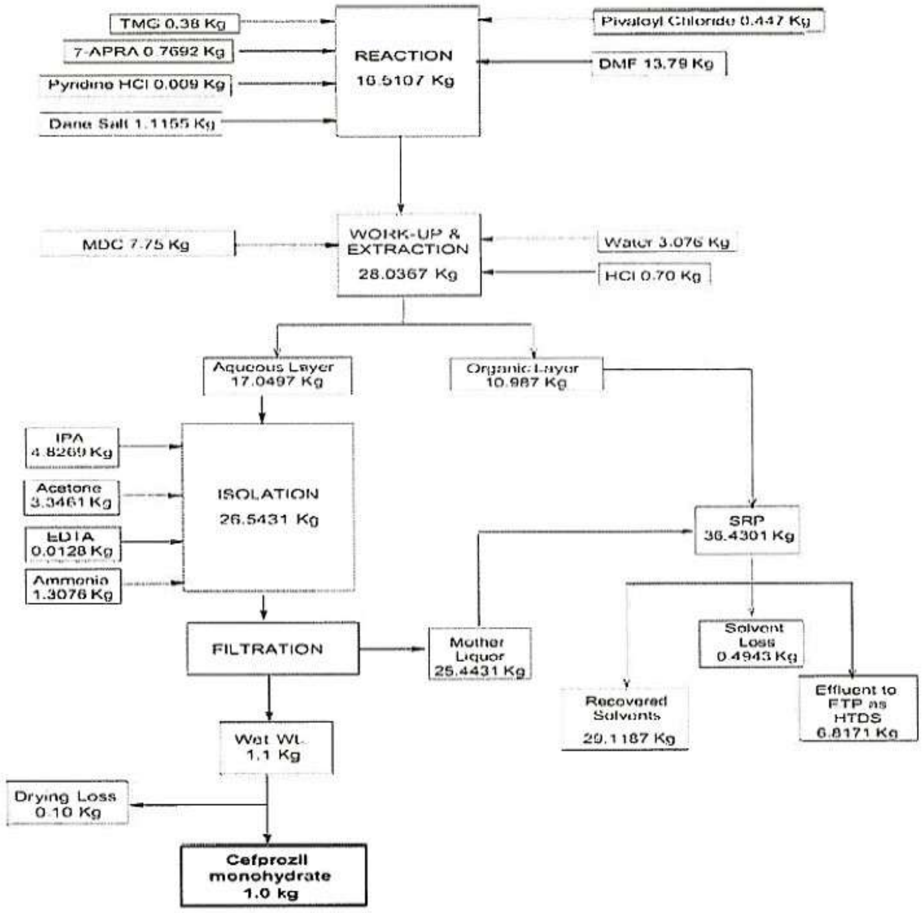
Flow chart : CEFPODOXIME ACID (PURE)



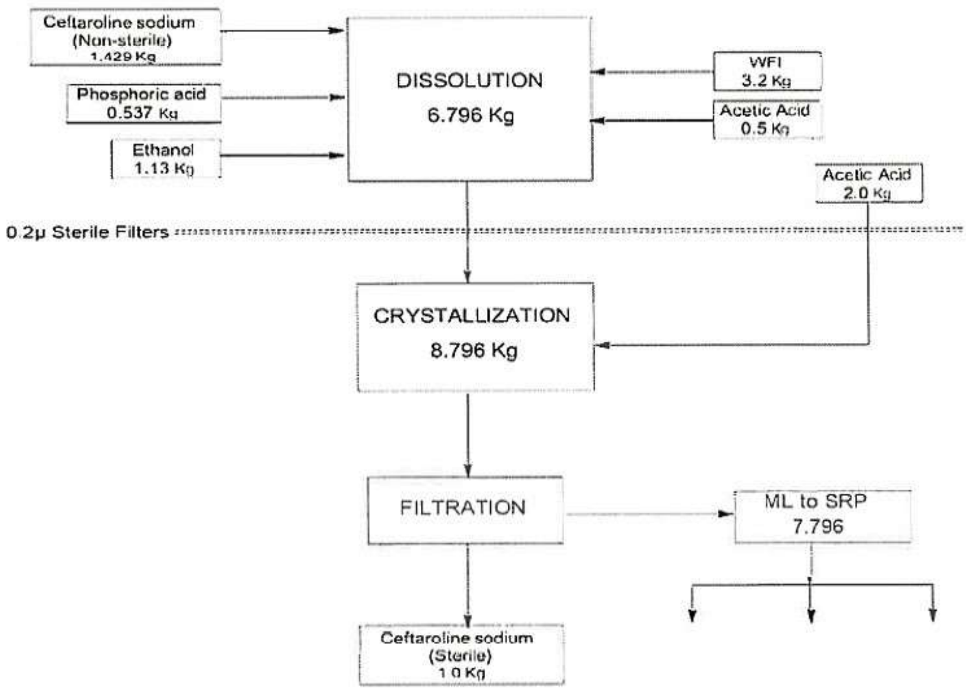
Flow chart : CEFPODOXIME PROXETIL



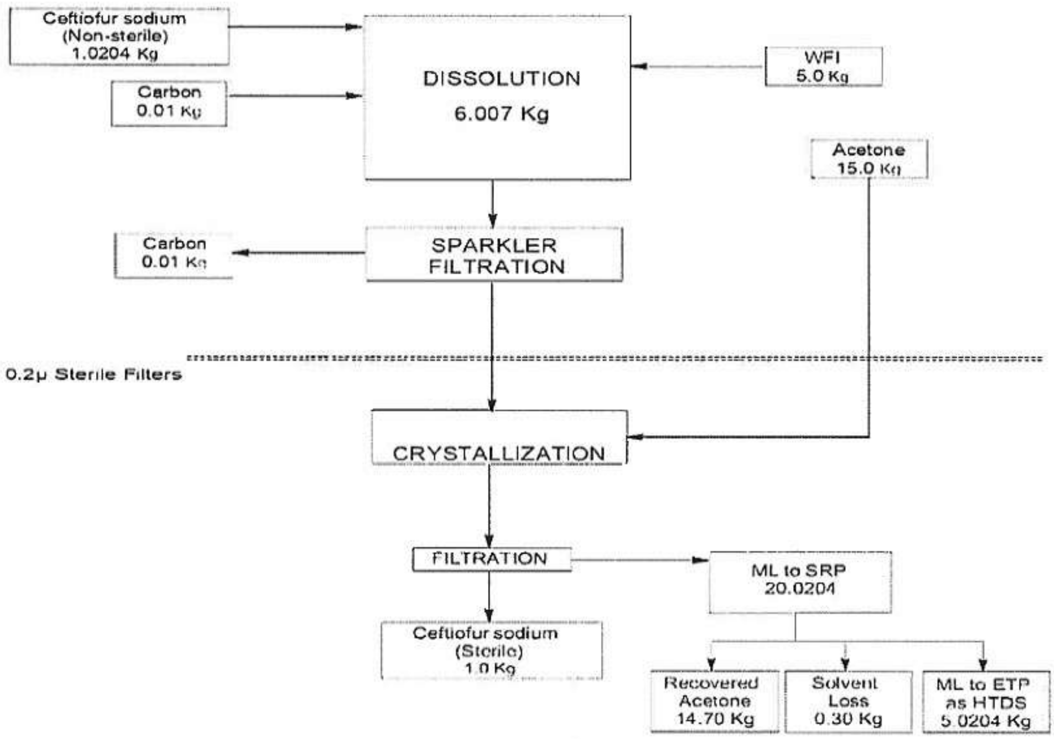
Flow chart : CEFPROZIL MONOHYDRATE



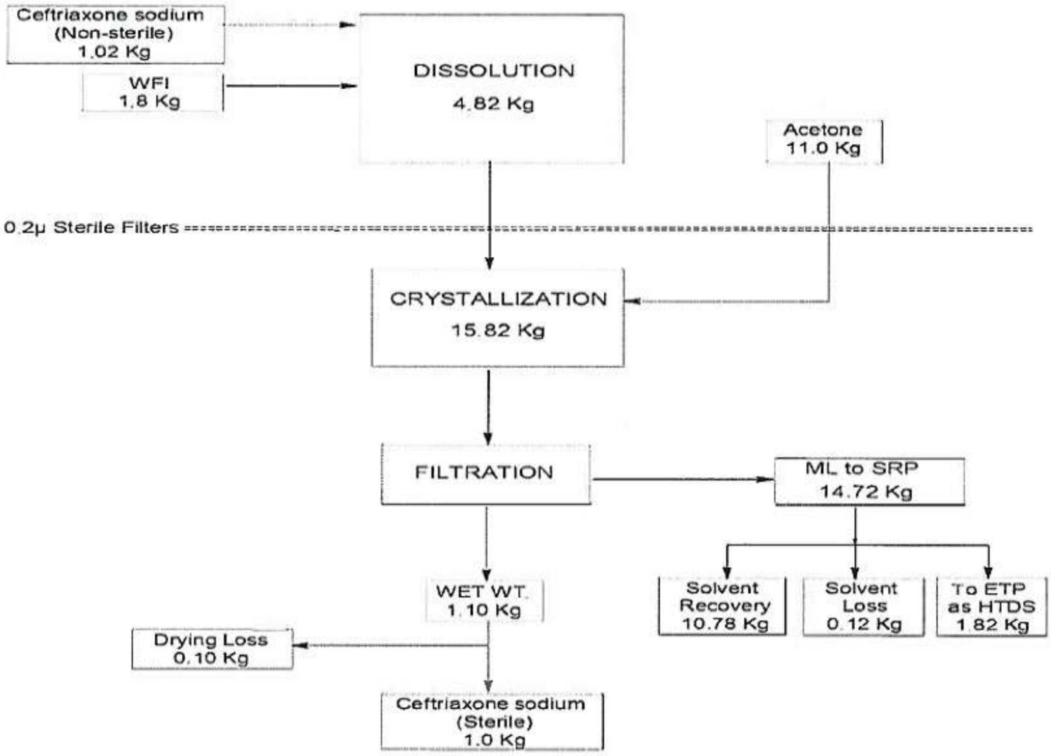
Flow chart : CEFTAROLINE SODIUM (STERILE)



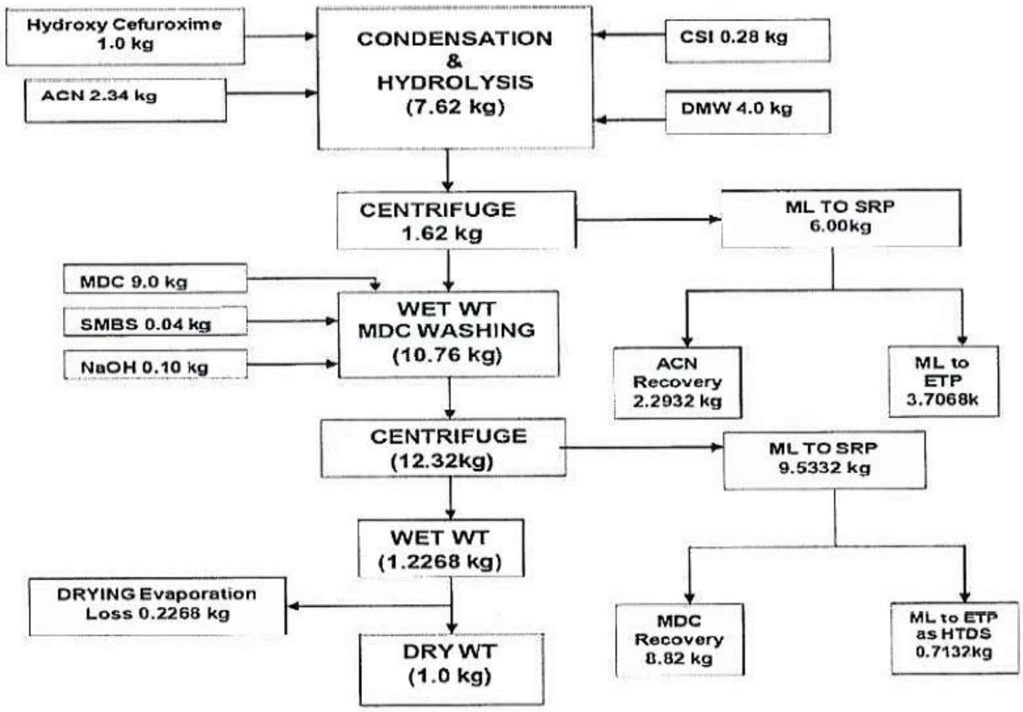
Flow chart : CEFTIOFUR SODIUM (STERILE)



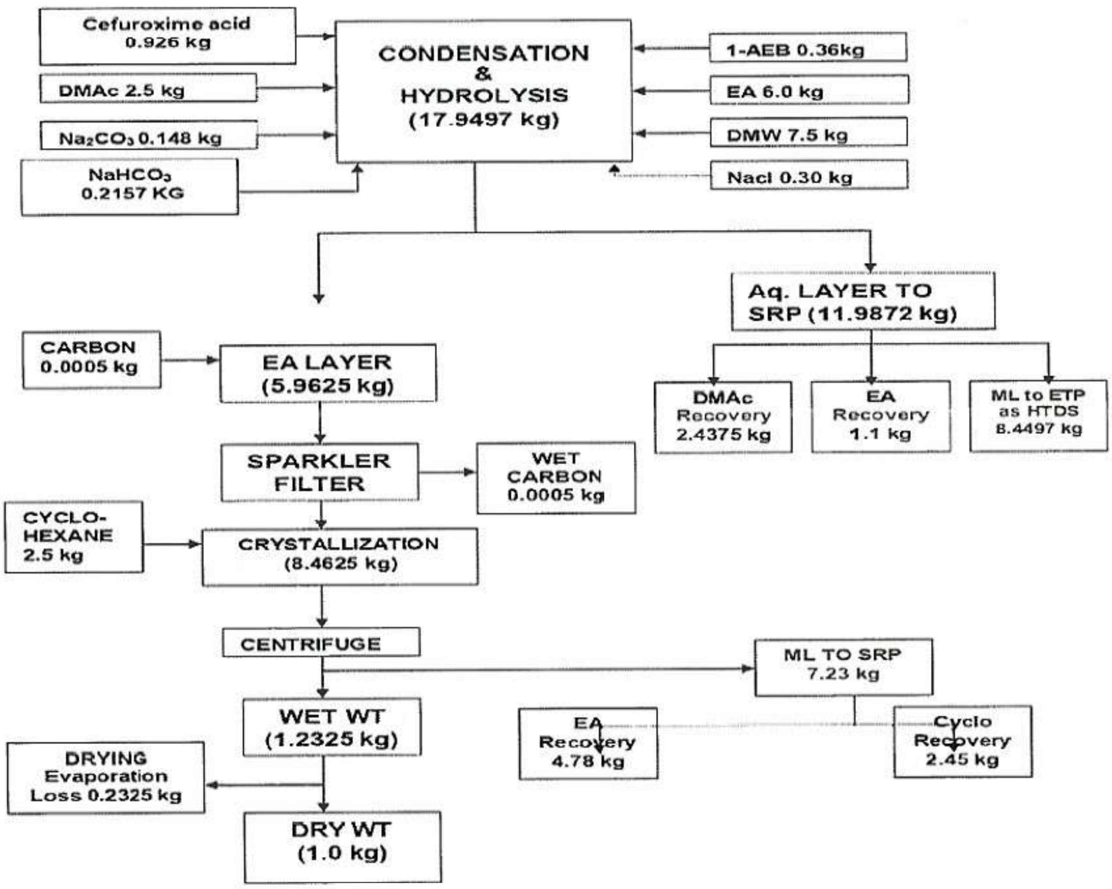
Flowchart : CEFTRIAXONE SODIUM (STERILE)



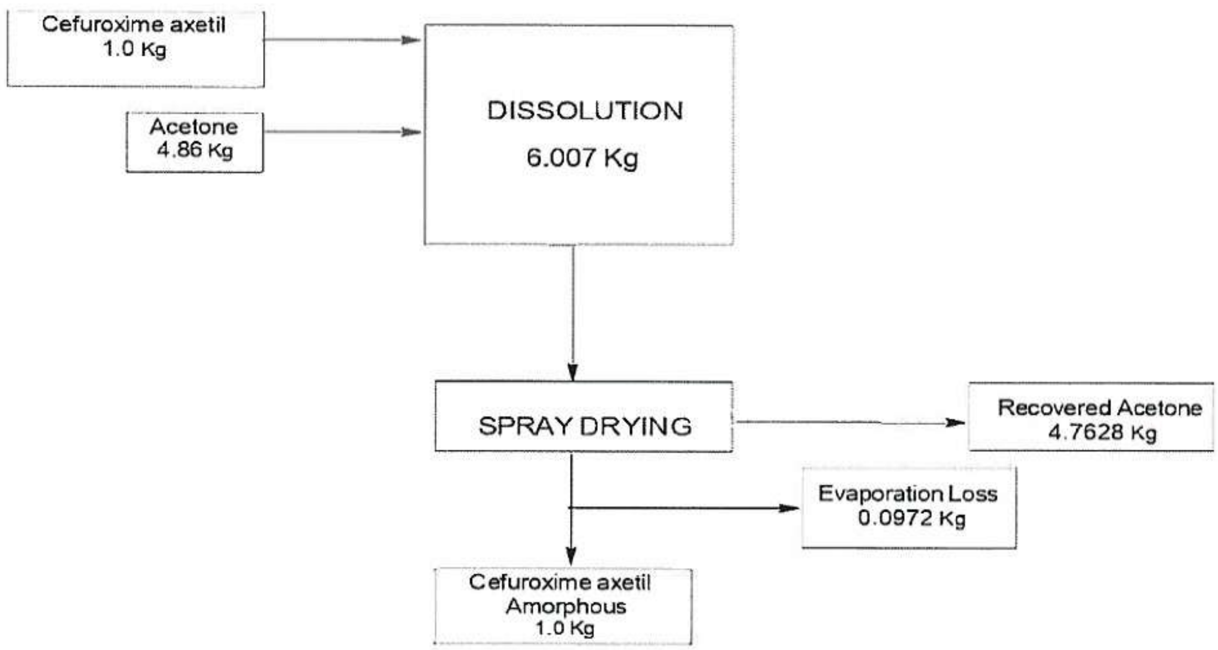
Flow chart : Cefuroxime acid



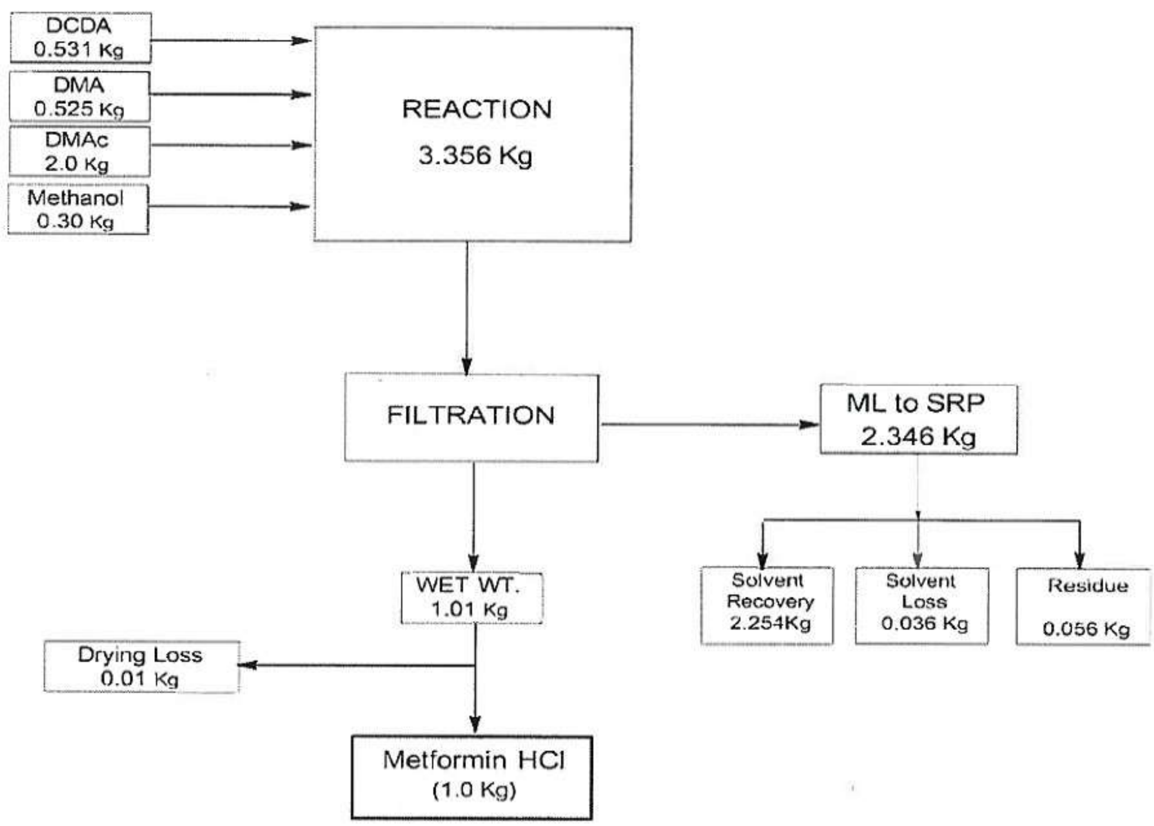
Flow chart : Cefuroxime Axetil



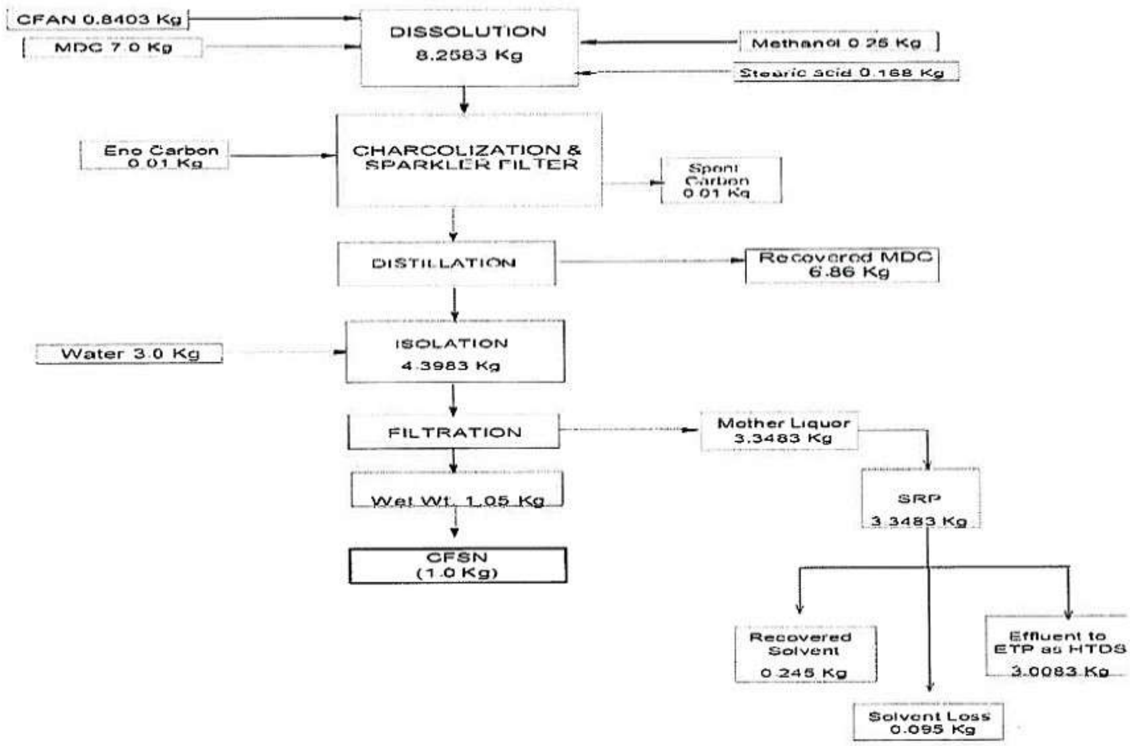
Flow chart : Cefuroxime Axetil (Amorphous)



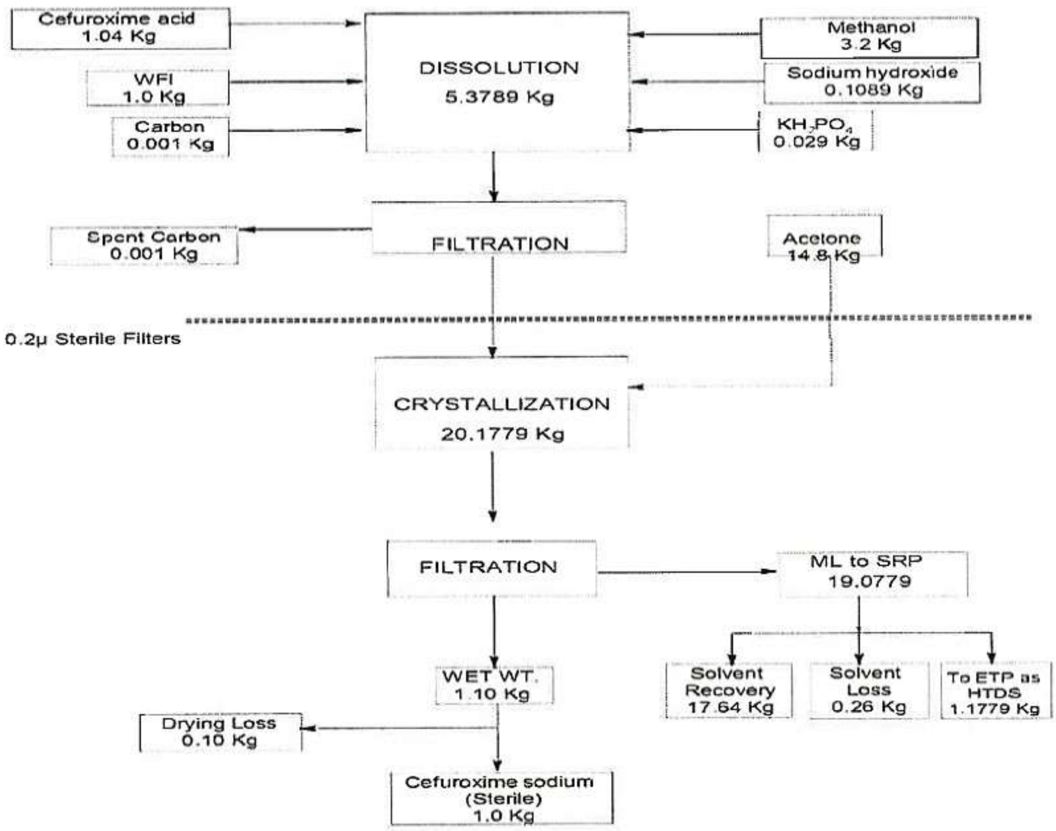
Flow chart : Metformin Hydrochloride



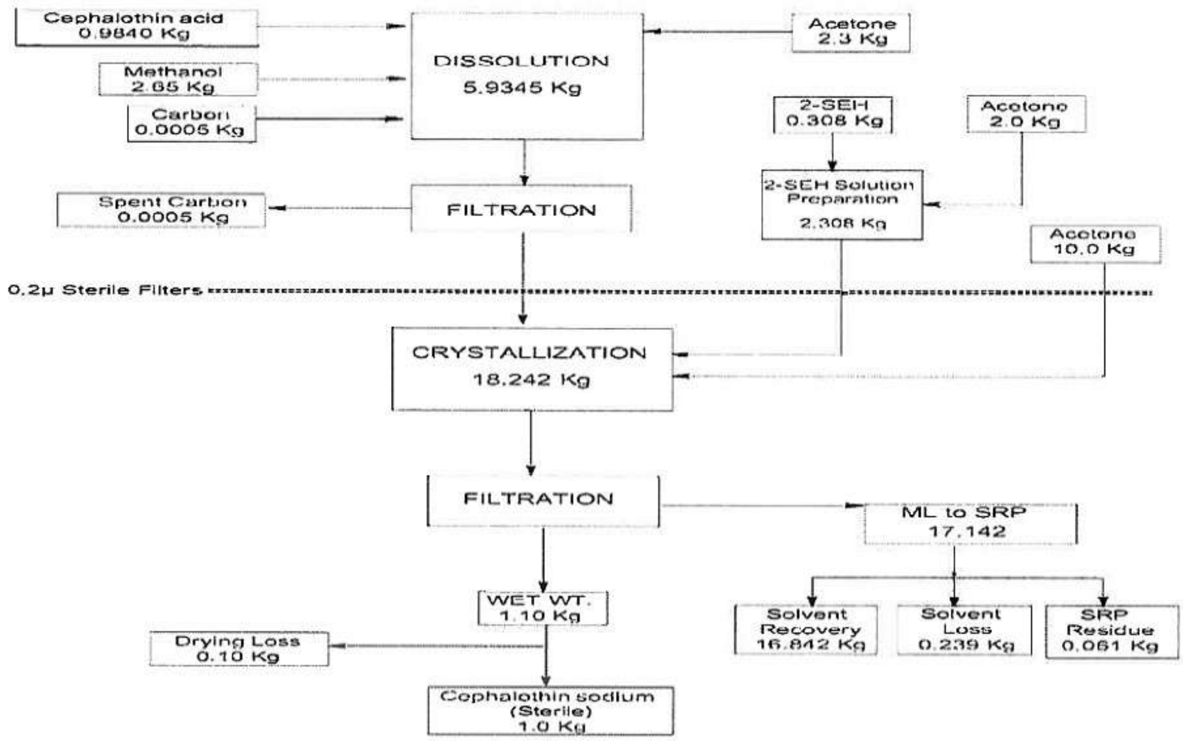
Flow chart : Cefuroxime Axetil (Coated)



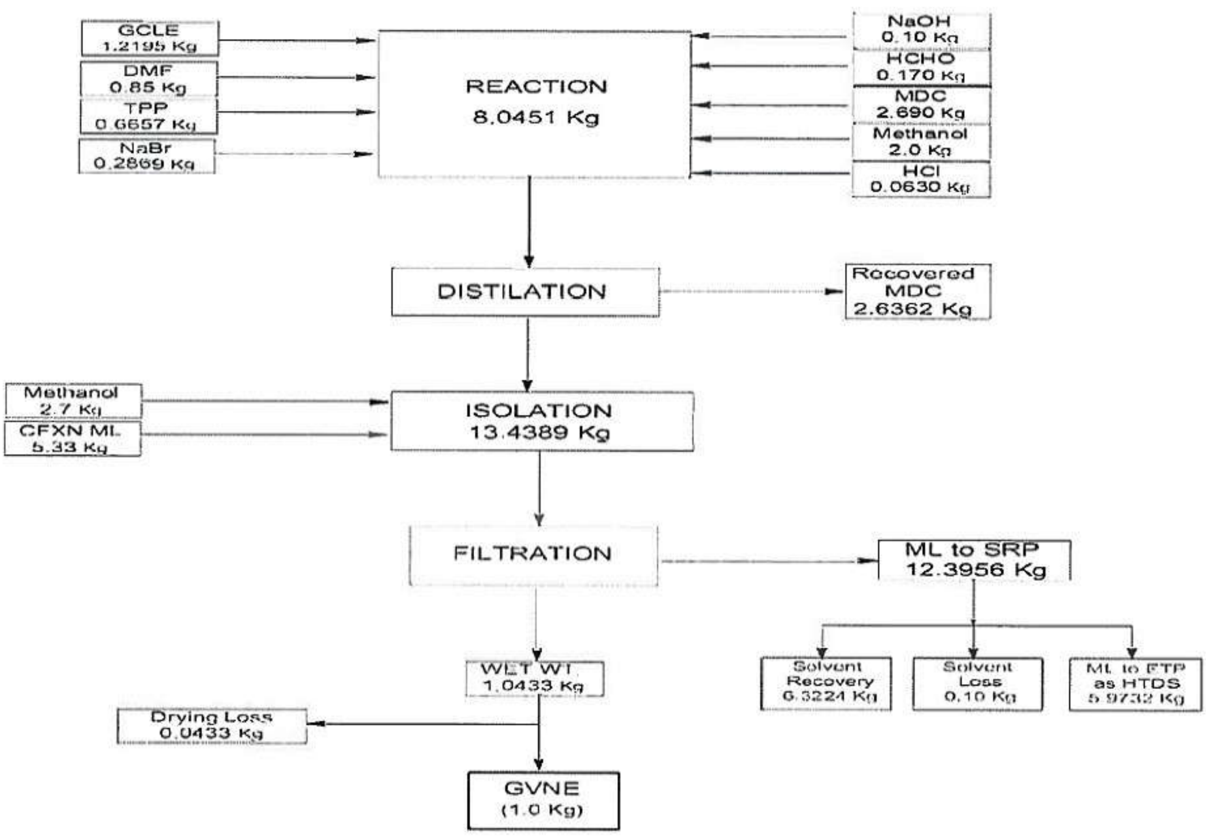
Flow chart : Cefuroxime Sodium (Sterile)



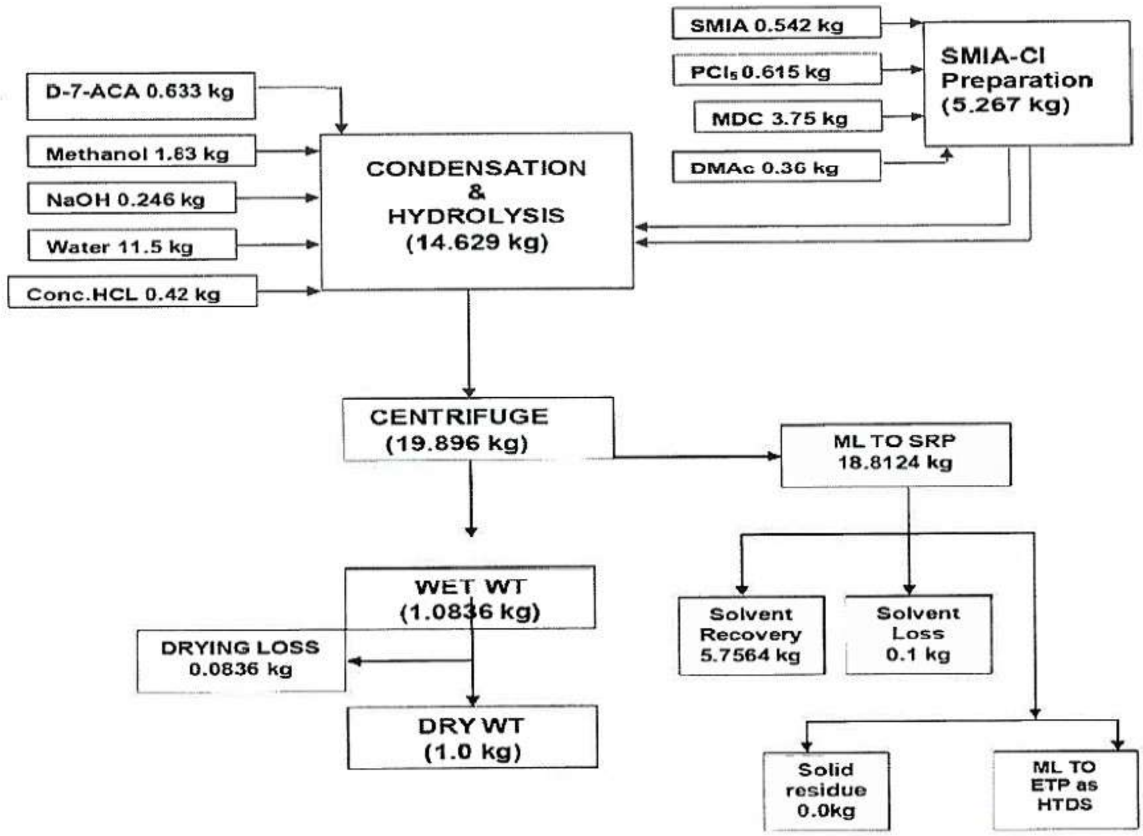
Flow chart : Cephalothin Sodium (Sterile)



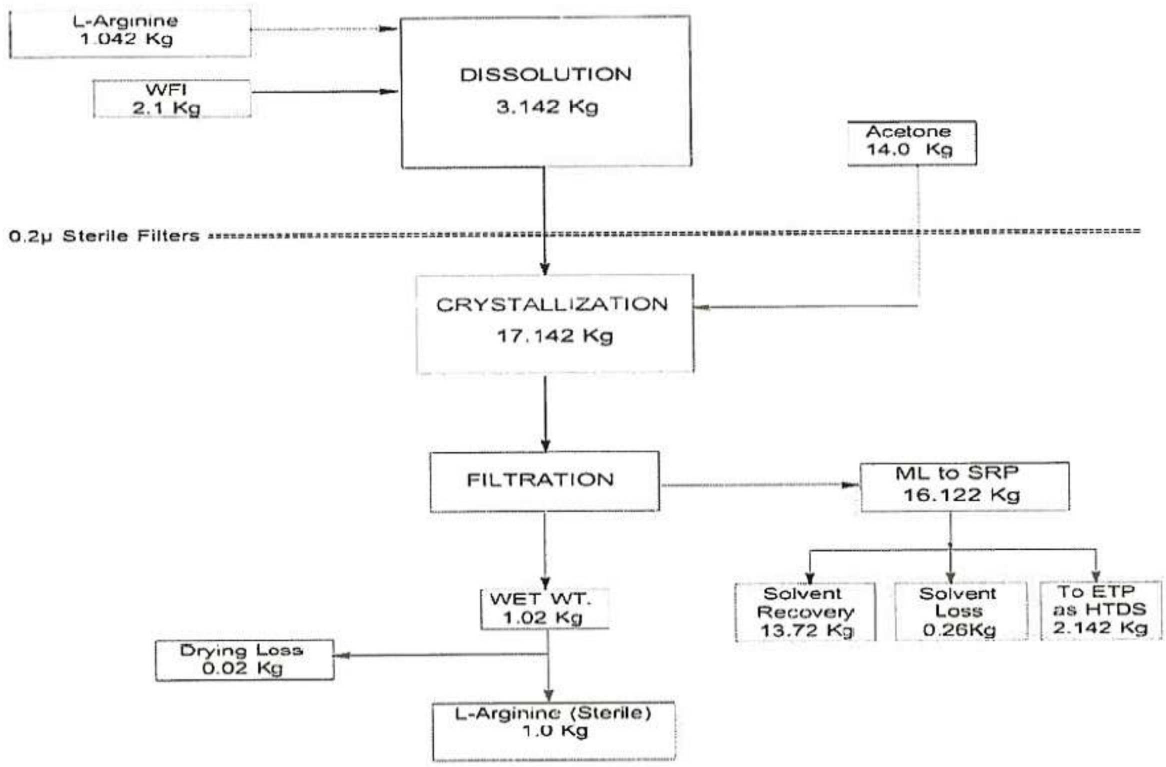
Flow chart : GVNE



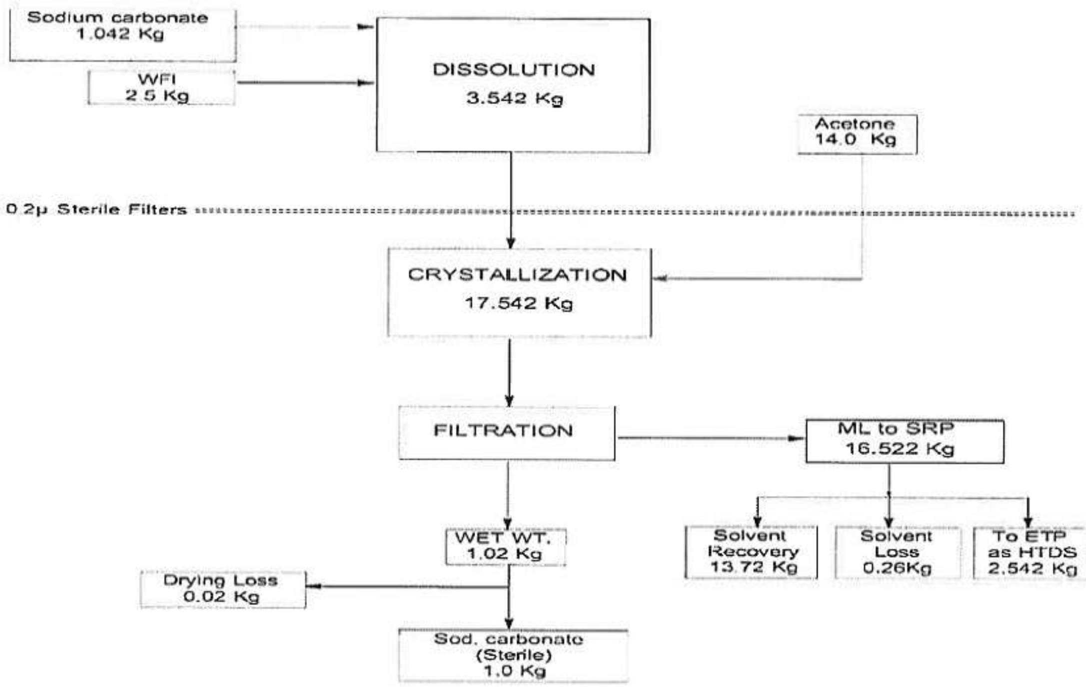
Flow chart : Hydroxy Cefuroxime



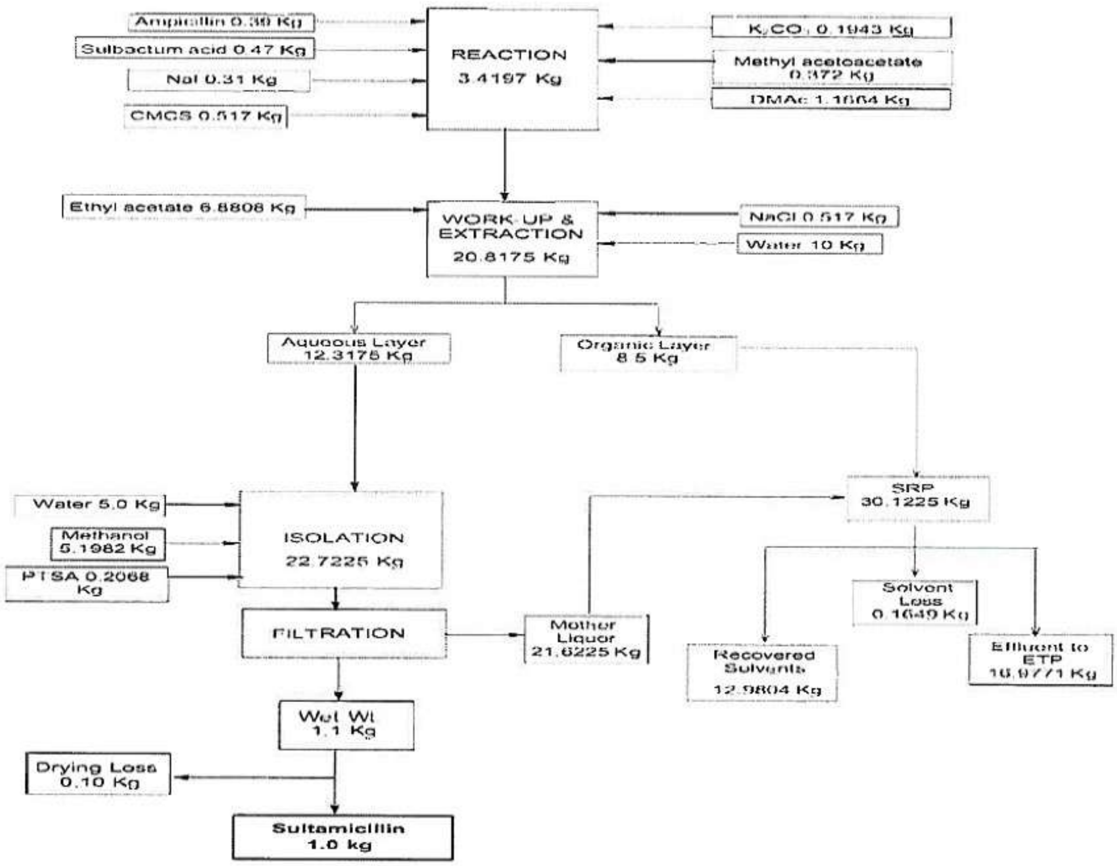
Flow chart : L-ARGININE (STERILE)



Flow chart : SODIUM CARBONATE (STERILE)



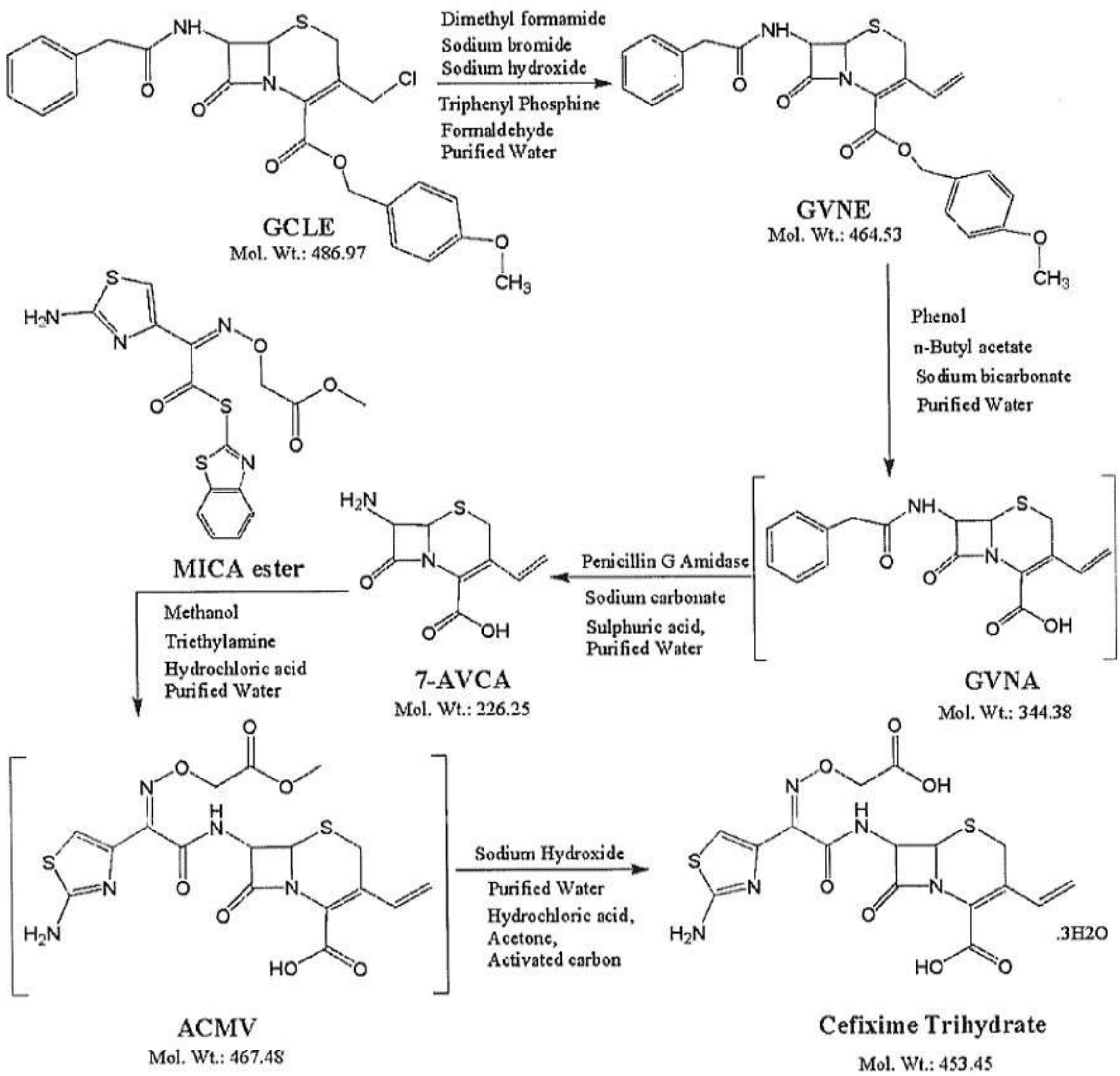
Flow chart : SULTAMICILLINE TOSYLATE



2.4 REACTION SCHEME WITH YIELD DATA

After examining the production details of all products and intermediates, the reaction schemes were thoroughly analyzed. The reaction schemes were studied to comprehend the chemicals and water consumption at each step. Collecting data on reaction yields was crucial for estimating water consumption. Below are the complete reaction schemes for each product.

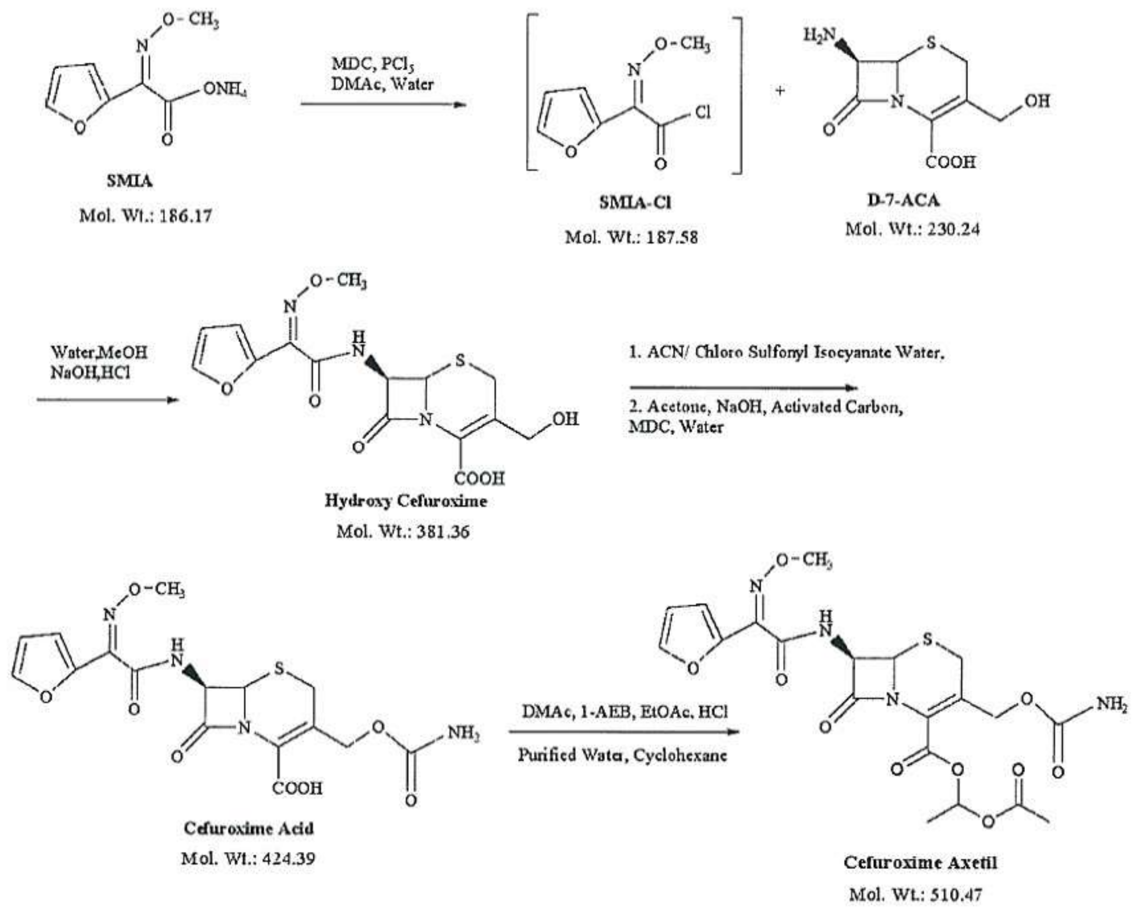
ROS : Cefixime Trihydrate



Yield Details:

Stage	KRM	Theoretical Yield	Observed Yield	% Yield
GVNE	GCLE	0.95	0.82	86.3
AVCA	GVNE	0.49	0.44	90
Cefixime TH	AVCA	2.24	2.03	90.62
Overall Yield		**1.04**	**0.73**	**70.38**

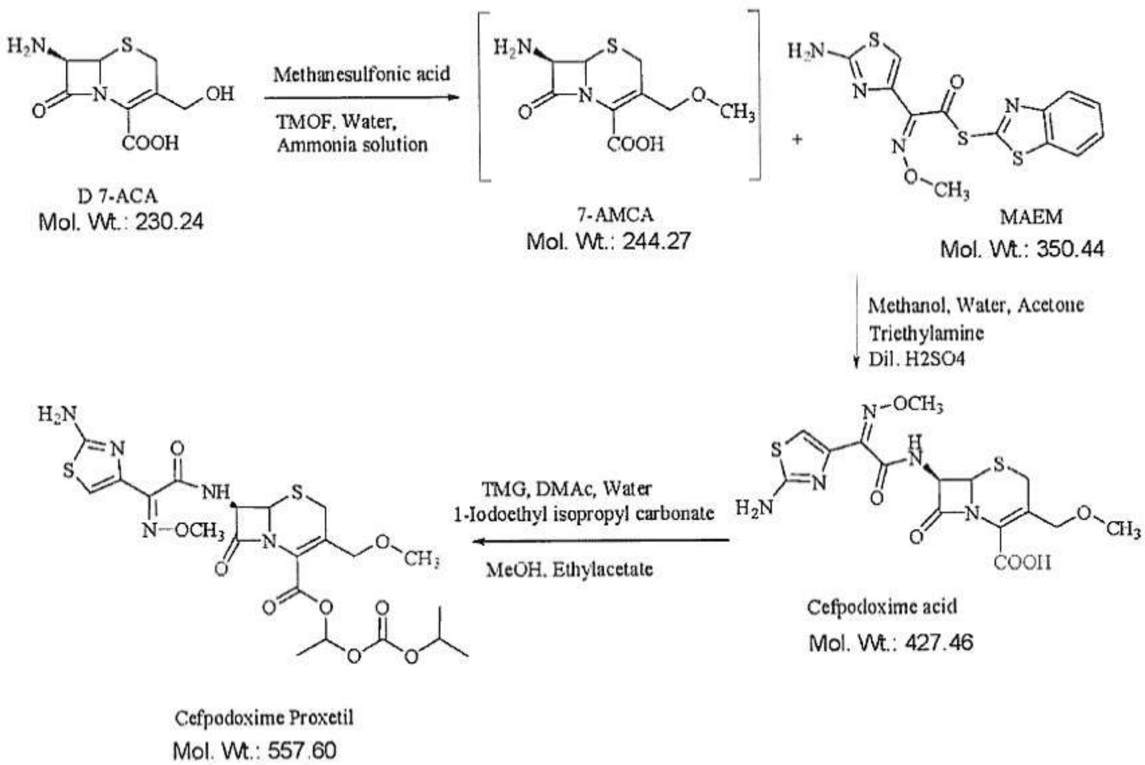
ROS: Cefuroxime Axetil



Yield Details:

Stage	KRM	Theoretical Yield	Observed Yield	% Yield
Hydroxy Cefuroxime	D-7ACA	1.66	1.58	95
Cefuroxime Acid	Hydroxy Cefuroxime	1.11	1	90
Cefuroxime Axetil	Cefuroxime Acid	1.20	1.08	90
Overall Yield		**2.21**	**1.71**	**76.95**

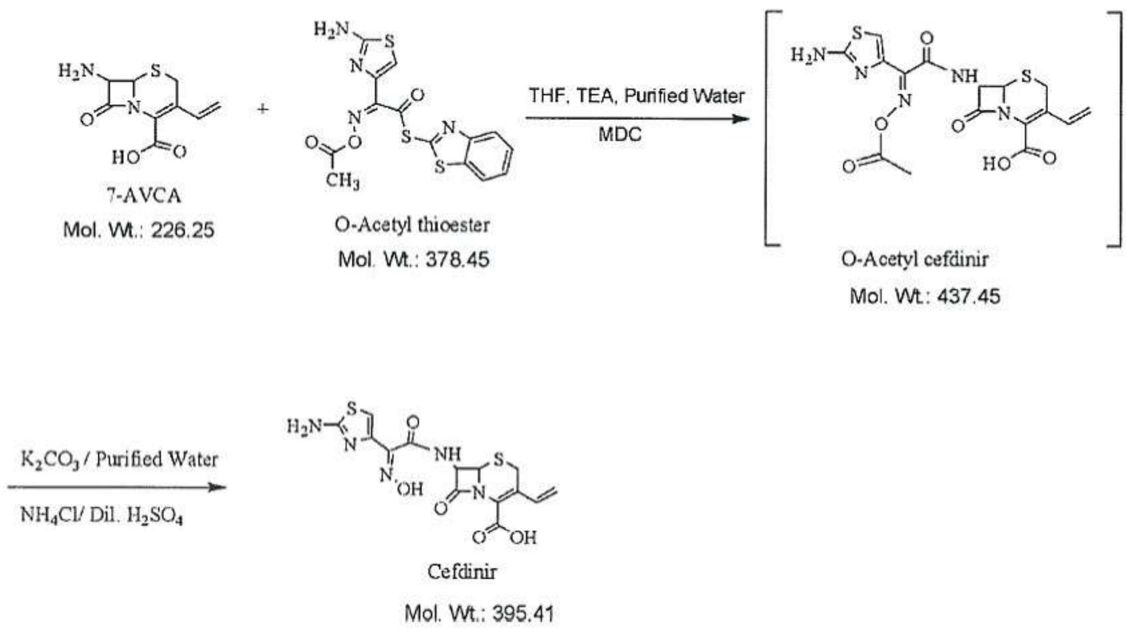
ROS: Cefpodoxime proxetil



Yield Details:

Stage	KRM	Theoretical Yield	Observed Yield	% Yield
Cefpodoxime Acid	D-7ACA	1.85	1.15	62.16
Cefpodoxime Proxetil	Cefuroxime Acid	1.30	1.15	88.46
Overall Yield		**2.41**	**1.32**	**54.99**

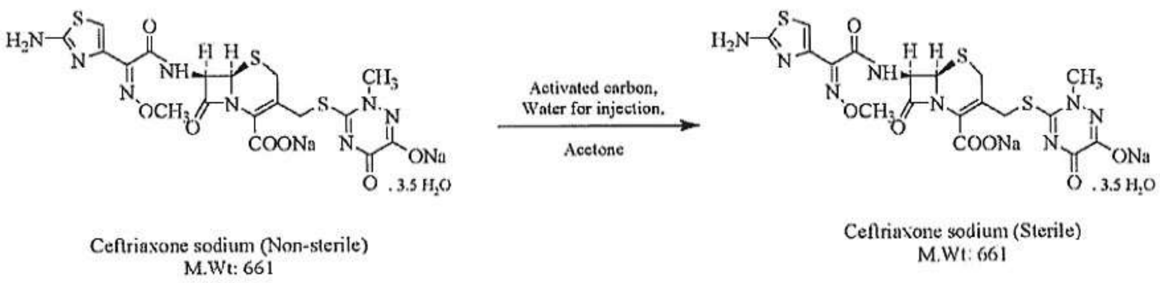
ROS : Cefdinir



Yield Details:

Stage	Key RM	Theoretical Yield	Observed Yield	% Yield
Cefdinir	7-AVCA	1.75	1.34	76.5

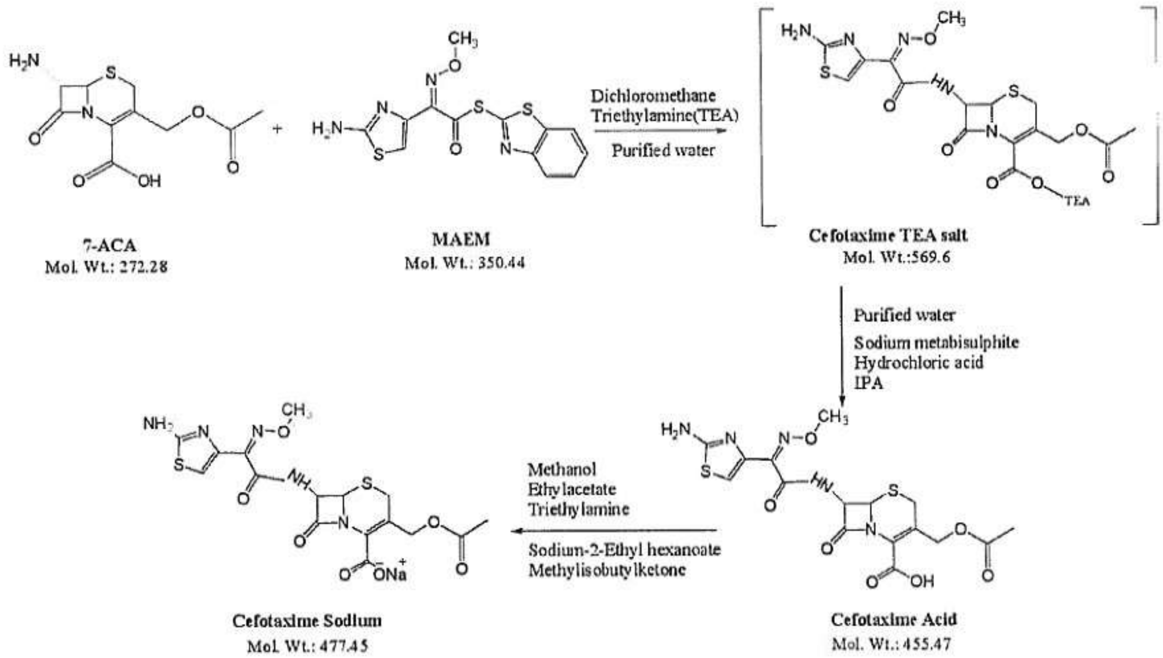
ROS: Ceftriaxone sodium



Yield Details:

Stage	Key RM	Theoretical Yield	Observed Yield	% Yield
Ceftriaxone Sodium (Sterile)	Ceftriaxone Sodium (Non sterile)	1	0.98	98

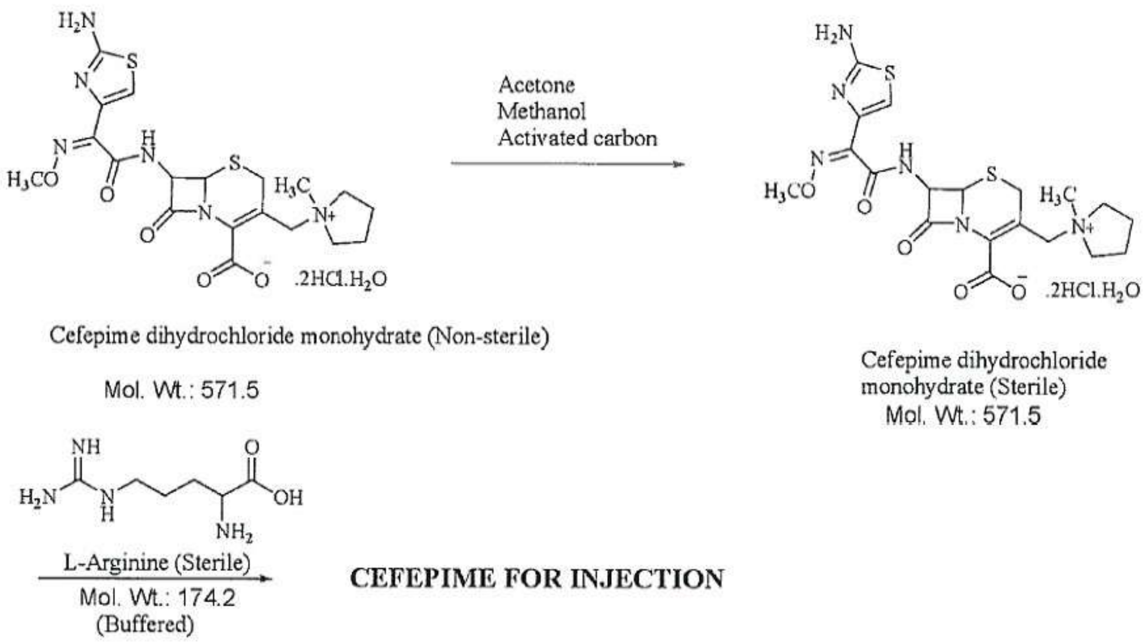
ROS: Cefotaxime sodium



Yield Details:

Stage	Key RM	Theoretical Yield	Observed Yield	% Yield
Cefotaxime Acid	7-ACA	1.67	1.65	98.8
Cefotaxime Sodium	Cefotaxime Acid	1.05	0.92	87.69
Overall Yield		**1.75**	**1.52**	**86.64**

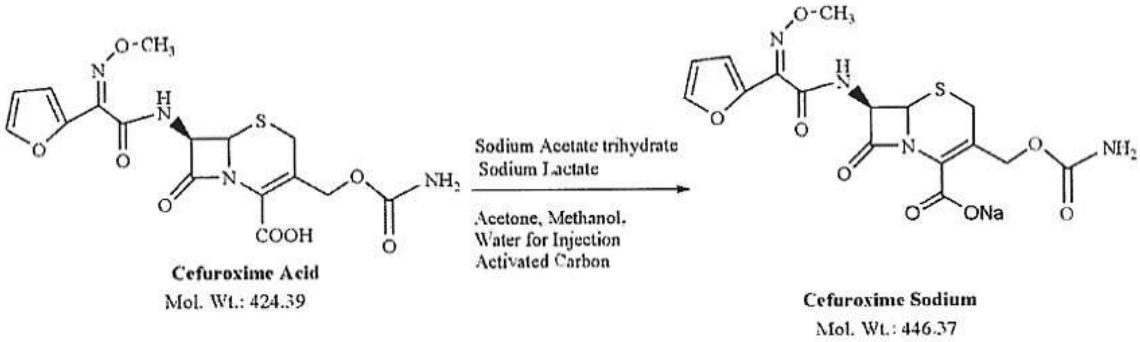
ROS: Cefepime (Injection)



Yield Details:

Stage	Key RM	Theoretical Yield	Observed Yield	% Yield
Cefipime Hcl (Sterile)	Cefipime(Non sterile)	1.0	0.94	94

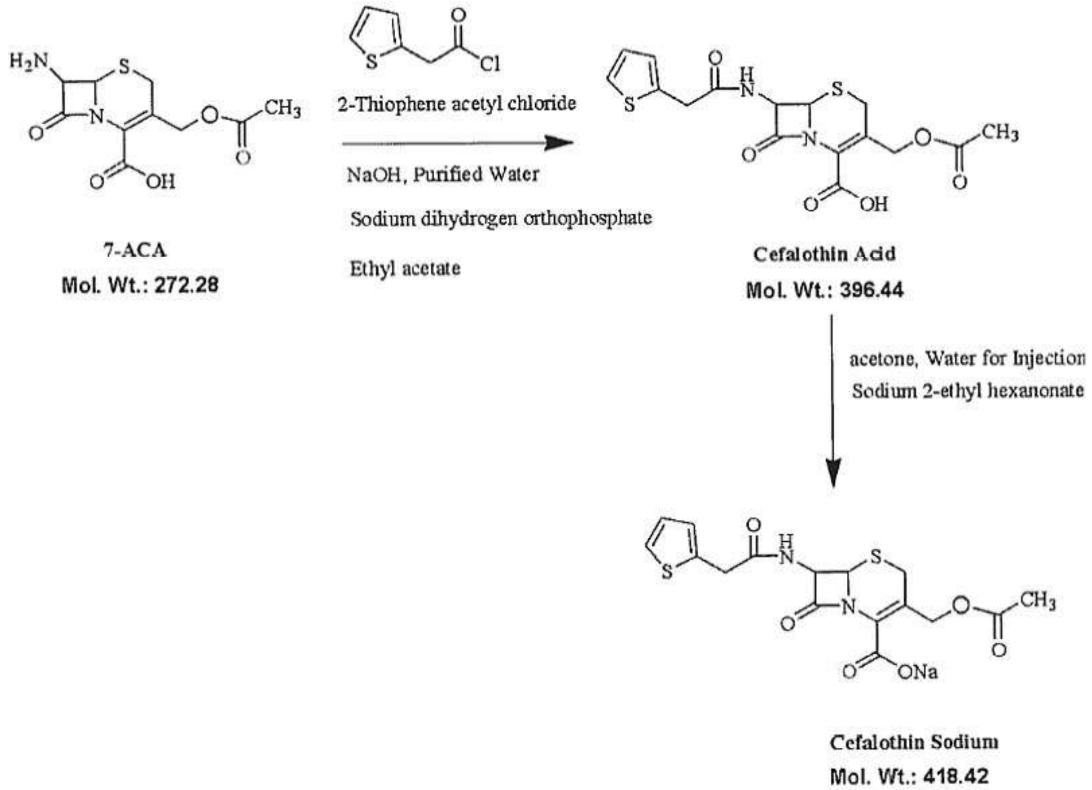
ROS : Cefuroxime sodium



Yield Details:

Stage	Key RM	Theoretical Yield	Observed Yield	% Yield
Cefuroxime Sodium	Cefuroxime Acid	1.05	0.96	91.57

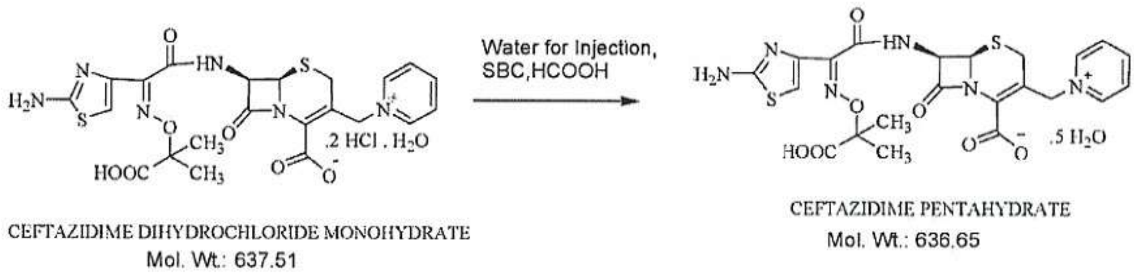
ROS : Cephalothin Sodium



Yield Details:

Stage	Key RM	Theoretical Yield	Observed Yield	% Yield
Cephalothin Acid	7-ACA	1.46	1.3	89
Cefotaxime Sodium	Cephalothin Acid	1.06	1.04	98
Overall Yield		**1.55**	**1.35**	**87.22**

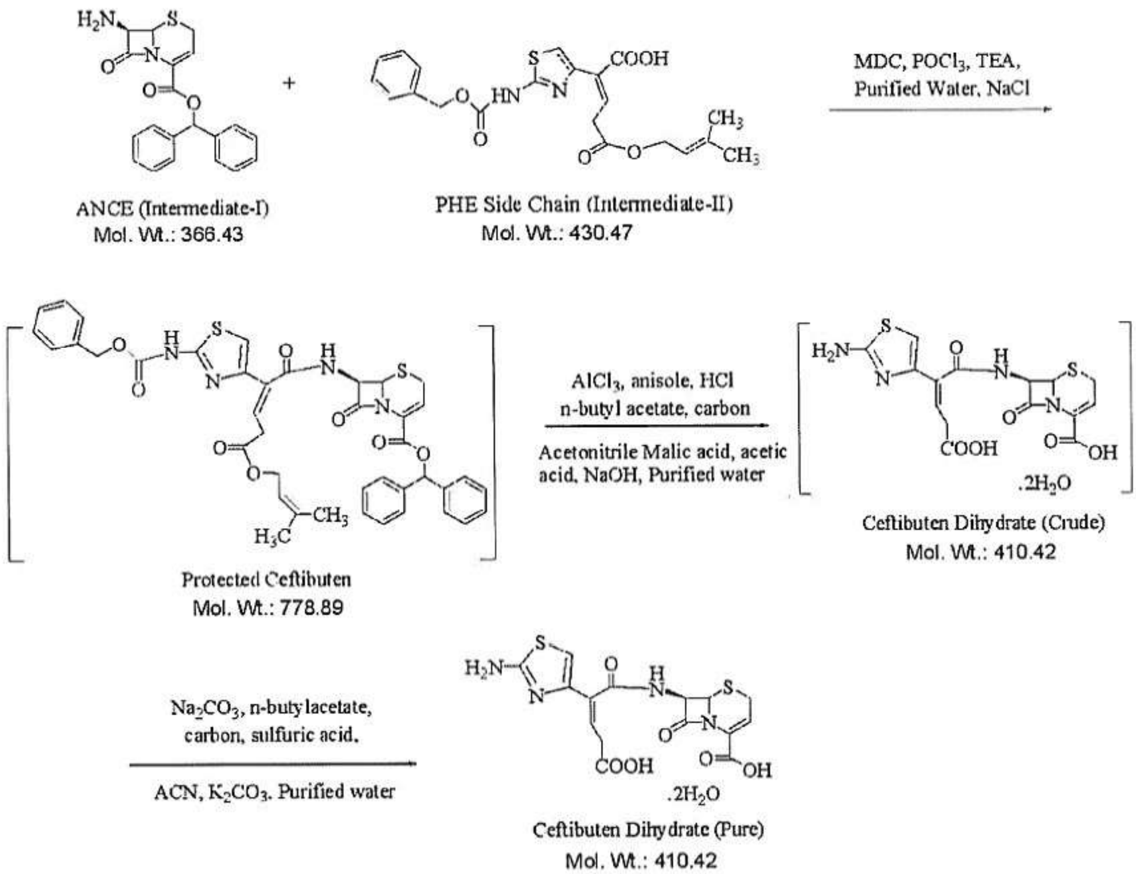
ROS : Ceftazidime pentahydrate



Yield Details:

Stage	Key RM	Theoretical Yield	Observed Yield	% Yield
Ceftazidime Pentahydrate(Sterile)	Ceftazidime Dihydrochloride	0.999	0.82	82.08

ROS: Ceftibuten



Yield Details:

Stage	Key RM	Theoretical Yield	Observed Yield	% Yield
Ceftibutene hydrate	ANCE	1.218	0.65	53.3

2.5 ANALYSIS OF PRODUCTION DATA

During the site inspection, production data spanning six months (August 23 to January 24) was obtained from the industry, shown in table 5. The primary objective was to establish operating current operating capacity so as to ensure alignment between the theoretical material balances and the actual scenario.

Table 5 Product wise six month actual production data

S.N	Product	EC approved in MT/day	August (MT/day)	September (MT/day)	October (MT/day)	November (MT/day)	December (MT/day)	January (MT/day)
1	Cefixime	1.786	0.82	0.77	1.51	1.42	1.45	1.45
2	Cefuroxime Axetil Amorphous	1.65	0.62	0.75	0.62	0.67	0.68	0.68
3	Cefuroxime Axetil - Coated	0.007	0.00	0.00	0.06	0.02	0.00	0.00
4	Cefpodoxime Prox	0.01	0.02	0.00	0.01	0.01	0.00	0.00
5	Cefditoren pivoxil	0.0035	0.00	0.00	0.00	0.00	0.00	0.00
6	Cefdinir	0.05	0.00	0.00	0.03	0.02	0.00	0.00
7	Ceftriaxone Sodium	0.84	0.00	0.00	0.00	0.16	0.08	0.16
8	Cefotaxime Sodium	0.4	0.00	0.00	0.00	0.00	0.00	0.00
9	Cefepime injection	0.0577	0.00	0.00	0.00	0.00	0.00	0.00
10	Cefuroxime SS	0.02723	0.00	0.00	0.00	0.00	0.00	0.00
11	Cephalothin SS	0.05	0.00	0.00	0.00	0.00	0.00	0.00
12	Cefazolin Sodium	0	0.00	0.00	0.00	0.00	0.00	0.00
13	Cefprozil	0.0005	0.00	0.00	0.00	0.00	0.00	0.00

14	Cefoxitin Sodium	0.001	0.00	0.00	0.00	0.00	0.00	0.00
15	Ceftiofur	0	0.00	0.00	0.00	0.00	0.00	0.00
16	Ceftaroline	0.00002	0.00	0.00	0.00	0.00	0.00	0.00
17	metformine HCl	0	0.00	0.00	0.00	0.00	0.00	0.00
18	Cefcapene pivoxil	0.00002	0.00	0.00	0.00	0.00	0.00	0.00
19	Ceftazidime pentahydrate	0.015	0.00	0.00	0.00	0.00	0.00	0.00
20	Ceftibuten hydrate	0.02	0.00	0.02	0.00	0.00	0.00	0.02
21	Cefotiam HCl	0.015	0.00	0.00	0.00	0.00	0.00	0.00
22	Sodium carbonate	0.002	0.00	0.00	0.00	0.00	0.00	0.02
23	L-arginine	0.002	0.00	0.00	0.00	0.06	0.00	0.00
24	Menthol crystal	16.6	0.00	0.00	0.00	0.00	0.00	0.00
25	Menthol Flex	6.6	0.00	0.00	0.00	0.00	0.00	0.00
26	Menthol liquid products/derivatives	16.6	0.00	0.00	0.00	0.00	0.00	0.00

As per the permissions granted to the industry, they are authorized to manufacture 39.8 Mt/day of Menthol-based products and 4.93 MT/day of other bulk Active Pharmaceutical Ingredients (APIs). However, during the audit, the industry communicated that they have ceased the production of menthol-based products due to a shift in market requirements. To accurately assess the actual operating capacity of the industry, the comparison of actual production is conducted only for the products currently being manufactured, i.e., bulk APIs.

The maximum production permission granted to the industry, as per their environmental clearance, is 4.93 MT/day for bulk APIs. The month-on-month percentage production is presented in the table below for detailed comparison.

Table 6 Actual production percentage of designed production

Months	Daily Average Production in MT	% of designed production
Aug-23	1.46	29.548%
Sep-23	1.53	31.037%
Oct-23	2.23	45.225%
Nov-23	2.35	47.642%
Dec-23	2.22	44.969%
Jan-24	2.33	47.125%

CHAPTER 3

SOURCE OF WATER

The groundwater is the only source of freshwater for the M/s Nectar Lifesciences Ltd (Unit-II). Industry has applied water abstraction permission from PWRDA for 1055 m^3/day or 1055 KLD or 31650 KL per month or 379800 KL per annum. As per the designed production of 44.73 T/day, fresh water requirement per MT of production is 23.58 KL/T.

3.1 GROUND WATER SITUATION AT THE DERABASSI AND ITS ADJOINING AREAS

The groundwater at the Derabassi and its adjoining areas is under extremely high stress (80%) (Figure 8) (Source: India water tool, Date: 20/05/2022). 'Extremely high' levels of water stress mean an average of 80 percent of the available water in an area is used for irrigation in agriculture, industries, and municipalities every year. According to the India water tool, the area at Derabassi and its adjoining areas is under overexploiting groundwater resources (Figure 9) (Source: India water tool, Date: 20/05/2022). A block is considered to be in the "over-exploited" category when the depletion of groundwater is more than 100%. Therefore, there is a need to use water judiciously for agriculture and industrial purposes.

Figure 8 Baseline water stress of ground water in the industrial area

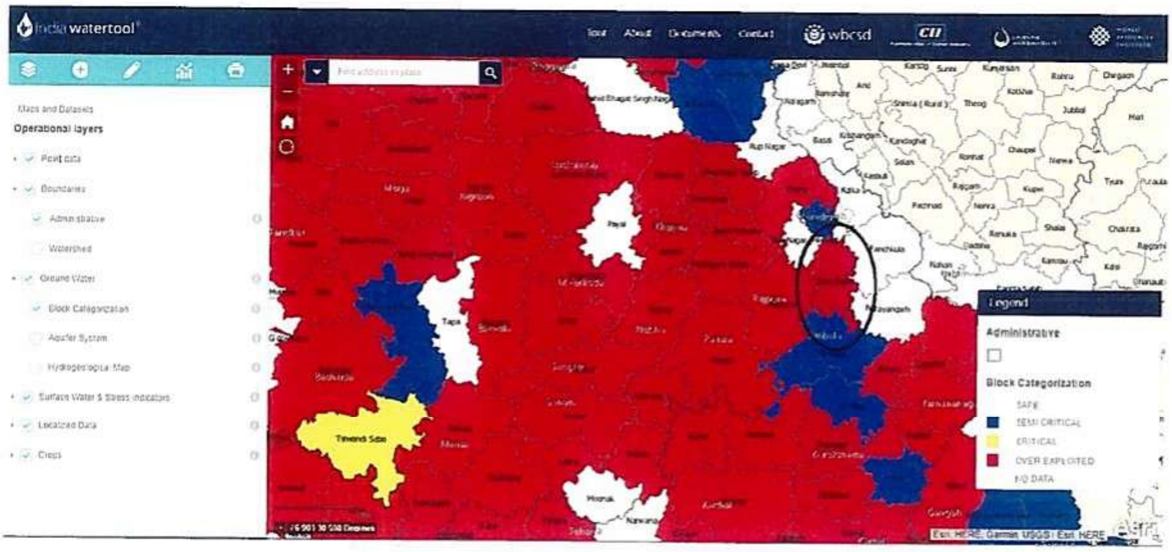


Figure 9 Block categorization of depletion of groundwater in the industrial area

3.2 WATER EXTRACTION ANALYSIS

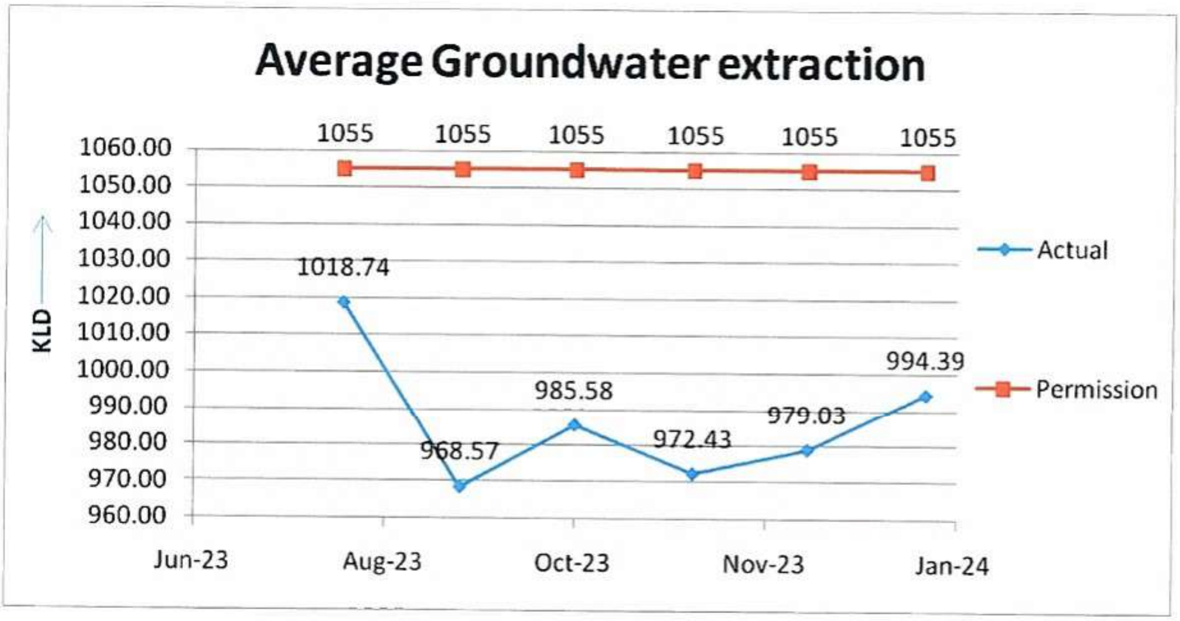
The approved total water withdrawal limit stands at 1055 KLD (31650 KL per month or 379800 KL per annum) for the production output of 44.73 tonnes per day. Groundwater extraction data from borewells, as presented in Table 7, delineates the water consumption scenario at M/s Nectar Lifesciences Ltd. Unit II, Derabassi. Two borewells are operational for groundwater extraction at the facility.

As data shown in table 7, the average monthly groundwater extraction figures during Aug 2023, Sept 2023, Oct 2023, Nov 2023, Dec 2023, and Jan 2024 are documented as 1018.74 KL, 968.57 KL, 985.58 KL, 972.43 KL, 979.03 KL, and 994.39 KL, respectively. The cumulative annual groundwater extraction during August 2023 to January 2024 adheres to the approved extraction limit set by the Punjab Water Resources Development Authority (PWRDA) shown in graph 1. The water withdrawal, when compared to the permissible limits granted by PWRDA, demonstrates percentages of 96.56%, 91.81%, 93.42%, 92.17%, 92.80%, and 94.25% for Aug 2023, Sept 2023, Oct 2023, Nov 2023, Dec 2023, and Jan 2024, respectively.

This analytical breakdown emphasizes compliance with regulatory water withdrawal limits and provides a quantitative assessment of groundwater extraction activities over the specified time frame. The utilization percentages underscore the facility's adherence to approved water withdrawal constraints during the mentioned months.

Table 7 Ground water extraction data from borewells for water consumption

Month	Average Groundwater Extracted (Aug 2023 to Jan 2024)
	(KLD)
August 2023	1018.74
September 2023	968.57
October 2023	985.58
November 2023	972.43
December 2023	979.03
January 2024	994.39
Total	**986.45**



Graph 1 Average groundwater extraction

3.3 ASSESSMENT OF GROUNDWATER QUALITY

In order to comprehensively assess the groundwater quality at Nectar Lifesciences Derabassi Unit II, a thorough sampling strategy has been devised. A total of nine samples will be collected as shown in table 8 and google map image figure 11 of groundwater sampling points with coordinates, strategically divided into three categories: upstream, downstream, and within the industrial premises. Two samples will be collected upstream of the facility to establish a baseline of the natural groundwater quality entering the site. Another set of two samples will be taken downstream, providing insights into any potential impact or alteration of water quality as it moves away from the industrial zone and one sample collected from the pond represents the surface water. Four groundwater samples are collected within the industry itself figure 10, two samples collected from the borewell and two samples collected from piezometers targeting areas that may have varying levels of interaction with industrial processes. These sampling points aim to cover a spectrum of potential influences on groundwater quality, such as discharge points, storage areas, and points near potential sources of contaminants. The samples undergo rigorous laboratory analysis to assess parameters such as pH, dissolved oxygen, heavy metals, and other relevant indicators.

The sample was collected and analysed by the TIET team engaged by auditors. The analysis of the groundwater sample was analyzed as the parameters specified by IS:10500 protocols.

This comprehensive groundwater quality assessment will not only help in understanding the environmental impact of industrial activities but also guide in implementing effective measures for sustainable water management and environmental conservation at Nectar Lifesciences Derabassi Unit II.

Table 8 Groundwater sampling location

S. No.	Sampling Location
1	Vill. Haripur Hindua Govt. School (Upstream)
2	Vill. Haripur Hindua Sarpanch House (Upstream)
3	Vill. Saidpura Pond
4	Vill. Haibatpur Near Overhead Tank (Downstream)
5	Vill. Haibatpur Mr. Virender House (Downstream)
6	Piezometer-1(Inside)
7	Piezometer-2(Inside)
8	Borewell-1(Inside)
9	Borewell-2(Inside)

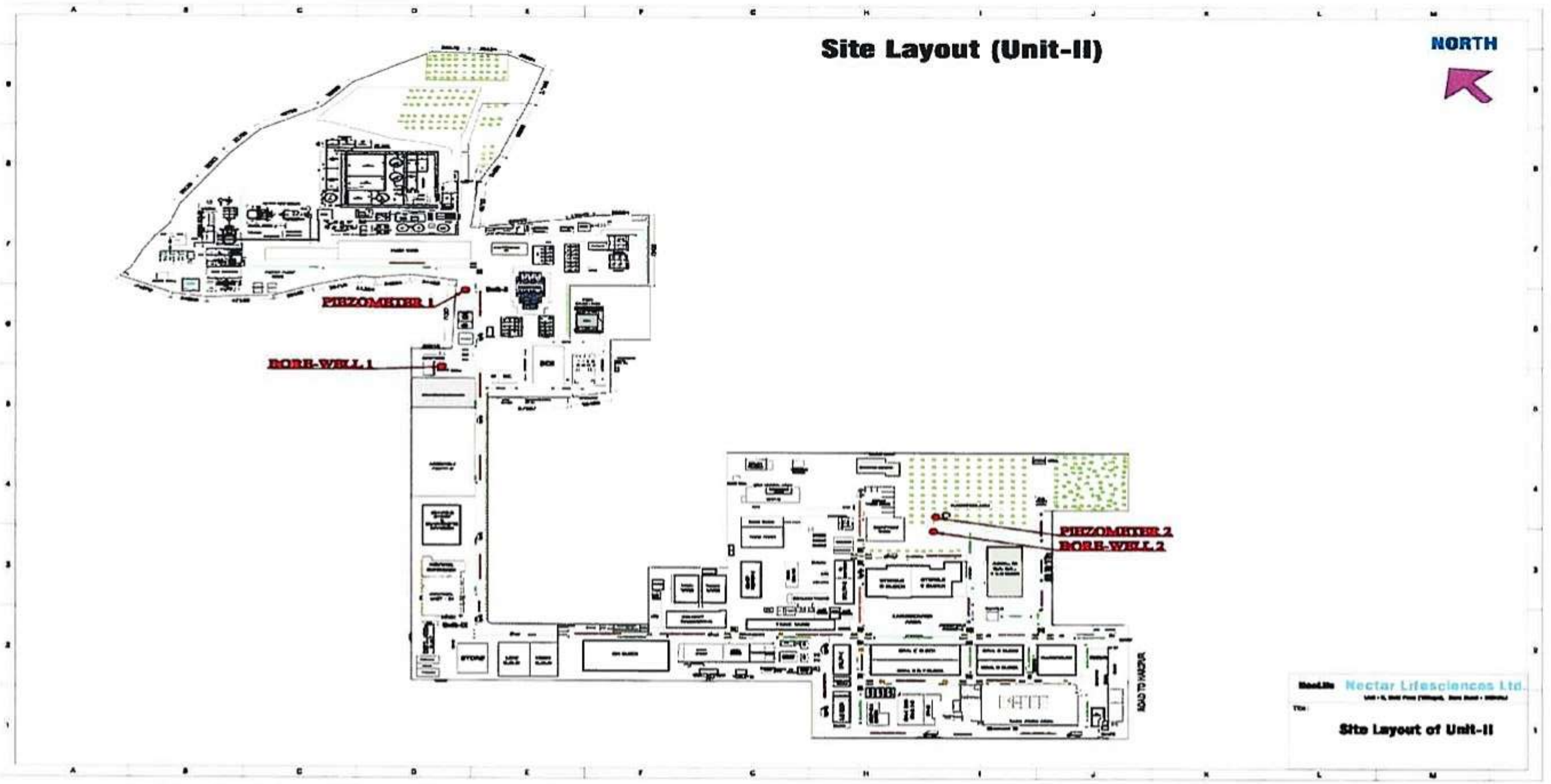


Figure 10 Groundwater sampling points within premises

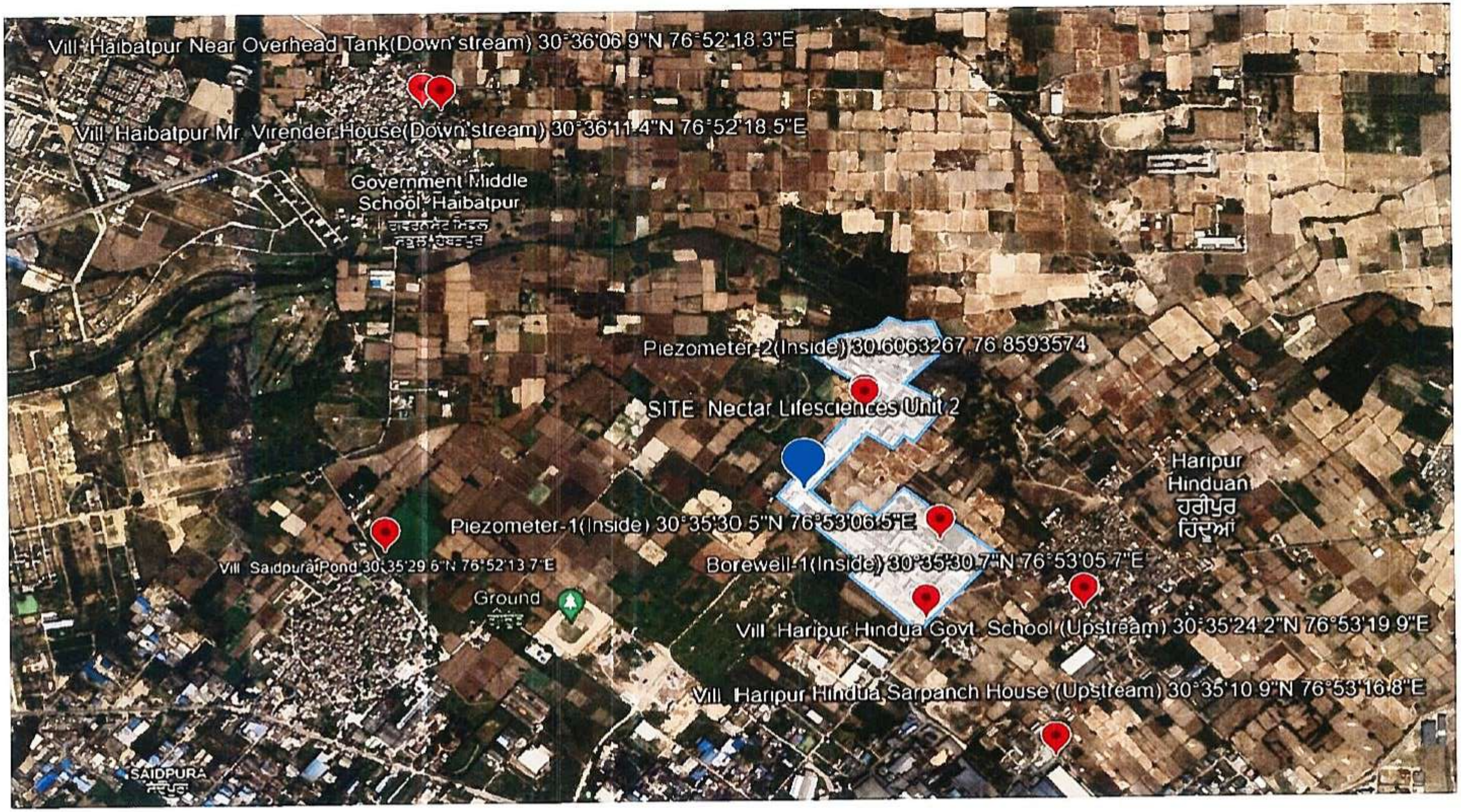


Figure 11 Google map image of groundwater sampling points with coordinates

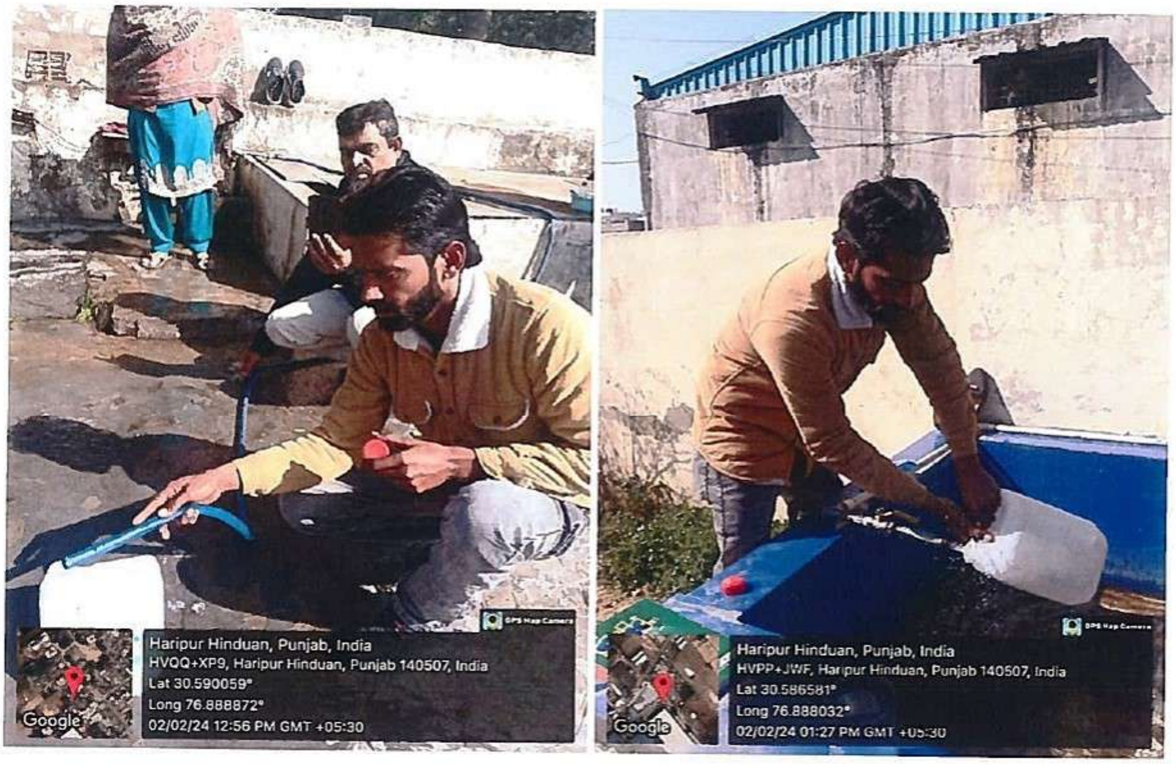


Figure 12 Vill. Haripur Hindua Govt. School & Sarpanch House (Upstream)

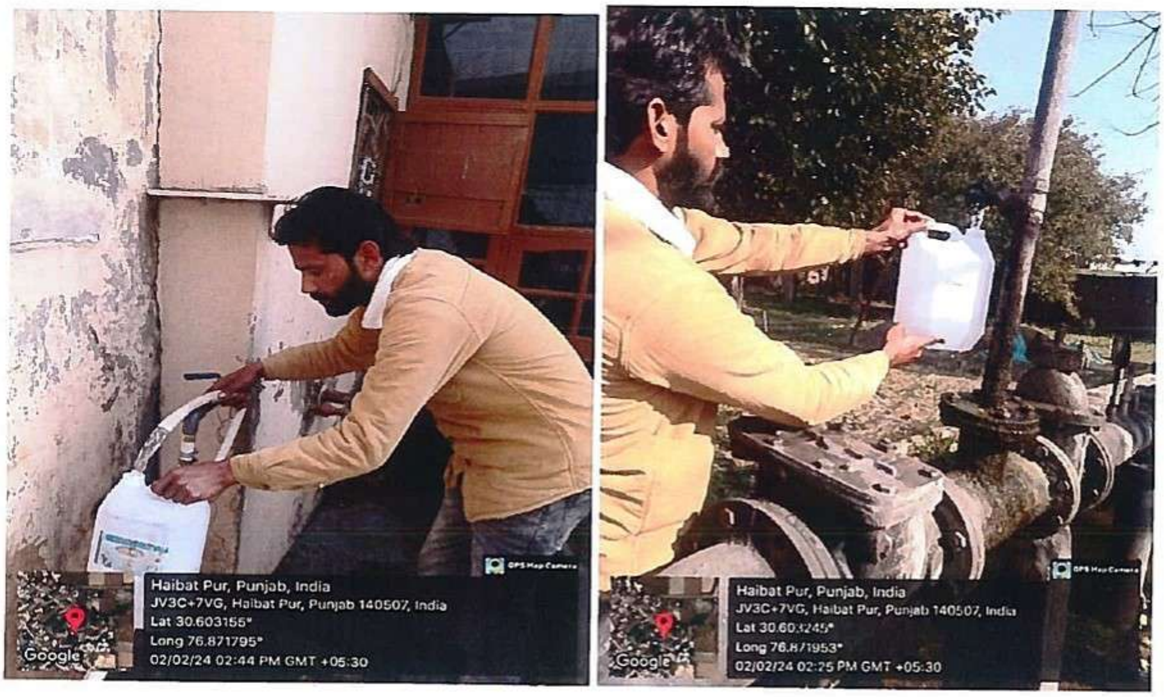


Figure 13 Vill. Haibatpur Near Overhead Tank & Mr. Virender House (Down stream)

Figure 14 Piezometer no 1 & 2

Figure 15 Borewell no 1 & 2

Figure 16 Vill. Saidpura Pond

A systematic and thorough investigation into water quality requires meticulous sampling from diverse locations, each providing a unique insight into the overall health of the aquatic ecosystem. Table 8 list represents a comprehensive snapshot of the water environment surrounding Villages Haripur Hindua and Haibatpur. Beginning upstream, the sampling points at Vill. Haripur Hindua Govt. School and Vill. Haripur Hindua Sarpanch House aims to capture the conditions before significant human intervention.

To analyse the surface water quality to Vill. Saidpura Pond, a critical water body in the vicinity, adds another layer to the analysis.

Shifting downstream, attention turns to Vill. Haibatpur, with samples collected near the Overhead Tank and Mr. Virender House. These points strategically cover areas influenced by human activities, contributing valuable data on potential contaminants and the overall impact on water quality.

Additionally, the inclusion of Piezometer-1, Piezometer-2, Borewell-1, and Borewell-2, all situated inside the ecosystem, provides insights into the groundwater quality and hydrogeological conditions.

This diverse array of sampling locations reflects a holistic approach to water quality assessment, acknowledging the intricate interplay between natural factors and human influence. The data collected from these points will not only aid in identifying potential sources of pollution but will also serve as a foundation for informed decision-making aimed at preserving and enhancing the water quality in the region. The strategic selection of these sampling sites ensures a comprehensive understanding of the water dynamics, contributing to the larger goal of sustainable water resource management in Villages Haripur Hindua and Haibatpur

Onsite testings were done in addition to sample collection Table 9 shows results as obtained during the onsite testing.

Table 9 Groundwater onsite results

Onsite Groundwater analysis				
S. No.	**Sampling Location**	**pH**	**Electrical Conductivity (µs/cm)**	**TDS (mg/l)**
1	Vill. Haripur Hindua Govt. School (Upstream)	7.15	212.5	107
2	Vill. Haripur Hindua Sarpanch House (Upstream)	7.19	162.15	82
3	Vill. Saidpura Pond	8.03	119.2	61
4	Vill. Haibatpur Near Overhead Tank (Down stream)	7.35	158	79
5	Vill. Haibatpur Mr. Virender House(Down stream)	7.19	200.7	102
6	Piezometer-1(Inside)	7.17	125.5	64
7	Piezometer-2(Inside)	7.76	157.1	79
8	Borewell-1(Inside)	7.11	145.2	73
9	Borewell-2(Inside)	7.04	143.2	72

3.2.1 Borewells Within premises

Table 10 presents the physico-chemical properties of groundwater samples extracted from borewells within the premises of M/s Nectar Lifesciences Unit-II. All measured physico-chemical parameters fall below the Drinking Water Standard (IS 10500), affirming the overall quality of the groundwater. The pH levels in Borewell 1 and Borewell 2 are recorded at 7.05 and 6.82, respectively. While Total Suspended Solids (TSS) in Borewell 1 is noted at 22.5 mg/l, Borewell 2 exhibits a lower TSS concentration at 7.5 mg/l. Furthermore, Total Dissolved Solids (TDS) exhibit values of 410 mg/l and 511 mg/l in Borewell 1 and Borewell 2, respectively. It is note to that both Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) are absent in the borewell results.

Table 10 Physico-chemical characteristic of groundwater from borewells within premises

Sr. No	Parameter	Unit	Drinking Water Standard (IS10500)	Result-Borewell 1	Result-Borewell 2
1	pH	---	6.5-8.5	7.05	6.82
2	Total Suspended Solids (TSS)	mg/l	—	22.5	7.5
3	Total Dissolved Solids (TDS)	mg/l	500	410	511
4	Chemical Oxygen Demand (COD)	mg/l	—	Not Detected	Not Detected
5	Biological Oxygen demand (BOD)	mg/l	—	Not Detected	Not Detected
6	Dissolved Oxygen (DO)	mg/l	—	Not Detected	Not Detected
7	Ammoniacal Nitrogen	%	75	Not Detected	Not Detected
8	Bioassay	%	< 90%	Not Detected	Not Detected
9	Phosphate	mg/l	5	0.40	1.60
10	Sulphate	mg/l	–	97.8	120.2
11	Sulphide	mg/l	2	0.26	0.31
12	Phenolic compound as C_6H_5OH	mg/l	1	Not Detected	Not Detected
13	Zinc as Zn	mg/l	5	0.00	0.88
14	Copper as Cu	mg/l	3	0.00	0.00

15	Total Chromium as Cr	mg/l	2	Not Detected	Not Detected
16	Hexavalent Chromium	mg/l	0.1	Not Detected	Not Detected
17	Cyanide as CN	mg/l	0.1	Not Detected	Not Detected
18	Arsenic as As	mg/l	0.2	Not Detected	Not Detected
19	Mercury as Hg	mg/l	0.01	Not Detected	Not Detected
20	Lead as Pb	mg/l	0.1	Not Detected	Not Detected
21	SAR	mg/l	26	7.00	12.0
*Above the Drinking Water Standard (IS10500)					

3.2.2 Piezometers within premises

Table 11 presents the physico-chemical characteristics of groundwater samples acquired from Piezometer 1 and Piezometer 2 within the premises of M/s Nectar Lifesciences Unit-II, compared with the Drinking Water Standard (IS10500). The recorded pH values of 7.6 and 7.2 in Piezometer 1 and Piezometer 2, respectively, demonstrate conformity to acceptable standards, reflecting the subtle equilibrium in the subterranean environment.Total Suspended Solids (TSS) a notable increase, assuming concentrations of 88 mg/l in Piezometer 1 and 76 mg/l in Piezometer 2, within the groundwater system. Total Dissolved Solids (TDS) value is 488 mg/l and 498 mg/l in Piezometer 1 & 2, respectively, indicating dissolved constituents in the groundwater.

The absence of Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) shows the quality of the groundwater. Some parameters such as Ammoniacal Nitrogen, Phosphate, Sulphate, Sulphide, Phenolic compounds, Cyanide, Sodium Adsorption Ratio (SAR) and heavy metals show the overall groundwater profile.

Table 11 Physico-chemical characteristic of groundwater from piezometer within premises

Sr. No	Parameter	Unit	Drinking Water Standard (IS10500)	Result-Piezometer 1	Result-Piezometer 2
1	pH	---	6.5-8.5	7.6	7.2
2	Total Suspended Solids (TSS)	mg/l	—	88	76
3	Total Dissolved Solids (TDS)	mg/l	500	488	498
4	Chemical Oxygen Demand (COD)	mg/l	—	Not Detected	Not Detected
5	Biological Oxygen demand (BOD)	mg/l	—	Not Detected	Not Detected
6	Dissolved Oxygen (DO)	mg/l	—	Not Detected	Not Detected
7	Ammoniacal Nitrogen	%	75	Not Detected	Not Detected
8	Bioassay	%	< 90%	Not Applicable	Not Applicable
9	Phosphate	mg/l	5	1.8	1.48
10	Sulphate	mg/l	–	110	105
11	Sulphide	mg/l	2	0.77	0.52
12	Phenolic compound as C_6H_5OH	mg/l	1	Not Detected	Not Detected
13	Zinc as Zn	mg/l	5	0.00	0.88
14	Copper as Cu	mg/l	3	0.00	0.00
15	Total Chromium as Cr	mg/l	2	Not Detected	Not Detected
16	Hexavalent Chromium	mg/l	0.1	Not Detected	Not Detected
17	Cyanide as CN	mg/l	0.1	Not Detected	Not Detected
18	Arsenic as As	mg/l	0.2	Not Detected	Not Detected
19	Mercury as Hg	mg/l	0.01	Not Detected	Not Detected
20	Lead as Pb	mg/l	0.1	Not Detected	Not Detected
21	SAR	mg/l	26	21.0	22.0
* Above the Drinking Water Standard (IS10500)					

3.3.3 Upstream Location

A comprehensive analysis of hydrological data upstream of M/s Nectar Lifesciences Unit-II, Vill. Haripur Hindua was identified for upstream investigations. Two groundwater collected from Vill Haripur Hindua and one surface water for a comprehensive assessment. The conducted water quality evaluation given in table 12 at the chosen upstream locations, specifically the pre-selected groundwater points in Vill. Haripur Hindua near Govt. School & Sarpanch house, create insights into the condition of these water sources relative to the established Drinking Water Standards (IS 10500).

The pH levels at all three designated locations conform to the stipulated range of 6.5-8.5, indicative of the neutral nature of the water. Specifically, Vill. Saidpura Pond exhibited a slightly alkaline nature with a pH of 7.53, values are within the permissible limits for drinking water standards.

Regarding the surface water study points, exemplified by Vill. Saidpura Pond, the analysis encompassed parameters such as Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), and Dissolved Oxygen (DO). Heavy metals are presumed to be absent, except for the presence of zinc. This scientific examination provides an understanding of the water quality status at the upstream locations, which is essential for informed environmental and public health assessments.

Table 12 Physico-chemical characteristic of upstream groundwater samples

Sr. No	Parameter	Unit	Drinking Water Standard (IS10500)	Result-Vill.Haripur Hindua Govt.School	Result-Vill.Haripur Hindua Sarpanch house	Vill. Saidpura Pond
1	pH	---	6.5-8.5	7.13	7.18	7.53
2	Total Suspended Solids (TSS)	mg/l	—	7.4	10.2	110
3	Total Dissolved Solids (TDS)	mg/l	500	382	378	495

4	Chemical Oxygen Demand (COD)	mg/l	—	Not Detected	Not Detected	4.0
5	Biological Oxygen demand (BOD)	mg/l	—	Not Detected	Not Detected	13.9
6	Dissolved Oxygen (DO)	mg/l	—	Not Detected	Not Detected	1.8
7	Ammoniacal Nitrogen	%	75	Not Detected	Not Detected	0.54
8	Bioassay	%	< 90%	Not Detected	Not Detected	Not Detected
9	Phosphate	mg/l	5	0.44	0.41	2.10
10	Sulphate	mg/l	–	167.0	157	280
11	Sulphide	mg/l	2	0.77	0.00	0.94
12	Phenolic compound as C_6H_5OH	mg/l	1	Not Detected	Not Detected	Not Detected
13	Zinc as Zn	mg/l	5	0.00	0.00	0.07
14	Copper as Cu	mg/l	3	0.00	0.00	0.00
15	Total Chromium as Cr	mg/l	2	Not Detected	Not Detected	Not Detected
16	Hexavalent Chromium	mg/l	0.1	Not Detected	Not Detected	Not Detected
17	Cyanide as CN	mg/l	0.1	Not Detected	Not Detected	Not Detected
18	Arsenic as As	mg/l	0.2	Not Detected	Not Detected	Not Detected
19	Mercury as Hg	mg/l	0.01	Not Detected	Not Detected	Not Detected
20	Lead as Pb	mg/l	0.1	Not Detected	Not Detected	Not Detected
21	SAR	mg/l	26	10.0	9.0	18.0
* Above the Drinking Water Standard (IS 10500)						

3.3.4 Downstream Location

After studying the hydrological data of downstream M/s Nectar Lifesciences Unit-II, Village Haibatpur was selected for the purpose of downstream analysis. It has been observed from Table 13 that all the physico-chemical parameters are below the Drinking Water Standard (IS 10500) One sample each for groundwater and surface water was taken. Water quality analysis conducted at downstream points near the overhead tank in Haibatpur and Mr. Virender's house shows important observations against the established Drinking Water Standards (IS 10500). The pH values at both locations are within the permissible range of 6.5-8.5, with readings of 7.20 and 7.25, ensuring the water's neutrality and suitability for consumption. Total Suspended Solids (TSS) and Total Dissolved Solids (TDS) levels in both samples demonstrate adherence to standards, indicating relatively low concentrations of particulate matter.

Table 13 Physico-chemical characteristic of downstreams groundwater samples

Sr. No	Parameter	Unit	Drinking Water Standard (IS10500)	Result-Haibatpur near overhead tank (Downstream)	Result-Haibatpur Mr. Virender House (Downstream)
1	pH	---	6.5-8.5	7.20	7.25
2	Total Suspended Solids (TSS)	mg/l	—	13.2	14.6
3	Total Dissolved Solids (TDS)	mg/l	500	401	416
4	Chemical Oxygen Demand (COD)	mg/l	—	Not Detected	Not Detected
5	Biological Oxygen	mg/l	—	Not Detected	Not Detected

	demand (BOD)				
6	Dissolved Oxygen (DO)	mg/l	—	Not Detected	Not Detected
7	Ammoniacal Nitrogen	%	75	Not Detected	Not Detected
8	Bioassay	%	< 90%	Not Detected	Not Detected
9	Phosphate	mg/l	5	0.49	0.47
10	Sulphate	mg/l	–	191.0	184
11	Sulphide	mg/l	2	0.26	0.31
12	Phenolic compound as C_6H_5OH	mg/l	1	Not Detected	Not Detected
13	Zinc as Zn	mg/l	5	0.00	0.00
14	Copper as Cu	mg/l	3	0.00	0.00
15	Total Chromium as Cr	mg/l	2	Not Detected	Not Detected
16	Hexavalent Chromium	mg/l	0.1	Not Detected	Not Detected
17	Cyanide as CN	mg/l	0.1	Not Detected	Not Detected
18	Arsenic as As	mg/l	0.2	Not Detected	Not Detected
19	Mercury as Hg	mg/l	0.01	Not Detected	Not Detected
20	Lead as Pb	mg/l	0.1	Not Detected	Not Detected
21	SAR	mg/l	26	8.00	8.0
* Above the Drinking Water Standard (IS10500)					

CHAPTER 4

WATER SCHEME

4.1 WATER USAGE BREAKDOWN

In the pharmaceutical industry, utilities play a pivotal role as the unsung heroes behind the scenes, ensuring the seamless orchestration of various processes critical to drug development and manufacturing. These utilities, encompassing water, steam, electricity, and HVAC (Heating, Ventilation, and Air Conditioning), are the silent enablers that transform pharmaceutical innovations from concept to reality.

In the industry, there are four major water-intensive sections like Process, Utilities, SRP, and domestic needs.

4.1.1 PROCESS

In the manufacturing process of each Active Pharmaceutical Ingredient (API), water is essential across various sections, including condensation, filtration, hydrolysis, and Clean-in-Place (CIP). To determine the overall water requirement, it is required to establish the product-specific water needs. Material balances for each product were consulted to quantify these requirements, and the consequent details are provided in Table 14.

Table 14 Theoretical water consumption

S.N	Product	EC approved in MT/day	Water Req per kg (in lt)	Total process water req (KLD)
1	Cefixime	1.786	78.40	140.02
2	Cefuroxime Axetil Amorphous	1.65	53.91	88.95
3	Cefuroxime Axetil - Coated	0.007	7.00	0.049
4	Cefpodoxime Prox	0.01	99.35	0.99
5	Cefditoren pivoxil	0.0035	31.91	0.11
6	Cefdinir	0.05	72.00	3.60
7	Ceftriaxone Sodium	0.84	4.88	4.10
8	Cefotaxime Sodium	0.4	0.10	0.04
9	Cefepime injection	0.0577	0.00	0.00
10	Cefuroxime SS	0.02723	1.00	0.03
11	Cephalothin SS	0.05	38.06	1.90
12	Cefprozil	0.0005	3.08	0.00
13	Cefoxitin Sodium	0.001	0.00	0.00
14	Ceftaroline	0.00002	3.20	0.00
15	Cefcapene pivoxil	0.00002	20.00	0.00
16	Ceftazidime pentahydrate	0.015	6.17	0.09
17	Ceftibuten hydrate	0.02	129.23	2.58
18	Cefotiam HCl	0.015	6.17	0.09
19	Sodium carbonate	0.002	2.50	0.01
20	L-arginine	0.002	2.10	0.00
		4.93697		**242.57**
24	Menthol crystal	16.6	2.89	-
25	Menthol Flex	6.6		-
26	Menthol liquid products/derivatives	16.6		-
		39.8		
	Grand Total	**44.74**		

The material balances discussed in Chapter 2 are used for these calculations. The overall water requirement for manufacturing 44.74 Metric Tonnes Per Day (MTPD) of product amounts to 242.57 kiloliters (KL).

Additional water is required for Clean-in-Place (CIP) processes to uphold product quality. Consequently, the total freshwater requirement in the process section totals approximately 290 Kiloliters per day (KLD).

During the site inspection, water consumption data spanning six months (August 23 to January 24) was obtained from the industry. The primary objective was to establish correlations between the acquired data and the industry's declared theoretical water balance. This effort aimed to ensure alignment between the theoretical projections provided by the industry and the actual water consumption observed on-site.

Furthermore, production data for the corresponding six-month duration was also acquired. This information serves a critical role in correlating the theoretical data deduced from material balances with real-world process water consumption. Additionally, it facilitates the examination of High Total Dissolved Solids (HTDS) and Low Total Dissolved Solids (LTDS) wastewater generation data, providing insights into the efficiency and accuracy of the industry's water management practices.

By juxtaposing the theoretical water balance, production data, and wastewater generation metrics, this comprehensive approach allows for a thorough assessment of the industry's adherence to projected values, contributing to a more accurate understanding of water utilization in the operational processes.

The facility's process section generates two distinct wastewater streams: High Total Dissolved Solids (HTDS) effluent, characterized by elevated levels of Total Dissolved Solids (TDS) and Chemical Oxygen Demand (COD), and Low Total Dissolved Solids (LTDS) effluent, which exhibits relatively lower TDS and COD concentrations, totaling approximately 195 kiloliters per day (KLD) and 101 KLD, respectively. Additionally, the Solvent Recovery Plant contributes 20 KLD of HTDS effluent to the overall wastewater output.

Table 15 Actual water consumption in process Unit II & I

X- Max Qty as per EC in Kg/day, **Y**- Product removed, **A**- Average production (MT/day), **B**- Average water in /day (KLD), **C**- Average HTDS(KLD), **D**- Average LTDS(KLD)

Unit II

			August 2023				September 2023				October 2023				November 2023				December 2023				January 2024			
S. No.	Product	X	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1	Cefixime	1786.00	0.82	64.59	50.2	18.73	0.77	60.40	47.15	17.51	1.51	118.12	92.21	34.25	1.42	111.55	87.08	32.34	1.45	11345	88.56	32.89	1.45	113.8	88.83	32.99
2	Cefuroxime Axetil Amorphous	1650.00	0.62	33.0	19.4	16.2	0.75	40.0	23.8	20.7	0.62	33.0	19.6	16.2	0.67	36.18	21.0	18.3	0.68	36.7	21.1	18.68	0.68	36.43	21.5	18.45
3	Cefuroxime Axetil - Coated	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	[illegible]
4	Cefpodoxime Prox	10.00	0.02	1.88	0.63	1.33	0.00	0.00	0.00	0.00	0.01	1.30	0.44	0.92	0.01	0.53	0.18	0.38	0.00	0.45	0.15	0.32	0.00	0.00	0.00	0.00
5	Cefditoren pivoxil	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Cefdinir	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	2.51	2.64	0.14	0.02	1.37	1.44	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Ceftriaxone Sodium	840.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.76	0.94	0.48	0.08	0.41	0.51	0.26	0.16	0.77	0.96	0.49
8	Cefotaxime Sodium	400.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Cefepime injection	57.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Cefuroxime SS	27.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Cephalothin SS	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	Cefazolin Sodium	Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Cefprozil	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	Cefoxitin Sodium	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

15	Ceftiofur	Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	Ceftaroline	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	Metformine HCl	Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	Cefcapene pivoxil	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	Ceftazidime pentahydrate	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Ceftibuten hydrate	20.00	0.00	0.00	0.00	0.00	0.02	2.09	2.51	1.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	2.73	3.29	2.11
21	Cefotiam HCl	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	Sodium carbonate	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.00
23	L-arginine	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.13	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		4936.97	1.46	99.68	70.7	36.88	1.53	102.6	73.45	39.49	2.23	155.33	115.0	52.22	2.35	150.52	111.2	51.60	2.22	151.1	111.0	52.15	2.33	153.7	114.6	54.05
24	Methol crystal	16600.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	Menthol Flex	6600.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	
26	Menthol liquid products/derivatives	16600.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0

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Unit I

S. No.	Product	X	August 2023				September 2023				October 2023				November 2023				December 2023				January 2024			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1	Cefixime Trihydrate	0.007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Cefuroxime Axetil	0.005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Cefpodoxime Prox	0.858	0.96	67.6	26.0	44.1	0.92	64.7	24.9	42.2	0.10	70.1	27	46	1.0	69.8	26.8	45.5	1.0	71.7	27.6	46.8	1.01	70.8	27.	46.1
4	Cefditoren Pivoxil	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Cefdinir	0.0105	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Ceftriaxone Sodium	0.480	0.36	1.47	1.5	1.2	0.36	1.5	1.5	1.2	0.22	0.9	0.9	0.7	0.2	0.48	0.48	0.4	0.3	1.4	1.39	1.13	0.2	0.82	0.83	0.67
7	Cefotaxime Sodium	0.200	0.06	0.6	0.35	0.3	0.12	1.4	0.8	0.66	0.11	1.2	0.7	0.6	0.07	0.83	0.46	0.4	0.18	2.1	1.17	1.01	0.15	1.65	0.92	0.79
8	Cefepime	0.0064	0.0	0.00	0.0	0.0	0.00	0.0	0.0	0.0	0.04	0.0	0.0	0.0	0.04	0.0	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.00	0.0	0.0
9	Cefuroxime SS	0.0641	0.0	0.00	0.0	0.0	0.08	0.05	0.06	0.59	0.08	0.05	0.1	0.6	0.07	0.05	0.06	0.57	0.0	0.0	0.0	0.0	0.03	0.023	0.03	0.26
10	Cephalothin Sodium	0.016	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	Cefazolin Sodium	0.064	0.0	0.0	0.0	0.0	0.02	0.03	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Cefprozil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.	0.0	0.0	0.0	0.0	0.0
13	Pipera+Tazo	0.45	0.21	0.46	0.0	0.7	0.1	0.21	0.0	0.31	0.08	0.2	0.0	0.1	0.1	0.12	0.0	0.18	0.06	0.14	0.00	0.22	0.1	0.21	0.0	0.31
14	Tazobactam SS	0.041	0.01	0.05	0.0	0.08	0.01	0.1	0.0	0.07	0.0	0.0	0.0	0.0	0.04	0.17	0.0	0.2	0.01	0.052	0.00	0.07	0.01	0.03	0.0	0.04
15	Meropenem	0.030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.004	0.04	0.05	0.025
16	Doripenem	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	Imipenem	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	Cloxacillin Sodium	0.052	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

19	Dicloxacillin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	Sulbactum Sodium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	Pantoprazole	0.010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	Ampicillin Sodium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	Ceftiofur Sodium	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	Omeprazole Sodium	0.010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	Cefpirome injection	0.0087	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	Sodium carbonate	0.002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	L-Arginine	0.0026	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.13	0.13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	Chloramphenicol	0.050	0.03	0.67	0.65	0.48	0.01	0.2	0.23	0.17	0.11	2.7	2.6	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04	1.03	1.01	0.75
29	Ceftibuten intermediate	0.0652	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04	3.7	4.3	2.51	0.03	2.9	3.39	1.98	0.04	3.61	4.22	2.47	0.0	0.0	0.0	0.0
30	Ceftazidime pentahydrate	0.050	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	Rabeprazole	0.010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	2.49	1.63	70.9	28.5	46.8	1.61	68.1	27.4	45.2	1.68	78.8	36	52	1.48	74.4	31.4	49.2	1.71	79.0	34.4	51.7	1.53	74.6	30	49

4.1.2 BOILER

A boiler serves as a critical component in various industrial and residential applications, playing a pivotal role in the generation of steam or hot water for heating, power generation, and industrial processes. The boiler functions by converting water into steam through the application of heat, utilizing diverse fuel sources such as rice husk and furnace oil. The efficiency and reliability of a boiler hold paramount significance, as they directly impact energy consumption and overall operational effectiveness.

M/s Nectar Lifesciences Derabassi Unit II is equipped with four boilers, and detailed information regarding these boilers is provided in Table 16. Effluents resulting from boiler blowdown (68 KLD) fall into the LTDS category.

Table 16 Boilers Detail

Unit-II	Capacity (TPH)	Status	Fuel (Capacity)	Blowdown	APCD
Boiler-1	40	Operational	Rice Husk (~210TPD)	34 Kl	ESP
Boiler-2	40	Operational	Rice Husk (~210TPD)	34 KL	ESP
Boiler-3	1.5	Not in operation	Furnace oil (0.75TPD)	NA	NA
Boiler-4	25	Stand By	Rice Husk	0 KL	Bag House

4.1.3 COOLING TOWERS

Cooling towers are essential components in industrial processes requiring heat dissipation. They play a crucial role in expelling excess heat generated during industrial operations, facilitating optimal machinery and equipment performance. As warm water circulates through the tower, a portion undergoes evaporation, carrying away heat and leaving cooler water for recirculation. This mechanism maintains thermal equilibrium, preventing industrial system overheating. The design and efficiency of cooling towers significantly impact energy consumption and environmental sustainability in industrial processes. Modern cooling towers, leveraging technological advancements, prioritize enhanced efficiency, reduced water usage, and adherence to environmental standards.

The cooling tower section in M/s Nectar Lifesciences Unit-2 is particularly water-intensive. At peak load, cooling towers installed with process section, the power plant, and Multiple Effect Evaporator cumulatively require 1099 KL of water. Subsequently, this operation results in substantial evaporation losses, with approximately 796 KL per day. Specifics regarding RO permeate water consumption for each of the 17 cooling towers are provided in the consumption details.

Table 17 Cooling Tower Detail

<table>
<tr><th rowspan="2">Sr. No.</th><th rowspan="2">Unit-II</th><th>Capacity</th><th rowspan="2">Status</th><th colspan="2">Feed Quantity</th><th colspan="2">Blowdown Quantity</th></tr>
<tr><th>(TR)</th><th>EMF Tag No.</th><th>(KLD)</th><th>EMF Tag No.</th><th>(KLD)</th></tr>
<tr><td>1</td><td>Cooling Tower-1</td><td>1050</td><td>Operational</td><td>FM-01</td><td>61.2</td><td>BDM-01</td><td>21</td></tr>
<tr><td>2</td><td>Cooling Tower-2</td><td>450</td><td>Operational</td><td>FM-02</td><td>23.5</td><td>BDM-01</td><td>12</td></tr>
<tr><td>3</td><td>Cooling Tower-3</td><td>1800</td><td>Operational</td><td>FM-03</td><td>137.5</td><td>BDM-02</td><td>47</td></tr>
<tr><td>4</td><td>Cooling Tower-4</td><td>1050</td><td>Operational</td><td rowspan="3">FM-04</td><td rowspan="3">98.2</td><td rowspan="5">BDM-03</td><td rowspan="5">97</td></tr>
<tr><td>5</td><td>Cooling Tower-5</td><td>450</td><td>Operational</td></tr>
<tr><td>6</td><td>Cooling Tower-6</td><td>450</td><td>Operational</td></tr>
<tr><td>7</td><td>Cooling Tower-7</td><td>3600</td><td>Operational</td><td>FM-05</td><td>126.7</td></tr>
<tr><td>8</td><td>Cooling Tower-8</td><td>3600</td><td>Operational</td><td>FM-06</td><td>96.8</td></tr>
<tr><td>9</td><td>Cooling Tower-9</td><td>600</td><td>Operational</td><td>FM-07</td><td>27.8</td><td>BDM-02</td><td>7.2</td></tr>
<tr><td>10</td><td>Cooling Tower-10</td><td>600</td><td>Operational</td><td>FM-08</td><td>71.3</td><td>BDM-04</td><td>29</td></tr>
</table>

11	Cooling Tower-11	600	Operational				
12	Cooling Tower-12	600	Operational				
13	Cooling Tower-13	450	Operational	FM-09	20.6	BDM-05	21.4
14	Cooling Tower-14	450	Operational				
15	Cooling Tower-15	450	Operational				
16	MEE Cooling Tower-1	1050	Operational	FM-11	53.9		18
17	Cooling Tower with Powerplant	1800	Operational	FM-12	385		10

A significant proportion of the water required for cooling towers is obtained from recycled Reverse Osmosis (RO) permeate, integrated after the Effluent Treatment Plant (ETP). It was observed that the feed to 15 cooling towers installed in the process sections and the cooling tower associated with the Multiple Effect Evaporator (MEE) is supplied with RO treated water, whereas the cooling tower installed with the power plant receives fresh water. The cooling tower at the power plant, due to its higher operating temperatures, experiences evaporative losses exceeding 95%, while other cooling towers exhibit approximately 60% evaporative losses.

The monitoring of water distribution and consumption patterns across different cooling towers at M/s Nectar Lifesciences Ltd. Unit-II was lacking, despite the recording of the total generated Reverse Osmosis (RO) permeate. Upon initial visits, the audit team directed the industry to install water meters across all cooling towers. This instruction aimed to facilitate a comprehensive understanding of the distribution of treated water among the cooling towers, ensuring a more detailed and accountable water management system. Below table shows 10 day data of RO permeate reused in the cooling towers attached in annexure VI.

Table 18 Cooling tower water consumption

Date	Total (KL)
22-Jan-2024	733
23-Jan-2024	743
24-Jan-2024	731
25-Jan-2024	685
26-Jan-2024	718
27-Jan-2024	724
28-Jan-2024	683
29-Jan-2024	663
30-Jan-2024	793
31-Jan-2024	702

Furthermore, approximately 253 kiloliters (KL) of blowdown is produced from the cooling towers. As this constitutes effluent, it is directed to the Effluent Treatment Plant (ETP) for necessary treatment. Given its low Total Dissolved Solids (TDS) content, it is amalgamated with the Low Total Dissolved Solids (LTDS) stream and subsequently sent directly to the ETP. The TDS levels at the blowdown pipelines of each cooling tower were measured during the visit on 02/02/2024 using handheld instruments to ensure accurate monitoring. The table below presents the results for the recorded TDS values.

Table 19 Onsite cooling tower TDS results

S. No.	Name of cooling tower	Location	Tag No.	TDS(mg/l)
1	Main Utility Cooling Tower	Near Canteen	ERCTR-01	660
2	Cooling Tower FRP	Near Canteen	ERCTR-02	690
3	Cooling Tower	Near Project Office	ERCTR-18,19	520
4	SRP-A Cooling Tower	Near SRP-A	ERCTR-20,21	685
5	Cooling Tower FRP	Behind SRP-A C.T	ERCTR-06	410
6	Cooling Tower FRP	Behind SRP-A C.T	ERCTR-07	481
7	SRP-B Cooling Tower	Behind SRP-B	ERCTR-10,11,1, 2&13	658
8	Sterile Utility Cooling Tower	Sterile Utility	ERCTR-14,15,16 &17	530
9	Cooling Tower	Near AVAM-14		863
10	SRP-C Cooling Tower	Behind SRP-C	ERCTR-03,04	1554
11	Cooling Tower FRP	On SRP-C Terrace	SVCT-01	Fins Change
12	Cooling Tower FRP	On SRP-C Terrace	SVCT-02	1295
13	Cooling Tower FRP	Unit-9 DMF Plant	MNCTR-901	400
14	Cooling Tower FRP	Unit-9 DMF Plant	MNCTR-902	320
15	Cooling Tower FRP	Unit-9 DMF Plant	MNCTR-903	330

16	Cooling Tower	Behind Power Plant	PPCTR-01	615
17	Cooling Tower FRP	In ETP	CTR-01	590
18	Cooling Tower FRP	In ETP	CTR-01	621
19	Cooling Tower FRP	In ETP	CTR-01	650
20	Cooling Tower FRP	In ETP	CTR-01	610

The average Total Dissolved Solids (TDS) value of all blowdown streams from the cooling towers is approximately 657 mg/l. This suggests that there may be room for improvement in the operational optimization of the cooling towers, presenting an opportunity for water conservation. Optimizing the cooling towers could potentially reduce the volumetric load on the effluent treatment plant, contributing to overall water efficiency and resource management within the facility.

4.1.4 REVERSE OSMOSIS PLANTS (RO)

Reverse Osmosis (RO) plants play a crucial role in industrial settings, serving as integral components in water treatment and purification processes. These systems utilize the principle of reverse osmosis to remove impurities, contaminants, and dissolved solids from water, producing high-quality, clean water suitable for various industrial applications. The RO plant in an industry acts as a reliable barrier, effectively filtering out unwanted substances, such as salts, minerals, and pollutants, which could otherwise compromise the integrity of industrial processes or impact the quality of end products. Overall, RO plants stand as indispensable assets in industrial operations, promoting resource conservation and ensuring a dependable supply of purified water for diverse manufacturing needs. There are 7 RO plants in M/s Nectar Lifesciences Derabassi Unit II, details of RO plants are given below in table 20.

Table 20 Process RO detail

Unit-II	Capacity	Site of Installation	Status	Quantity of Permeate Water (KLD)	Quantity of RO Reject (KLD)	Total
RO Plant-1	35(KL/Hr)	Power Plant	Operational	138	59	197
RO Plant-2	35(KL/Hr)	Power Plant	Stand by	–	–	–
RO Plant-3	15(KL/Hr)	Oral H plant	Operational	113.9	52.4	166.3
RO Plant-4	05(KL/Hr)	Sterile plant	Operational	63.3	29	92.3
RO Plant-5	05(KL/Hr)	Power Plant	Non-operational	--	--	--
RO Plant-6	03(KL/Hr)	Oral C plant-1	Operational	40.6	18.6	59.2
RO Plant-7	03(KL/Hr)	Oral C plant-2	Operational	72.24	33.13	105.37
				428.0	**192.13**	**620.17**

In utility sections, reject streams from Reverse Osmosis (RO) plants assigned to the boiler and process sections collectively contribute to the Low Total Dissolved Solids (LTDS) category and is sent to ETP for treatment.

4.1.5 SOLVENT RECOVERY PROCESS

Within M/s Nectar Lifesciences Ltd. Unit II, the Solvent Recovery Plant (SRP) is instrumental in reclaiming solvents used in various manufacturing processes. This recovery process, while economically and environmentally beneficial, leads to the generation of wastewater. The industry consumes 20 KLD (Kiloliters per day) of freshwater, and the subsequent solvent recovery in the SRP results in the generation of an equivalent 20 KLD of wastewater.

The wastewater from the SRP requires diligent examination to assess its characteristics, including composition and potential contaminants. This information is pivotal for optimizing the performance of the Effluent Treatment Plant (ETP) and ensuring compliance with environmental regulations. Additionally, the efficiency of the ETP in treating the solvent-laden wastewater should be evaluated to confirm that the discharged water meets necessary quality standards for safe disposal or reuse.

This concise assessment underlines the importance of addressing wastewater generation in the Solvent Recovery Plant, contributing to improved water management and environmental responsibility within the pharmaceutical manufacturing facility.

4.2 WATER BALANCE

The overarching water balance is graphically represented in Figure 19, providing a comprehensive breakdown of the distribution of fresh water-consuming streams, wastewater-generating streams, and recycling streams. This water balance underwent meticulous scrutiny through an extensive examination of secondary data, employing a diverse array of metering and monitoring devices, including ultrasonic flow meters and water testing methodologies. Precise water flow measurements were executed at both intake and discharge points using ultrasonic flow meters. These measurements underwent thorough verification against the operational capacities of relevant pumps and equipment to precisely assess consumptions in various areas and equipment within the plant. In instances where scaling affected pipeline conditions, making ultrasonic flow meter measurements impractical, alternative methodologies were applied. These included indirect techniques such as bucket and stopwatch measurements, line size and design velocity assessments, and flow meter measurements provided by the plant team. Figure 17 and 18 showcase the instruments and gadgets employed for these meticulous flow measurements.

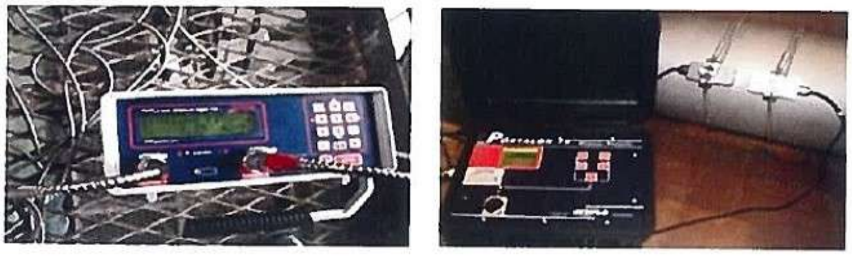


Figure 17 Ultrasonic flow meter

Figure 18 Bucket and Stopwatch flow measure

WATER BALANCE,

Nectar Life Sciences Ltd., Unit-II

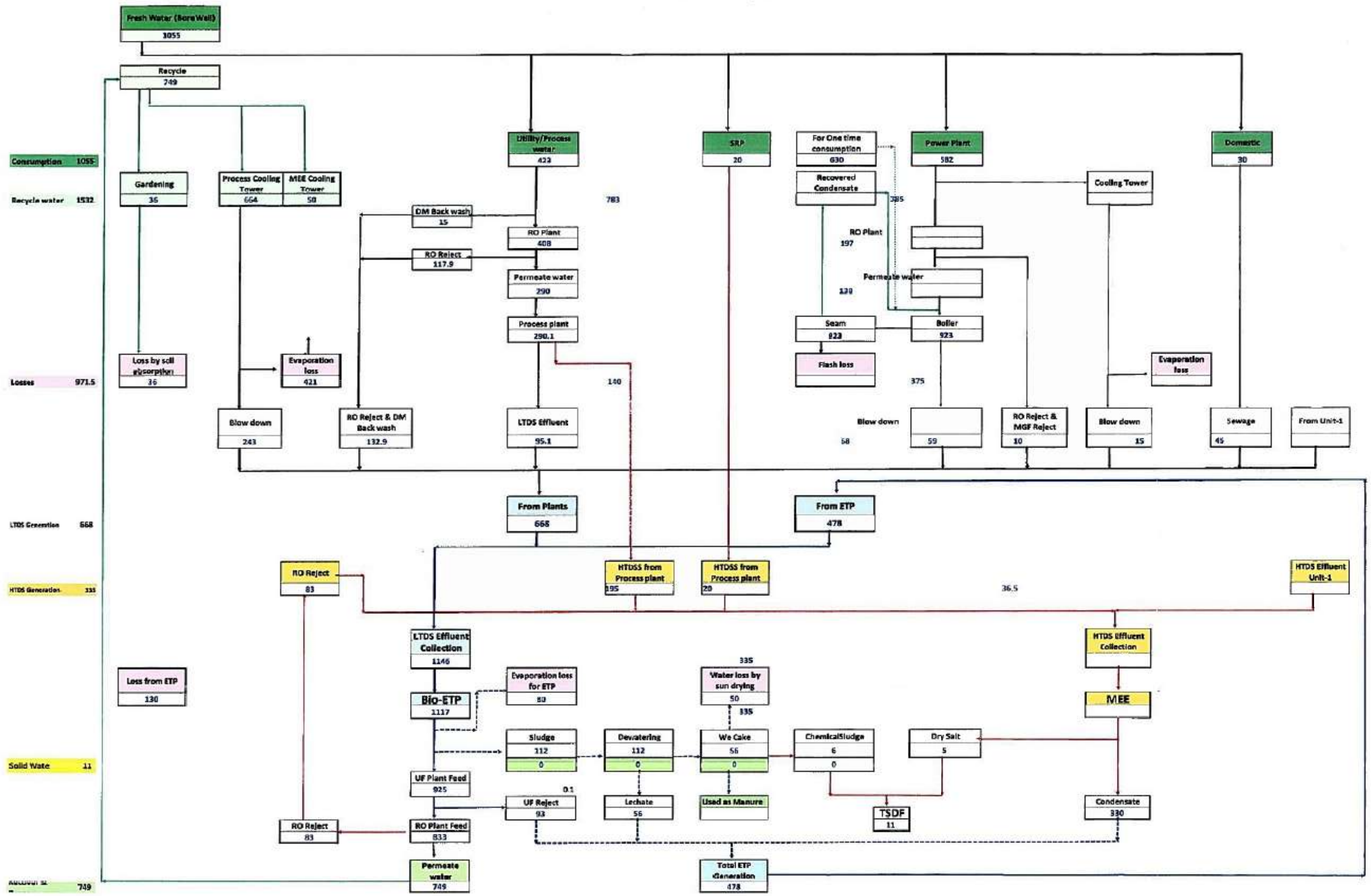


Figure 19 Water Balance

CHAPTER 5

WASTE WATER GENERATION

The process section of the facility generates two distinct wastewater streams: High Total Dissolved Solids (HTDS) effluent characterized by high concentrations of Total Dissolved Solids (TDS) and Chemical Oxygen Demand (COD), and Low Total Dissolved Solids (LTDS) effluent with relatively lower TDS and COD levels, amounting to approximately 195 KLD and 101 KLD, respectively. Additionally, the Solvent Recovery Plant contributes 20 KLD of HTDS effluent.

Within the utility operations, reject streams from Reverse Osmosis (RO) plants dedicated to the boiler and process sections collectively contribute to the LTDS category, with quantities of 59 KLD and 130 KLD, respectively. Effluents resulting from blowdown in the boiler (68 KLD) and cooling tower discharges (180 KLD) also contribute to the LTDS category. All LTDS streams are systematically collected and directed to the Effluent Treatment Plant (ETP), while the HTDS stream undergoes treatment in the Multiple Effect Evaporator (MEE) followed by the Agitated Thin Film Dryer (ATFD).

The collaboration between M/s Nectar Lifesciences Ltd. Unit-II and its sister concern, M/s Nectar Lifesciences Ltd. Unit-I, under the necessary permissions from the Punjab Pollution Control Board (PPCB), involves the transfer of LTDS and HTDS streams from Unit-I to Unit-II.

The entire spectrum of wastewater generated undergoes effective treatment in the ETP, followed by a comprehensive 3-stage Reverse Osmosis (RO) process. This meticulous treatment sequence ensures that the discharged water achieves the requisite quality standards for safe reuse as makeup water in the cooling towers, underscoring the facility's commitment to sustainable water management practices.

5.1 WASTEWATER MANAGEMENT AND RECYCLING

The facility's process section generates two distinct wastewater streams: Low Total Dissolved Solids (LTDS) effluent and High Total Dissolved Solids (HTDS) effluent. In utility operations, reject streams from Reverse Osmosis (RO) plants dedicated to the boiler and process sections contribute collectively to the LTDS category. Effluents resulting from blowdown in the boiler and cooling tower discharges also contribute to the LTDS category. All LTDS streams are systematically collected and directed to the Effluent Treatment Plant (ETP), while the HTDS stream undergoes treatment in the Multiple Effect Evaporator (MEE) followed by the Agitated Thin Film Dryer (ATFD). The LTDS and HTDS streams from sister concern unit M/s Nector Life Sciences Unit-I are also treated at the facility of M/s Nectar Lifesciences Ltd. Unit-2. The entire wastewater spectrum undergoes effective treatment in the ETP, followed by a comprehensive 3-stage Reverse Osmosis (RO) process, ensuring compliance with requisite quality standards for safe reuse as makeup water in the cooling towers, emphasising the facility's commitment to sustainable water management practices.

During the industry visit, it was noted that the facility has installed an Effluent Treatment Plant (ETP) with a capacity of 1500 KLD to treat low TDS wastewater. The components include one collection tank-1 (Low TDS), one Oil and Grease trap, two Equalization tanks, three Primary Aerations, one Primary Tube Settler, two Secondary Aerations, one Secondary Tube Settler, two Sand and Activated carbon filters, one UF and RO Plant with capacity of 1500 KLD each, two Sludge drying beds, and one Decanter.

Furthermore, the industry has installed two Multiple Effect Evaporators (MEE) with capacities of 350 KLD and 90 KLD, respectively, at their premises. However, only the MEE with a capacity of 350 KLD is currently in operation, attributed to demand constraints. The operating MEE of 350 KLD capacity is employed to treat high TDS wastewater, comprising a pre-heater, stripper, four Calandria in series, condensate collection tank, concentrate collection tank, and solvent stripper for neutralization.

The output liquid stream from the bottom of the Stripper Column enters the evaporator for concentration. The evaporator, a long tube forced circulation type, utilizes the first hot Thermic oil to evaporate the effluent. The evaporated water, in the form of steam at 4.5 kg/cm2 g pressure, is employed for evaporating the effluent in the second, third, and fourth stages at atmospheric pressure. The evaporated water from the fourth stage is then condensed in the steam condenser using cooling water. The condensate is collected in receiving tanks and recycled into plant utilities. The concentrate from MEE undergoes further treatment in the ATFD, and the resulting solid/semi-solid material is collected for disposal to a common Treatment, Storage, and Disposal Facility (TSDF).

5.2 ENGINEERING AND PROCESS SPECIFICATIONS OF ETP

The ETP is designed to handle 1500 KLD of low TDS stream waste water. The wastewater treatment system comprised of following units;

Table 21 Dimensional detail of ETP

Section	Dimensions	Net Operating Volume	Material of Construction	Retention Period
Oil and grease trap	7000 x 8000 mm	224 KL	RCC	
Equalization tank-1	21000 x 8000 mm	672 KL	RCC	10.75 hrs
Equaliation tank-2	21000 x 8000 mm	672 KL	Rcc	10.75 hrs
Pre-primary clarifier	8000 mm dia	242 KL	RCC	3.87 hrs
Pre-aeration tank	14000 x 18000 mm	1474.2 KL	RCC	23.58
Aeration tank-1	14000 x 28000 mm	2214.8 KL	RCC	35.43 hrs
Secondary clarifier-1	8000 mm dia	235.6 KL	RCC	3.76 hrs
Aeration tank-1	22000 x 28000 mm	3819.2 KL	RCC	61.10 hrs
Secondary clarifier-2	8000 mm dia	251.2 KL	RCC	4.01 hrs
Post equalization tank-1	17625 x 7000 mm	493.5 KL	Rcc	7.89 hrs
Post equalization tank-2	17625 x 7000 mm	493.5 KL	RCC	7.89 hrs
Post-primary clarifier	8000 mm dia	251.2 KL	RCC	4.01 hrs
MGF feed tank (multi-grade filter)	8000 x 3500 mm	112 KL	RCC	1.79 hrs
Treated water tank	17625 x 7000 mm	523.6 KL	RCC	8.37 hrs

5.2.1 TREATMENT SCHEME

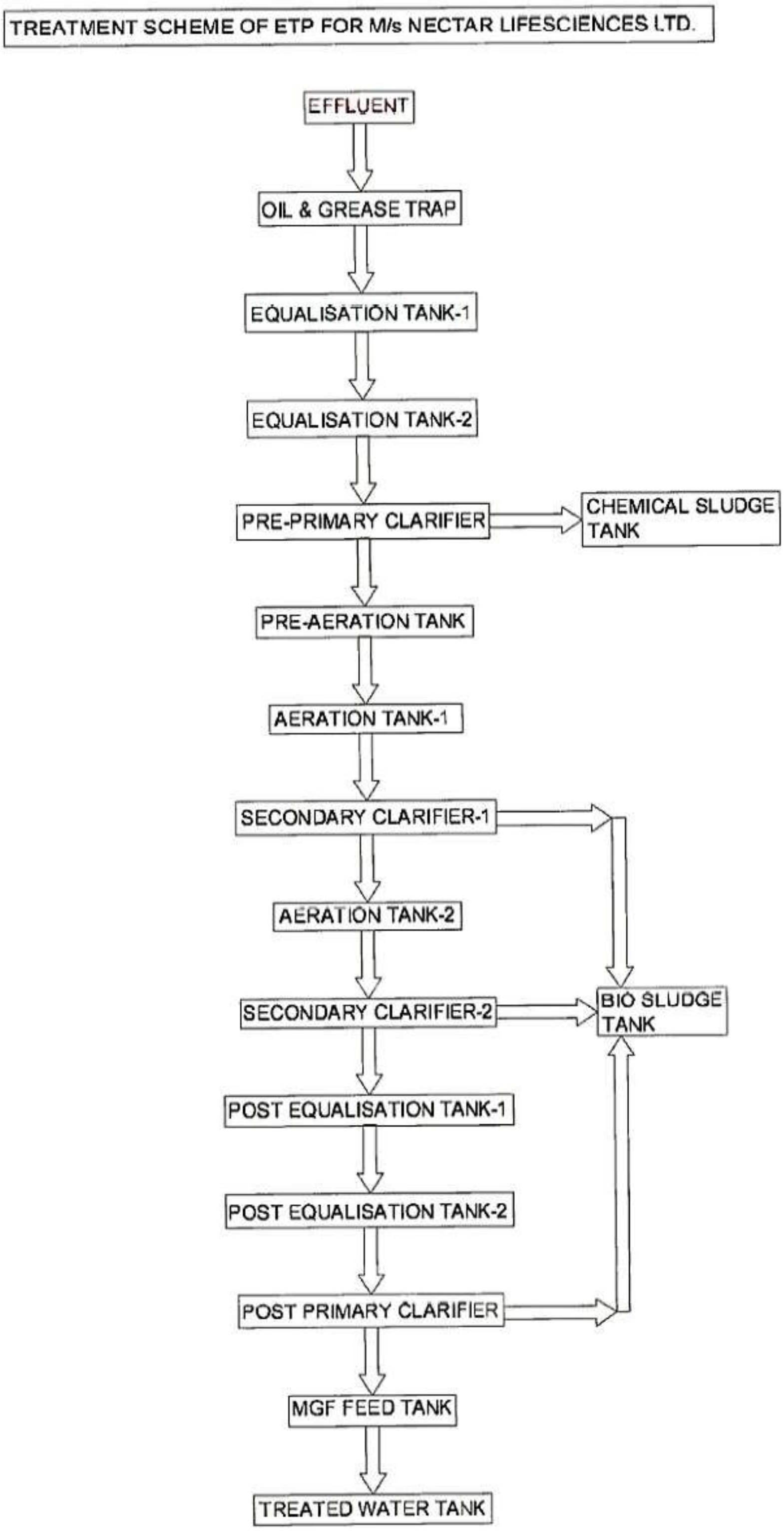


Figure 20 Treatment scheme

5.2.2 SEGMENTED ASSESSMENT OF ETP EFFLUENT QUALITY

The assessment of wastewater quality at Nectar Lifesciences Ltd., Derabassi Unit II, is a critical aspect of environmental management, ensuring compliance with regulatory standards and promoting responsible industrial practices. To comprehensively evaluate the wastewater characteristics, a systematic sampling approach was employed, collecting ten samples from various strategic points within the facility. These sampling locations were strategically chosen to represent different stages of the industrial processes, allowing for a thorough analysis of the effluent's composition. The collected samples will undergo a series of tests to measure parameters such as pH, biochemical oxygen demand (BOD), chemical oxygen demand (COD), suspended solids, and other relevant indicators. The results of this analysis will provide valuable insights into the impact of industrial activities on water quality and assist in formulating effective wastewater treatment strategies. Nectar Lifesciences Ltd. remains committed to environmental stewardship, and this proactive approach to monitoring and managing wastewater quality underscores the company's dedication to sustainable and responsible manufacturing practices. The findings from these samples will contribute to ongoing efforts to enhance environmental performance, safeguarding the surrounding ecosystems and communities. The sampling points to collect wastewater at Nectar Lifesciences Ltd. Derabassi Unit II is given in Table No. 22

Table 22 Wastewater sampling Points

S.No.	Wastewater Sampling Points
1	Equalization Tank
2	UF Inlet
3	ETP Final RO Reject
4	ETP Final RO Permeable
5	MEE Inlet (Feed Tank)
6	MEE Condence
7	Pre aeration Outlet
8	Aeration 1(Clarifire 1 Outlet)
9	Aeration 2(Clarifire 2 Outlet)

Figure 21 Equalization Tank & UF Feed

Figure 22 ETP final RO Reject & Permeable

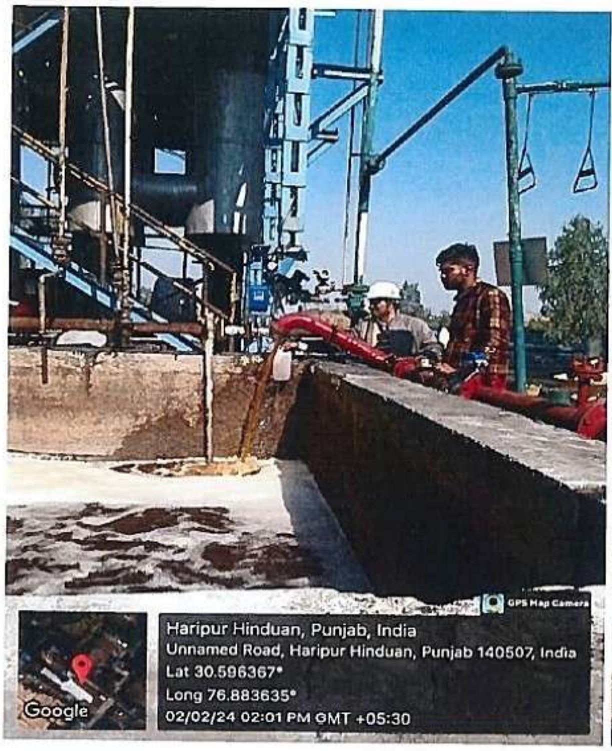


Figure 23 MEE Inlet(feed tank) & MEE condensate

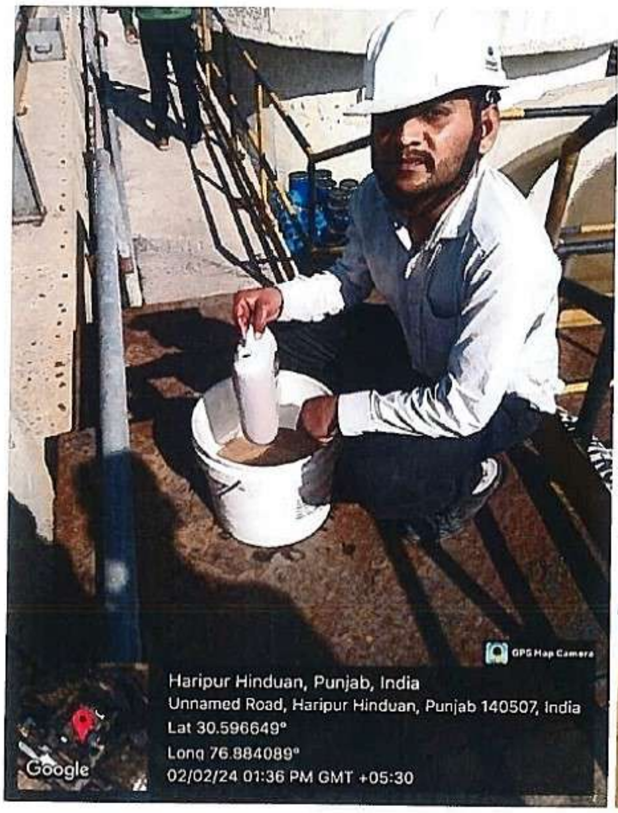


Figure 24 Aeration 1 & 2 (Clarifier 1 & 2 outlet)

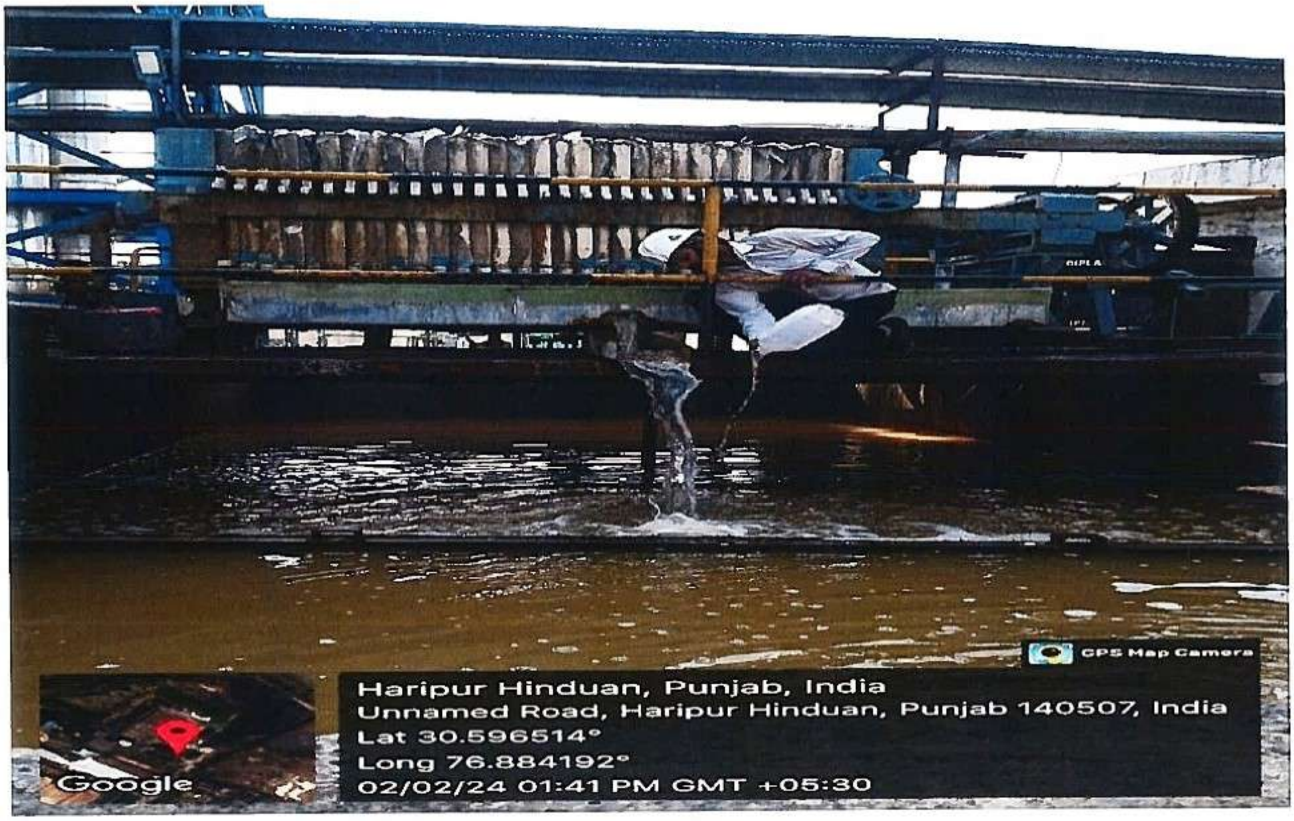


Figure 25 Pre Aeration outlet

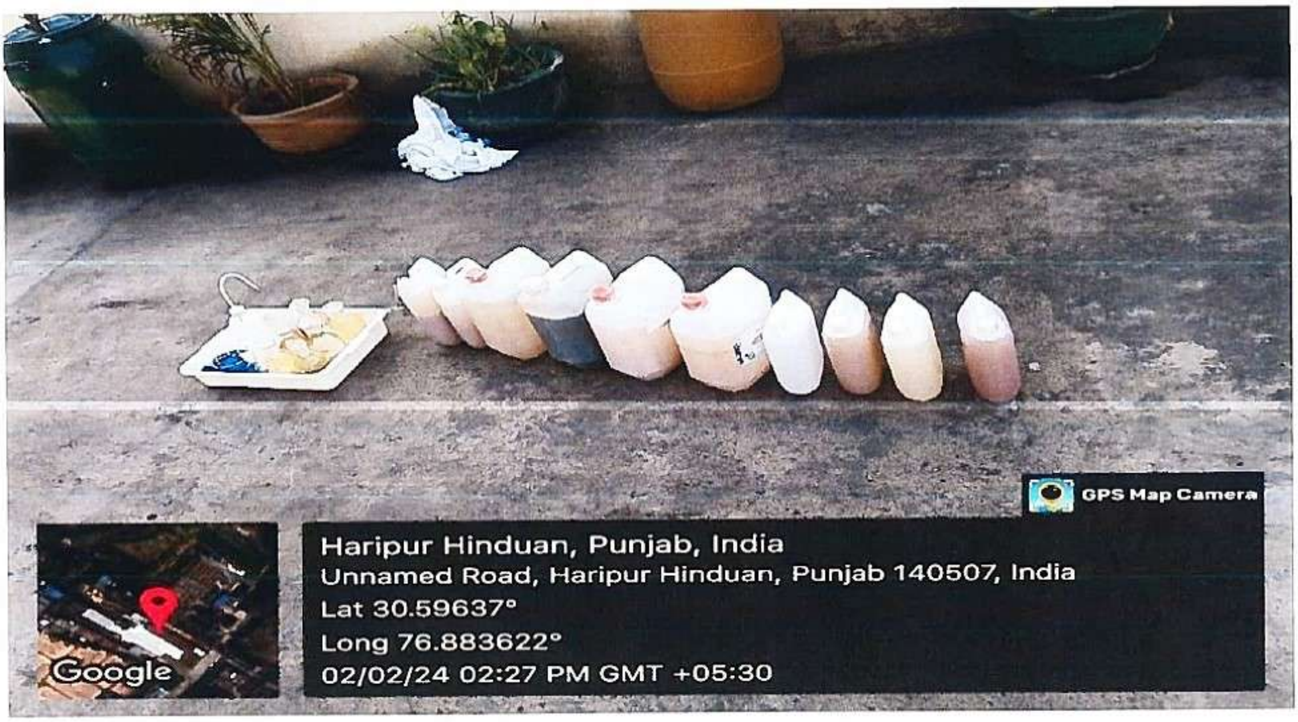


Figure 26 Wastewater samples collected from different points at M/s Nectar Lifesciences unit II

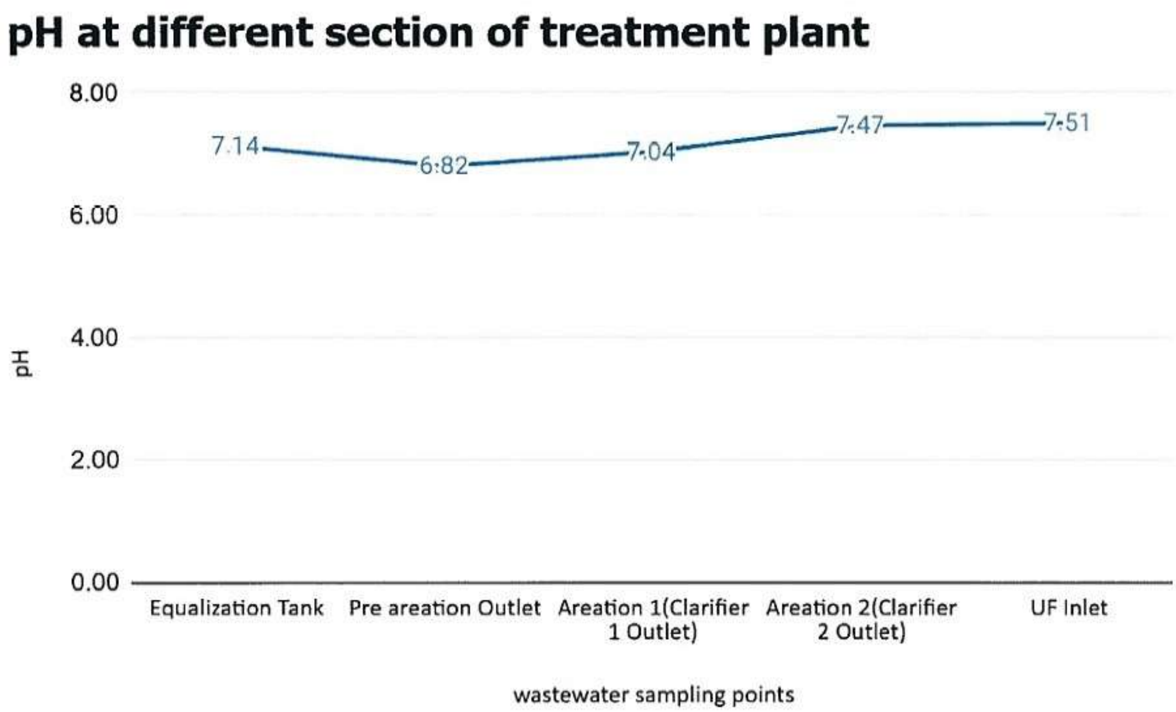
The conducted analysis of various physico-chemical parameters at different treatment stages within the wastewater treatment plant provides a comprehensive understanding of the treatment efficiency and the quality of the effluent. Table 23 shows results for various parameters at different locations as discussed above.

Table 23 Physico-chemical characteristic of wastewater collected from different points of ETP

Sr. No	Parameter	Unit	Equalization Tank	Pre-Aeration Outlet	Aeration 1 (Clarifier-1 Outlet)	Aeration 2 (Clarifier-2 Outlet)	UF Inlet
1	pH	---	7.14	6.82	7.04	7.47	7.51
2	Total Suspended Solids (TSS)	mg/l	4630	3780	1278	659	459
3	Total dissolved Solid (TDS)	mg/l	3898	3580	3550	3540	3540
4	Chemical Oxygen Demand (COD)	mg/l	3789.0	2975.0	1157.0	661.0	437.0
5	Biological Oxygen demand (BOD)	mg/l	1659.0	1254.00	480.00	260.00	120.00
7	Ammoniacal Nitrogen	%	110.00	102	95	92	90
8	Bioassay	%	NA	NA	NA	NA	< 90%
9	Phosphate as P	mg/l	44.3	40	20.0	8.0	4.90
10	Sulphide	mg/l	4.02	3.78	2.67	99.0	1.90
11	Phenolic compound	mg/l	ND	ND	ND	ND	ND
12	Zinc	mg/l	0.174	0.147	0.088	0.039	0.007
13	Copper	mg/l	ND	ND	ND	ND	ND
14	Total Chromium	mg/l	ND	ND	ND	ND	ND
15	Hexavalent Chromium	mg/l	ND	ND	ND	ND	ND
16	Cyanide as (HCN)	mg/l	ND	ND	ND	ND	ND
17	Arsenic	mg/l	ND	ND	ND	ND	ND

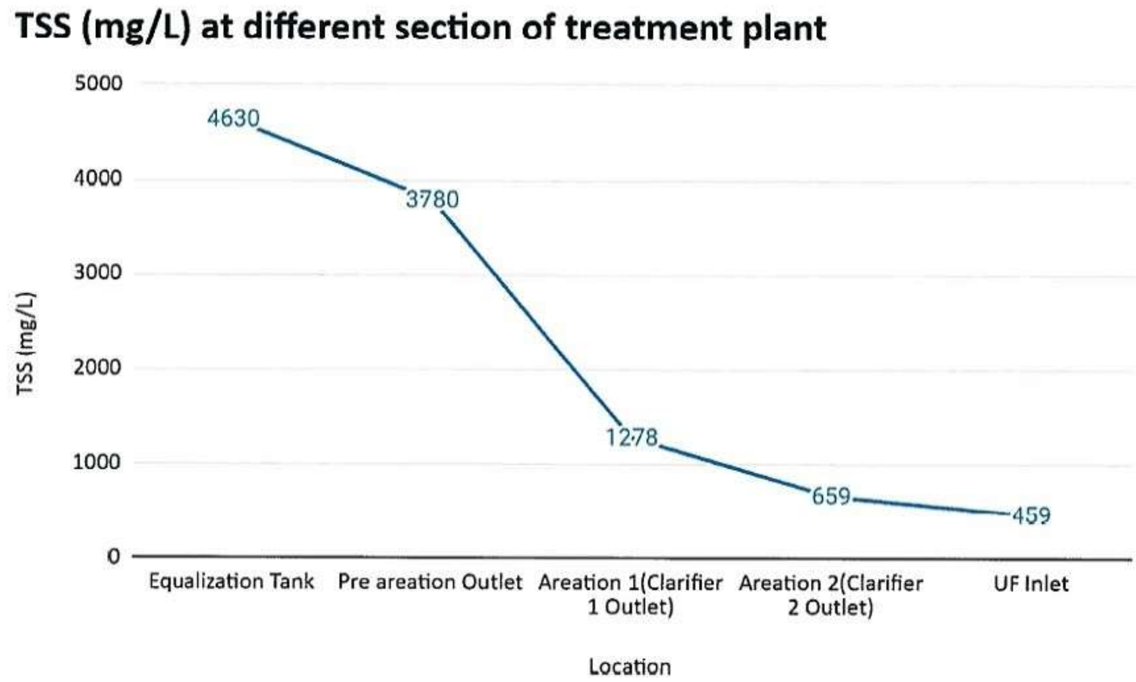
18	Mercury	mg/l	ND	ND	ND	ND	ND
19	Lead	mg/l	ND	ND	ND	ND	ND
20	MLSS	mg/l	—	—	2500	4200	—
21	MLVSS	mg/l	—	—	1400	2000	—
22	SAR	mg/l	1094.00	167	98.0	35.0	965.00

The pH levels throughout the treatment process, ranging from the equalization tank to the ultrafiltration (UF) inlet, are consistently down within the recommended range of 6.5 to 8.5. Variations in pH are observed, with values ranging from 6.82 in the pre-aeration outlet to 7.51 at the UF inlet shown in graph 2, reflecting the dynamic nature of the treatment stages.

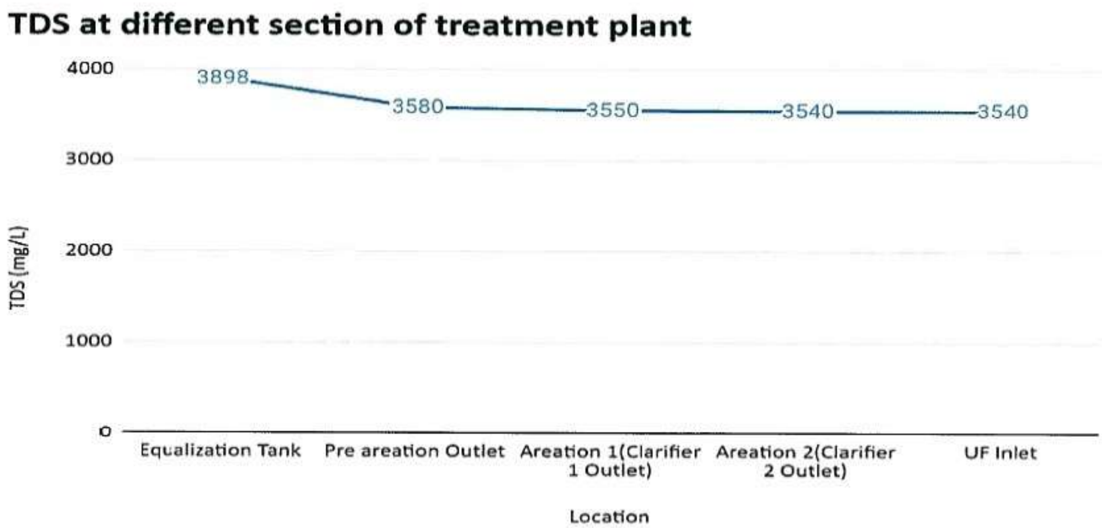


Graph 2 pH Analysis at different sections of ETP

Total Suspended Solids (TSS) concentrations exhibit a reduction across the treatment stages, decreasing from 4630 mg/l in the equalization tank to 459 mg/l at the UF inlet (graph 3). Similarly, Total Dissolved Solids (TDS) concentrations decrease from 3898 mg/l in the equalization tank to 3540 mg/l at both Aeration 2 (Clarifier 2 outlet) and UF inlet shown in graph 4, indicating effective removal of dissolved constituents during the treatment process. TSS levels decreased by approximately 90.1%, while TDS concentrations were reduced by around 9.1%. These findings are in line with expectations.

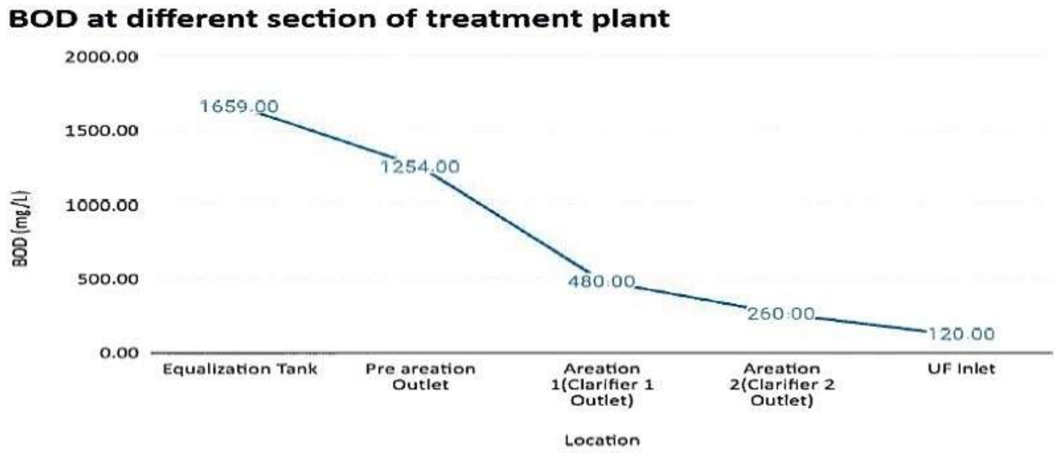


Graph 3 TSS Analysis

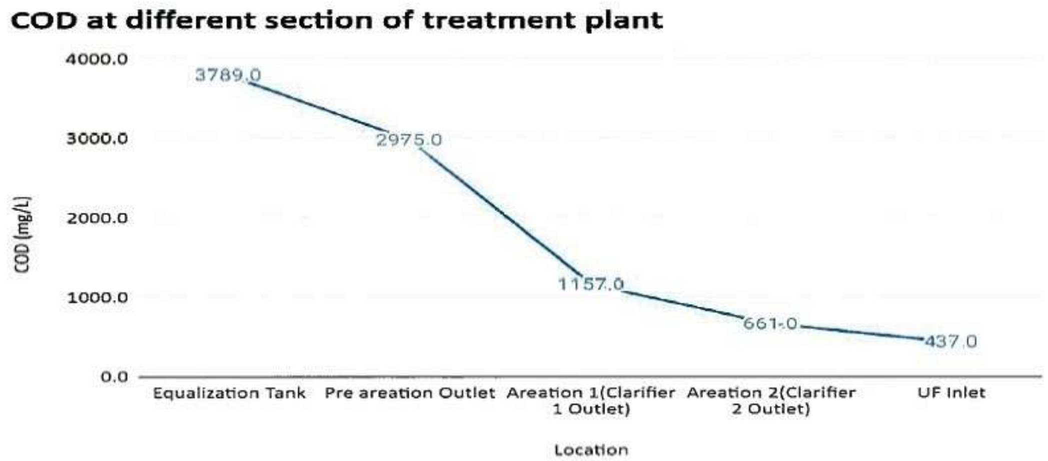


Graph 4 TDS Analysis

The levels of Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) witness significant reductions, meeting the discharge standards. For instance, COD decreases from 3789 mg/l in the equalization tank to 437 mg/l at the UF inlet (graph 6), while BOD decreases from 1659 mg/l to 120 mg/l (graph 5). COD levels decrease by approximately 88.5%, while BOD concentrations exhibit a reduction of around 92.7%. Ammoniacal Nitrogen percentages demonstrate gradual reduction from 110% in the equalization tank to 90% at the UF inlet, UF inlet results are complying with permissible levels shown in graph 7.

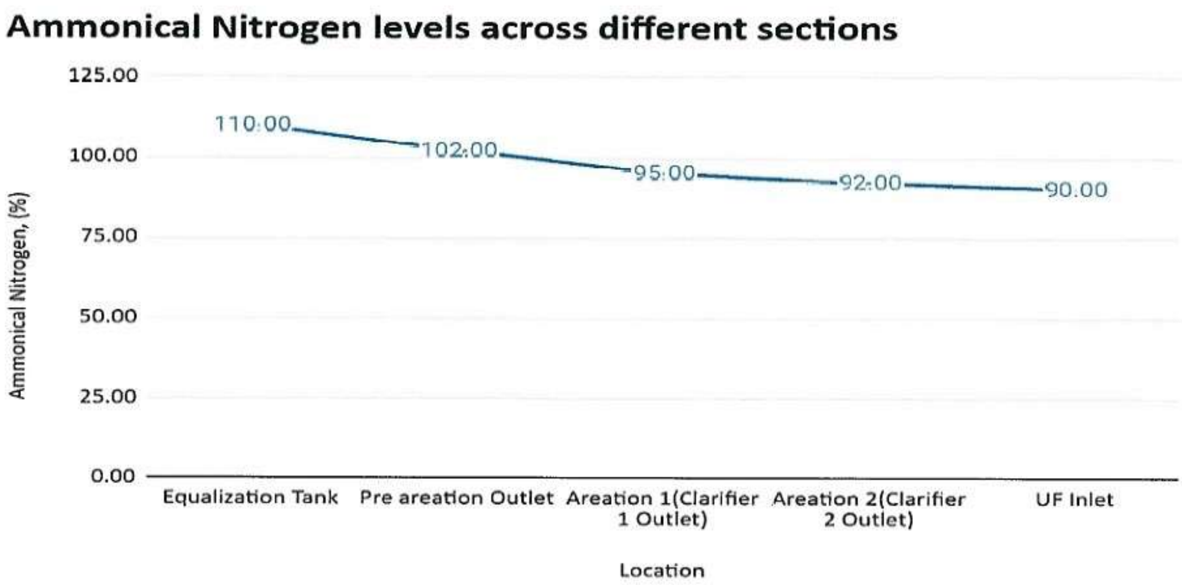


Graph 5 BOD Analysis



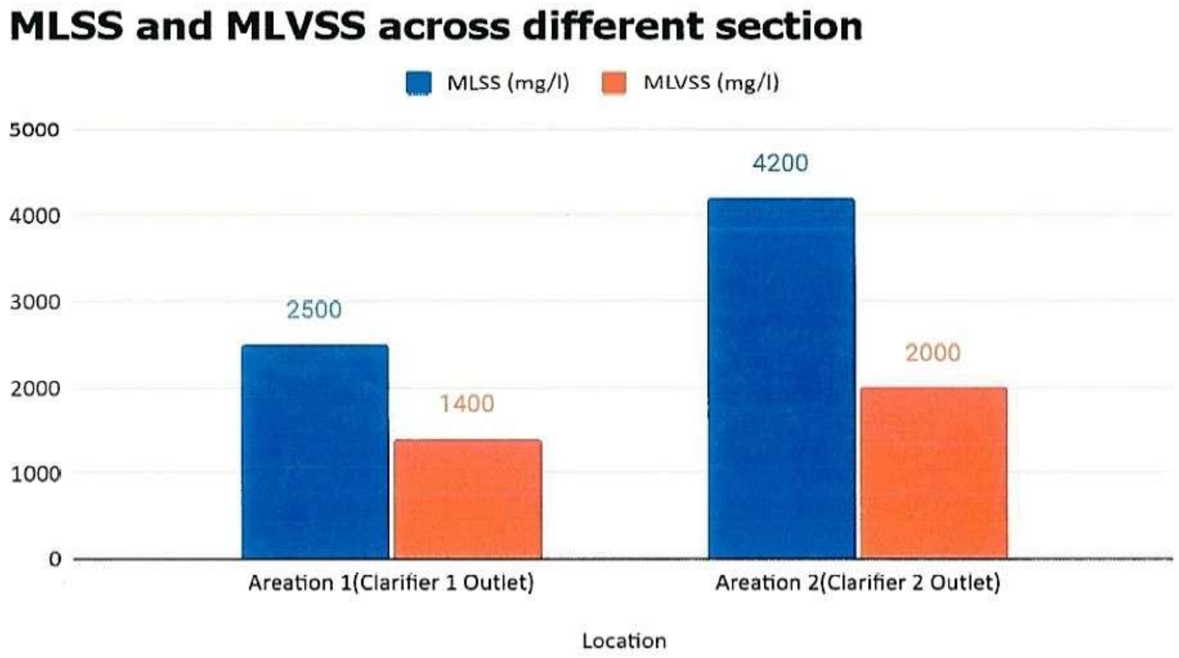
Graph 6 COD Analysis

Phosphate levels decrease substantially from 44.3 mg/l in the equalization tank to 4.90 mg/l at the UF inlet. The concentrations of heavy metals such as Zinc exhibit a marked reduction, with levels diminishing from 0.174 mg/l in the equalization tank to 0.007 mg/l at the UF inlet, well below the permissible limit of 5 mg/l. Other heavy metals, including Copper, Total Chromium, Hexavalent Chromium, Cyanide, Arsenic, Mercury, and Lead, remain below detection limits (ND), signifying effective removal or negligible presence.



Graph 7 Ammonical Nitrogen Analysis

Additionally, the observed levels of MLSS (Mixed Liquor Suspended Solids) and MLVSS (Mixed Liquor Volatile Suspended Solids) in the aeration stages indicate active microbial activity contributing to the treatment process.



Graph 8 MLSS and MLVSS Analysis

After undergoing Ultrafiltration (UF), the treated wastewater proceeds to a 3-stage Reverse Osmosis (RO) treatment plant with a capacity of 1500 kiloliters per day (KLD) for additional purification. The physicochemical characteristics of the water after RO treatment are detailed in Table 24. Additionally, a reject effluent stream with high Total Dissolved Solids (TDS) is produced during this process, which is directed to the Multiple Effect Evaporator (MEE) feed. A sample of the RO reject was also analyzed, which yielded expected results as shown in table 24.

Table 24 Physico-chemical characteristic of ETP RO

Sr. No	Parameter	Unit	Standard*	Final RO Reject	Final RO Permeable
1	pH	---	6.5-8.5	7.10	7.90
2	Total Suspended Solids (TSS)	mg/l	100	789	7.8
3	Total dissolved Solid (TDS)	mg/l	—	13360	189
4	Chemical Oxygen Demand (COD)	mg/l	250	6532.0	72.0
5	Biological Oxygen demand (BOD)	mg/l	30	2121.0	29.00
7	Ammoniacal Nitrogen	%	100	98.0	ND
12	Zinc	mg/l	5	0.080	ND
13	Copper	mg/l	3	ND	ND
14	Total Chromium	mg/l	2	ND	ND
15	Hexavalent Chromium	mg/l	0.1	ND	ND
16	Cyanide as (HCN)	mg/l	0.1	ND	ND
17	Arsenic	mg/l	0.2	ND	ND
18	Mercury	mg/l	0.01	ND	ND
19	Lead	mg/l	0.1	ND	ND
20	MLSS	mg/l	—	—	—
21	MLVSS	mg/l	—	—	—
22	SAR	mg/l	< 26	4426.00	16.0
* MoEF notification G.S.R. 541(E) on dated 6 Aug2021					

The Sodium Adsorption Ratio (SAR) levels vary across stages, with notable reductions observed from 1094 mg/l in the equalization tank to 16 mg/l at the RO permeate, indicating a favourable change in the water's sodium content.

In conclusion, the wastewater treatment plant demonstrates effective removal of pollutants, bringing the effluent in compliance with regulatory standards. The detailed assessment provides valuable insights into the treatment efficiency and environmental impact, contributing to informed decision-making for sustainable wastewater management.

Figure 27 ETP RO Plant

5.2.3 ANALYSIS OF ETP OPERATIONAL RECORDS

The operational records from the Effluent Treatment Plant (ETP) offer a detailed examination of its water treatment capabilities, tracing the journey from the Load Total Dissolved Solids (LTDS) at the ETP inlet to the usage of permeate in various utilities. The initial wastewater quality is gauged through LTDS measurements at the inlet, setting the stage for subsequent treatment processes. Ultrafiltration (UF) serves as an initial barrier, with the UF Feed indicating pre-treatment water load and the UF Permeate reflecting reductions in suspended solids and contaminants. The role of Reverse Osmosis (RO) is pivotal, with RO Permeate demonstrating the efficacy in eliminating dissolved solids. Additionally, the allocation of treated water for gardening and utility purposes, measured in kiloliters, highlights the plant's contribution to eco-friendly water use. Monthly data analysis on these parameters sheds light on the ETP's operational efficiency, underscoring the importance of consistent LTDS reduction, quality permeate production, and sustainable permeate usage. This ongoing evaluation is crucial for enhancing ETP operations and promoting effective water management practices.

Table 25 Six month data of average treated LTDS wastewater in ETP

Months	LTDS (ETP Inlet)	UF feed	UF Permeate	RO Permeate	Permeate Consumption in Garden (KL)	Permeate Consumption in Utility (KL)
Aug-23	1064.62	905.1	814.59	724.99	32.42	645.18
Sep-23	1057.45	898.83	808.95	728.05	34.57	643.75
Oct-23	1052.29	918.69	844.13	759.72	34.13	674.01
Nov-23	1054.16	916.93	825.24	742.36	29.67	661.16
Dec-23	1044.26	918.39	830.22	747.2	29.81	665.01
Jan-24	1070.15	917.21	825.49	743.24	28.26	663.37

The analysis of the Effluent Treatment Plant (ETP) operational records over six months provides key insights into its performance and efficiency in managing wastewater treatment processes. On average, the Low Total Dissolved Solids (LTDS) entering the ETP was measured at 1057.16 KLD, indicating the typical volumetric LTDS load at the inlet, six months Logbook of ETP attached in annexure V. The treatment process begins with Biological treatment followed by ultrafiltration, where the average UF Feed volume was 912.53 KLD, reduced to an average UF Permeate of 824.77 KLD, showcasing a significant removal of suspended solids and impurities.

Further purification through reverse osmosis led to an average RO Permeate of 740.93 KLD, illustrating the effectiveness of this stage in further reducing dissolved solids. The treated water's application is also noteworthy, with an average of 31.48 kiloliters allocated for gardening and 658.75 kiloliters for utility purposes, emphasizing the plant's role in sustainable water management. Notable monthly fluctuations, such as the increase in UF Permeate by 35.18 KLD in October 2023, highlight the variable efficiency of treatment processes and the impact of operational adjustments or incoming water quality changes. These observations underscore the ETP's critical function in enhancing water quality and supporting eco-friendly water reuse, while also pointing to the importance of ongoing operational monitoring and optimization.

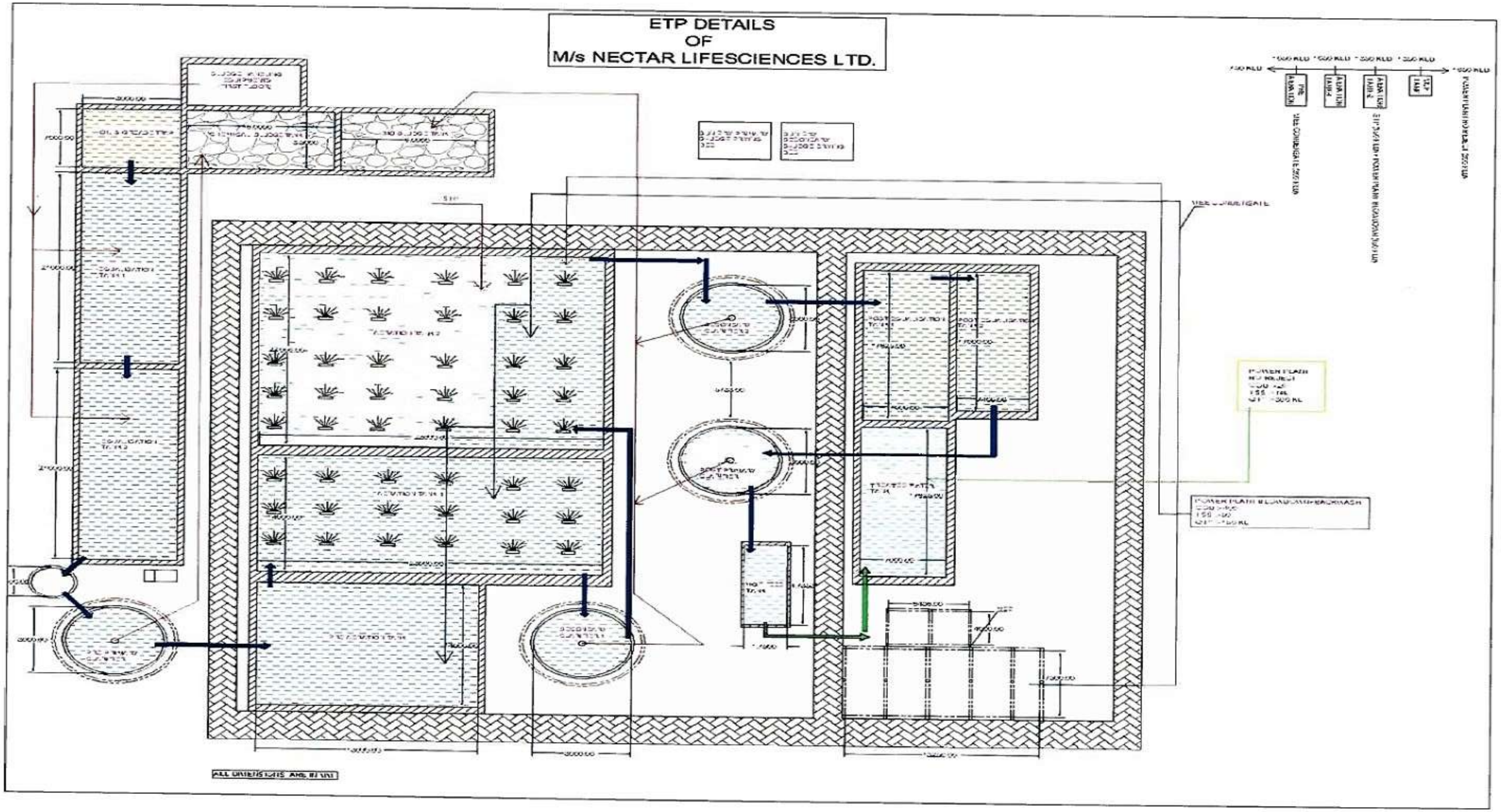


Figure 28 ETP detail of M/s Nectar Lifesciences Unit II

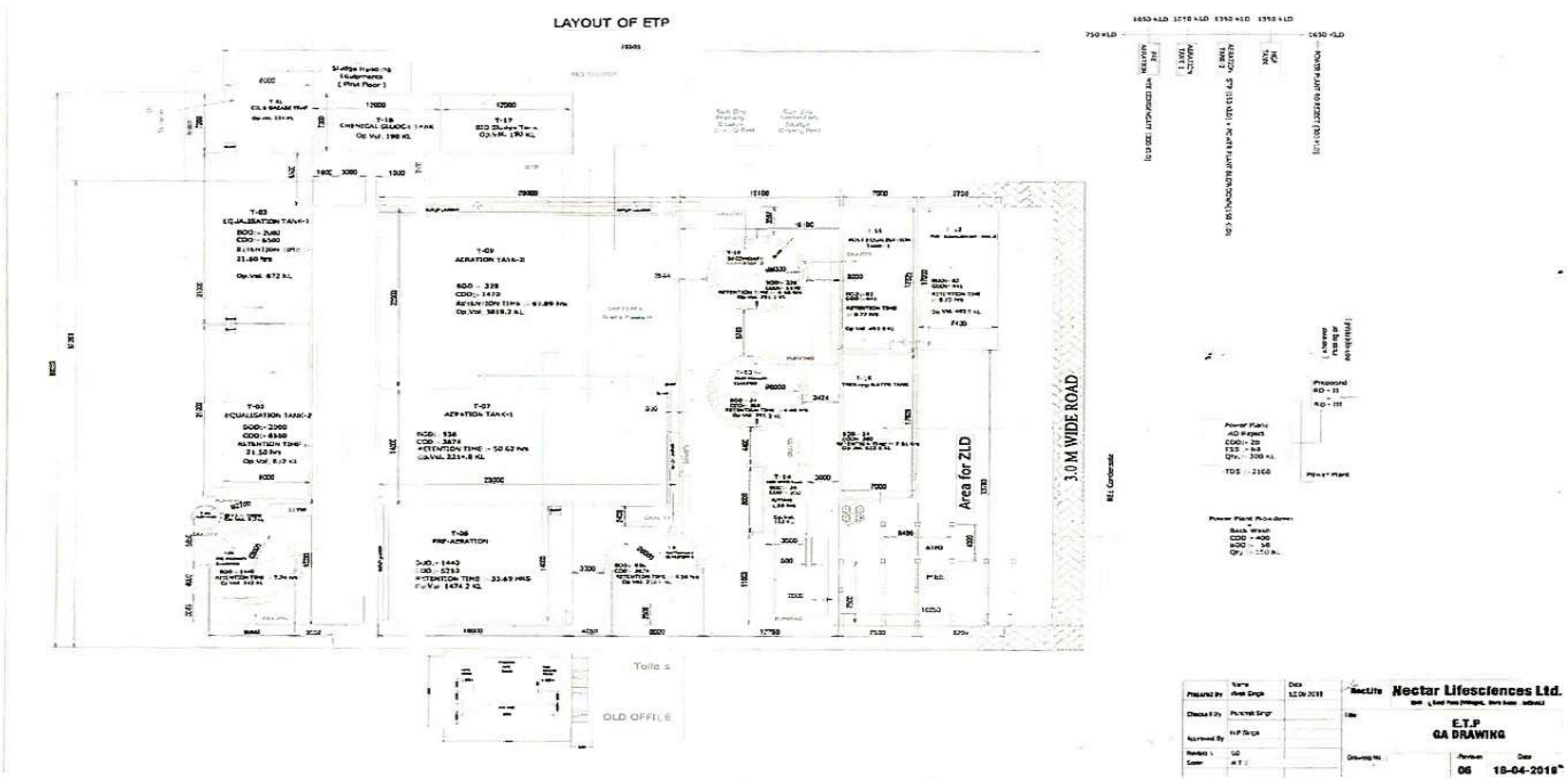


Figure 29 Layout plan of ETP

5.3 ENGINEERING AND PROCESS SPECIFICATIONS OF MEE

A Multiple Effect Evaporator (MEE) plant is a sophisticated thermal process widely used in industries for concentrating solutions, particularly in the evaporation of water from various liquid products. The MEE plant typically operates in multiple stages, each involving a separate calandria. Let's delve into the four stages of an MEE plant and explore the functions and specifications of each calandria.

First Stage Calandria: The first-stage calandria is where the feed enters the MEE system. Its primary function is to initiate the evaporation process by heating the liquid solution. The calandria consists of a series of tubes through which steam passes, transferring its latent heat to the feed. As the liquid absorbs heat, it begins to evaporate, producing vapor. This vapor is then directed to the subsequent stage for further concentration.

Second Stage Calandria: As the vapor from the first stage enters the second stage calandria, the concentration process intensifies. The second-stage calandria, much like the first, employs the latent heat of steam to further evaporate water from the solution. The concentrated liquid is separated from the vapor, and the process repeats as vapor from the second stage moves on to the third stage.

Third Stage Calandria: The third-stage calandria continues the concentration process, enhancing the overall efficiency of the evaporation. The vapor produced in this stage carries a higher concentration of the solute, leaving behind an increasingly concentrated liquid. The calandria design and specifications are crucial in maintaining optimal heat transfer efficiency, ensuring the economic viability of the entire MEE system.

Fourth Stage Calandria: In the fourth and final stage, the vapor generated is typically highly concentrated. The fourth-stage calandria maximizes the concentration of the solute, and the vapor leaving this stage is condensed to yield the final concentrated product. The specifications of this calandria, including the material used, surface area, and design, play a crucial role in achieving the desired product concentration efficiently.

In summary, the four stages of an MEE plant, each with its respective calandria, work in tandem to progressively concentrate solutions. The calandria's design, material, and specifications are optimized for efficient heat transfer, ensuring the MEE plant's overall effectiveness in producing concentrated products while minimizing energy consumption.

5.3.1 CHARACTERISTICS OF MEE

Table 26 Characteristics of MEE

INPUT PARAMETER		CALENDRLA I-FC	CALENDRIA II-FC	CALENDRIA III- FC	CALENDRIA IV-FC	
FEED FLOW RATE	KG/HR	14000.00	8187.69	5558.37	3059.34	
DENSITY OF THE NEED	KG/M^3	993.00	1050.00	1100.00	1350.00	
VISCOSITY OF FEED	KG/M SEC	0.01	0.01	0.01	0.01	
SP. HEAT CAPACITY	KCAL/KG DEGC	0.99	0.98	0.97	0.95	
TEMPERATURE BODY INLET	DEG C	84.50	90.00	80.50	70.50	
FEED SOLIDS BODY INLET		2.00	3.42	5.04	9.15	
NET SOLIDS	KG/HR	280.00	280.00	280.00	280.00	
PREHETER DATA			PH-2	PH-3	PH-4	PHC
PREHETER INLET TEMP	DEG C		73.50	60.50	45.00	30.00
PREHETER OUTLET TEMP	DEG C		84.50	73.50	60.50	45.50
CALENDRLA DATA						
B.P.E.	DEG.C	0.00	0.50	2.50	6.50	0.00
JACKET TEMPERATURE	DEG C	100.00	89.50	79.50	67.50	49.50
BOILING TEMPERATURE	DEG C	90.00	80.00	68.00	50.00	
ACTUAL BOILING TEMPERATURE	DEG C	90.00	80.50	70.50	56.5	
DESIGN HEAT TRANSFER COEF.	KCAL/(M^2(A)	1000.00	800.00	700.00	450.00	

TUBE OUTSIDE DIAMETER	MM	38.00	38.00	38.00	38.00	
TUBE THICKNESS	MM	1.50	1.50	1.50	1.50	
TUBE LENGTH	MTR	12.00	12.00	12.00	12.00	
EVR RATIO		0.490				
LIVE STEAM TEMP.	DEG C	153				
LIVE STEAM PRESS.(ABS)	KG/CM^2(A)	5.50				
LIVE STEAM RATE	KG/HR	2981.00				
AMOUNT OF MIXED STEAM	KG/HR	6083.67				
RECYCLED VAPOURS	KG/HR	3102.67				
CALCULATIONS		Steam Economy	0.22			
CONDENSATE QTY	KG/HR	6023	8704	11306	13777	
TOTAL VAPOURS TO JACKEY	KG/HR	6084	2825.47	2786.92	2741.57	
VAPOURS FOR PREHEATER	KG/HR	0.00	278.68	325.60	383.12	
VAPOURS FOR EVAPORATION	KG/HR	6022.84	2518.53	2433.45	2331.04	
EVAPORATION DUE TO HEAT	KG/HR	5951.74	2491.28	2402.76	2288.55	Vapour to cond.
TOTAL EVAPORATION	KG/HR	5812.31	2629.31	2499.14	2359.56	2574.97
(HEAT + FLASH)	KG/HR					33.00
OUTLET FLOW	KG/HR	8187.69	5558.37	3059.24	699.68	42.00
OUTLET SOLIDS		3.42	5.04	9.15	40.02	163165.31
						Cooling Water Required
TOTAL EVAPORATION	KG/HR	13300				

DESIGN OF FC EFFECTS						
INLET TEMPERATURE	DEG.C	90	80.5	70.5	56.5	
OUTLET TEMPERATURE	DEG.C	92	81.9	71.55	57.075	
CIRCULATION LIQUID RATE	KG/HR	1643510	1002749	1319779	2400473	
CIRCULATION LIQUID RATE	M^3/HR	1655	955	1200	1778	
CORRECTED CIR. FLOW	M^3/HR	1656	955	1200	1779	
LMTD	DEG.C	8.96	8.28	8.46	10.71	
AREA BY DESIGN	M^2	362.34	207.58	226.82	270.67	
NO OF TUBES	NOS.	274.75	157.40	171.99	205.67	
CORRECTED NO. OF TUBES	NOS.	276	158	172	206	
DESIGN VELOCITY /TUBE	M/ SEC	1.7	1.7	2	2.5	
NO OF TUBES / PASS	NOS.	281	162	173	205	
NO. OF PASSES		1.0	1.0	1.0	1.00	

DETAILS OF MULTI-EFFECT EVAPORATOR OF M/s NECTAR LIFESCIENCES LTD.

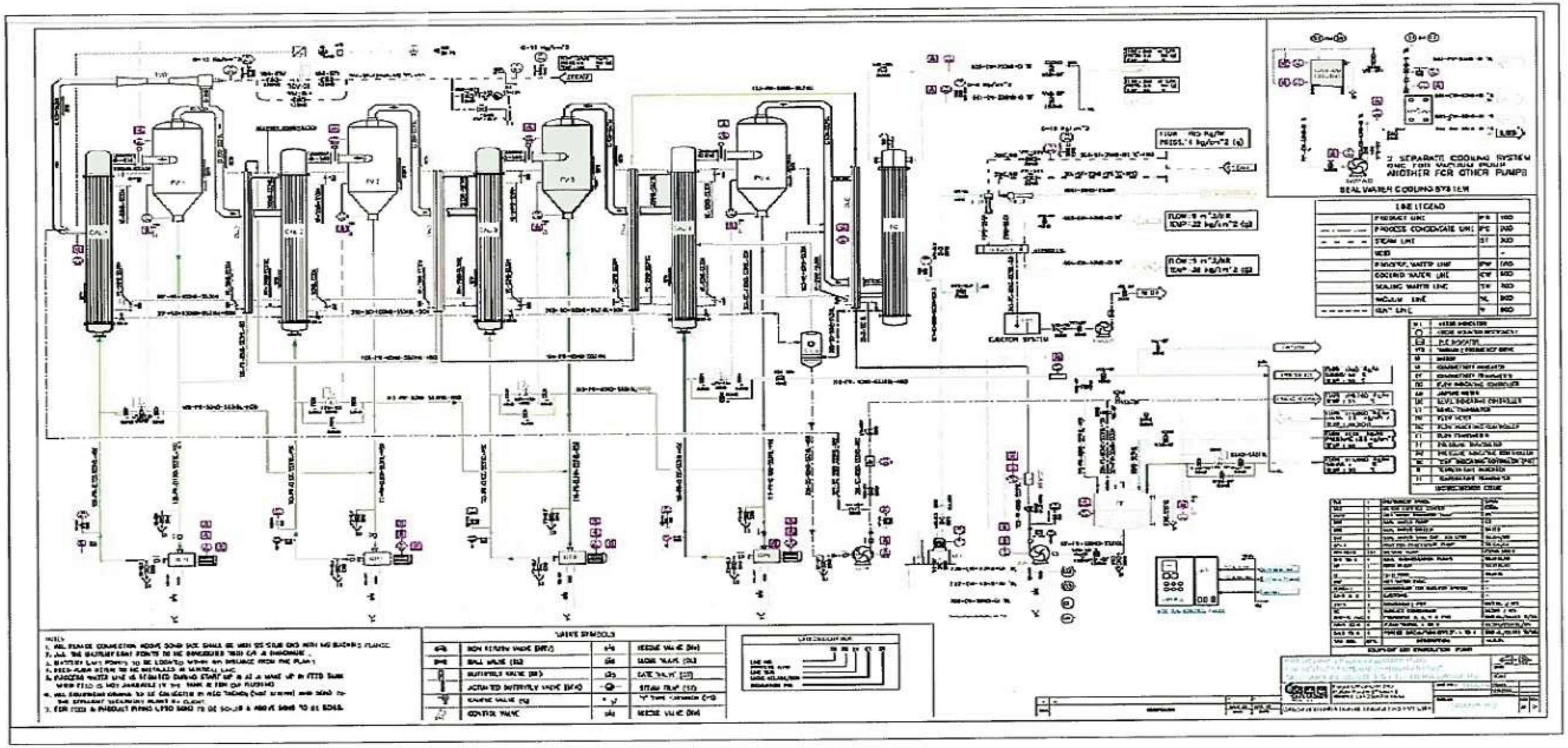


Figure 30 Design detail of MEE

Figure 31 Multi Effective Evaporator(MEE)

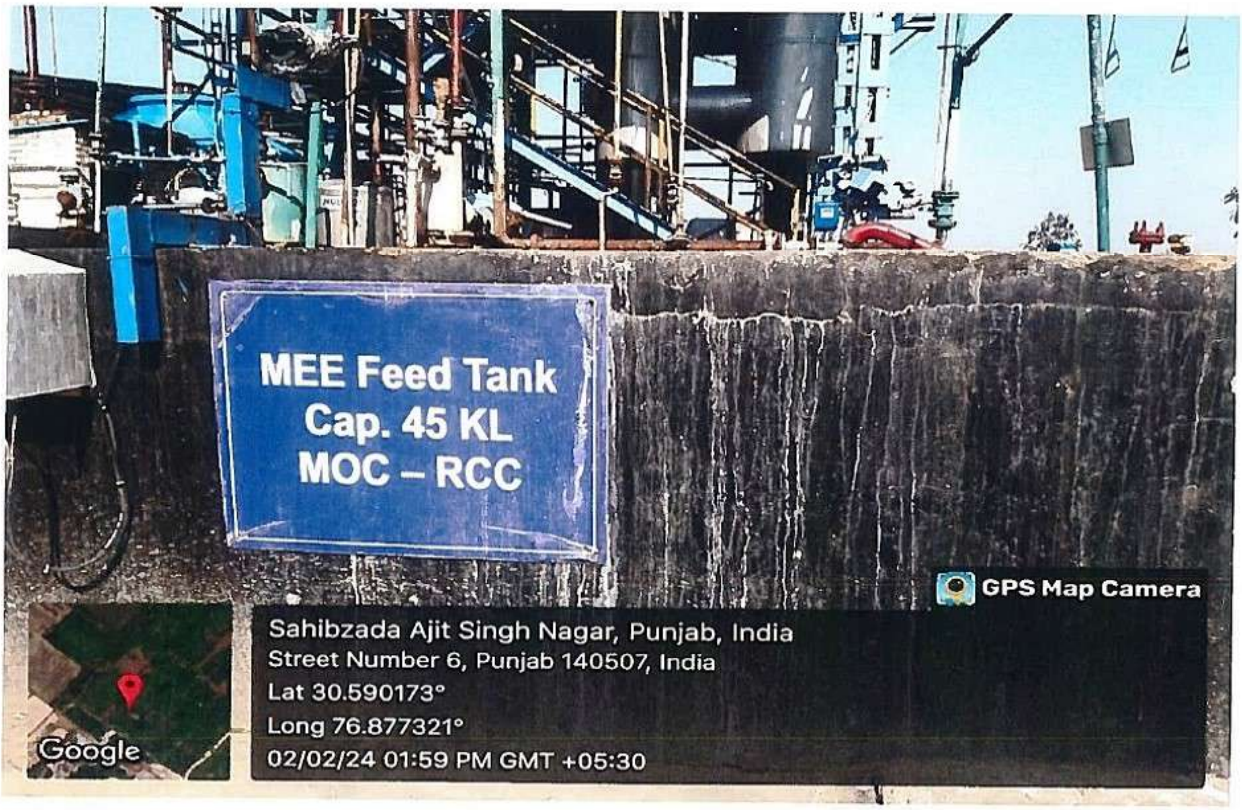
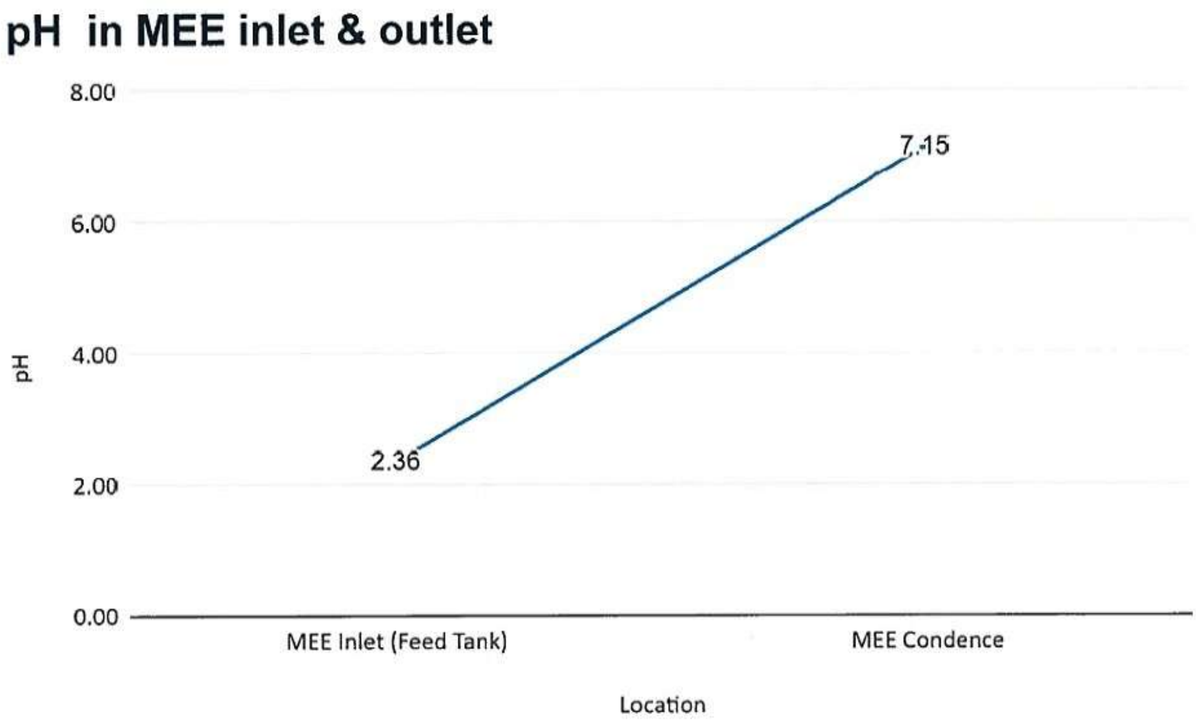


Figure 32 MEE Feed Tank

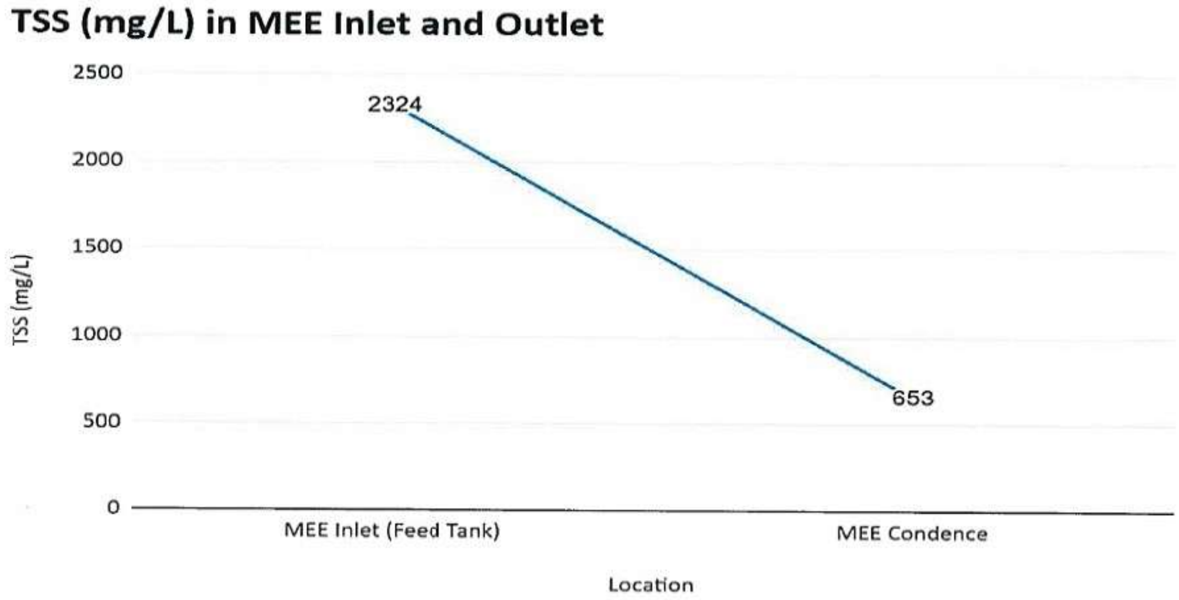
5.3.2 ASSESSMENT OF MEE EFFLUENT QUALITY

The comprehensive assessment of parameters at the inlet (Feed Tank) and condensate of the Multiple Effect Evaporator (MEE) plant. The pH levels at the MEE Inlet acidic nature and Condensate neutral with pH of 2.36 & 7.15 respectively in graph 9.



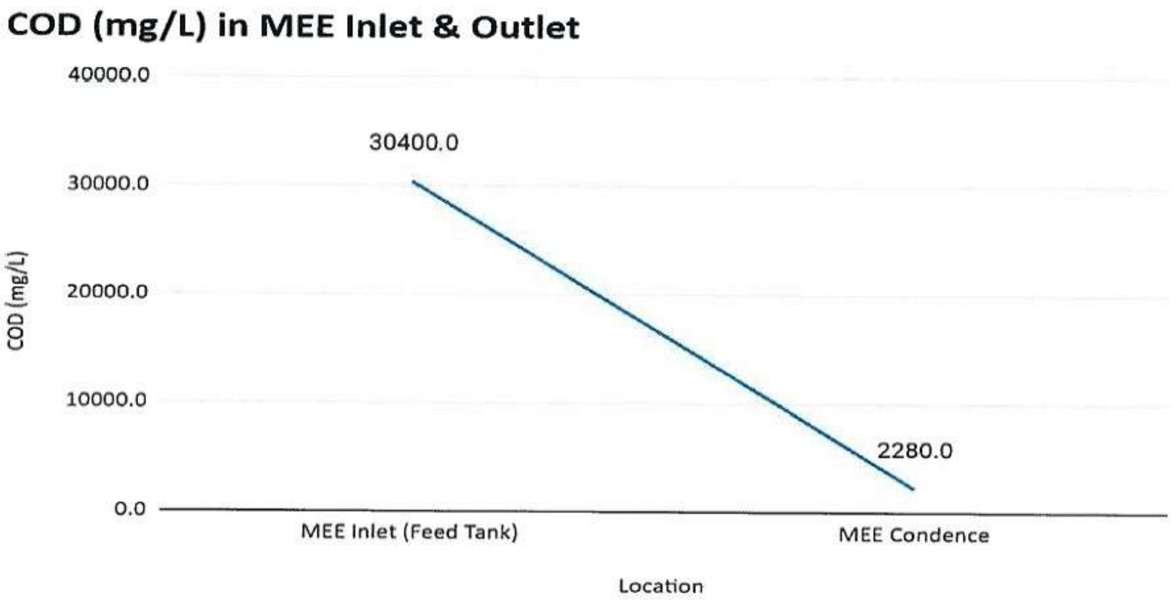
Graph 9 pH in MEE inlet and outlet

The Total Suspended Solids (TSS) value reduction from 19340 mg/l in the Inlet to 430 mg/l in the Condensate (graph 10).

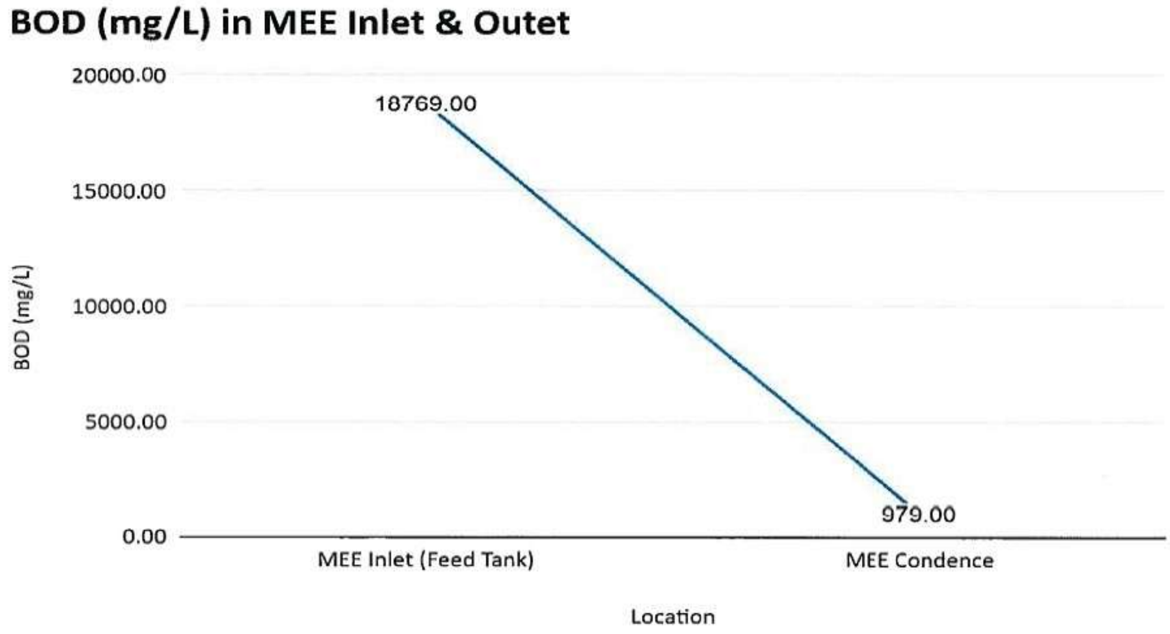


Graph 10 TSS in MEE inlet and outlet

Levels of Chemical Oxygen Demand (COD) & Biological Oxygen Demand (BOD) goes down, COD decreasing from 30400.0 mg/l to 2280.0 mg/l and BOD from 18769.00 mg/l to 979.00 mg/l, suggesting successful treatment through the evaporation stages.



Graph 11 COD in MEE inlet and outlet



Graph 12 BOD in MEE inlet and outlet

Metal contaminants, including Zinc, Copper, Total Chromium, Hexavalent Chromium, Cyanide, Arsenic, Mercury, and Lead, generally conform to stipulated standards in the Condensate, with many contaminants not detected. Particularly, Zinc levels reduced from 1.180 mg/l in the Inlet and not detected in the Condensate, indicating efficient removal. Ammoniacal Nitrogen levels decrease from 98.00% in the Inlet to non-detectable (ND) levels in the Condensate, underscoring successful elimination during the evaporation process.

Sodium Adsorption Ratio (SAR) levels, reflecting the sodium content relative to other ions, exhibit a positive outcome, with a reduction from 7897.00 mg/l in the Inlet to 438.00 mg/l in the Condensate. This reduction signifies a potential minimization of adverse effects on soil structure.

Table 27 Physico-chemical characteristic of MEE

Sr. No	Parameter	Unit	MEE Inlet (Feed Tank)	MEE Condensate
1	pH	---	2.36	7.15
2	Total Suspended Solids (TSS)	mg/l	2324	653
3	Total dissolved Solid (TDS)	mg/l	19340	430
4	Chemical Oxygen Demand (COD)	mg/l	30400.0	2280.0
5	Biological Oxygen demand (BOD)	mg/l	18769.00	979.00
7	Ammoniacal Nitrogen	%	98.00	ND
12	Zinc	mg/l	1.180	ND
13	Copper	mg/l	ND	ND
14	Total Chromium	mg/l	ND	ND
15	Hexavalent Chromium	mg/l	ND	ND
16	Cyanide as (HCN)	mg/l	ND	ND
17	Arsenic	mg/l	ND	ND
18	Mercury	mg/l	ND	ND
19	Lead	mg/l	ND	ND
20	MLSS	mg/l	—	—
21	MLVSS	mg/l	—	—
22	SAR	mg/l	7897.00	438.00

5.3.3 ASSESSMENT OF MEE OPERATIONAL RECORDS

The comprehensive six-month dataset detailing the average concentration of High Total Dissolved Solids (HTDS) in treated wastewater, originating from the Multiple Effect Evaporator (MEE) plant and undergoing further treatment in the Annular Thin Film Dryer (ATFD), offers valuable insights into the broader water treatment process. All volumetric measurements are expressed in kiloliters (KL).

The extensive six-month dataset detailing the mean High Total Dissolved Solids (HTDS) treated wastewater in the Multiple Effect Evaporator (MEE) plant, along with subsequent processing in the Annular Thin Film Dryer (ATFD), offers a meticulous scientific account of the water treatment continuum. Volumetric measurements are consistently expressed in kiloliters (KL), enhancing precision.

As shown in table 28, In August 2023, the feed to MEE comprised 274.43 KL, yielding a condensate of 268.94 KL which is 98%. Subsequently, the ATFD received 5.48 KL, producing 2.9 KL of condensate. The total condensate amounted to 271.79 which is 99.04% water is recovered, six months Logbook of MEE & ATFD are attached in annexure IV. September saw similar patterns, with incremental changes in feed volumes and corresponding condensate production. Across subsequent months until January 2024 explained in table 28, this systematic dataset underscored the dynamic efficiency of the MEE and ATFD processes, illustrating the nuanced reduction in total dissolved solids and the precise recovery of condensate. The substantial quantities of salt recuperated from the ATFD throughout the period serve as a notable metric, affirming the adeptness of the treatment process in scientifically reclaiming valuable resources from the wastewater stream.

This scientific representation accentuates the consistent and efficient treatment of wastewater through the MEE plant and the subsequent ATFD refinement, embodying a meticulous reduction in total dissolved solids and the precise recovery of condensate. The significant volumes of salt recuperated from the ATFD affirm the prowess of this treatment process in reclaiming valuable resources in a scientifically rigorous manner.

Table 28 Six month data of average HTDS treated wastewater in MEE

Months	Feed to MEE (KL)	Condensate From MEE (KL)	Water recovery %	Feed to ATFD (KL)	Condensate from ATFD (KL)	Water recovery %	Total Condensate (KL)	Total water recovery %	Solids from ATFD (Kg)
August 2023	274.43	268.94	98.00	5.48	2.9	52.0	272	99.04	2625
September 2023	277.37	270.41	97.49	6.94	3.9	55.6	274	98.89	3082
October 2023	274.93	266.68	97.00	8.24	4.2	50.7	271	98.52	4065
November 2023	274.00	266.26	97.18	7.73	4.0	52.2	270	98.65	4033
December 2023	224.97	218.21	97.00	6.76	3.5	51.5	222	98.55	3285
January 2024	253.03	245.44	97.00	7.59	3.8	50.1	249	98.50	3774

CHAPTER 5

ZERO LIQUID DISCHARGE SCHEME

The water management system of the industry is designed to facilitate the full recycling and reuse of treated wastewater within its operational cycle. At operational peak, the facility generates an output of 749 kiloliters per day (KLD) of Reverse Osmosis (RO) permeate. A considerable volume of this permeate is efficiently utilized within the cooling towers, and an allocation of approximately 30 KLD is designated for irrigation purposes.

A key aspect of the system's efficiency is the strategic utilization of recycled Reverse Osmosis (RO) permeate, sourced following treatment from the Effluent Treatment Plant (ETP), to fulfill a significant portion of the cooling towers' water requirements. It has been noted that the supply to the fifteen cooling towers, installed across various processing units as well as to the cooling tower associated with the Multiple Effect Evaporator (MEE), predominantly relies on RO-treated water. In contrast, the cooling tower serving the power generation facility is supplied with fresh water.

Table 29 Section-wise distribution of various cooling towers utilizing RO permeate.

Sr. No.	Unit-II	Capacity (TR)	Feed Quantity (KLD)
1	Cooling Tower-1	1050	61.2
2	Cooling Tower-2	450	23.5
3	Cooling Tower-3	1800	137.5
4	Cooling Tower-4	1050	98.2
5	Cooling Tower-5	450	
6	Cooling Tower-6	450	

7	Cooling Tower-7	3600	126.7
8	Cooling Tower-8	3600	96.8
9	Cooling Tower-9	600	27.8
10	Cooling Tower-10	600	71.3
11	Cooling Tower-11	600	
12	Cooling Tower-12	600	
13	Cooling Tower-13	450	20.6
14	Cooling Tower-14	450	
15	Cooling Tower-15	450	
16	MEE Cooling Tower-1	1050	53.9
17	Gardening	NA	31.5
	Total		**749**

The water distribution and consumption monitoring system across various cooling towers at M/s Nectar Lifesciences Ltd. Unit-II was found to be inadequate, despite the recording of the total generated Reverse Osmosis (RO) permeate. During initial assessments, the audit team instructed the industry to install water meters across all cooling towers. This directive aimed to enhance the understanding of how treated water is distributed among the cooling towers, thereby establishing a more comprehensive and accountable water management framework. The data presented in Table 30 illustrates a 10-day record of RO permeate reused in the cooling towers. The total water consumption depicted in the table aligns with the total RO permeate generated during the same period, as confirmed by the logbook of the RO system, which was verified during the audit. A copy of the RO logbook is attached in Annexure-V for reference.

Table 30 Actual RO permeate consumption in Cooling towers

Sr. No.	Date	22-Jan	23-Jan	24-Jan	25-Jan	26-Jan	27-Jan	28-Jan	29-Jan	30-Jan	31-Jan	Monthly Total	Month average
1	Main Utility Cooling Tower	50	54	65	68	67	57	70	62	57	62	612	61.2
2	Cooling Tower FRP	58	37	39	21	29	13	6	8	10	14	235	23.5
3	Cooling Tower	145	135	166	147	146	127	154	63	150	142	1375	137.5
4	SRP-A Cooling Tower	65	103	80	116	104	109	99	94	111	101	982	98.2
5	SRP-B Cooling Tower (Cap:2400)	139	144	111	103	131	130	100	101	175	133	1267	126.7
6	Sterile Utility Cooling Tower (Cap:2400)	91	120	83	46	82	104	81	141	128	92	968	96.8
7	Cooling Tower near AVM-14	34	27	30	31	28	30	29	20	29	20	278	27.8
8	SRP-C Cooling Tower	85	60	82	79	51	72	66	85	68	65	713	71.3
9	Cooling Tower FRP (DMF)	15	14	13	15	21	22	25	30	22	29	206	20.6
10	Cooling Tower (PP)	0	0	0	0	0	0	0	0	0	0	0	0
11	Cooling Tower MEE	51	49	62	59	59	60	53	59	43	44	539	53.9
12	Cumulative Permeate consumption in CT	733	743	731	685	718	724	683	663	793	702	7175	717.5
13	Permeate consumption in Gardening	42	32	29	35	25	0	32	35	31	20	281	28.1
	Total	775	775	760	720	743	724	715	698	824	722	7456	745.6

CHAPTER 6

FINDINGS AND INFERENCES

A team of auditors from School of Energy and Environment, TIET visited multiple times to M/s Nectar Lifesciences Ltd. Unit II, Derabassi for sample collection, document verification, on-site investigation and discussions. The purpose is to comprehensively assess and evaluate the freshwater consumption, wastewater generation, and the adequacy of the Effluent Treatment Plant (ETP) and Multi Effective Evaporator (MEE) at the site. Additionally, the study aims to provide insights and comments on the overall effectiveness of the zero liquid discharge (ZLD) scheme implemented in the industry, the following conclusions/ recommendations are made.

1. The tehsil of Derabassi groundwater condition is under high stress and overexploited. Therefore, it is recommended to maximize the reuse of treated wastewater to reduce ground water consumption.

2. The industry is running below its installed capacity. The production during August 2023, September 2023, October 2023, November 2023, December 2023 and January 2024 was 29.54%, 31.03%, 45.22%, 47.64%,44.96% and 47.12% respectively against the designed capacity (4.93 T per day). Menthol based products have not been considered in this evaluation as the industry has ceased its production due to market requirements.

3. The average groundwater extracted during the last six months (August 2023-January 2024) was 986.45KL per day. Daily groundwater extracted during the audit period was under the extraction limit (1055 KLD).

4. To assess the impact of industrial activities on groundwater quality comprehensively samples were collected from nine locations, including upstream, downstream, and within the premises. Key findings from onsite groundwater analysis revealed

a. The pH levels measured at all sampling locations fell within the safe drinking water range of 6.5-8.5, indicating neutral to slightly alkaline conditions conducive to maintaining healthy groundwater quality.

b. Total Suspended Solids (TSS) was detected in almost all the groundwater samples with Borewell 1 at 22.5 mg/l and Borewell 2 at 7.5 mg/l

c. Total Dissolved Solids (TDS) were observed at 410 mg/l in Borewell 1 and 511 mg/l in Borewell 2, which matched with the standard for the area.

d. Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) were not detected in borewell samples, suggesting minimal organic pollution.

e. Zinc was detected at 0.88 mg/l in Borewell 2, with all other heavy metals (Copper, Total Chromium, Hexavalent Chromium, Cyanide, Arsenic, Mercury, Lead) not detected, showcasing effective control over potential toxic elements.

f. Phosphate levels were low, with 0.40 mg/l in Borewell 1 and 1.60 mg/l in Borewell 2, indicating controlled nutrient levels that minimize risks of eutrophication.

5. At peak load, cooling towers require 1099 KL per day of water, distributed among those in the Process section, the power plant, and the tower associated with the Multiple Effect Evaporator (MEE). This operation cumulatively results in substantial evaporation losses, with approximately 796 KL per day. Furthermore, approximately 253 kiloliters (KL) of blowdown is produced from the cooling towers. As this constitutes effluent, it is directed to the Effluent Treatment Plant (ETP) for necessary treatment. Further, RO permeate water is being reused as the makeup water of cooling towers.

6. The average Total Dissolved Solids (TDS) value of all blowdown streams from the cooling towers is approximately 657 mg/l. This suggests that there may be room for improvement in the operational optimization of the cooling towers, presenting an opportunity for water conservation. Optimizing the cooling towers could potentially reduce the volumetric load on the effluent treatment plant, contributing to overall water efficiency and resource management within the facility.

7. According to the material balance analysis, the overall water requirement for manufacturing 44.74 Metric Tonnes Per Day (MTPD) of product amounts to 242.53 kiloliters (KL). Additionally, water is essential for Clean-in-Place (CIP) processes to uphold product quality. Consequently, the cumulative freshwater requirement in the process section totals approximately 290 Kiloliters per day (KLD).

8. The treatment capacity of MEE at ETP is 350 KLD or 127750 KL per annum. The MEE is running below its installed capacity. MEE had been running at an average 75.17% of its installed capacity during last six months.

9. The assessment of parameters at the inlet and condensate of the Multiple Effect Evaporator (MEE) plant reveals significant changes. At the MEE inlet, pH levels indicate acidity, whereas in the condensate, pH levels are neutral. Total Dissolved Solids (TDS) decrease from 19340 mg/l at the inlet to 430 mg/l in the condensate, indicating effective removal. Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) values also decrease substantially, suggesting successful treatment during evaporation stages. Metal contaminants such as Zinc, Copper, Total Chromium, Hexavalent Chromium, Arsenic, Mercury, and Lead were not detected in the outlets. Similarly, Cyanide was also not detected in the results. Notably, Zinc levels decrease from 1.180 mg/l at the inlet to non-detectable levels in the condensate, indicating efficient removal. Ammonical Nitrogen levels decrease significantly, underscoring successful elimination during evaporation. Sodium

Adsorption Ratio (SAR) levels decrease from 7897.00 mg/l at the inlet to 438.00 mg/l in the condensate, suggesting a potential reduction in possible adverse effects on soil structures.

10. Domestic waste generated from the premises is added to the LTDS stream directed towards the effluent treatment plant.

11. During the initial audit visit with PPCB officials, two solar ponds containing legacy waste were identified on the industry premises. One pond contained High Total Dissolved Solids (HTDS) waste, while the other contained Low Total Dissolved Solids (LTDS) waste. These ponds posed long-term environmental risks such as leaching. The audit team instructed the industry to take advantage of the lower capacity operation of their ETP and MEE by treating a small volume of this waste daily and gradually emptying the tanks. By the conclusion of the audit, the industry had significantly reduced the contents of the ponds by utilizing the daily capacity of their ETP and MEE. Verification of the MEE and ETP logbooks for this period revealed an increase in load and sludge generation, confirming that the waste was indeed treated within the in-house facilities. Photograph of the emptied ponds attached as Annexure VIII.

12. The flow analysis of the water pipeline was analyzed on-site to cross check the data provided by the industry. The measured value of flow rates at all locations were observed to be in close proximity to the values shown by the water meters installed by the industry at the site.

13. The industry is currently operating at less than 50% of its total capacity, yet it continues to consume approximately 90% of the total water demand. This phenomenon can be attributed to the necessity of running utilities such as cooling towers and chilling units at their full capacities, regardless of variations in production levels. Additionally, during the site visit, the industry clarified that the increased frequency of Clean-in-Place (CIP) procedures,

driven by the current market-oriented product mix, has resulted in higher water consumption.

14. The analysis of the Effluent Treatment Plant (ETP) operational records over six months provides key insights into its performance and efficiency in managing wastewater treatment processes. On average, the Low Total Dissolved Solids (LTDS) entering the ETP was measured at 1057.16 KLD, indicating the typical contaminant load at the inlet followed by ultrafiltration, where the average UF Feed volume was 912.53 KLD, reduced to an average UF Permeate of 824.77 KLD. Further purification through reverse osmosis led to an average RO Permeate of 740.93 KLD

15. The treated water's reuse with an average of 31.48 kiloliters allocated for gardening and 708 kiloliters for utility purposes, reflected on the plant's scheme for zero liquid discharge. Notable monthly fluctuations, such as the increase in UF Permeate by 35.18 KLD in October 2023, highlight the variable efficiency of treatment processes and the impact of operational adjustments or incoming water quality changes. These observations underscore the ETP's critical function in enhancing water quality and supporting eco-friendly water reuse, while also pointing to the importance of ongoing operational monitoring and optimization.

16. The quality analysis of Effluent Treatment Plant (ETP) at M/s Nectar Lifesciences Ltd Unit-2 showcased adequate efficiency in managing wastewater. Key observations included a significant reduction in Total Suspended Solids (TSS) from 4630 mg/l in the equalization tank to 459 mg/l at the UF Inlet, and a substantial decrease in Chemical Oxygen Demand (COD) from 3789.0 mg/l to 437.0 mg/l through the treatment stages. Biological Oxygen Demand (BOD) also saw a remarkable reduction from 1659.0 mg/l to 120.0 mg/l. Additionally, pH levels were maintained within the standard range of 6.5-8.5 throughout the process.

17. Inadequate monitoring of water distribution across cooling towers at M/s

Nectar Lifesciences Ltd. Unit-II was noted despite recording total RO permeate generation. Industry was directed by the audit team to install water metres at cooling towers for better management. Ten-day data of RO permeate reuse in cooling towers matched total RO permeate generated, further proving reuse of RO permeate.

RECOMMENDATIONS

After thorough observation and analysis of production data spanning the last six months, alongside material balances, process stoichiometry, and comprehensive assessment of water consumption, generation, and sludge data, it is evident that the industry operates in a zero liquid discharge manner. It operates within a closed-loop water management system, where all generated wastewater finally undergoes treatment and subsequent refinement in a RO unit connected post ETP. The RO permeate water is then reused in the cooling towers and for gardening purposes. Even the rejects produced from the RO unit attached to the ETP are being redirected back to the MEE, thus perpetuating the recycling of waste within the cyclic process. This emphasises the industry's commitment to maximizing water reuse and aligns with the principle of zero liquid discharge. Despite the industry's closed-loop water management approach, it's crucial to note that certain processes need monitoring. For instance, the average TDS from cooling tower blowdowns was found to be relatively low at 657 mg/l, indicating inefficient blowing. With proper management, there's potential to reduce overall water requirements, thereby easing the burden on wastewater management facilities, fresh water needs, and energy consumption. Therefore it is recommended that a comprehensive total water management system is implemented so as to optimize water consumption and usage further.

Note: This report is based on the technical information provided by the industry and pollution load assessed by TIET team with all the material balance calculations during the industry visit and cannot be deemed to be a certificate for any legal implications.

(Dr. Anoop Verma)
Prof. & Head
School of Energy & Environment, Thapar Institute of engineering & technology

ANNEXURE I

PUNJAB POLLUTION CONTROL BOARD
Zonal Office-1, Vatavaran Bhawan, Nabha Road, Patiala – 147001
Website:- www.ppcb.gov.in

Office Dispatch No : **Registered/Speed Post** **Date:**

Industry Registration ID: *R12SAS22596* **Application No :** *23772629*

To,
Mr.ch.tirupathi Rao
Nectar Lefesciences Ltd (unit-2)
Mohali,Mohali-140507

Subject: Renewal of consent to operate granted under section 21 of the Air (Prevention & Control of Pollution) Act, 1981

1. Particulars of Consent to Operate under Air Act, 1981 granted to the industry

Consent to Operate Certificate No.	*CTOA/Renewal/SAS/2023/23772629*
Date of issue :	*01/12/2023*
Date of expiry :	*31/01/2024*
Certificate Type :	*Renewal*
Previous CTO No. & Validity :	*CTOA/Renewal/SAS/2022/20443954* *From:20/12/2022 To:30/06/2023*

2. Particulars of the Industry

Name & Designation of the Applicant	*Mr.ch.tirupathi Rao, (Environment Head)*
Address of Industrial premises	*Nectar Lifesciences Ltd (unit-2),* *Village Saidpura, Tehsil Dera Bassi,* *Derabassi,Sas Nagar-140507*
Capital Investment of the Industry	*93121.86 lakhs*
Category of Industry	*Red*
Type of Industry	*Drugs and Pharmaceuticals*
Scale of the Industry	*Large*
Office District	*Sas Nagar*

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Nectar Lifesciences Ltd (unit-2),Village Saidpura, Tehsil Dera Bassi,Derabassi,Sas Nagar,140507
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ANNEXURE I (Continue)

All the term and conditions same as mentioned in the original consent no. CTOA/Renewal/SAS/2022/20443951 dated 20/12/2022 (valid upto 30/6/2023), is hereby further extended upto 31/1/2024. This extension letter may be appended with the original consent letter issued to the project proponent and subsequent extensions letters with the condition the industry shall comply with the decisions given by the Chairman of the Board held on 17/11/2023 and submit the report within stipulated time period accordingly.

01/12/2023

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

Endst. No.: **Dated:**

A copy of the above is forwarded to the following for information and necessary action please:

1) Environmental Engineer, Punjab Pollution Control Board, Regional Office, SAS Nagar

01/12/2023

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

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Nectar Lifesciences Ltd (unit-2),Village Saidpura, Tehsil Dera Bassi,Derabassi,Sas Nagar,140507
Page2

ANNEXURE II

PUNJAB POLLUTION CONTROL BOARD

Zonal Office-1, Vatavaran Bhawan, Nabha Road, Patiala – 147001

Website:- www.ppcb.gov.in

Office Dispatch No : Registered/Speed Post Date:

Industry Registration ID: *R12SAS22596* Application No : *23777031*

To,

Mr Puneet Sud
Nectar Lefesciences Ltd (unit-2)
Mohali,Mohali-140507

Subject: Renewal of consent to operate granted under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974

1. Particulars of Consent to Operate under Water Act, 1974 granted to the industry

Consent to Operate Certificate No.	*CTOW/Renewal/SAS/2023/23777031*
Date of issue :	*01/12/2023*
Date of expiry :	*31/01/2024*
Certificate Type :	*Renewal*
Previous CTO No. & Validity :	*CTOW/Renewal/SAS/2022/20441856* *From:20/12/2022 To:30/06/2023*

2. Particulars of the Industry

Name & Designation of the Applicant	*Mr.ch.tirupathi Rao, (Environment Head)*
Address of Industrial premises	*Nectar Lifesciences Ltd (unit-2),* *Village Saidpura, Tehsil Dera Bassi,* *Derabassi,Sas Nagar-140507*
Capital Investment of the Industry	*93121.86 lakhs*
Category of Industry	*Red*
Type of Industry	*Drugs and Pharmaceuticals*
Scale of the Industry	*Large*
Office District	*Sas Nagar*

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ANNEXURE II (Continue)

All the term and conditions same as mentioned in the original consent no. CTOW/Renewal/SAS/2022/20441856 dated 20/12/2022 (valid upto 30/6/2023), is hereby further extended upto 31/1/2024. This extension letter may be appended with the original consent letter issued to the project proponent and subsequent extensions letters with the condition the industry shall comply with the decisions given by the Chairman of the Board held on 17/11/2023 and submit the report thereafter within stipulated time period.

01/12/2023

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

Endst. No.: **Dated:**

A copy of the above is forwarded to the following for information and necessary action please:

1) Environmental Engineer, Punjab Pollution Control Board, Regional Office, SAS Nagar

01/12/2023

(Rajeev Gupta)
Environmental Engineer
For & on behalf
of
(Punjab Pollution Control Board)

ANNEXURE III

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1 of 1,051

Fwd: Process the application for the NOC of groundwater for Nectar Lifescience Limited, Unit-2 (Unit Identification Number 20230100595). Inbox ×

Manoj Bidhar
to me

5:09 PM (2 minutes ago)

---------- Forwarded message ---------
From: **Manoj Bidhar** <manoj.bidhar@neclife.com>
Date: Sat, Feb 3, 2024 at 5:07 PM
Subject: Fwd: Process the application for the NOC of groundwater for Nectar Lifescience Limited, Unit-2 (Unit Identification Number 20230100595)
To: Jasvinder Singh <jasvinder.baddi@neclife.com>

---------- Forwarded message ---------
From: **Tirupathi Rao** <tirupathi.rao@neclife.com>
Date: Wed, Nov 8, 2023 at 1:58 PM
Subject: Process the application for the NOC of groundwater for Nectar Lifescience Limited, Unit-2 (Unit Identification Number 20230100595).
To: <pwrda@punjab.gov.in>, <param.kalon.pwrda@punjab.gov.in>

Respected Sir,

We have filed an online application for the NOC of groundwater on the PWRDA portal with Reference "Unit Identification Number 20230100595" for Nectar Lifescience Limited Unit-2 in the Derabassi location. We have attached the fee details for your reference and kindly request the necessary fee adjustment as per the requirements and the process of

ANNEXURE IV

Log Book

Multi Effect Evaporator (MEE) & Agitated Thin film Dryer (ATFD)

Nectar Life Sciences Limited, Unit II

Date	Feed to MEE			Condensate from MEE			Feed to ATFD			Condensate from ATFD			Total Condensate	Salt from ATFD
	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	KL	MT
01/08/2023	98128	98398	270	126659	126924	265	7108	7114	5	1423	1426	3	268	2400
02/08/2023	98398	98678	280	126924	127203	279	7114	7119	6	1426	1429	3	282	2600
03/08/2023	98678	98952	274	127203	127462	259	7119	7125	5	1429	1432	3	262	2450
04/08/2023	98952	99227	275	127462	127766	240	7125	7130	6	1432	1435	3	243	2500
05/08/2023	99227	100115	288	127766	128048	282	7130	7136	6	1435	1438	3	285	2760
06/08/2023	100118	100374	259	128048	128302	254	7136	7141	5	1438	1441	3	257	2180
07/08/2023	100374	100664	290	128302	128586	284	7141	7147	6	1441	1444	3	287	2800
08/08/2023	100664	100944	280	128586	128861	274	7147	7152	6	1444	1447	3	277	2600
09/08/2023	100944	101204	260	128861	129115	255	7152	7158	5	1447	1450	3	258	2200
10/08/2023	101204	101465	261	129115	129371	256	7158	7163	5	1450	1452	2.5	258	2420
11/08/2023	101465	101755	290	129371	129655	284	7163	7169	6	1452	1455	3	287	2900
12/08/2023	101755	102015	260	129655	129910	255	7169	7174	5	1455	1458	2.5	257	2300
13/08/2023	102015	102297	282	129910	130187	276	7174	7180	6	1458	1461	3	279	2640
14/08/2023	102297	102576	279	130187	130460	273	7180	7185	6	1461	1464	3	276	2880
15/08/2023	102576	102842	266	130460	130721	261	7185	7190	5	1464	1467	3	264	2320
16/08/2023	102842	103112	270	130721	130986	265	7190	7196	5	1467	1469	2.5	267	2900
17/08/2023	103112	103400	288	130986	131268	282	7196	7202	6	1469	1472	3	285	2760
18/08/2023	103400	103680	280	131268	131542	274	7202	7207	6	1472	1475	3	277	2600
19/08/2023	103680	103960	280	131542	131816	274	7207	7213	6	1475	1478	3	277	2600
20/08/2023	103960	104242	282	131816	132093	276	7213	7218	6	1478	1481	3	279	2640
21/08/2023	104242	104530	288	132093	132375	282	7218	7224	5	1481	1484	3	285	2760
22/08/2023	104530	104796	266	132375	132636	261	7224	7230	5	1484	1487	2.5	263	2820
23/08/2023	104796	105066	270	132636	132900	265	7230	7235	5	1487	1489	2.5	267	2900
24/08/2023	105066	105332	266	132900	133161	261	7235	7240	5	1489	1492	2.5	263	2820
25/08/2023	105332	105604	272	133161	133427	267	7240	7246	5	1492	1494	2.5	269	2940
26/08/2023	105604	105879	275	133427	133697	270	7246	7251	6	1494	1497	3	273	2500
27/08/2023	105879	106159	280	133697	133971	274	7251	7257	6	1497	1500	3	277	2600
28/08/2023	106159	106439	280	133971	134246	274	7257	7262	6	1500	1503	3	277	2600
29/08/2023	106439	106721	282	134246	134522	276	7262	7268	6	1503	1506	3	279	2640
30/08/2023	106721	106971	250	134522	134767	245	7268	7273	5	1506	1509	2.5	248	2500
31/08/2023	106971	107231	260	134767	135022	255	7273	7278	5	1509	1511	2.5	257	2500
Total			8233			8068			164			85.5	8154	81360

Checked & Verified by [signature] Plant Manager [signature]

Log Book

Multi Effect Evaporator (MEE) & Agitated Thin film Dryer (ATFD)

Nectar Life Sciences Limited, Unit-II

Date	Feed to MEE			Condensate from MEE			Feed to ATFD			Condensate from ATFD			Total Condensate	Salt from ATFD
	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	KL	MT
01/09/2023	107231	107491	2.60	135022	135277	2.55	7279	7286	07	1511	1515	04	2.59	3225
02/09/2023	107491	107782	2.91	135277	135553	2.76	7286	7293	07	1515	1519	04	2.86	2950
03/09/2023	107782	108060	2.78	135553	135830	2.71	7293	7300	07	1519	1523	04	2.75	2375
04/09/2023	108060	108335	2.75	135830	136098	2.68	7300	7307	07	1523	1527	04	2.72	3250
05/09/2023	108335	108625	2.90	136098	136381	2.83	7307	7314	07	1527	1531	04	2.87	3050
06/09/2023	108625	108905	2.80	136381	136654	2.73	7314	7321	07	1531	1535	04	2.77	2437
07/09/2023	108905	109175	2.70	136654	136917	2.63	7321	7328	07	1535	1539	04	2.67	2475
08/09/2023	109175	109465	2.90	136917	137200	2.83	7328	7335	07	1539	1543	04	2.87	2625
09/09/2023	109465	109730	2.65	137200	137458	2.58	7335	7342	07	1543	1547	04	2.62	2614
10/09/2023	109730	109996	2.66	137458	137717	2.59	7342	7349	07	1547	1550	03	2.62	2125
11/09/2023	109996	110286	2.90	137717	138001	2.84	7349	7355	07	1550	1554	04	2.88	2500
12/09/2023	110286	110546	2.60	138001	138254	2.53	7355	7362	07	1554	1557	03	2.56	2410
13/09/2023	110546	110828	2.82	138254	138529	2.75	7362	7369	07	1557	1561	04	2.79	3050
14/09/2023	110828	111108	2.80	138529	138802	2.73	7369	7376	07	1561	1565	04	2.77	2625
15/09/2023	111108	111374	2.66	138802	139061	2.59	7376	7383	07	1565	1569	04	2.63	2725
16/09/2023	111374	111645	2.71	139061	139325	2.64	7383	7390	07	1569	1573	04	2.68	3225
17/09/2023	111645	111934	2.89	139325	139607	2.82	7390	7396	07	1573	1577	04	2.86	2650
18/09/2023	111934	112200	2.66	139607	139866	2.59	7396	7404	07	1577	1581	04	2.63	3225
19/09/2023	112200	112484	2.84	139866	140143	2.77	7404	7411	07	1581	1585	04	2.81	3700
20/09/2023	112484	112772	2.88	140143	140424	2.81	7411	7418	07	1585	1589	04	2.85	3100
21/09/2023	112772	113061	2.89	140424	140706	2.82	7418	7425	07	1589	1593	04	2.86	2650
22/09/2023	113061	113327	2.66	140706	140965	2.59	7425	7431	07	1593	1597	04	2.63	2450
23/09/2023	113327	113605	2.78	140965	141237	2.72	7431	7438	07	1597	1601	04	2.76	2500
24/09/2023	113605	113865	2.60	141237	141490	2.53	7438	7445	07	1601	1605	04	2.57	3825
25/09/2023	113865	114140	2.75	141490	141758	2.68	7445	7452	07	1605	1609	04	2.72	2825
26/09/2023	114140	114415	2.75	141758	142026	2.68	7452	7459	07	1609	1613	04	2.72	3350
27/09/2023	114415	114705	2.90	142026	142309	2.83	7459	7466	07	1613	1617	04	2.87	3025
28/09/2023	114705	114986	2.81	142309	142583	2.74	7466	7473	07	1617	1621	04	2.78	3150
29/09/2023	114986	115272	2.86	142583	142861	2.79	7473	7480	07	1621	1624	03	2.82	4000
30/09/2023	115272	115552	2.80	142861	143134	2.73	7480	7487	07	1624	1627	03	2.76	4000
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Checked & Verified by [signature] Plant Manager [signature]

ANNEXURE IV (Continue)

Log Book

Multi Effect Evapaorator (MEE) & Agitated Thin film Dryer (ATFD)

Nectar Life Sciences Limited, Unit-II

Date	Feed to MEE			Condensate from MEE			Feed to ATFD			Condensate from ATFD			Total Condensate	Salt from ATFD
	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	KL	MT
01/10/2023	115552	115834	282	143134	143408	274	7487	7496	9	1627	1631	4	275	4366
02/10/2023	115834	116135	301	143408	143700	292	7496	7505	9	1631	1636	5	297	4030
03/10/2023	116135	116413	278	143700	143970	271	7505	7513	8	1636	1640	4	274	4340
04/10/2023	116413	116693	280	143970	144241	272	7513	7521	8	1640	1644	4	276	4100
05/10/2023	116693	116963	270	144241	144503	262	7521	7524		1644	1648	4	266	4100
06/10/2023	116963	117251	288	144503	144782	279	7524	7533	9	1648	1652	4	284	4140
07/10/2023	117251	117521	270	144782	145044	262	7533	7546	8	1652	1656	4	266	4100
08/10/2023	117521	117801	280	145044	145316	272	7546	7555	9	1656	1660	4	276	4400
09/10/2023	117801	118061	260	145316	145568	252	7555	7562	7	1660	1664	4	256	3900
10/10/2023	118061	118321	260	145568	145820	252	7562	7570	8	1664	1668	4	256	3900
11/10/2023	118321	118583	262	145821	146075	254	7570	7578	8	1668	1672	4	258	3860
12/10/2023	118593	118853	270	146075	146336	262	7578	7586	8	1672	1676	4	266	4100
13/10/2023	118853	119113	260	146336	146588	252	7586	7594		1676	1680	4	256	3800
14/10/2023	119113	119383	270	146588	146851	262	7594	7602	8	1680	1684	4	266	4100
15/10/2023	119383	119648	265	146851	147108	257	7602	7610	8	1684	1688	4	261	3960
16/10/2023	119648	119928	280	147108	147379	272	7610	7618	8	1688	1692	4	276	4400
17/10/2023	119928	120193	265	147379	147641	262	7618	7626	8	1692	1696	4	266	4100
18/10/2023	120193	120463	270	147641	147903	262	7626	7635	9	1696	1700	4	266	4100
19/10/2023	120463	120734	271	[illegible]	148166	263	7635	7643	8	1700	1704	4	267	4130
20/10/2023	120734	121014	280	148166	148437	272	7643	7651	8	1704	1708	4	276	4400
21/10/2023	121014	121286	272	148437	148701	264	7651	7659	8	1708	1712	4	268	4160
22/10/2023	121286	121571	285	148701	148973	272	7659	7668	9	1712	1716	4	276	4600
23/10/2023	121571	121843	272	148973	149237	264	7668	7676	8	1716	1720	4	268	3900 4460
24/10/2023	121843	122103	260	149237	149489	252	7676	7684	8	1720	1724	4	256	3800
25/10/2023	122103	122373	270	149489	149751	262	7684	7692	8	1724	1728	4	266	4100
26/10/2023	122373	122647	274	149751	150017	266	7692	7700	8	1728	1732	4	270	3700 4220
27/10/2023	122647	122937	290	150017	150288	286	7700	7709	9	1732	1737	5	286	4100 3700
28/10/2023	122937	123220	283	150288	150572	275	7709	7717	8	1737	1741	4	279	4400
29/10/2023	123230	123505	265	150572	150848	276	7717	7725	9	1741	1746	5	281	3550
30/10/2023	123505	123742	237	150848	151127	278	7725	7734	9	1746	1751	5	292	3610
31/10/2023	123742	124082	[illegible]	151127	151403	261	7734	7743	9	1751	1756	5	265	3700
														121946

Checked & Verified by ________ Plant Manager ________ For Nectar Life Sciences Ltd

Log Book

Multi Effect Evapaorator (MEE) & Agitated Thin film Dryer (ATFD)

Nectar Life Sciences Limited, Unit-II

Date	Feed to MEE			Condensate from MEE			Feed to ATFD			Condensate from ATFD			Total Condensate	Salt from ATFD
	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	KL	MT
1 Nov 2023	124087	124370	283	151409	151639	230	7743	7751	8	1756	1760	4	234	4000
2 Nov 2023	124370	124654	284	151639	151916	277	7751	7758	7	1760	1763	3	280	3000
3 Nov 2023	124654	124940	286	151916	152194	278	7758	7766	8	1763	1767	4	282	4000
4 Nov 2023	124940	125222	282	152244	152517	273	7766	7775	9	1767	1772	5	275	4500
5 Nov 2023	125222	125499	277	152517	152786	269	7775	7783	8	1772	1776	4	273	4000
6 Nov 2023	125499	125759	260	152786	153067	281	7783	7792	9	1776	1780	5	296	4500
7 Nov 2023	125759	126056	297	153067	153327	260	7792	7799	7	1780	1783	3	263	3000
8 Nov 2023	126056	126318	262	153327	153601	274	7799	7807	8	1783	1787	4	273	4000
9 Nov 2023	126318	126593	255	153601	153849	245	7807	7814	7	1787	1790	3	251	3000
10 Nov 2023	126593	126855	262	153849	154103	254	7814	7822	8	1790	1794	4	258	4000
11 Nov 2023	126855	127120	265	154103	154361	258	7822	7829	7	1794	1797	3	261	3000
12 Nov 2023	127120	127395	275	154361	154628	267	7829	7837	8	1797	1801	4	271	4000
13 Nov 2023	127395	127655	260	154628	154881	253	7837	7844	7	1801	1805	4	257	4000
14 Nov 2023	127655	127927	272	154881	155145	264	7844	7852	8	1805	1809	4	268	4000
15 Nov 2023	127927	128195	268	155145	155407	262	7852	7858	6	1809	1815	6	268	4000
16 Nov 2023	128195	128477	282	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17 Nov 2023	128477	128747	270	155680	155943	263	7864	7871	7	1819	1823	4	267	4000
18 Nov 2023	128747	129022	275	155943	156211	268	7874	7881	7	1823	1826	3	271	3000
19 Nov 2023	129022	129294	272	156211	156477	266	7881	7887	6	1826	1829	3	269	3000
20 Nov 2023	129294	129574	280	156477	156748	271	7887	7896	9	1829	1834	5	276	4000
21 Nov 2023	129574	129849	275	156748	157015	267	7896	7904	8	1834	1838	4	271	4000
22 Nov 2023	129849	130129	280	157015	157286	271	7904	7913	9	1838	1842	4	275	4000
23 Nov 2023	130129	130398	269	157286	157547	261	7913	7921	8	1842	1846	4	265	4000
24 Nov 2023	130398	130663	265	157547	157805	258	7921	7928	7	1846	1850	4	262	3500
25 Nov 2023	130663	130935	272	157805	158069	264	7928	7936	8	1850	1854	4	268	4000
26 Nov 2023	130935	131215	280	158069	158340	271	7936	7945	9	1854	1863	9	280	4000
27 Nov 2023	131215	131505	290	158340	158621	281	7945	7954	9	1863	1867	4	285	4000
28 Nov 2023	131505	131765	260	158621	158873	252	7954	7962	8	1867	1871	4	256	4000
29 Nov 2023	131765	132037	272	[illegible]	159133	265	[illegible]	[illegible]	7	1871	1874	4	269	3500
30 Nov 2023	132037	132302	265	159133	159392	259	[illegible]	797		1874	1877	3	262	3000
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Checked & Verified by ________ Plant Manager ________

ANNEXURE IV (Continue)

Log Book
Multi Effect Evaporator (MEE) & Agitated Thin film Dryer (ATFD)
Nectar Life Sciences Limited, Unit-II

Date	Feed to MEE			Condensate from MEE			Feed to ATFD			Condensate from ATFD			Total Condensate	Salt from ATFD
	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	KL	MT
1 Dec 2023	132302	132522	220	159397	159610	213	7975	7982	7	1877	1880	3	216	3600
2 Dec 2023	132522	132742	220	159610	159823	213	7982	7989	7	1880	1884	4	217	2900
3 Dec 2023	132742	132962	220	159823	160037	213	7989	7995	7	1884	1887	3	21	3600
4-Dec-2023	132962	133180	218	160037	160248	211	7995	8002	7	1887	1891	4	215	2850
5-Dec-2023	133180	133405	225	160248	160466	2 8	8002	8009	7	1891	1895		222	2150
6-Dec-2023	133405	133625	220	160466	160680	213	8009	801	7	1895	1898	3	216	3600
7-Dec-2023	133625	133847	222	160680	160895	2 5	8015	802	7	1898	1901	3	218	3660
8-Dec-2023	133847	134072	225	160895	161113	218	8022	8029	7	1901	1905	4	222	3250
9 Dec-2023	134072	134292	220	161113	161327	2 4	8029	8035	7	1905	1908	4	217	3100
10-Dec-2023	134292	134513	221	161327	161541	214	8035	8042	7	1908	1912	4	218	3130
11-Dec 2023	134513	134731	218	161541	161753	211	8042	8048	7	1912	1915	4	215	3040
12-Dec 2023	134731	134951	220	161753	161966	213	8048	8055	7	1915	1919	4	217	3100
13-Dec-2023	134951	135171	220	161966	162179	213	8055	8062	7	1919	1922	4	217	3100
14-Dec-2023	135171	135406	235	162179	162407	228	8062	8069	7	1922	1926	4	231	3550
15-Dec-2023	135406	135626	220	162407	162621	213	8069	8075	7	1926	1929	4	217	3100
16-Dec-2023	135626	135847	221	162621	162835	214	8075	8082	7	1929	1933	4	218	3130
17-Dec-2023	135847	136068	221	162835	163050	214	8082	8088	7	1933	1936	4	222	3130
18-Dec-2023	136068	136293	225	163050	163268	218	8088	8095	7	1936	1940	4	225	3250
19-Dec-2023	136293	136521	228	163268	163489	221	8095	8102	7	1940	1943	4	229	3140
20-Dec 2023	136521	136753	232	163489	163714	225	8102	8109	7	1943	1947	4	236	3460
21-Dec-2023	136753	136993	240	163714	163947	233	8109	8116	7	1947	1950	4	212	3700
22-Dec-2023	136993	137208	215	163947	164155	208	8116	8123	6	1950	1953	3	215	3450
23-Dec-2023	137208	137426	218	164155	164367	211	8123	8129	7	1953	1957	4	236	3040
24-Dec-2023	137426	137666	240	164367	164600	233	8129	8136	7	1957	1960	4	2 4	3700
25-Dec-2023	137666	137883	217	164600	164810	210	8136	8143	7	1960	1964	4	217	3010
26-Dec-2023	137883	138103	220	164810	165024	213	8143	8149	7	1964	1967	4	210	3100
27-Dec-2023	138103	138316	213	165024	165230	207	8149	8156	6	1967	1971		218	2890
28-Dec-2023	138316	138537	221	165230	165444	214	8156	8163	7	1971	1974	4	253	3130
29-Dec-2023	138537	138794	257	165444	165694	249	8163	8170	8	1974	1978	4	238	3710
30-Dec-2023	138794	139036	242	165694	165929	235	8170	8177	7	1978	1982	4	238	3760
31-Dec-2023	139036	139276	240	165929	166161	233	8177	8185	7	1982	1985	4	236	3700
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Log Book
Multi Effect Evaporator (MEE) & Agitated Thin film Dryer (ATFD)
Nectar Life Sciences Limited, Unit-II

Date	Feed to MEE			Condensate from MEE			Feed to ATFD			Condensate from ATFD			Total Condensate	Salt from ATFD
	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	Initial reading	Final Reading	Difference (KL)	KL	MT
01/01/24	139276	139516	240	166161	166394	233	8185	8192	7	1985	1988	3	236	2050
02/01/24	139516	139751	235	166394	166622	228	8192	8199	7	1988	1992	4	231	3450
03/01/24	139751	140013	262	166622	166876	254	8199	8207	8	1992	1996	4	258	3990
04/01/24	140013	140283	270	166876	167138	262	8207	8215	8	1996	2000	4	266	4000
05/01/24	140283	140531	248	167138	167379	241	8215	8222	7	2000	2003	4	244	3400
06/01/24	140531	140776	245	167379	167616	238	8222	8230	7	2003	2007	4	241	3160
07/01/24	140776	141024	248	167616	167857	241	8230	8237	7	2007	2010	4	244	3500
08/01/24	141024	141276	252	167857	168101	244	8237	8245	8	2010	2014	4	248	4000
09/01/24	141276	141524	248	168101	168342	241	8245	8252	7	2014	2017	3	244	3000
10/01/24	141524	141769	245	168342	168580	238	8252	8259	7	2017	2021	4	242	4000
11/01/24	141769	142029	260	168580	168832	252	8259	8267	8	2021	2025	4	256	4000
12/01/24	142029	142291	262	168832	169086	254	8267	8275	7	2025	2029	4	258	4000
13/01/24	142291	142561	270	169086	169348	262	8275	8283	8	2029	2033	4	266	4000
14/01/24	142561	142796	235	169348	169576	228	8283	8290	7	2033	2036	3	231	3000
15/01/24	142796	143036	240	169576	169809	233	8290	8297	7	2036	2041	5	238	5000
16/01/24	143036	143303	267	169809	170068	259	8297	8305	8	2041	2044	3	262	3000
17/01/24	143303	143558	255	170068	170315	247	8305	8313	8	2044	2048	4	251	4000
18/01/24	143558	143820	262	170315	170569	254	8313	8321	8	2048	2052	4	258	4000
19/01/24	143820	144081	261	170569	170822	253	8321	8329	8	2052	2056	4	257	4000
20/01/24	144081	144339	258	170822	171072	250	8329	8337	8	2056	2060	4	254	4000
21/01/24	144339	144596	257	171072	171322	249	8337	8344	8	2060	2064	4	253	4000
22/01/24	144596	144857	261	171322	171575	253	8344	8352	8	2064	2068	4	257	4000
23/01/24	144857	145113	256	171575	171823	248	8352	8360	8	2068	2072	4	252	4000
24/01/24	145113	145364	251	171823	172067	243	8360	8367	8	2072	2076	4	247	4000
25/01/24	145364	145616	252	172067	172311	244	8367	8375	8	2076	2080	4	248	4000
26/01/24	145616	145867	251	172311	172555	243	8375	8382	8	2080	2084	4	247	4000
27/01/24	145867	146121	254	172555	172801	246	8382	8390	8	2084	2088	4	250	4000
28/01/24	146121	146370	249	172801	173043	242	8390	8398	7	2088	2091	3	245	3000
29/01/24	146370	146624	256	173043	173289	246	8398	8405	8	2091	2096	5	251	5000
30/01/24	146624	146869	245	173289	173527	238	8405	8412	7	2096	2099	3	241	3000
31/01/24	146869	147120	251	173527	173770	243	8412	8420	8	2099	2103	4	247	4000
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Checked & Verified by ___ Plant Manager ___

ANNEXURE V

Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Treatment)
Nectar Life Sciences Limited, Unit-II

Date	LTDS (ETP) Initial	LTDS (ETP) Final	LTDS (ETP) Difference (KL)	UF Feed Initial	UF Feed Final	UF Feed Difference (KL)	UF Permeate-A Initial	UF Permeate-A Final	UF Permeate-A Difference (KL)	UF Permeate-B Initial	UF Permeate-B Final	UF Permeate-B Difference (KL)	Total KL	RO Permeate Initial	RO Permeate Final	RO Permeate Difference (KL)
1-Jan-2024	436940	438020	1080			929	179484	179803	319	181081	181598	517	836	359797	360547	750
2-Jan-2024	438020	439140	1120			960	179803	180205	402	181598	182060	462	864	360547	361326	779
3-Jan-2024	439140	440240	1100			942	180205	180454	249	182060	182659	599	848	361326	362088	762
4-Jan-2024	440240	441340	1100			945	180454	181064	610	182659	182900	241	851	362088	362851	763
5-Jan-2024	441340	442452	1112			955	181064	181367	304	182900	183456	556	860	362851	363628	777
6-Jan-2024	442452	443472	1020			871	181367	181546	179	183456	184061	605	784	363628	364333	705
7-Jan-2024	443472	444513	1041			890	181546	181813	267	184061	184594	534	801	364333	365056	723
8-Jan-2024	444513	445538	1025			880	181813	182087	274	184594	185113	518	792	365056	365768	713
9-Jan-2024	445538	446657	1120			963	182087	182480	393	185113	185586	474	867	365768	366545	777
10-Jan-2024	446657	447722	1065			916	182480	182850	371	185586	186040	454	824	366545	367290	745
11-Jan-2024	447722	448722	1000			861	182850	183102	251	186040	186564	524	775	367290	367990	700
12-Jan-2024	448722	449732	1010			869	183102	183883	782	186564	186564	0	782	367990	368693	703
13-Jan-2024	449732	450833	1101			945	183883	184133	250	186564	187165	601	851	368693	369459	766
14-Jan-2024	450833	451858	1025			881	184133	184265	132	187165	187826	661	793	369459	370172	713
15-Jan-2024	451858	452923	1065			815	184265	184354	90	187826	188470	644	734	370172	370833	661
16-Jan-2024	452923	454003	1080			928	184354	184605	250	188470	189055	585	835	370833	371585	752
17-Jan-2024	454003	455065	1062			912	184605	184785	181	189055	189695	640	821	371585	372323	738
18-Jan-2024	455065	456196	1131			972	184785	185008	223	189695	190347	652	875	372323	373111	787
19-Jan-2024	456196	457330	1134			975	185008	185215	207	190347	191018	671	878	373111	373903	792
20-Jan-2024	457330	458382	1052			906	185215	185310	95	191018	191738	720	815	373903	374638	735
21-Jan-2024	458382	459451	1069			920	185310	185443	133	191738	192433	695	828	374638	375382	744
22-Jan-2024	459451	460561	1110			954	185443	185658	215	192433	193077	644	859	375382	376157	775
23-Jan-2024	460561	461674	1113			956	185658	185879	221	193077	193716	639	860	376157	376932	775
24-Jan-2024	461674	462766	1092			938	185879	186073	194	193716	194366	650	844	376932	377691	760
25-Jan-2024	462766	463799	1033			889	186073	186184	111	194366	195055	69	800	377691	378412	720
26-Jan-2024	463799	464865	1066			917	186184	186409	224	195055	195656	601	825	378412	379154	743
27-Jan-2024	464865	465902	1037			892	186409	186607	198	195656	196260	604	802	379154	379878	724
28-Jan-2024	465902	466928	1026			881	186607	186764	157	196260	96896	636	793	379878	380593	715
29-Jan-2024	466928	467928	1000			861	186764	186991	227	196896	197444	548	775	380593	381291	698
30-Jan-2024	467928	469113	1185			1019	186991	187296	305	197444	198056	612	917	381291	3 2115	824
31-Jan-2024	469113	470115	1002			893	187296	187453	157	198056	198703	647	804	382115	382837	722

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Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Treatment)
Nectar Life Sciences Limited, Unit-II

Date	LTDS (ETP) Initial	LTDS (ETP) Final	LTDS (ETP) Difference (KL)	UF Feed Initial	UF Feed Final	UF Feed Difference (KL)	UF Permeate-A Initial	UF Permeate-A Final	UF Permeate-A Difference (KL)	UF Permeate-B Initial	UF Permeate-B Final	UF Permeate-B Difference (KL)	Total KL	RO Permeate Initial	RO Permeate Final	RO Permeate Difference (KL)
1-Dec-2023	404515	405604	1031			961	165002	163324	322	166826	167317	491	813	33 3	[illegible]	[illegible]
2-Dec-2023	405604	406699	1095			913	165324	163696	372	167317	167704	415	559	[illegible]	[illegible]	[illegible]
3-Dec-2023	406699	407766	1067			934	165696	169066	322	167904	165269	[illegible]	537	[illegible]	[illegible]	4
4-Dec-2023	407766	408833	1067			939	169068	169440	372	163269	165735	465	537	333	[illegible]	[illegible]
5-Dec-2023	408833	409853	1020			394	169440	169812	372	165735	169307	573	945	[illegible]	[illegible]	[illegible]
6-Dec-2023	409853	410392	1039			912	169812	170184	322	169307	169752	443	815	3	[illegible]	[illegible]
7-Dec-2023	410392	411959	1067			934	170 54	170556	372	169752	170224	417	545	[illegible]	37	[illegible]
8-Dec-2023	411959	413026	1067			939	170556	170925	372	170224	170697	473	545	[illegible]	[illegible]	[illegible]
9-Dec-2023	413026	414076	1050			923	170925	171300	37	170697	171156	460	832	[illegible]	[illegible]	7
10-Dec-2023	414076	415097	1021			893	171300	171672	37	171156	171593	437	509	[illegible]	[illegible]	[illegible]
11-Dec-2023	415097	416132	1035			916	171672	172044	372	171593	172041	445	920	3 27	3	[illegible]
12-Dec-2023	416132	417203	1071			842	172044	172411	37	172041	172517	471	843	[illegible]	[illegible]	[illegible]
13-Dec-2023	417203	418219	1016			939	172411	172785	37	172517	172959	472	544	[illegible]	[illegible]	[illegible]
14-Dec-2023	4183??	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
15-Dec-2023	419337	420289	952			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
16-Dec-2023	420399	421158	1019			[illegible]	173532	173904	372	[illegible]	174396	117	5	[illegible]	[illegible]	[illegible]
17-Dec-2023	421357	422415	1037			357	173904	174276	372	174390	174509	415		[illegible]	34140	[illegible]
18-Dec-2023	422445	423535	1090			959	174276	174645	372	174509	175360	441		[illegible]	[illegible]	[illegible]
19-Dec-2023	423535	424560	1025			902	174649	175020	372	175360	175746	445	[illegible]	[illegible]	[illegible]	[illegible]
20-Dec-2023	424560	425612	1052			926	175020	175392	372	175746	176201	461	833	35	[illegible]	[illegible]
21-Dec-2023	425612	426695	1083			[illegible]	175392	175764	37	176201	176637	4?	858	[illegible]	35	[illegible]
22-Dec-2023	426695	427714	1019			596	175764	176136	372	176637	177122	[illegible]	907	3	[illegible]	[illegible]
23-Dec-2023	427714	428763	1049			923	176136	176509	372	177122	177579	457	831	[illegible]	[illegible]	[illegible]
24-Dec-2023	428763	429792	1029			9?	176509	176880	37	177531	178024	4?	915	[illegible]	[illegible]	[illegible]
25-Dec-2023	429792	430821	1029			9?	176880	177252	372	178024	178417	4?	915	[illegible]	[illegible]	[illegible]
26-Dec-2023	430821	431833	1012			592	177252	177624	372	178467	178896	4?	800	[illegible]	[illegible]	[illegible]
27-Dec-2023	431833	432933	1000			9?	177624	177996	372	178896	17938	42		[illegible]	[illegible]	[illegible]
28-Dec-2023	432933	433968	1035			911	177996	178368	372	179318	179764	44	[illegible]	[illegible]	[illegible]	735
29-Dec-2023	433565	434903	1035			911	178368	178740	372	179 64	15?212	4		[illegible]	[illegible]	[illegible]
30-Dec-2023	434903	435915	1012			891	178740	179112	372	15?32	150641	4?	[illegible]	[illegible]	[illegible]	[illegible]
31-Dec-2013	435915	436940	1025			902	179112	179484	372	130?4	131031	44		[illegible]	[illegible]	[illegible]

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ANNEXURE V (Continue)

Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Treatment)
Nectar Life Sciences Limited, Unit-II

Date	LTDS (ETP)			UF Feed			UF Permeate-A			UF Permeate-B			Total	RO Permeate		
	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	KL	Initial	Final	Difference (KL)
1-Nov-2023	312441	313446	1067			927	158766	159089	321	151365	151516	511	824	336079	336510	761
2-Nov-2023	314010	315058	1045			905	159059	159212	224	151516	152110	594	817	336820	336646	786
3-Nov-2023	315050	316000	1045			995	159212	159578	215	152110	153040	531	896	336566	336636	805
4-Nov-2023	316200	317229	1029			895	159576	159561	223	153040	153623	553	806	336636	336553	725
5-Nov-2023	317229	318243	1014			881	159801	160017	216	153623	154200	577	793	336553	336546	713
6-Nov-2023	318243	319277	1036			960	160017	160307	290	154200	154772	520	810	336546	336564	720
7-Nov-2023	319277	320317	1039			904	160307	160628	321	154720	155212	492	813	336564	336566	771
8-Nov-2023	320211	321256	1029			904	160628	160995	367	155212	155658	446	813	336566	336566	733
9-Nov-2023	321256	322458	1022			941	160995	161292	295	155658	156205	549	847	336566	336597	760
10-Nov-2023	322458	323495	1034			918	161292	161598	305	156205	156729	531	836	336597	336577	740
11-Nov-2023	323495	324512	1017			886	161598	161905	307	156729	157219	490	797	336578	336561	722
12-Nov-2023	324512	325557	1045			910	161905	162272	367	157219	157671	452	819	336561	336576	736
13-Nov-2023	325557	326628	1071			931	162272	162659	387	157671	158122	451	838	336576	336593	752
14-Nov-2023	326628	327718	1090			948	162659	162980	321	158122	158654	532	853	336593	336611	767
15-Nov-2023	327718	328763	1045			904	162980	163266	286	158654	159157	532	818	336611	336550	727
16-Nov-2023	328763	329805	1042			905	163266	163556	290	159157	159714	527	817	336550	336580	735
17-Nov-2023	329806	330829	1024			891	163556	163844	288	159714	160228	514	802	336580	336567	722
18-Nov-2023	330829	331929	1100			958	163844	164126	282	160228	160798	570	852	336567	336621	776
19-Nov-2023	331929	332991	1062			923	164126	164424	298	160798	161341	543	831	336621	336591	744
20-Nov-2023	332991	334043	1052			915	164424	164694	270	161341	161595	554	824	336591	336573	745
21-Nov-2023	334043	335097	1054			916	164694	164952	258	161595	162431	836	824	336573	336591	742
22-Nov-2023	335097	336161	1064			995	164952	165301	319	162431	163007	517	876	336591	336655	805
23-Nov-2023	336161	337225	1047			911	165301	165615	314	163007	163513	506	820	336655	336569	727
24-Nov-2023	337225	338282	1057			914	165615	165980	365	163513	163971	457	822	336589	336591	727
25-Nov-2023	338282	339277	1039			904	165980	166246	366	163971	164418	447	813	336591	336584	731
26-Nov-2023	339277	400295	1018			885	166246	166126	390	164418	164825	407	797	336584	336570	716
27-Nov-2023	400295	401423	1037			901	166736	167037	301	164825	165337	512	813	336570	336587	732
28-Nov-2023	401423	402456	973			846	167037	167367	330	165337	165769	432	762	336587	336542	692
29-Nov-2023	402456	403480	1052			924	167367	167685	312	165769	166282	514	822	336542	336604	742
30-Nov-2023	403480	404588	1100			954	167685	168002	317	166282	166826	544	861	336604	336633	775

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Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Treatment)
Nectar Life Sciences Limited, Unit-II

Date	LTDS (ETP)			UF Feed			UF Permeate-A			UF Permeate-B			Total	RO Permeate		
	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	KL	Initial	Final	Difference (KL)
1-Nov-2023	312441	313446	1067			927	158766	159089	321	151365	151516	511	824	336079	336510	761
2-Nov-2023	314010	315058	1045			905	159059	159212	224	151516	152110	594	817	336820	336646	786
3-Nov-2023	315050	316000	1045			995	159212	159578	215	152110	153040	531	896	336566	336636	805
4-Nov-2023	316200	317229	1029			895	159576	159561	223	153040	153623	553	806	336636	336553	725
5-Nov-2023	317229	318243	1014			881	159801	160017	216	153623	154200	577	793	336553	336546	713
6-Nov-2023	318243	319277	1036			960	160017	160307	290	154200	154772	520	810	336546	336564	720
7-Nov-2023	319277	320317	1039			904	160307	160628	321	154720	155212	492	813	336564	336566	771
8-Nov-2023	320211	321256	1029			904	160628	160995	367	155212	155658	446	813	336566	336566	733
9-Nov-2023	321256	322458	1022			941	160995	161292	295	155658	156205	549	847	336566	336597	760
10-Nov-2023	322458	323495	1034			918	161292	161598	305	156205	156729	531	836	336597	336577	740
11-Nov-2023	323495	324512	1017			886	161598	161905	307	156729	157219	490	797	336578	336561	722
12-Nov-2023	324512	325557	1045			910	161905	162272	367	157219	157671	452	819	336561	336576	736
13-Nov-2023	325557	326628	1071			931	162272	162659	387	157671	158122	451	838	336576	336593	752
14-Nov-2023	326628	327718	1090			948	162659	162980	321	158122	158654	532	853	336593	336611	767
15-Nov-2023	327718	328763	1045			904	162980	163266	286	158654	159157	532	818	336611	336550	727
16-Nov-2023	328763	329805	1042			905	163266	163556	290	159157	159714	527	817	336550	336580	735
17-Nov-2023	329806	330829	1024			891	163556	163844	288	159714	160228	514	802	336580	336567	722
18-Nov-2023	330829	331929	1100			958	163844	164126	282	160228	160798	570	852	336567	336621	776
19-Nov-2023	331929	332991	1062			923	164126	164424	298	160798	161341	543	831	336621	336591	744
20-Nov-2023	332991	334043	1052			915	164424	164694	270	161341	161595	554	824	336591	336573	745
21-Nov-2023	334043	335097	1054			916	164694	164952	258	161595	162431	836	824	336573	336591	742
22-Nov-2023	335097	336161	1064			995	164952	165301	319	162431	163007	517	876	336591	336655	805
23-Nov-2023	336161	337225	1047			911	165301	165615	314	163007	163513	506	820	336655	336569	727
24-Nov-2023	337225	338282	1057			914	165615	165980	365	163513	163971	457	822	336589	336591	727
25-Nov-2023	338282	339277	1039			904	165980	166246	366	163971	164418	447	813	336591	336584	731
26-Nov-2023	339277	400295	1018			885	166246	166126	390	164418	164825	407	797	336584	336570	716
27-Nov-2023	400295	401423	1037			901	166736	167037	301	164825	165337	512	813	336570	336587	732
28-Nov-2023	401423	402456	973			846	167037	167367	330	165337	165769	432	762	336587	336542	692
29-Nov-2023	402456	403480	1052			924	167367	167685	312	165769	166282	514	822	336542	336604	742
30-Nov-2023	403480	404588	1100			954	167685	168002	317	166282	166826	544	861	336604	336633	775

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Plant Manager :

ANNEXURE V (Continue)

Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Treatment)
Nectar Life Sciences Limited, Unit-II

Date	LTDS (ETP)			UF Feed			UF Permeate-A			UF Permeate-B			Total	RO Permeate		
	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	KL	Initial	Final	Difference (KL)
1-Sep-2023	305591	306657	1066			906	133591	134072	481	126044	126379	335	816	249686	250421	735
2-Sep-2023	306657	310663	1066			854	134072	134517	446	126379	126701	322	761	250421	251112	692
3-Sep-2023	310662	311752	1091			921	134422	135083	561	126701	126971	268	934	251112	251863	750
4-Sep-2023	311752	312857	1104			734	135717	135678	555	126925	127226	232	845	251863	252627	760
5-Sep-2023	312857	303931	1079			917	135878	136265	591	127226	127464	238	825	252623	253365	743
6-Sep-2023	313930	314990	1060			963	136265	136784	511	127454	127718	258	775	253365	254064	699
7-Sep-2023	314466	315923	974			524	136786	137246	461	127713	127991	284	745	254064	254925	821
8-Sep-2023	315923	316875	952			309	137246	137634	436	127996	128281	292	718	254725	255390	665
9-Sep-2023	316875	317908	1033			875	137684	138134	570	128289	128578	290	960	255390	256101	711
10-Sep-2023	317908	318974	1066			906	138134	138714	531	128578	128859	281	816	256101	256835	734
11-Sep-2023	318974	320035	1061			964	138741	139261	543	128859	129123	264	812	256836	257566	731
12-Sep-2023	320035	321106	1076			910	139161	139711	550	129124	129393	269	769	257566	258303	737
13-Sep-2023	321106	322177	1071			916	139711	140252	541	129393	129626	229	914	258303	259040	737
14-Sep-2023	322177	323298	1121			953	140301	140892	591	129626	129914	267	858	259040	259813	772
15-Sep-2023	323298	324346	1042			890	140441	141166	572	129944	130222	280	851	259885	300571	721
16-Sep-2023	324346	325491	1143			725	141424	142029	610	130213	130491	268	835	300574	301331	756
17-Sep-2023	325491	326637	1146			973	142034	142185	611	130491	130735	265	875	301332	302111	758
18-Sep-2023	326637	327747	1110			954	142655	143200	548	130735	131081	324	846	302111	302875	764
19-Sep-2023	327747	328878	1131			961	143200	143746	546	131084	131402	318	865	302875	303654	779
20-Sep-2023	328878	330020	1141			920	143746	144282	540	131402	131741	333	873	303654	304440	786
21-Sep-2023	330020	331162	1142			921	144282	144810	528	131741	132022	281	809	304440	305177	737
22-Sep-2023	331162	332114	952			804	144810	145330	520	132021	132360	336	728	305177	305988	811
23-Sep-2023	332114	333087	973			827	145330	145788	458	132360	132647	287	745	305982	306552	670
24-Sep-2023	333087	334029	942			809	145788	146107	452	132647	132919	272	725	306552	307207	655
25-Sep-2023	334029	335093	1064			883	146183	146696	513	132919	133201	282	795	307207	307922	715
26-Sep-2023	335093	336040	947			818	146696	147153	457	133201	133480	279	736	307922	308581	659
27-Sep-2023	336040	337054	1014			862	147154	147657	521	133480	133752	272	775	308581	309283	698
28-Sep-2023	337054	338030	976			829	147657	148052	395	133752	134104	352	746	309283	309955	672
29-Sep-2023	338030	339199	1169			941	148052	148592	540	134104	134411	305	845	309955	310719	764
30-Sep-2023	339199	340319	1120			999	148592	149206	614	134411	134697	286	899	310719	311578	859

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Plant Manager :

Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Treatment)
Nectar Life Sciences Limited, Unit-II

Date	LTDS (ETP)			UF Feed			UF Permeate-A			UF Permeate-B			Total	RO Permeate		
	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	KL	Initial	Final	Difference (KL)
1-Aug-2023	275521	276572	1071			510	123752	124207	455	110630	110995	364	819	267212	267941	729
2-Aug-2023	276572	277614	1042			596	124207	124633	426	110995	111370	375	801	267941	268654	713
3-Aug-2023	277614	278707	1068			468	124633	125007	376	111370	111811	441	817	268654	269381	727
4-Aug-2023	278707	279746	1039			443	125009	125379	370	111811	112366	555	925	269381	270115	734
5-Aug-2023	279746	280812	1066			706	125379	125754	375	112366	112707	441	816	270115	270848	733
6-Aug-2023	280812	281830	1018			586	125754	126134	380	112707	113165	9	779	270842	271534	693
7-Aug-2023	281830	282844	1014			567	126134	126526	392	113165	113459	294	776	271534	272224	690
8-Aug-2023	282844	283855	1011			859	126526	126878	352	113459	113910	421	773	272225	272913	688
9-Aug-2023	283855	284900	1045			839	126878	127225	350	113910	114360	450	800	272913	273625	712
10-Aug-2023	285200	286255	1055			891	127226	127594	312	114360	114856	496	503	273625	274344	719
11-Aug-2023	286255	287317	1061			507	127540	127592	353	114856	115342	486	501	274344	275067	723
12-Aug-2023	[illegible]	[illegible]	1076			910	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	724
13-Aug-2023	288137	289255	1065			926	128232	128522	290	115794	116321	527	817	275785	276512	727
14-Aug-2023	289216	290371	1116			948	128521	128801	255	116321	116840	519	974	276512	277232	720
15-Aug-2023	290371	291415	1044			542	128801	129123	322	116840	117377	537	853	277232	277946	714
16-Aug-2023	291416	292460	1044			612	129123	129363	240	117417	117930	513	853	277946	278521	575
17-Aug-2023	292459	293649	1190			462	129363	129612	249	117930	118531	601	910	278531	279312	791
18-Aug-2023	294136	295202	1066			442	129612	129882	270	118350	119131	541	811	250714	251469	755
19-Aug-2023	295202	296366	1164			920	129882	130240	360	119131	119685	555	945	251473	252194	721
20-Aug-2023	296366	297526	1160			946	130240	130452	212	119785	120305	551	813	251779	252545	766
21-Aug-2023	298121	299102	1126			579	130452	130744	292	120399	120367	564	911	252545	253324	664
22-Aug-2023	298122	299077	976			564	130744	131040	296	120869	121327	450	746	253324	254065	756
23-Aug-2023	299627	300722	1110			474	131040	131335	295	121327	121918	591	968	254065	254829	764
24-Aug-2023	300137	301830	1092			361	131339	131624	285	121878	122461	583	954	254829	255494	691
25-Aug-2023	301310	302875	1015			411	131624	131992	368	122461	122959	495	774	255494	256148	731
26-Aug-2023	302321	303987	1066			467	131992	132284	302	122959	123455	524	911	256148	256832	716
27-Aug-2023	303391	304471	1081			884	132274	132401	227	123483	124083	612	824	256530	257594	732
28-Aug-2023	304471	305676	1076			811	132401	132689	295	124083	124595	512	527	257594	258305	714
29-Aug-2023	305516	306616	1048			511	132685	132984	295	124459	125166	561	522	258305	259024	649
30-Aug-2023	306566	307510	954			624	133424	133256	327	125102	125529	425	726	259193	259836	719
31-Aug-2023	307970	308541	1031			610	133286	133591	305	125590	126164	571	59	259736	260466	729

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Plant Manager :

ANNEXURE V (Continue)

Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Recover & Reuse)
Nectar Life Sciences Limited, Unit-II

Date	Permeate Consumption in MEE CT			Permeate Consumption in Graden (KL)			Permeate Consumption Utility(KL)		
	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)
1-Jan-2024	10710	10761	51	826	856	30			663
2-Jan-2024	10761	10805	44	856	876	20			715
3-Jan-2024	10805	10856	51	876	897	21			610
4-Jan-2024	10856	10924	68	897	919	22			673
5-Jan-2024	10924	10972	48	919	964	45			684
6-Jan-2024	10972	11014	42	964	996	32			631
7-Jan-2024	11014	11064	50	996	1020	24			644
8-Jan-2024	11064	11112	48	1020	1052	32			633
9-Jan-2024	11112	11163	51	1052	1082	30			641
10-Jan-2024	11163	11208	45	1082	1111	29			671
11-Jan-2024	11208	11257	49	1111	1150	34			612
12-Jan-2024	11257	11301	44	1150	1179	29			625
13-Jan-2024	11301	11345	42	1179	1204	25			597
14-Jan-2024	11345	11400	55	1204	1228	24			634
15-Jan-2024	11400	11445	45	1228	1252	24			592
16-Jan-2024	11445	11515	70	1252	1271	19			663
17-Jan-2024	11515	11566	51	1271	1305	34			651
18-Jan-2024	11566	11617	51	1305	1335	30			706
19-Jan-2024	11617	11674	57	1335	1365	30			705
20-Jan-2024	11674	11718	44	1365	1397	32			653
21-Jan-2024	11718	11771	53	1397	1421	24			667
22-Jan-2024	11771	11822	51	1421	1463	42			652
23-Jan-2024	11822	11871	49	1463	1495	32			694
24-Jan-2024	11871	11933	62	1495	1524	29			567
25-Jan-2024	11933	11992	59	1524	1555	31			626
26-Jan-2024	11992	12051	59	1559	1584	25			659
27-Jan-2024	0	66	66	1584	1584	0			664
28-Jan-2024	60	113	51	1584	1616	32			630
29-Jan-2024	113	172	59	1616	1651	35			605
30-Jan-2024	172	215	43	1651	1682	31			750
31-Jan-2024	215	259	44	1682	1702	20			618

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Plant Manager :

Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Recover & Reuse)
Nectar Life Sciences Limited, Unit-II

Date	Permeate Consumption in MEE CT			Permeate Consumption in Graden (KL)			Permeate Consumption Utility(KL)		
	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)
1-Nov-2023	7540	7586	46	13982	14006	24			679
2-Nov-2023	7586	7638	52	14006	14029	23			657
3-Nov-2023	7638	7702	64	14041	14078	37			714
4-Nov-2023	7702	7767	65	14073	14095	22			634
5-Nov-2023	7767	7848	81	14095	14122	27			667
6-Nov-2023	7848	7881	33	14123	14148	25			672
7-Nov-2023	7881	7926	45	14148	14176	28			618
8-Nov-2023	7926	7975	49	14176	14205	29			652
9-Nov-2023	7975	8020	45	14205	14227	22			693
10-Nov-2023	8020	8064	44	14227	14260	33			658
11-Nov-2023	8065	8120	51	14260	14294	34			677
12-Nov-2023	8120	8165	45	14299	14317	18			673
13-Nov-2023	8165	8216	51	14317	14340	23			673
14-Nov-2023	8216	8250	34	14340	14360	20			716
15-Nov-2023	8255	8319	64	14360	14401	41			632
16-Nov-2023	8319	8370	51	14401	14446	45			634
17-Nov-2023	8370	8432	62	14446	14486	40			632
18-Nov-2023	8432	8485	55	14486	14513	27			644
19-Nov-2023	8470	8524	64	14513	14542	29			666
20-Nov-2023	8524	8575	51	14542	14567	25			669
21-Nov-2023	8575	8626	51	14567	14605	38			653
22-Nov-2023	8626	8670	44	14605	14640	35			776
23-Nov-2023	8670	8721	51	14640	14652	12			671
24-Nov-2023	8721	8774	53	14652	14683	31			657
25-Nov-2023	8774	8835	61	14683	14715	32			638
26-Nov-2023	8835	8885	52	14715	14757	42			624
27-Nov-2023	8885	8936	51	14757	14797	40			641
28-Nov-2023	8936	8997	61	14797	14832	35			574
29-Nov-2023	8997	9042	45	14832	14852	20			683
30-Nov-2023	9042	9086	44	14852	14882	30			701

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Plant Manager :

ANNEXURE V (Continue)

Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Recover & Reuse)
Nectar Life Sciences Limited, Unit-II

Date	Permeate Consumption in MEE CT			Permeate Consumption in Graden (KL)			Permeate Consumption Utility(KL)		
	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)
1-Oct-2023	5941	5994	53	12934	12959	35			676
2-Oct-2023	5994	6042	48	12959	12991	32			658
3-Oct-2023	6042	6092	50	12991	13033	42			716
4-Oct-2023	6092	6156	64	13033	13069	36			647
5-Oct-2023	6156	6221	65	13069	13114	45			606
6-Oct-2023	6221	6302	81	13114	13175	61			589
7-Oct-2023	6302	6335	33	13175	13213	36			664
8-Oct-2023	6335	6380	45	13213	13243	32			666
9-Oct-2023	6380	6429	49	13243	13278	35			723
10-Oct-2023	6429	6474	45	13278	13338	60			641
11-Oct-2023	6474	6523	49	13338	13380	42			627
12-Oct-2023	6523	6574	51	13380	13425	45			642
13-Oct-2023	6574	6619	45	13425	13457	32			649
14-Oct-2023	6619	6670	51	13457	13487	30			720
15-Oct-2023	6670	6709	39	13487	13519	32			667
16-Oct-2023	6709	6773	64	13519	13549	30			713
17-Oct-2023	6773	6824	51	13549	13574	25			731
18-Oct-2023	6824	6874	50	13574	13598	24			705
19-Oct-2023	6874	6929	55	13598	13618	20			720
20-Oct-2023	6929	6978	49	13618	13638	20			674
21-Oct-2023	6978	7028	51	13638	13668	30			663
22-Oct-2023	7028	7080	51	13668	13698	30			727
23-Oct-2023	7080	7124	44	13698	13733	35			661
24-Oct-2023	7124	7175	51	13733	13768	35			656
25-Oct-2023	7175	7238	63	13768	13803	35			616
26-Oct-2023	7238	7299	61	13803	13835	32			626
27-Oct-2023	7299	7349	50	13835	13867	32			651
28-Oct-2023	7349	7390	41	13867	13902	35			601
29-Oct-2023	7390	7451	61	13902	13937	35			759
30-Oct-2023	7451	7496	45	13937	13967	30			705
31-Oct-2023	7496	7540	44	13967	13992	25			738

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Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Recover & Reuse)
Nectar Life Sciences Limited, Unit-II

Date	Permeate Consumption in MEE CT			Permeate Consumption in Graden (KL)			Permeate Consumption Utility(KL)		
	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)
1-Sep-2023	4454	4509	55	11897	11932	35			645
2-Sep-2023	4509	4547	38	11932	11974	42			641
3-Sep-2023	4547	4597	50	11974	12014	40			601
4-Sep-2023	4597	4657	60	12014	12059	45			660
5-Sep-2023	4657	4718	61	12059	12099	40			636
6-Sep-2023	4718	4788	70	12099	12134	35			642
7-Sep-2023	4788	4818	30	12134	12159	25			594
8-Sep-2023	4818	4858	40	12159	12199	40			616
9-Sep-2023	4858	4903	45	12199	12234	35			575
10-Sep-2023	4903	4944	41	12234	12269	35			631
11-Sep-2023	4944	4959	15	12269	12304	[illegible]			[illegible]
12-Sep-2023	4959	5002	0	12304	12339	35			648
13-Sep-2023	5002	5082	40	12339	12374	35			652
14-Sep-2023	5082	5131	49	12374	12404	30			669
15-Sep-2023	5131	5171	40	12404	12439	35			693
16-Sep-2023	5171	5231	60	12439	12499	60			646
17-Sep-2023	5231	5281	50	12499	12545	46			610
18-Sep-2023	5281	5329	48	12545	12585	40			692
19-Sep-2023	5329	5377	48	12585	12620	35			676
20-Sep-2023	5377	5427	50	12620	12654	34			696
21-Sep-2023	5427	5479	52	12654	12677	23			704
22-Sep-2023	5479	5529	50	12677	12717	40			710
23-Sep-2023	5529	5569	40	12717	12761	44			56
24-Sep-2023	5569	5620	51	12759	12789	30			59
25-Sep-2023	5620	5672	52	12789	12814	25			577
26-Sep-2023	5672	5732	60	12814	12834	20			68
27-Sep-2023	5732	5782	50	12834	12854	20			629
28-Sep-2023	5782	5832	50	12854	12884	30			598
29-Sep-2023	5832	5892	60	12884	12904	20			68
30-Sep-2023	5892	5941	49	12904	12934	3			73

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ANNEXURE V (Continue)

Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Recover & Reuse)
Nectar Life Sciences Limited, Unit-II

Date	Permeate Consumption in MEE CT			Permeate Consumption in Graden (KL)			Permeate Consumption Utility(KL)		
	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)
1-Sep-2023	4449	4504	55	11897	11932	35			645
2-Sep-2023	4504	4547	43	11932	11974	42			644
3-Sep-2023	4547	4597	50	11974	12014	40			607
4-Sep-2023	4597	4657	60	12014	12059	45			660
5-Sep-2023	4657	4718	61	12059	12099	40			655
6-Sep-2023	4718	4788	70	12099	12134	35			642
7-Sep-2023	4788	4818	30	12134	12159	25			594
8-Sep-2023	4818	4858	40	12159	12199	40			616
9-Sep-2023	4858	4903	45	12199	12234	35			575
10-Sep-2023	4903	4944	41	12234	12269	35			631
11-Sep-2023	4944	4992	48	12269	12304	35			658
12-Sep-2023	4992	5042	50	12304	12339	35			648
13-Sep-2023	5042	5082	40	12339	12374	35			652
14-Sep-2023	5082	5131	49	12374	12404	30			662
15 Sep 2023	5131	5171	40	12404	12439	35			633
16 Sep-2023	5171	5231	60	12439	12499	60			646
17 Sep-2023	5231	5281	50	12499	12545	46			610
18-Sep-2023	5281	5329	48	12545	12585	40			692
19-Sep-2023	5329	5377	48	12585	12620	35			676
20-Sep-2023	5377	5427	50	12620	12654	34			626
21-Sep-2023	5427	5479	52	12654	12677	23			704
22-Sep-2023	5479	5529	50	12677	12717	40			710
23-Sep-2023	5529	5569	40	12717	12759	42			565
24-Sep-2023	5569	5620	51	12759	12789	30			558
25-Sep-2023	5620	5672	52	12789	12814	25			574
26-Sep-2023	5672	5733	60	12814	12834	20			638
27-Sep-2023	5733	5783	50	12834	12854	20			629
28-Sep 2023	[illegible]	5833	50	12854	12884	30			592
29-Sep 2023	5831	5892	60	12884	12904	20			684
30-Sep-2023	5892	5941	49	12904	12934	30			730

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Plant Manager :

Log Book
Flow Meter Reading of Effluent Treatment and Recycling (Recover & Reuse)
Nectar Life Sciences Limited, Unit-II

Date	Permeate Consumption in MEE CT			Permeate Consumption in Graden (KL)			Permeate Consumption Utility(KL)		
	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)	Initial	Final	Difference (KL)
1-Aug-2023	2980	3010	30	10366	10401	35			664
2-Aug-2023	3010	3050	40	10401	10435	40			639
3-Aug-2023	3050	3080	30	10435	10475	40			637
4-Aug-2023	3080	3120	40	10475	11020	45			645
5-Aug-2023	3120	3155	35	11020	11052	32			655
6-Aug-2023	3155	3170	15	11052	11091	35			643
7-Aug-2023	3170	3215	45	11091	11127	36			669
8-Aug-2023	3215	3275	60	11127	11166	39			594
9-Aug-2023	3275	3324	49	11166	11201	35			628
10-Aug-2023	3324	3394	70	11201	11231	30			619
11-Aug-2023	3394	3441	40	11231	11266	35			629
12-Aug-2023	3443	3478	35	11266	11296	30			664
13-Aug-2023	3478	3529	63	11296	11331	35			641
14-Aug-2023	3529	3591	50	11331	11356	25			673
15-Aug-2023	3591	3636	45	11357	11391	35			634
16-Aug-2023	3636	3652	44	11391	11446	55			593
17-Aug-2023	3695	3749	54	11446	11476	30			734
18-Aug-2023	3749	3797	60	11476	11496	20			657
19-Aug-2023	3795	3847	55	11496	11526	30			686
20-Aug-2023	3847	3892	45	11526	11551	35			641
21-Aug-2023	3892	3928	35	11551	11583	32			674
22-Aug-2023	3928	4013	52	11583	11625	42			567
23-Aug-2023	4013	4079	66	11625	11667	42			669
24-Aug-2023	4055	4093	45	11667	11693	30			655
25-Aug-2023	4093	4143	56	11693	11722	25			616
26-Aug-2023	4141	4207	66	11722	11743	21			634
27-Aug-2023	4207	4254	45	11743	11768	25			666
28-Aug-2023	4254	4309	55	11768	11800	32			625
29-Aug-2023	4309	4369	60	11800	11834	34			670
30-Aug-2023	4369	4409	40	11834	11867	31			571
31-Aug-2023	4409	4449	40	11867	11897	0			659

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Plant Manager :

ANNEXURE VI

Log Book

Reuse of Treated water (RO Permeate) in Process Cooling Towers

Nectar Lifesciences Ltd., Unit-II

Date	Main Utility Cooling Tower (KL)			Cooling Tower FRP (KL)			Cooling Tower (KL)			SRP-A Cooling Tower (KL)			SRP-B Cooling Tower (Cap:2400) (KL)		
	FM-01			FM-02			FM-03			FM-04			FM-05		
	Initial Reading	Final Readding	Qnty, KL	Initial Reading	Final Reading	Qnty, KL	Initial Reading	Final Reading	Qnty, KL	Initial Reading	Final Rading	Qnty, KL	Initial Reading	Final Reading	Qnty, KL
22/01/24	0	50	50	0	58	58	516	661	145	174	239	65	3392	3531	139
23/01/24	50	104	54	58	95	37	661	796	135	239	342	103	3531	3675	144
24/01/24	104	169	65	95	134	39	796	962	166	342	422	80	3675	3587	111
25/01/24	169	237	68	134	155	21	962	1109	147	422	538	116	3587	3690	103
26/01/24	237	304	67	153	184	29	1109	1255	146	538	642	104	3690	3821	131
27/01/24	304	361	57	184	197	13	1255	1382	127	642	751	109	3821	3951	130
28/01/24	361	431	70	197	203	6	1382	1526	154	751	850	99	3951	4051	100
29/01/24	431	493	62	203	211	8	1536	1599	63	850	944	94	4051	4152	101
30/01/24	493	550	57	211	221	10	1599	1749	150	944	1055	111	4152	4327	175
31/01/24	550	612	62	221	235	14	1749	1891	142	1055	1156	101	4327	4460	133

For Nector LifeSciences Ltd.

Authorised Signatory

Log Book

Reuse of Treated water (RO Permeate) in Process Cooling Towers

Nectar Lifesciences Ltd., Unit-II

Date	Sterile Utility Cooling Tower (Cap:2400) (KL)			Cooling Tower near AVM-14 (KL)			SRP-C Cooling Tower (KL)			Cooling Tower FRP (DMF) (KL)			Cooling Tower MEE (KL)		
	FM-06			FM-07			FM-08			FM-09			FM-11		
	Initial Reading	Final Readding	Qnty, KL	Initial Reading	Final Reading	Qnty, KL	Initial Reading	Final Reading	Qnty, KL	Initial Reading	Final Rading	Qnty, KL	Initial Reading	Final Reading	Qnty, KL
22/01/24	69	160	91	0	34	34	7105	7190	85	0	15	15	11771	11822	51
23/01/24	160	280	120	34	61	27	7190	7250	60	15	29	14	11822	11871	49
24/01/24	280	363	83	61	91	30	7250	7332	82	29	42	13	11871	11933	62
25/01/24	363	409	46	91	122	31	7332	7411	79	42	57	15	11933	11992	59
26/01/24	409	491	82	122	150	28	7411	7462	51	57	78	21	11992	12051	59
27/01/24	491	595	104	150	180	30	7462	7534	72	78	100	22	0	60	60
28/01/24	595	676	81	180	209	29	7534	7600	66	100	125	25	60	113	53
29/01/24	0	141	141	209	229	20	7600	7685	85	125	155	30	113	172	59
30/01/24	141	269	128	229	258	29	7685	7753	68	155	177	22	172	215	43
31/01/24	299	391	92	258	278	20	7753	7818	65	177	206	29	215	259	44

For Nector LifeSciences Ltd.

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ANNEXURE VII

Log Book

Solid Waste Generation from ETP-Biological and MEE Process (Waste Category : ~~53.3~~ 35.3)

Nectar Lifesciences Ltd., Unit-II

Date	Sludge Generation				Inventory			
	Primary Treatment	Secondary Biological	MEE & ATFD	Total	Opening Stock	Generation	Disposal	Closing Stock
	Kg	Kg	Kg	Kg	MT	MT	MT	MT
01/08/2023	1607	1071	4050	6728	0	6.7	0	6.7
02/08/2023	1571	1047	4200	6818	6.7	6.8	0	13.5
03/08/2023	1662	1068	4110	6840	14	6.8	0	20.3
04/08/2023	1618	1079	4125	6822	20	6.8	0	27.1
05/08/2023	1599	1066	4320	6986	27	7.0	0	34.1
06/08/2023	1527	1018	3885	6429	34	6.4	0	40.6
07/08/2023	1521	1014	4350	6885	41	6.9	0	47.4
08/08/2023	1517	1011	4200	6728	47	6.7	0	54.2
09/08/2023	1568	1045	3900	6513	54	6.5	0	60.7
10/08/2023	1584	1056	3915	6554	61	6.6	0	67.2
11/08/2023	1592	1061	4350	7004	67	7.0	0	74.2
12/08/2023	1605	1070	3900	6575	74	6.6	0	80.2
13/08/2023	1662	1068	4230	6960	81	6.9	0	87.7
14/08/2023	1674	1116	4185	6974	88	7.0	0	94.7
15/08/2023	1574	1049	3990	6613	95	6.6	0	101.3
16/08/2023	1574	1049	4050	6673	101	6.7	0	108.0
17/08/2023	1785	1190	4320	7295	108	7.3	0	115.3
18/08/2023	1599	1066	4200	6866	115	6.9	0	122.1
19/08/2023	1664	1109	4200	6973	122	7.0	0	129.1
20/08/2023	1712	1141	4230	7084	129	7.1	0	136.2
21/08/2023	1688	1125	4320	7133	136	7.1	0	143.3
22/08/2023	1464	976	3990	6429	143	6.4	0	149.8
23/08/2023	1665	1110	4050	6825	150	6.8	0	156.6
24/08/2023	1684	1122	3990	6796	157	6.8	0	163.4
25/08/2023	1522	1015	4080	6617	163	6.6	0	170.0
26/08/2023	1599	1066	4125	6791	170	6.8	0	176.8
27/08/2023	1621	1081	4200	6901	177	6.9	0	183.7
28/08/2023	1569	1046	4200	6816	184	6.8	0	190.5
29/08/2023	1572	1048	4230	6850	191	6.9	0	197.4
30/08/2023	1431	954	3750	6135	197	6.1	0	203.5
31/08/2023	1607	1071	3900	6578	203	6.6	11.12	198.9

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Plant Manager

ANNEXURE VII (Continue)

Log Book

Solid Waste Generation from ETP-Biological and MEE Process (Waste Category : 53:3)

Nectar Lifesciences Ltd., Unit-II

Date	Sludge Generation				Inventory			
	Primary Treatment	Secondary Biological	MEE & ATFD	Total	Opening Stock	Generation	Disposal	Closing Stock
	Kg	Kg	Kg	Kg	MT	MT	MT	MT
1-9-2023	1599	1066	3225	5891	199	5.9	0	204.8
2-9-2023	1507	1004	2950	5461	205	5.5	0	210.3
3-9-2023	1635	1090	2875	5600	210	5.6	0	215.9
4-9-2023	1656	1104	3250	6011	216	6.0	0	221.9
5-9-2023	1618	1079	3000	5697	222	5.7	0	227.6
6-9-2023	1522	1015	2750	5287	228	5.3	0	232.9
7-9-2023	1461	974	3250	5685	233	5.7	0	238.6
8-9-2023	1428	952	2625	5005	239	5.0	0	243.9
9-9-2023	1549	1033	2650	5232	244	5.2	0	248.8
10-9-2023	1599	1066	4250	6916	249	6.9	0	255.7
11-9-2023	1592	1061	2500	5154	256	5.2	0	260.9
12-9-2023	1605	1070	4050	6725	261	6.7	0	267.6
13-9-2023	1607	1071	3000	5678	268	5.7	0	273.3
14-9-2023	1682	1121	2650	5454	273	5.5	0	278.7
15-9-2023	1571	1047	2775	5393	279	5.4	0	284.1
16-9-2023	1721	1147	3225	6093	284	6.1	0	290.2
17-9-2023	1716	1144	2650	5511	290	5.5	0	295.7
18-9-2023	1665	1110	3225	6000	296	6.0	0	301.7
19-9-2023	1696	1131	3200	6027	302	6.0	0	307.8
20-9-2023	1712	1141	3100	5954	308	6.0	0	313.7
21-9-2023	1714	1142	2650	5506	314	5.5	0	319.2
22-9-2023	1428	952	2950	5330	319	5.3	0	324.6
23-9-2023	1459	973	2500	4932	325	4.9	0	329.5
24-9-2023	1428	952	2875	5255	329	5.3	0	334.7
25-9-2023	1558	1039	2875	5472	335	5.5	0	340.2
26-9-2023	1444	962	3250	5656	340	5.7	0	345.9
27-9-2023	1521	1014	3025	5560	346	5.6	0	351.4
28-9-2023	1464	976	3150	5589	351	5.6	0	357.0
29-9-2023	1664	1109	4000	6773	357	6.8	0	363.8
30-9-2023	1764	1176	4000	6939	364	6.9	0	370.7

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Plant Manager

ANNEXURE VII (Continue)

Log Book

Solid Waste Generation from ETP-Biological and MEE Process (Waste Category : ~~53.3~~ 35.3)

Nectar Lifesciences Ltd., Unit-II

Date	Sludge Generation				Inventory			
	Primary Treatment	Secondary Biological	MEE & ATFD	Total	Opening Stock	Generation	Disposal	Closing Stock
	Kg	Kg	Kg	Kg	MT	MT	MT	MT
01/10/23	1590	1060	4460	7110	371	7.1	0	377.8
02/10/23	1568	1045	4030	6643	378	6.6	0	384.5
03/10/23	1716	1144	4340	7201	384	7.2	0	391.7
04/10/23	1544	1029	4400	6973	392	7.0	0	398.7
05/10/23	1521	1014	4100	6635	399	6.6	0	405.3
06/10/23	1554	1036	4140	6729	405	6.7	0	412.0
07/10/23	1558	1039	4100	6697	412	6.7	0	418.7
08/10/23	1558	1039	4400	6997	419	7.0	0	425.7
09/10/23	1650	1100	3800	6550	426	6.6	0	432.3
10/10/23	1585	1057	3800	6442	432	6.4	0	438.7
11/10/23	1525	1017	3860	6402	439	6.4	0	445.1
12/10/23	1568	1045	4100	6713	445	6.7	0	451.8
13/10/23	1607	1071	3800	6478	452	6.5	0	458.3
14/10/23	1721	1147	4100	6968	458	7.0	0	465.3
15/10/23	1568	1045	3950	6563	465	6.6	0	471.8
16/10/23	1583	1055	4400	7037	472	7.0	0	478.9
17/10/23	1566	1044	4100	6710	479	6.7	0	485.6
18/10/23	1593	1062	4100	6755	486	6.8	0	492.3
19/10/23	1593	1062	4130	6785	492	6.8	0	499.1
20/10/23	1578	1052	4400	7030	499	7.0	0	506.1
21/10/23	1581	1054	4160	6795	506	6.8	0	512.9
22/10/23	1716	1144	4400	7261	513	7.3	0	520.2
23/10/23	1571	1047	4160	6778	520	6.8	0	527.0
24/10/23	1575	1050	3800	6425	527	6.4	0	533.4
25/10/23	1558	1039	4100	6697	533	6.7	0	540.1
26/10/23	1527	1018	4220	6764	540	6.8	0	546.9
27/10/23	1558	1039	3700	6297	547	6.3	0	553.2
28/10/23	1459	973	4490	6922	553	6.9	0	560.1
29/10/23	1461	974	3550	5985	560	6.0	0	566.1
30/10/23	1649	1100	3610	6359	566	6.4	0	572.4
31/10/23	1544	1029	3700	6273	572	6.3	0	578.7

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Plant Manager

ANNEXURE VII (Continue)

Log Book

Solid Waste Generation from ETP-Biological and MEE Process (Waste Category : 53:3) 35.3

Nectar Lifesciences Ltd., Unit-II

Date	Sludge Generation				Inventory			
	Primary Treatment Kg	Secondary Biological Kg	MEE & ATFD Kg	Total Kg	Opening Stock MT	Generation MT	Disposal MT	Closing Stock MT
01/11/2023	1601	1067	4000	6668	579	6.7	0	585.4
02/11/2023	1568	1045	3000	5613	585	5.6	0	591.0
03/11/2023	1716	1144	4000	6861	591	6.9	0	597.8
04/11/2023	1544	1029	4500	7073	598	7.1	0	604.9
05/11/2023	1521	1014	4000	6535	605	6.5	0	611.5
06/11/2023	1554	1036	4500	7089	611	7.1	0	618.5
07/11/2023	1558	1039	3000	5597	619	5.6	0	624.1
08/11/2023	1558	1039	4000	6597	624	6.6	0	630.7
09/11/2023	1623	1082	3000	5705	631	5.7	0	636.4
10/11/2023	1585	1057	4000	6642	636	6.6	0	643.1
11/11/2023	1525	1017	3000	5542	643	6.7	0	648.6
12/11/2023	1568	1045	4000	6613	649	6.7	0	655.2
13/11/2023	1607	1071	4000	6678	655	8.6	0	661.9
14/11/2023	1635	1090	4000	6725	662	6.6	0	668.6
15/11/2023	1568	1045	6000	8613	669	6.6	0	677.3
16/11/2023	1563	1042	4000	6605	677	5.8	0	683.9
17/11/2023	1536	1024	4000	6560	684	5.7	0	690.4
18/11/2023	1650	1100	3000	5750	690	7.6	0	696.2
19/11/2023	1593	1062	3000	5655	696	6.1	0	701.8
20/11/2023	1578	1052	5000	7630	702	6.9	0	709.5
21/11/2023	1581	1054	4000	6635	709	6.6	0	716.1
22/11/2023	1716	1144	4000	6861	716	6.9	0	722.4
23/11/2023	1571	1047	4000	6618	723	6.6	0	729.6
24/11/2023	1575	1050	3500	6125	730	11.5	0	735.7
25/11/2023	1558	1039	4000	6597	736	6.6	0	742.3
26/11/2023	1527	1018	9000	11544	742	6.4	0	753.8
27/11/2023	1558	1039	4000	6597	754	6.6	0	760.4
28/11/2023	1459	973	4000	6432	760	6.4	0	766.9
29/11/2023	1593	1062	3500	6155	767	6.2	0	773.0
30/11/2023	1649	1100	3000	5749	773	5.7	0	778.8

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Plant Manager

ANNEXURE VII (Continue)

Log Book

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Solid Waste Generation from ETP-Biological and MEE Process (Waste Category : 53:3)

Nectar Lifesciences Ltd., Unit-II

Date	Sludge Generation				Inventory			
	Primary Treatment	Secondary Biological	MEE & ATFD	Total	Opening Stock	Generation	Disposal	Closing Stock
	Kg	Kg	Kg	Kg	MT	MT	MT	MT
01/12/23	1554	1036	3600	6189	779	6.2	0	785.0
02/12/23	1642	1095	2900	5637	785	5.6	0	790.6
03/12/23	1601	1067	3600	6268	791	6.3	0	796.9
04/12/23	1601	1067	2850	5518	797	5.5	0	802.4
05/12/23	1530	1020	2750	5300	802	5.3	0	807.7
06/12/23	1558	1039	3600	6197	808	6.2	0	813.9
07/12/23	1601	1067	3660	6328	814	6.3	0	820.2
08/12/23	1601	1067	3250	5918	820	5.9	0	826.1
09/12/23	1575	1050	3100	5725	826	5.7	0	831.8
10/12/23	1532	1021	3130	5653	832	5.7	0	837.5
11/12/23	1552	1035	3040	5627	838	5.6	0	843.2
12/12/23	1607	1071	3100	5778	843	5.8	0	848.9
13/12/23	1599	1066	3100	5766	849	5.8	0	854.7
14/12/23	1602	1068	3550	6220	855	6.2	0	860.9
15/12/23	1428	952	3100	5480	861	5.5	0	866.4
16/12/23	1604	1069	3130	5803	866	5.8	0	872.2
17/12/23	1631	1087	3130	5848	872	5.8	0	878.0
18/12/23	1635	1090	3250	5975	878	6.0	0	884.0
19/12/23	1538	1025	3340	5903	884	5.9	0	889.9
20/12/23	1578	1052	3460	6090	890	6.1	0	896.6
21/12/23	1625	1083	3700	6408	896	6.4	0	902.4
22/12/23	1529	1019	3450	5998	902	6.0	0	908.4
23/12/23	1574	1049	3040	5663	905	5.7	0	914.1
24/12/23	1544	1029	3700	6273	914	6.3	0	920.4
25/12/23	1544	1029	3010	5583	920	5.6	0	925.9
26/12/23	1518	1012	3100	5630	926	5.6	0	931.6
27/12/23	1500	1000	2890	5390	932	5.4	0	937.0
28/12/23	1552	1035	3130	5717	937	5.7	0	942.7
29/12/23	1552	1035	3710	6297	943	6.3	0	949.0
30/12/23	1518	1012	3760	6290	949	6.3	0	955.3
31/12/23	1538	1025	3700	6263	955	6.3	0	961.5

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Plant Manager

ANNEXURE VII (Continue)

Log Book

Solid Waste Generation from ETP-Biological and MEE Process (Waste Category : ~~53.3~~ 35.3)

Nectar Lifesciences Ltd., Unit-II

Date	Sludge Generation				Inventory			
	Primary Treatment Kg	Secondary Biological Kg	MEE & ATFD Kg	Total Kg	Opening Stock MT	Generation MT	Disposal MT	Closing Stock MT
01/01/24	1620	1080	2090	4790	962	5	0	966
02/01/24	1680	1120	3450	6250	966	6	0	973
03/01/24	1649	1100	3990	6739	973	7	0	979
04/01/24	1650	1100	4000	6750	979	7	0	986
05/01/24	1668	1112	3400	6180	986	6	0	992
06/01/24	1530	1020	3560	6110	992	6	0	998
07/01/24	1562	1041	3500	6103	998	6	0	1004
08/01/24	1538	1025	4000	6563	1004	7	0	1011
09/01/24	1679	1120	3000	5799	1011	6	0	1017
10/01/24	1598	1065	4000	6663	1017	7	0	1023
11/01/24	1500	1000	4000	6500	1023	7	0	1030
12/01/24	1515	1010	4000	6525	1030	7	0	1036
13/01/24	1652	1101	4000	6753	1036	7	0	1043
14/01/24	1538	1025	3000	5563	1043	6	0	1049
15/01/24	1598	1065	5000	7663	1049	8	0	1056
16/01/24	1620	1080	3000	5700	1056	6	0	1062
17/01/24	1593	1062	4000	6655	1062	7	10	1059
18/01/24	1696	1131	4000	6827	1059	7	0	1065
19/01/24	1701	1134	4000	6835	1065	7	0	1072
20/01/24	1578	1052	4000	6630	1072	7	0	1079
21/01/24	1604	1069	4000	6673	1079	7	0	1086
22/01/24	1665	1110	4000	6775	1086	7	0	1092
23/01/24	1669	1113	4000	6782	1092	7	0	1099
24/01/24	1638	1092	4000	6730	1099	7	0	1106
25/01/24	1550	1033	4000	6583	1106	7	0	1112
26/01/24	1599	1066	4000	6665	1112	7	0	1119
27/01/24	1555	1037	4000	6592	1119	7	0	1126
28/01/24	1539	1026	3000	5565	1126	6	0	1131
29/01/24	1500	1000	5000	7500	1131	8	11	1128
30/01/24	1778	1185	3000	5963	1128	6	32	1101
31/01/24	1503	1002	4000	6505	1101	7	0	1108

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Plant Manager

ANNEXURE VIII

Photo of High COD and Low COD Solar Pond
Nectar Life Sciences Ltd, Unit-II

High COD Solar Pond
Water emptied out and sludge under sun drying.

Low COD Solar Pond
Tank almost emptied, Lechate coming out which being remmoved regularly.