# PRIMO CHEMICALS LTD

**FORMERLY KNOWN AS**

# PUNJAB ALKALIES AND CHEMICALS LTD.

## NANGAL-UNA ROAD, NAYA NANGAL.
## PUNJAB


# ENVIRONMENTAL AUDIT & ENVIRONMENTAL STATEMENT

## FOR THE YEAR 2022-2023

**MEL/PCL/ES 2023/ 01** **September, 2023**

## PREPARED BY


## MANTEC CONSULTANTS PVT. LTD.

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# FORM-V

**(See Rule 14)**

**Environmental Audit & Environmental Statement for the financial year ending the 31st March 2023**

## PART-A

| | | | |
|---|---|---|---|
| 1. | Name and address of the owner / occupier of the industrial operation or process | : | Sh. Naveen Chopra<br>Managing Director<br>M/s Primo Chemicals Ltd. formerly known as Punjab Alkalies and Chemicals Ltd.<br>Naya Nangal,<br>District – Ropar<br>Punjab |
| 2. | Industry Category<br>Primary-(STC Code)<br>Secondary (SIC Code) | : | Large<br><br>2812 |
| 3. | Production Capacity<br>Unit – I<br>Unit - II | : | <br>70 TPD Caustic Soda<br>370 TPD Caustic Soda |
| 4. | Year of Establishment | : | Plant commissioned in 1984 |
| 5. | Date of the last Environmental Statement submitted | : | September, 2022 |

## PART-B

## WATER AND RAW MATERIAL CONSUMPTION

### (i) Water Consumption ($m^3$/year)

Process : 252408
Cooling : 238239
Domestic : 16425

| Name of Products | Process water consumption per unit Of product output | |
|---|---|---|
| | During the Previous Financial Year (2021-2022) | During the Current Financial Year (2022-2023) |
| | 1 | 2 |
| (i) FOR CAUSTIC SODA LYE | 4.371 $M^3$/MT | 3.738 $M^3$/MT |

### (ii) Raw Material Consumption

| *Name of Raw Materials | Name of Products | Consumption of Raw Material Per Unit of Output (MT/Year) | |
|---|---|---|---|
| | | During the Previous Financial Year (2021-2022) | During the Current Financial Year (2022-2023) |
| Salt | Caustic soda | 1.59 | 1.59 |
| Soda Ash | Caustic soda | 0.0044 | 0.0050 |
| Barium Carbonate | Caustic soda | 0.0084 | 0.0086 |
| Hydrogen | Hydrochloric acid | 0.0113 | 0.0113 |
| Chlorine | Hydrochloric acid | 0.2656 | 0.2656 |
| Chorine Tailings | Sodium hypo chloride | 0.0999 | 0.0999 |
| For Caustic Soda Lye | Caustic Soda | 0.0082 | 0.0082 |

* Industry may use codes if disclosing details of raw material would violate contractual obligations, otherwise all industries have to name the raw materials used.

## PART-C

# Pollution Discharged to Environment/unit of Output

(PARAMETER AS SPECIFIED IN THE CONSENT GRANTED)

**UNIT-I**

| Pollutants | | Quantity of Pollutants Discharged (mass/day) | Concentration of Pollutants in Discharges (mass/volume) | Prescribed Standards | Percentage of Variation from Prescribed Standards with Reason |
|---|---|---|---|---|---|
| (a) | **Water** | Zero Discharge | | | |
| | pH | - | - | 5-9 | - |
| | Total Suspended Solids | - | - | 100 mg/l | - |
| (b) | **Air** | | | | |
| | Hypo stack Chlorine | 0.000797 kg/day | 8.59 mg/$Nm^3$ | 15 mg/$Nm^3$ | (-)42.7 |
| | HCl vent, HCl content | 0.00223 kg/day | 11.15 mg/$Nm^3$ | 35 mg/$Nm^3$ | (-)68.1 |

## PART-C (CONTD.)

# Pollution Discharged to Environment/unit of Output

(PARAMETER AS SPECIFIED IN THE CONSENT GRANTED)

**UNIT-2**

| Pollutants | | Quantity of Pollutants Discharged (mass/day) | Concentration of Pollutants in Discharges (mass/volume) | Prescribed Standards | Percentage of Variation from Prescribed Standards with Reason |
|---|---|---|---|---|---|
| (a) | **Water** | Zero Discharge | | | |
| | pH | - | 7.51 | 5-9 | Within limits |
| | Total Suspended Solids | 3.32 kg/day | 25.67 mg/l | 100 mg/l | (-)74.33 |
| (b) | **Air** | | | | |
| | Hypo stack Chlorine | 0.000865 kg/day | 9.75 mg/$Nm^3$ | 15 mg/$Nm^3$ | (-)37.8 |
| | HCl vent, HCl content | 0.000857 kg/day | 10.07 mg/$Nm^3$ | 35 mg/$Nm^3$ | (-)73.6 |

-ve indicates % variation w.r.t standards (within limits)

## PART-D

## HAZARDOUS WASTES

(As specified under Hazardous Wastes (Management and Handling) Rules, 2000)

| Hazardous Wastes | | Total Quantity Generated (MT) | |
|---|---|---|---|
| | | During the Previous Financial Year (2021-2022) | During the Current Financial Year (2022-2023) |
| (a) | From process | | |
| (i) | Used/Spent Oil(Category 5.1) | NIL | NIL |
| (ii) | Spent Acid/Sulphuric Acid (Category17.2) | 2200.094 MT | 2686.160 MT |
| (iii) | Bio Medical Waste | 7.915 Kg | 20.770 Kg |
| (iv) | MEE Sludge(Category 35.3) | 84.236 | 108.601 MT |
| (b) | From pollution control facilities | NIL | NIL |

## PART-E

## SOLID WASTES (NON HAZARDOUS)

| | Total Quantity (ON DRY BASIS MT) | |
|---|---|---|
| | During the previous financial year (2021-2022) | During the Current financial year (2022-2023) |
| (a) From process | **2313.557** | **2735.874** |
| (b) From pollution control facilities (from tanks/vessels) | Nil | Nil |
| (c) (1) quantity recycled or re-utilized within the unit<br>(2) Sold Disposed | Nil | Nil |

## PART-F

## CHARACTERISTICS OF SOLID WASTES (BRINE SLUDGE)

| Sl. No. | Parameter | Unit | Membrane Cell, Unit-I | Membrane Cell, Unit-II |
|---|---|---|---|---|
| 1. | Loss on Drying (Water ) | % | - | 36.70 |
| 2. | NaCl | % | - | 6.90 |
| 3. | Calcium as CaCO3 | % | - | 10.60 |
| 4. | Magnesium as Mg(OH)2 | % | - | 9.20 |
| 5. | Acid insoluble | % | - | 36.60 |

### QUANTITY OF SOLID WASTE (BRINE SLUDGE) ON DRY BASIS

| Solid waste | Unit-I | Unit-II | Total |
|---|---|---|---|
| Brine Sludge from Drum Filter /Decanter(MT) | 0.000 | 1784.812 | 1784.812 |
| Brine Sludge from Brine sludge Pits, MT | 0.000 | 650.396 | 650.396 |
| Precipitation Tanks / Vessels, MT | 0.000 | 150.333 | 150.333 |
| Sludge from salt saturator MT | 0.000 | 150.333 | 150.333 |
| **Total Solid waste Generated, MT** | **0.000** | **2735.874** | **2735.874** |

## PART-G

M/s Primo Chemicals Ltd. formerly known as Punjab Alkalies and Chemicals Ltd., Naya Nangal, has taken pollution control measures since commissioning of the plant. Though several pollution control measures have been taken by them, still efforts are on to preserve natural resources. In the manufacturing process of sodium hydroxide, chlorine gas is also produced Chlorine gas and Hydrogen as product. A major portion of the gas is processed and liquefied to liquid chlorine for sale. The other major portion is utilized in the production of hydrochloric acid. The tail chlorine gas from all the sections of plant such as chlorine liquefaction, chlorine storage, chlorine filling etc. are neutralized in the caustic soda solution resulting in the formation of sodium hypochlorite liquor.

Automatic chlorine detectors have been installed around the industry to check any chlorine leakage.

The management of industry is alive to necessity of the conservation of natural resources. In the continued efforts, the industry has planted many trees and shrubs in its drive for afforestation.

## PART-H

The management of industry is quite conscious of the issues of environmental protection. Number of measures has been taken by the industry to protect the environment as detailed below:-

1. The waste HCl generated during regenerating of ION Exchange Column going to the ETP, which is neutralized with caustic soda solution for pH adjustment. Now the above waste acid is being collected in storage tank and reused in the ETP for pH adjustment. This has been adopted in both units.
2. The brine drained during sample collection at various points was earlier passing to the ETP increasing the chloride and TDS content. The same has now been re-circulated and reused in the system.
3. In the precipitated tank area the pump gland leakages was also passing to the ETP. The same is stopped totally and this also has reduced the TDS load in the ETP.
4. Continuous recording of effluent discharged with graphs in Control Room.
5. Tanker inspection platform provided.
6. Company is certified under ISO 9001:2015, ISO 14001: 2015, ISO 22000:2018 and ISO 50001:2018.
7. System for pre-treatment of chlorine section effluent is installed and the same is taken to ETP for further treatment.
8. Three new high volume samplers and one handy sampler are procured replacing the old ones.
9. Periodic measurement and monitoring of sound level at various locations inside the Plant has been implemented to control sound pollution.
10. The additional sod. Hypo tower installed in sod .hypo plant to scrub all the waste chlorine gas in complete soda so for capacity of the sod. Hypo plant U-2 is increased.
11. A green belt has been developed in side the plant premises.
12. All the solid sludge (Brine sludge) is stored in side the plant premises.
13. Proper storage facilities provided to store used lubricating oil as transformer oil (hazardous waste)
14. The mercury bearing brine sludge generated from 1984-1998 with mercury cells stored in side the plant premises in impervious brine sludge Pit No.1 . The sludge samples @ different depths were got tested twice in the past from NABL lab to check Mercury if any. It was not detected and accordingly the industry as retain to PPCB for declaring mercury bearing brine sludge as non-hazardous as the same has become inert over a period of about 24 years.

## PART- I

**(Any other particulars for improving the quality of the environment.)**

# Detailed Report Enclosed

# CHAPTER – 1

## EXECUTIVE SUMMARY

- For preparation of Environmental Statement (Environmental Audit) for the assessment year 2022-2023, M/s Primo Chemicals Ltd. formerly known as Punjab Alkalies and Chemicals Ltd., Nangal-Una Road, Naya Nangal, Punjab retained M/s. Mantec Consultants Pvt. Ltd., New Delhi.

- M/s. Primo Chemicals Ltd. formerly known as Punjab Alkalies and Chemicals Ltd. are manufacturing Caustic Soda Lye as the principal product, Chlorine and Hydrogen as co-products and Hydrochloric Acid, Sodium Hypochlorite and Spent Sulphuric Acid as by-products.

- Detailed manufacturing process for the production of principal and by products has been described in this Environmental Statement. Different manufacturing units have been dealt with individually, giving chemical reactions of various processes.

- A statement of quality and quantities of raw material, consumed vis-a-vis products and by-products manufactured has been projected.

- Material balancing of raw material utilized and products & by-products manufactured has been carried out and mentioned in the report. Tables clearly giving the inputs & outputs have been presented. Such balancing indicates that negligible quantities of raw material, products and by-products are coming out in the form of waste. On the whole, the materials are getting balanced comprehensively.

- The quality and quantity of pollution generated in the form of liquid, solid and gaseous emissions have been assessed. Their method of treatment and disposal has been described as pollution control measures.

  It has been observed that the air emissions coming out of the treatment facilities conform to the prescribed standards. Satisfactory measures have been adopted for the storage of sludge generated from the process and treatment facilities.

- Impacts of such pollution control measures have been assessed and described. The study reveals that with such measures there are no negative impacts on different environmental media viz. Ground water, surface water, soil, atmosphere, flora & fauna. There are no cultural site/ ancient monuments, etc in the vicinity of the industry.
- Energy consumption for air and water pollution control equipment for the year 2022-2023 has been detailed.

- The industry has well take care the area of development of vegetation. The management has planted about 8140 trees/shrubs.
- The management of the industry being conscious of environmental protection has taken several steps in this direction and has made several significant achievements.

- Overall, the industry is doing well for conserving the environment and has taken the appropriate steps for controlling the pollution levels.

## CHAPTER-2

# PREAMBLE

## 2.1 GENERAL

In pursuance of the Gazette Notification No. 155.GSR383 (E) dated 28th April, 1993 by Govt. of India, Department of Environment, Ministry of Environment & Forests (MoEF), M/s Primo Chemicals Ltd. formerly known as Punjab Alkalies & Chemicals Ltd. (PACL), Naya Nangal, appointed M/s. Mantec Consultants Pvt. Ltd., New Delhi for carrying out Environmental Audit (Presently called Environmental Statement), under the provision of Law. This report has been prepared on the basis of data / information furnished by the industry.

## 2.2 BRIEF COMPANY PROFILE

M/s. Primo Chemicals Ltd. formerly known as Punjab Alkalies and Chemicals Ltd. (PACL), Naya Nangal, is a Chlor-alkali unit, manufacturing Sodium Hydroxide (Caustic Soda) from Sodium Chloride (Brine) by electrolytic process, generating the attendant by- products viz., chlorine hydrogen, hydrochloric acid and bleach liquor (sodium hypochlorite).

The plant was commissioned in January 1984 at a cost of Rs 35 crores, with technical collaboration from Uhde-Gmbh, Germany with a production capacity of 33,000 TPA of Caustic Soda. Due to the enhanced market potential, PACL augmented caustic soda production capacity from 33,000 TPA to 40,730 TPA in 1989-90 and subsequently it was further increased to 73,750 TPA in the year 1995-96 by installing 100 TPD membrane cell plant. The mercury cell plant converted to 200 TPD membrane cell plant from 170 TPD mercury cell plant in the year 1998 and total capacity increases to 99,000 TPA. The present production capacity of the plant is approximately 1,65,000 TPA.

The management being conscious for the welfare of its employees has provided facilities of a canteen, rest room, personal protective equipment etc. By way of perks, canteen allowance, liveries and washing allowances have been granted to the entitled employees.

## 2.3 LOCATION

The Primo Chemicals Ltd. formerly known as Punjab Alkalies & Chemicals Ltd., Naya Nangal complex is located west of Sutlej River, 1 km from Nangal-Una State Highway No. 22. It is 16 km from Bhakra Dam, on a sprawling plot area of approximately 32.6174 hectares (80.6 acres), with corporate office at Chandigarh.

# CHAPTER – 3

# MANUFACTURING PROCESS

## 3.1 GENERAL

The basic ingredients for the manufacture of main products (Caustic soda, chlorine & hydrogen) and by-products (hydrochloric acid, sodium hypo-chlorite is sodium chloride (common salt) and water.

Detailed manufacturing processes of products and by-products are as follows:-

## 3.2 MANUFACTURING PROCESS BY MEMBARANE CELL TECHNOLOGY

### 3.2.1 Salt Handling & Brine Treatment

For the manufacture of sodium hydroxide, principal raw material is industrial grade sodium chloride. This salt of approximately 97% purity, procured mainly from Gujarat is transported to the plant by railway wagons & trucks. The salt unloaded inside the factory is manually transferred to the salt yard from where it is fed to the saturators through bucket elevators. The saturated brine of about 310 gm/liter concentration flows to the precipitation tank, where the impurities of calcium, magnesium, sulphates, iron and other insoluble contents are removed by treating it with chemicals like soda ash, caustic soda, barium carbonate and flocal. The treated brine flows to the clarifier where the impurities are allowed to settle and removed as sludge.

### 3.2.2 Brine Clarification

From the precipitation tank, the brine overflows to the central inlet of the clarifier. Here, a definite quantity of flocculent solution is mixed with the brine. In the clarifier, the major portions of solids are removed from the brine and are discharged from the underflow to the vacuum drum filter. From the clarified brine tank, it is pumped to the anthracite filters.

### 3.2.3 Brine Filtration and Polishing

To remove any residual solid impurities, the clarifier brine is filtered through two stage of filtration:

First Stage of Filtration : Anthracite Filters
Second Stage of filtration : Polishing Filters

Polished brine is collected in a polished brine tank and is pumped through a recuperator in order to heat the brine to $65^{o}$ C (approximately).

### 3.2.4 Secondary Brine Purification

From the brine recuperator, the polished brine is sent to the secondary purification section. This section serves to remove the calcium and magnesium cations still contained in the brine to the residual content of less than 30ppb. The brine is purified in two ion exchange columns connected in series. The pure brine passes to the brine head tank via brine heat exchangers which serve to heat brine during the start up and also serve to cool brine during shut down.

### 3.2.5 Electrolyser Section

Pure brine of 310 ± 10 gm per liter NaCl is fed to anodic side of electrolyser. Membrane, which is partition between anodic and cathodic cells, selectively allows only Na ions and does not allow OH and Cl ions to pass through. Also 3-4 moles of H2O per mole of Na+ ions penetrate through membrane towards cathodic side (cathode is of Nickel and anode is of Titanium construction). Cl evolves at anodic side and $H_2$ evolves on cathodic side. Anolyte coming out of the cells is of 200-220 gm/liter i.e. depletion is 90-110 gm/liter of NaCl. A portion of the catholyte is pumped to caustic concentration unit for further concentration of the product to 47.5% from 32$\pm$ 2 %. Anolyte from cells is passed to anolyte tank, which after dechlorination and pH adjustments, termed as lean brine, is pumped to the brine saturators.

### 3.2.6 Chlorate Destruction

To a purge stream of anolyte, HCl is added and heat is applied through steam. This causes the chlorate to break up to give chlorine, which is sent to the chlorine system. The acidified anolyte free from chlorate is sent back to the anolyte steam.

### 3.2.7 Catholyte and Hydrogen

Catholyte and $H_2$ mixture from catholyte side of electrolysers are sent to the catholyte tank from where 32-33 % caustic is pumped to the storage tanks and a part of it is pumped back to the electrolyser through a cooler after adding DM water to it. Hydrogen is separated in a catholyte header itself and is sent for processing. $H_2$ is cooled in a heat exchanger to about $45^0$ C and is sent to demister through a safety vessel and is finally transferred to HCl synthesis unit and to other destinations like boiler, flakers and bottling units.

### 3.2.8 Hydrogen Handling

Hydrogen gas is separated from catholyte and is pumped from gasholder to (i) HCl plant for making hydrochloric acid, (ii) to fusion plant for the use as a fuel (iii) a neighboring hydrogen bottling plant and (iv) to the boiler.

### 3.2.9 Chlorine Handling and Filling

Chlorine liberated in the anode compartment of the electrolyser is saturated with anolyte and the same after separation is treated in the chlorine section of the plant. In this section the gas is cooled, dried with sulphuric acid and compressed to a pressure of 3.2 Kg/ $cm^2$. The compressed gas is liquefied in the liquefier using freon 22 as refrigerant. The liquid chlorine flows to one of the four insulated MS storage bullets. From the bullets, tonners are filled with 900 Kg. Chlorine, inspected and tested before dispatch.

### 3.2.10 Hydrochloric Acid Unit

A portion of chlorine gas after Cl2 compressors is diverted to HCl plant and is burnt with hydrogen gas in a furnace to form hydrochloric acid following the reaction given below:

$H_2 + Cl_2 \longrightarrow 2HCl$

The HCl vapours are absorbed in water to form 30-33% HCl. The residual unabsorbed HCl gas coming out of the primary absorber is now absorbed in water in the tail gas absorber forming weak acid which flows to primary absorber to form concentrated acid. HCl is stored in three FRP/MS rubber lined tanks.

### 3.2.11 Sodium Hypochlorite Production

In this section of the plant, fugitive chlorine gases from all sources are taken for neutralization with caustic soda to form sodium hypochlorite bleach liquor so that the chlorine emission to the environment is eliminated. This not only minimizes the emissions of dangerous chlorine to the atmosphere but also adds to revenue generation. The process involves the following reactions:

Sodium hypochlorite (NaOCl)

$2NaOH + Cl2 \longrightarrow NaOCl + NaCl + H2O$

## CHAPTER -4

## PRODUCTION IN THE YEAR OF 2022-2023

### 4.1 PRODUCTS

List of products manufactured by Primo Chemicals Ltd. formerly known as PACL with quantities as reported by the management, are given below in Table - 4.1

**Table - 4.1**

**PRODUCTION DETAILS**

| S. No. | Name of the Product | Units | Production in the year 2022-23 |
|---|---|---|---|
| 1. | Caustic Soda Lye Gross (Net Production) | MT | 134977.397/ (125739.181) |
| 2 | Liquid Chlorine | MT | 109482.303 |
| 4 | Hydrochloric Acid | MT | 55942.869 |
| 5 | Hydrogen Gas | $Nm^3$ | 37793671.900 |
| 6 | Sodium Hypochlorite | MT | 20685.270 |

# CHAPTER-5

## MATERIAL BALANCE

### 5.1 SODIUM HYDROXIDE UNIT

#### 5.1.1 Input / Output Statement for the Year 2022-2023

| Annual Input | | | | Annual Output | | |
|---|---|---|---|---|---|---|
| **Sl. No.** | **Input** | **Unit** | **Quantity** | **Output** | **Unit** | **Quantity** |
| **i.** | Salt | MT | 214614.061 | NaOH | **MT** | 134977.397507 |
| **ii.** | Soda Ash | MT | 675.960 | $Cl_2$ (gas) | **MT** | 119589.971 |
| **iii.** | Barium Carbonate | MT | 1167.220 | $H_2$ | **Nm3** | 37793671.90 |
| **iv.** | Flocculants | KGS | 3645.500 | Liquid Chlorine | **MT** | 109482.303 |
| **v.** | Water | KL | 507072.00 | Sodium Hypo | **MT** | 20685.270 |
| **vi.** | | | | Hydrochloric Acid | **MT** | 55942.869 |

#### 5.1.2 Material Balancing for the Year 2022-2023

**a. Basis**

i. $2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 + H_2$

$116.91 + 36.032 \rightarrow 80.016 + 70.91 + 2.016$

ii. Average Purity of crude NaCl = 95%

iii. Average cell efficiency = 95% (Unit I-95%, Unit II-95%)

**b. Calculation**

Pure NaCl available in crude salt 214614.061 x 0.95 per annum= 203883.358

| Product | Calculation based on stoichiometric equation | Theoretical Production (MT) | Actual Production (MT) | Percentage Variation |
|---|---|---|---|---|
| **NaOH** | (203883.358 x 80.016 / 116.91) x 0.95 | 132565.513 | 112022.731 | (-)18.338% |
| **$Cl_2$ (gas)** | (203883.358 x 70.91/116.91) x 0.95 | 117479.261 | 102777.165 | (-)14.305% |
| **$H_2$** | (203883.358 x 2.016 / 116.91) x 0.95 | 3339.982 | 3374.435 | (+)1.021% |

The variation in actual production is due to variation in current efficiency caused by deterioration in membrane conditions.

## 5.2 CHLORINE BALANCE

### 5.2.1 Chlorine Utilization Statement for the Year 2022-2023

| Generation | Quantity (MT) | Utilization | Quantity (MT) |
|---|---|---|---|
| Chlorine Gas Produced | 119589.971 | Production of Liquid Chlorine | 109482.303 |
| Chlorine Gas From Tonner Purging | 4664.132.265 | Chlorine Gas to HCl Plant | 12703.273 |
| | | Chlorine Gas From Process Neutralized in Sod hypo Plants | 2068.527 |
| Total Chlorine Generated | **124254.103** | Total Chlorine Utilized | **124254.103** |

## 5.3 HYDROGEN BALANCE

### 5.3.1 Hydrogen Utilization Statement for the Year 2022-2023

| Generation | Quantity($Nm^3$) | Utilization ($Nm^3$) | Quantity($Nm^3$) |
|---|---|---|---|
| $H_2$ Gas Produced | 37793671.9 | $H_2$ in HCl Plant | 7025248.0 |
| | | $H_2$ Dispatched | 3213831.0 |
| | | $H_2$ for Boilers | 21993784.0 |
| | | $H_2$ Vent | 5560808.9 |
| **Total** | **37793671.9** | **Total** | **37793671.9** |

## 5.4 HYDROCHLORIC ACID PLANT

### 5.4.1 Input Output Statement for the Year 2022-2023

| Input | Quantity(MT) | Output | Quantity(MT) |
|---|---|---|---|
| Chlorine gas | 12080.964 | Hydrochloric acid | 55942.869 |
| Hydrogen gas | 55942.869 | Average Conc. | 31.00% |
| Water (DM Water) | 36033.725 | HCl Content (100%) | 15813.361 |

### 5.4.2 Material Balancing for the Year 2022-2023

**a. Basic**

i. $H_2$ + $Cl_2$ → 2HCl
2.016 + 70.91 → 72.926

ii. Average concentration of product HCl = 31.00%

**b. Calculation**

(12703.273 x 72.926 x 100) / (31.00 x 70.91) = 42143.329

| Theoretical Production (MT) | Actual Production (MT) | % age Variation | Remarks |
|---|---|---|---|
| 42143.329 | 55942.869 | (+) 24.667% | Concentration variation |

### 5.4.3 Material Balancing for the Year 2022-2023

Chlorine utilized for Sodium Hypo Product = 2068.527 MT
Quantity of sodium hypochlorite liquor produced = 20685.270 MT
Chlorine input in Sodium Hypochlorite liquor = 2068.527 MT

$2\ NaOH + Cl_2 \rightarrow NaOCl + NaCl + H_2O$

## 5.5 SODIUM HYPOCHLORITE PLANTS

### 5.5.1 Input Output Statement for the Year 2022-2023

| Input | Quantity(MT) | Output | Quantity(MT) |
|---|---|---|---|
| Chlorine Gas for Sodium Hypo | 2068.527 | Sodium Hypo Chlorite Liquor | 20685.270 |
| Caustic Soda for Sodium Hypo MT | 3550.926 | Available Chlorine (% ) | 9.994 % |
| Total Chlorine Input | 2068.527 | Total Chlorine Output | 2068.527 |

## 5.6 WATER BALANCE

### 5.6.1 Water Utilization Statement for the Year 2022-2023

| Input | Quantity ($m^3$) | Output | Quantity ( $m^3$) |
|---|---|---|---|
| Water drawn from RIVER SATLUJ | 507072 | Water Consumed for Process | 252408 |
| Water drawn from Primo Chemicals Ltd. Colony Bore well | 316081 | Domestic Water Consumption Inside Plant 3 | 16425 |
| | | Domestic Water Consumption in Primo Chemicals Ltd. Housing Colony 4 | 316081 |
| | | Water Consumed for Industrial Cooling 2 | 238239 |
| **Total Water Drawn** | **823153** | **Total Water Utilization** | **823153** |

## CHAPTER-6

## POLLUTION GENERATION

### 6.1 INDUSTRIAL LIQUID EMISSIONS (WASTE WATER)

#### 6.1.1 Raw Water

The main source of raw water for M/s Primo Chemicals Ltd. formerly known as PACL, Naya Nangal is River Satluj flowing across the Naya Nangal town. As given in Table 6.1 the total industrial water consumption of Primo Chemicals Ltd. for financial year 2022-2023 was 507072 $m^3$ out of which 252408 $m^3$ was used in the process, 238239 $m^3$ was used for industrial cooling and 16425 $m^3$ was used for industrial domestic purpose. Based on the data provided by PACL, the quality of process water is given at Table 6.1 Since there are substantial losses through evaporation in process of industrial cooling, the figure given above reflects only the make-up water. As on an average 42000 $m^3$ per month of water drawn from Satluj River is used for industrial process, industrial cooling and industrial domestic purpose. Industrial cooling water from different units is recycled through cooling towers, the make-up water or evaporation losses work out to mere 3.5% of water recycled.

**Table-6.1**

**Water Utilization Statement**

| | |
|---|---|
| Total water drawn in 2022-2023 | **507072** $m^3$ |
| Total water used in 2022-2023 for | |
| Process | 252408 $m^3$ |
| Industrial Cooling | 238239 $m^3$ |
| Industrial Domestic | 16425 $m^3$ |
| …… | |
| | **507072 $m^3$** |

**Table – 6.2**
**Process Water Quality**
**(2022-2023)**

| Sl. No. | Parameter | Concentration Values | | |
|---|---|---|---|---|
| | | **Min.** | **Max.** | **Avg.** |
| 1. | pH | 7.1 | 7.7 | 7.4 |
| 2. | Total Hardness as $CaCO_3$ | 92 | 112 | 104 |
| 3. | Chlorides as Cl | 7.10 | 10.2 | 8.85 |

Note:- Except pH all values are in mg/l

### 6.1.2 Effluent Generation

Approximately 78.836$m^3$/day of waste water is generated from process which is discharged after treatment.

### 6.1.3 Effluent Treatment

M/s Primo Chemicals Ltd. formerly known as PACL consumed 16425 $m^3$ of water for industrial domestic purpose and 252408 $m^3$ for process in 2022-2023. The characteristic of the process is given in Table-6.2. A part of this water is consumed and the remaining comes out as effluent. The month-wise characteristics showing minimum, maximum and average values of relevant parameters in process effluent are given at Table 6.3. These tables show that the characteristics of effluent after treatment are within the stipulated standards.

**Table – 6.3**

**Treated Effluent Quality (Per Month)**

| Month | pH | Total Suspended Solids (mg/l) | Total Residual Chlorine (mg/l) |
|---|---|---|---|
| April, 2022 | 7.5 | 25 | Nil |
| May, 2022 | 7.5 | 24 | Nil |
| June, 2022 | 7.5 | 18 | Nil |
| July, 2022 | 7.4 | 24 | Nil |
| August, 2022 | 7.2 | 22 | Nil |
| September, 2022 | 7.1 | 20 | Nil |
| October, 2022 | 7.1 | 21 | Nil |
| November, 2022 | 7.1 | 21 | Nil |
| December, 2022 | 7.2 | 21 | Nil |
| January, 2023 | 7.2 | 21 | Nil |
| February, 20223 | 6.5 | 18 | Nil |
| March, 2023 | 7.2 | 20 | Nil |

**Table – 6.4**

**Treated Effluent Quality (2022-2023)**

| Sl. No. | Parameter | Concentration Values | | |
|---|---|---|---|---|
| | | **Min.** | **Max.** | **Avg.** |
| 1 | pH | 6.5 | 7.5 | 7.2 |
| 2 | Total Suspended solids | 18 | 25 | 21 |
| 3 | Total Residual Chlorine | Nil | Nil | Nil |

Note:- Except pH all values are in mg/l

## 6.2 INDUSTRIAL GASEOUS EMISSIONS

### 6.2.1 Source of Gaseous Emission

Following are the source of gaseous emission from the industry.

i. **HCl Plant:** In the hydrochloric acid plant, hydrogen and chlorine are burned to produce hydrochloric acid. During the process, there is a high probability of emission of vapors and mist of hydrochloric acid and unburned chlorine. To capture such emission, the secondary absorber has been provided. Residual chlorine in the tail gas is absorbed in water to make weak acid, which is fed to the primary absorber.

ii. **Chlorine Gas:** In this plant unutilized gas from the process is fed to the waste air dechlorination unit where it is reacted with caustic solution to form sodium hypo separately. The capacity of the dechlorination units is sufficient to neutralize the waste gas of the plant. The emission of chlorine from hypo vent remains well within the limits.

iii. **Boilers:** There are three oil boilers:

a) Thermax Boiler of capacity 5 MT and fuel used is $H_2$-Gas / Furnace Oil.
b) Sterling Boiler of capacity 10 MT and fuel used is $H_2$-Gas / Furnace Oil. Hydrogen gas, a product of the industry, is also used as fuel in the boilers which is a non polluting fuel.
c) Third Boiler i.e. HUSK FIRED BOILER of capacity 8 MT, Rice Husk is used as fuel having bag filters as APCD.

The design of the boilers is such that the resultant gaseous emissions are within the limits as prescribed by the regulatory agencies.

### 6.2.2 Emission Characteristics

The major gaseous pollutants emitted from Primo Chemicals Ltd formerly PACL, Naya Nangal are hydrochloric acid vapor and mist from HCl plant, hydrogen from hydrogen vent and chlorine from hypo stack. The industry is continuously monitoring their stacks through out the year and results are submitted every month to Punjab Pollution Control Board. The emission characteristics of different stacks of Unit-I and Unit-II are given in Table 6.4 and 6.5.

**TABLE-6.5**

**STACK MONITORING DATA (MONTHLY)**

| Month | Membrane Cell, Unit-I | | Membrane Cell, Unit-II | |
|---|---|---|---|---|
| | Hypo Stack | HCL Stack | Hypo Stack | HCl Stack |
| | Chlorine, mg/m$^3$ | HCl, mg/m$^3$ | Chlorine, mg/m$^3$ | HCl, mg/m$^3$ |
| April, 2022 | 3.29 | 3.31 | 3.14 | 3.99 |
| May, 2022 | 3.47 | 3.03 | 3.39 | 3.73 |
| June, 2022 | 3.78 | 3.89 | 3.78 | 3.89 |
| July, 2022 | 3.31 | 2.80 | 3.42 | 4.25 |
| August, 2022 | 3.43 | 2.92 | 3.42 | 3.89 |
| September, 2022 | 3.07 | 3.16 | 3.19 | 3.65 |
| October, 2022 | 2.72 | 3.29 | 3.23 | 3.37 |
| November, 2022 | 2.84 | 3.12 | 2.89 | 3.16 |
| December, 2022 | 2.40 | 2.73 | 2.38 | 2.79 |
| January, 2023 | 2.37 | - | 2.36 | 2.67 |
| February, 2023 | 2.60 | 2.95 | 2.72 | 3.02 |
| March, 2023 | 2.60 | 2.95 | 2.72 | 2.83 |

**TABLE-6.6**

**SOURCES OF AIR EMISSIONS AND POLLUTION LOAD IN UNIT-I & II (2022-2023)**

| Sl. No. | Source of Air Pollution | Pollutant | Avg. Conc. of Pollutants (mg/Nm$^3$) | | Pollution Load (kg./day) | |
|---|---|---|---|---|---|---|
| | | | Unit-I | Unit-II | Unit-I | Unit-II |
| 1. | HCI Vent | HCl | 4.47 | 4.44 | 8.94 X 10^-3 | 8.88 X 10^-3 |
| 2. | Hypo Stack | Chlorine | 3.99 | 4.22 | 7.98 X 10^-3 | 8.44 X 10^-3 |

## 6.3 SOLID WASTE

### 6.3.1 Source

There is continuous generation of non-hazardous waste from the process of PACL. Following are the sources of its generation.

| Sl. No. | Type | Source |
|---|---|---|
| 1. | Non-hazardous solid waste (Brine sludge) | Saturator<br>Precipitation tank<br>Chemical tank/pits<br>Drum filter/Decanter<br>Brine clarifier |

### 6.3.2 Generation

The total non-hazardous waste generated from Primo Chemicals Ltd. formerly known as PACL for the assessment year 2022-2023 was **4278.247** MT (wet basis) and **2735.874 MT** (dry basis). The quantities of sludge generated from Unit-I and Unit-II from different sections are given in Table-6.7 and 6.8.

## Table – 6.7

## QUANTITY OF SLUDGE FROM PACL SOLID WASTE (BRINE SLUDGE) PER MONTH

| Moth | Basis | Membrane Cell, Unit-I | | | | Membrane Cell, Unit-II | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Brine sludge from drum filter/ decanter, MT | Brine sludge from brine sludge pits, MT | Brine sludge from precipitation tanks/ vessels, MT | Sludge from brine saturator, MT | Brine sludge from drum filter/ decanter, MT | Brine sludge from brine sludge pits, MT | Brine sludge from precipitation tanks / vessels, MT | Sludge from brine saturator, MT |
| April, 2022 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 291.910 | 30.168 | 0.000 | 0.000 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 185.071 | 19.338 | 0.000 | 0.000 |
| May, 2022 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 236.380 | 143.196 | 0.000 | 0.000 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 152.700 | 90.930 | 0.000 | 0.000 |
| June, 2022 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 219.220 | 100.800 | 12.400 | 0.000 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 137.890 | 60.480 | 8.003 | 0.000 |
| July, 2022 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 106.200 | 201.820 | 0.000 | 26.148 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 64.846 | 122.908 | 0.000 | 16.813 |
| August, 2022 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 221.062 | 133.285 | 20.095 | 15.928 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 138.827 | 83.170 | 12.600 | 10.003 |
| September,2022 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 157.566 | 136.450 | 78.171 | 24.479 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 98.794 | 86.100 | 50.811 | 15.520 |
| October, 2022 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 286.714 | 31.386 | 0.000 | 26.950 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 184.071 | 20.150 | 0.000 | 17.559 |
| November,2022 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 289.788 | 30.890 | 44.400 | 29.120 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 186.913 | 19.850 | 28.200 | 18.200 |
| December, 2022 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 222.500 | 94.802 | 46.542 | 0.000 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 138.840 | 58.620 | 29.042 | 0.000 |
| January, 2023 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 285.578 | 22.325 | 0.000 | 26.850 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 180.200 | 13.400 | 0.000 | 16.872 |
| February, 2023 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 218.076 | 92.823 | 33.450 | 18.100 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 138.260 | 58.850 | 21.677 | 11.400 |
| March, 2023 | Wet | 0.000 | 0.000 | 0.000 | 0.000 | 284.076 | 26.433 | 0.000 | 12.166 |
| | Dry | 0.000 | 0.000 | 0.000 | 0.000 | 178.400 | 16.600 | 0.000 | 7.640 |

**Table – 6.8**

**QUANTITY OF SLUDGE FROM PACL**
**SOLID WASTE (BRINE SLUDGE)**

| Sludge | Unit-I | | Unit-II | | Total | |
|---|---|---|---|---|---|---|
| | Wet (X1) | Dry (Y1) | Wet (X2) | Dry (Y2) | Wet (X1+X2) | Dry (Y1+Y2) |
| Brine Sludge from Drum Filter/Decanter (MT) | 0.000 | 0.000 | 2819.070 | 1784.812 | 2819.070 | 1784.812 |
| Brine Sludge from brine sludge Pits, MT | 0.000 | 0.000 | 1044.378 | 650.396 | 1044.378 | 650.396 |
| Brine Sludge from precipitation Tanks / Vessels, MT | 0.000 | 0.000 | 235.058 | 150.333 | 235.058 | 150.333 |
| Sludge from brine saturator, MT | 0.000 | 0.000 | 179.741 | 150.333 | 179.741 | 150.333 |
| **Total Solid Waste Generated, MT** | **0.000** | **0.000** | **4278.247** | **2735.874** | **4278.247** | **2735.874** |

### 6.3.3 Characteristics of Solid waste generated.

Quality of solid wastes generated is continuously monitored and recorded. The characteristics of solid waste generated from various sections during the year 2021-2022 are given in table 6.9.

**Table – 6.9**
**PUNJAB ALKALIES & CHEMICALS LTD.**

**Average Quality of Brine Sludge Generated During Year 2022-2023**

| Sl. No. | Parameter | Unit | Membrane Cell, Unit-I | Membrane Cell, Unit-II |
|---|---|---|---|---|
| 1 | Loss on Drying (water) | % | -- | 36.70 |
| 2 | NaCl | % | -- | 6.90 |
| 3 | Calcium as $CaCO_3$ | % | -- | 10.60 |
| 4 | Magnesium as $Mg(OH)_2$ | % | -- | 9.20 |
| 5 | Acid insoluble | % | -- | 36.60 |

# CHAPTER – 7

## POLLUTION CONTROL

### 7.1 EFFLUENT TREATMENT

The industry has two process streams (Unit-I & Unit-II) to produce caustic soda and chlorine with membrane cell technology. Each process unit is having separate effluent treatment plant. The effluent from various sections such as Primary Brine Section, Secondary Brine Section, DM Water, Cell House, HCl Plant, Utility Section, Boiler Section etc., are taken to the effluent treatment plant through in-plant effluent collection channels. The streams may be acidic or alkaline in nature. There is no other contamination in the effluent. The effluent is neutralized by proper pH adjustment by adding caustic or HCl and is finally pumped to RO plant for further treatment and the return water from RO is used in the process in cooling towers as makeup water and RO reject is send to MEE(Evaporators). MEE permeate is taken in the permeate pit for use in cooling towers and MEE rejects is taken in the drying beds from where MEE sludge is collected and filled in properly labeled LDPE bags and same is stored separately and sent to common TSDF facility at Nimbua. Left behind leachate from drying beds is collected in a separate low lying pit, from where it is pumped to RO reject pit for feeding to MEE.

**Effluent Treatment Plant in Unit-I**

The flow diagram of effluent treatment plant is given in Fig. 7.1. Effluent treatment plant in unit-I has one collection pit, two settling chambers and one final chamber. Size and capacity of unit-I ETP is as under:

| **Pit/Chamber** | **Size** | | |
|---|---|---|---|
| **Units** | **Length** | **Breadth** | **Depth** |
| Collection pit | 1.3 M | 1.3 M | 2.1 M |
| Mixing cum settling chamber-I | 7.75 M | 5.70 M | 3.3 M |
| Mixing cum settling chamber-II | 7.75 M | 5.70 M | 3.3 M |
| Treatment Chamber | 10.9 M | 4.6 M | 3.3 M |

**Effluent Treatment capacity: 500 $m^3$/day**

Effluent from various sections of Unit-I & Unit-II is collected in the collection pit and is taken to one of the two settling chambers where it is allowed to mix properly. Spurger's are provided for spurging compressed air. After proper mixing it is allowed to settle. One settling chamber remains under operation while the other is kept as a standby, which is taken into line when last one is taken out for mixing and settling.

From the mixing cum settling chambers, the effluent is pumped to treatment chamber where a chemical such as caustic soda or HCl is added from overhead storage tank for pH adjustment of the effluent. pH is continuously monitored and the required caustic or hydrochloric acid is added. Air is passed through spurges provided in the chamber for proper mixing and it is circulated through a pump. The capacity of the pump is 40$m^3$/hr. After the pH is maintained at round 8, the effluent is pumped through HDPE pipeline to RO plant (capacity 300$m^3$/day) for further purification to achieve the desired TDS value of less than 500 ppm. The RO return water is used in the process in cooling towers as makeup water and RO reject is send to MEE(Evaporators). MEE permeate is taken in the permeate pit for use in cooling towers and MEE rejects is taken in the drying beds from where MEE sludge is collected and filled in properly labeled LDPE bags and same is stored separately and sent to common TSDF facility at Nimbua. Left behind leachate from drying beds is collected in a separate low lying pit, from where it is pumped to RO reject pit for feeding to MEE.

**Fig 7.1 Flow Charts –Effluent Treatment Plant, Unit-1**

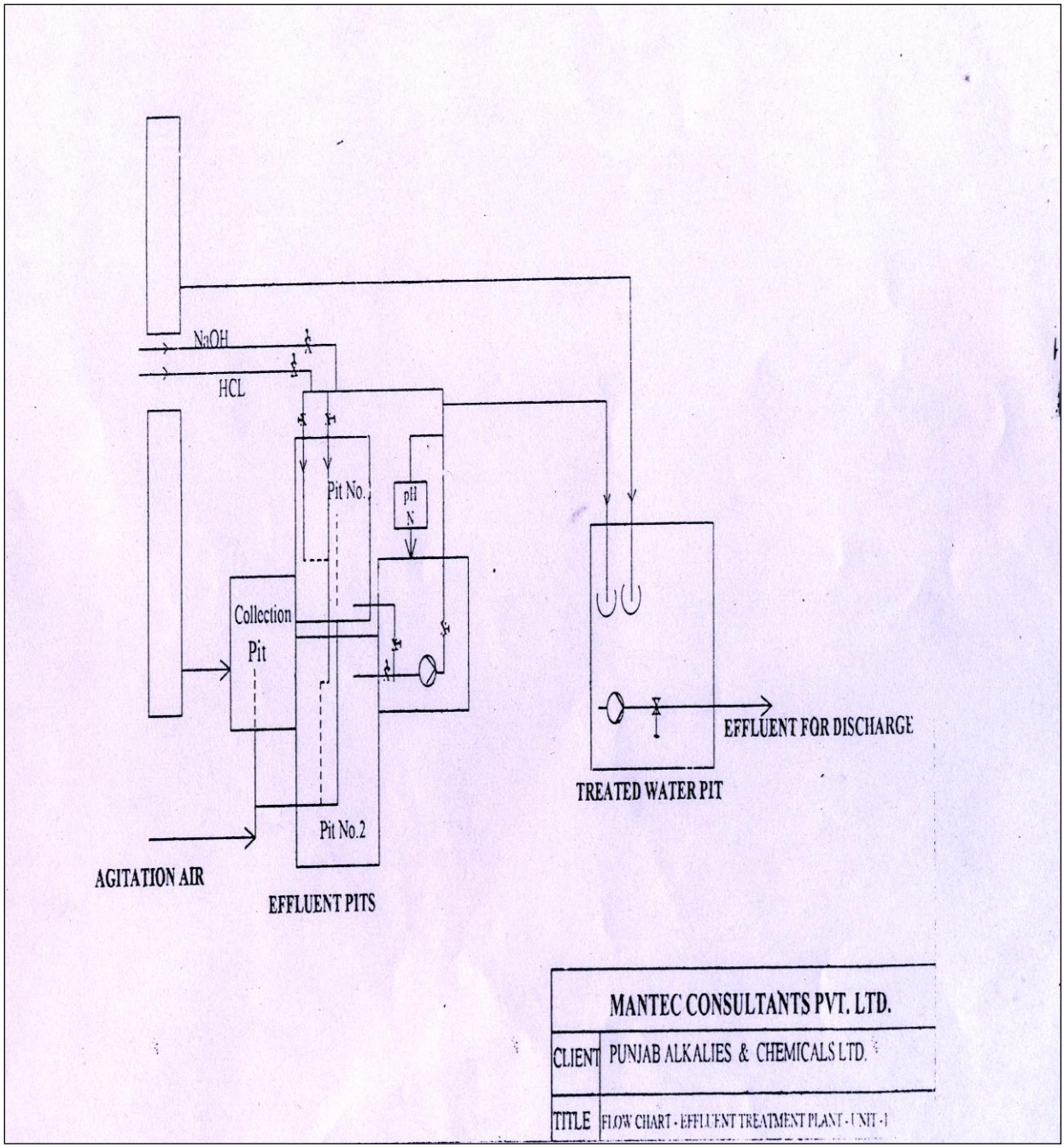


**Table – 7.1**

**Treated Effluent Quality (2022-2023)**

| Sl. No. | Parameter | Concentration Values | | |
|---|---|---|---|---|
| | | **Min.** | **Max.** | **Avg.** |
| 1 | pH | 6.5 | 7.5 | 7.2 |
| 2 | Total Suspended solids | 18 | 25 | 21 |
| 3 | Total Residual Chlorine | Nil | Nil | Nil |

Note:- Except pH all values are in mg/l

## 7.2 AIR POLLUTION CONTROL

Chlorine gas and HCl fumes are the main sources of air pollution generated in the plant from various process streams, tanks, vessels, process equipments, pipe lines during manufacturing, storing or handling of chlorine etc. All the fugitive emissions of chlorine gas are sucked through a blower and are passed through waste air dechlorination unit where waste chlorine gas is neutralized with caustic soda solution. Similarly HCl fumes generated from the storage tank and during HCI preparation are taken to the above unit where it is neutralized with the alkali.

Chlorine gas produced in the electrolyzer is taken for cooling, drying, compression and liquefaction for making liquid chlorine. The unliquidified chlorine gas is known as sniff gas which is taken to HCl plant for burning with hydrogen to make HCl and the sniff gas which can not be burned in HCl plant is taken to waste air dechlorination units. If the hydrogen content in the chlorine is higher then the sniff gas will have higher percentage of hydrogen gas. Beyond 4% hydrogen in chlorine forms explosive mixture and therefore the liquefaction efficiency is maintained to keep the hydrogen percentage in sniff chlorine gas below 4%. Thus, it is possible to liquify the gas to a maximum possible in membrane cell plant.

Under normal plant conditions, about 1000 kgs. of chlorine gas is required to be neutralized in Unit-I and 2500 kgs of chlorine is required to be neutralized in Unit-II.

A unit wise detail of the air pollution treatment and control system is given below:

In the waste air dechlorination plant of Unit-I, there are three sodium hypo towers where caustic soda and chlorine reacts counter currently. The waste chlorine gas enters into the first tower and the caustic soda enters into third tower. The caustic overflows from the third tower, goes to second tower and the overflow from the second tower goes to the first tower. Chlorine reacts with the caustic in the first tower and forms sodium hypochlorite, which overflows to the sodium hypo receiver and is withdrawn periodically as a product. The un-neutralized chlorine gas goes to the second tower where it reacts with caustic solution to make weak sodium hypo. The third tower acts as a buffer tower. In case, un-reacted chlorine gas leaves the second tower, then the same will get neutralized in that tower. In case of excess flow of chlorine to the first tower, the same is controlled/neutralized by automatic opening of caustic lye to the hypo tower no. I.

1. The flow of chlorine gas and caustic to the first tower is controlled by reduction Potential which is measured continuously in the first tower.

2. Neutralization capacity of the plant = 5 MT/day of chlorine gas

3. Caustic circulation pump capacity = 2 Nos. 20 $m^3$/hour capacity each

4. Hypo circulation pump capacity = 3 nos. 60 $m^3$/hour capacity each

**Unit-II**

In the waste air dechlorination plant of unit-II there are four sodium hypo towers where caustic soda and chlorine reacts counter currently. Under normal plant operation, waste chlorine gas from all sections of the plant is first taken to the sodium hypo towers where sodium hypo chlorite is formed by absorbing chlorine gas in caustic soda lye. Sodium Hypo Chlorite is collected in receiver and is withdrawn periodically as a product. The unreacted chlorine gas is further passed to 2nd and 3rd tower for complete absorption in caustic soda lye and the final product is collected for sale. Similarly when the first sodium hypo tower gets exhausted the second hypo is taken in line.

i. Neutralization capacity of sodium hypo plant = 1000 kg/hr. chlorine gas
ii. Pump capacity
iii Sodium hypo circulation pump capacity = 6 nos. 100 $m^3$ /hr. each

**HCI Vapors**

Each HCI furnace is provided with tail gas absorber. HCI vapor from the first absorber of the HCI furnace is taken to the tail gas absorber where acid mist is absorbed in waste to make weak HCI acid, the same is fed to the first absorber.

HCI vapor from tanks is taken to the waste air dechlorination unit for neutralization through the exhaust blower and pipeline arrangement.

A new HCI absorber has been installed in unit II to absorb all the gas from the road tanker during filling.

In order to keep a watch on the emission from various stacks, periodic monitoring of emission is carried out. Apart from this, ambient air quality is also monitored from time to time. The average ambient quality monitored at Primo Chemicals Ltd. is given in Table-7.2.

**Table – 7.2**

**PUNJAB ALKALIES & CHEMICALS LIMITED, NAYA NANGAL**
**AMBIENT AIR MONITORING DATA (MONTHLY)**

| Month | Location of Respirable dust sampler | Parameter | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $PM_{10}$, $\mu g/m^3$ | $PM_{2.5}$, $\mu g/m^3$ | $SO_2$, $\mu g/m^3$ | $NO_2$, $\mu g/m^3$ | CO, $mg/m^3$ | $NH_3$, $\mu g/m^3$ | $O_3$, $\mu g/m^3$ | Pb $\mu g/m^3$ | As, $ng/m^3$ | Ni, $ng/m^3$ | $C_6H6$ $\mu g/m^3$ | B(a)P $ng/m^3$ |
| April, 2022 | Railway siding area | 34 | 28 | 24 | 26 | 0.4 | 162 | 34 | Nil | Nil | Nil | Nil | Nil |
| May, 2022 | Railway siding area | 34 | 28 | 24 | 24 | 0.4 | 160 | 34 | Nil | Nil | Nil | Nil | Nil |
| June, 2022 | Railway siding area | 30 | 28 | 25 | 28 | 0.3 | 162 | 36 | Nil | Nil | Nil | Nil | Nil |
| July, 2022 | Railway siding area | 32 | 28 | 26 | 28 | 0.4 | 160 | 34 | Nil | Nil | Nil | Nil | Nil |
| Aug. 2022 | Railway siding area | 36 | 28 | 28 | 26 | 0.5 | 162 | 36 | Nil | Nil | Nil | Nil | Nil |
| Sep. 2022 | Railway siding area | 32 | 28 | 26 | 24 | 0.4 | 160 | 34 | Nil | Nil | Nil | Nil | Nil |
| Oct. 2022 | Railway siding area | 30 | 28 | 24 | 26 | 0.5 | 162 | 34 | Nil | Nil | Nil | Nil | Nil |
| Nov. 2022 | Railway siding area | 32 | 28 | 26 | 24 | 0.4 | 160 | 32 | Nil | Nil | Nil | Nil | Nil |
| Dec. 2022 | Railway siding area | 28 | 28 | 22 | 24 | 0.2 | 160 | 30 | Nil | Nil | Nil | Nil | Nil |
| Jan. 2023 | Railway siding area | 30 | 26 | 24 | 26 | 0.6 | 162 | 34 | Nil | Nil | Nil | Nil | Nil |
| Feb. 2023 | Railway siding area | 28 | 28 | 22 | 24 | 0.2 | 162 | 30 | Nil | Nil | Nil | Nil | Nil |
| March 2023 | Railway siding area | 28 | 26 | 26 | 24 | 0.4 | 160 | 32 | Nil | Nil | Nil | Nil | Nil |

## Table – 7.3

**PUNJAB ALKALIES & CHEMICALS LIMITED, NAYA NANGAL**
**AMBIENT AIR MONITORING DATA**
**Average Annual data 2022-2023**

| Sl. No. | Location of High Volume Sampler | Parameters | | |
|---|---|---|---|---|
| | | Chlorine, $\mu g/m^3$ | HCl, $\mu g/m^3$ | SPM, $\mu g/m^3$ |
| 1. | Railway Siding Area | NIL | NIL | 43.52 |
| 2. | Near Electrical Sub-station | NIL | NIL | 40.57 |
| 3. | Near South–west Boundary | NIL | NIL | 40.98 |

**Note:-** At all the locations, ambient air found within the prescribed limit (prescribed limit of SPM = 500 $\mu g/m^3$)

For ambient air monitoring three locations were selected to cover the entire plant area. The distance, direction and position selected for high volume sampler are as follows:-

## Table – 7.4

**AIR MONITORING LOCATIONS**

| Sl. No. | Location | Distance from Centre of the Plant | Direction |
|---|---|---|---|
| 1. | Railway siding area | 300 meters | E |
| 2. | Electrical sub-stations | 250 meters | N |
| 3. | Near South–West Boundary | 200 meters | S -W |

## 7.3 SOLID WASTES GENERATION (BRINE SLUDGE)

The brine sludge presently generated in plant is non-hazardous as per Schedule – 1 of the hazardous waste Management & Handling Rules 2016 and the same is being stored in active brine sludge pit.

## 7.4 NON HAZARDOUS WASTE STORAGE (BRINE SLUDGE WASTE STORAGE FROM OLD MERCURY PROCESS)

Approx 26642 M.T of Sludge generated earlier in Mercury cell process(till 1998) is stored in environment friendly impervious brine sludge pit No-1 and the same is closed with good earth and over grown with the green plants. The sludge samples @ different depths were got tested twice in the past from NABL lab to check Mercury if any. Mercury was not detected and accordingly the industry as retain to PPCB for declaring mercury bearing brine sludge as non-hazardous as the same has become inert over a period of about 24 years.

## 7.5 HAZARDOUS WASTE GENERATION

### (A) Used Transformer Oil and Used Lubricating Oil

Used transformer oil and used lubricating oil are the hazardous wastes generated from the process. These wastes are disposed by sale to authorized preprocessors under intimation to PPCB. Quantities of waste transformer oil and used lubricating oil generated during the year 2022-2023 are given below.

(i) Used Transformer Oil NIL Liter
(ii) Used Lubricating Oil NIL Liter

## 7.6 GROUND WATER QUALITY MONITORING

Ground water samples from five hand pumps installed inside the plant Premises at locations authorized by Punjab Pollution Control Board are regularly tested twice in every month and reports submitted to PPCB on monthly basis.

| **Hand pump no.** | **Location** |
|---|---|
| **1** | **Near Horticulture Nursery** |
| **2** | **Near NFL Boundary** |
| **3** | **Opposite Stores Building** |
| **4** | **Near Raw Water Storage Tank** |

Physio-chemical qualities of ground water from above hand pumps tested during the year 2022-2023are detailed in tables 7.6 (1), 7.6(2). 7.6 (3) and 7.6 (4) .

**Table-7.6(1)**

**THE PHYSICO-CHEMICAL QUALITY OF HAND PUMP AT HORTICULTURE NURSERY**

| Parameter | April 2022 | | May 2022 | | June 2022 | | July 2022 | | August 2022 | | September 2022 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of Sampling | 06.04.2022 | 25.04.2022 | 05.05.2022 | 22.05.2022 | 08.06.2022 | 29.06.2022 | 05.07.2022 | 26.07.2022 | 06.08.2022 | 30.08.2022 | 06.09.2022 | 27.09.2022 |
| pH | 7.5 | 7.6 | 7.6 | 7.5 | 7.07 | 8.00 | 8.10 | 8.32 | 7.97 | 8.20 | 8.20 | 8.30 |
| Total Dissolved Solids,( mg/l) | 288 | 286 | 288 | 288 | 330 | 340 | 240 | 221 | 278 | 340 | 320 | 370 |
| Hardness(Total) as $CaCO_3$,( mg/l) | 246 | 252 | 252 | 250 | 280 | 280 | 220 | 140 | 160 | 160 | 150 | 110 |
| Chlorides as $CaCO_3$, (mg/l ) | 16 | 16 | 16 | 16 | 4 | 6 | 90 | 115 | 140 | 177 | 130 | 190 |
| Sulphate as $SO_4$, (mg/l) | 12 | 14 | 14 | 14 | 20 | 25 | 30 | 25 | 20 | 25 | 20 | 20 |
| Mercury (mg/l) | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL |

The samples were colourless and odourless. Free Chlorine, Total Chlorine, and Ammonia were below detection limit.

**At all the location noise found within the prescribed limit.**

Prescribed permissible limits are:-

| | | |
|---|---|---|
| pH | : | 6.5-8.5 |
| Total Dissolved Solids, mg/l | : | 2000 |
| Total Hardness, mg/l | : | 600 |
| Chlorides as $CaCO_3$, mg/l | : | 1000 |
| Sulphate as $SO_4$, mg/l | : | 400 |
| Mercury, mg/l | : | No Relaxation |

## Table-7.6(1) (Contd…)
## THE PHYSICO-CHEMICAL QUALITY OF HAND PUMP AT HORTICULTURE NURSERY

| Parameter | October 2022 | | November 2022 | | December 2022 | | January 2023 | | February 2023 | | March 2023 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of Sampling | 04.10.2022 | 28.10.2022 | 03.11.2022 | 29.11.2022 | 06.12.2022 | 27.12.2022 | 03.01.2023 | 31.01.2023 | 07.02.2023 | 28.02.2023 | 07.03.2023 | 28.03.2023 |
| pH | 8.10 | 8.20 | 8.20 | 8.20 | 7.80 | 7.20 | 7.25 | 7.40 | 7.20 | 7.70 | 7.80 | 7.67 |
| Total Dissolved Solids,( mg/l) | 310 | 320 | 320 | 300 | 320 | 328 | 330 | 345 | 350 | 370 | 376 | 389 |
| Hardness(Total) as $CaCO_3$,( mg/l) | 120 | 120 | 120 | 110 | 125 | 130 | 132 | 140 | 142 | 148 | 150 | 130 |
| Chlorides as $CaCO_3$, (mg/l ) | 135.5 | 35.5 | 135.5 | 117.5 | 117.5 | 117.5 | 117.5 | 120 | 122 | 132 | 132 | 132 |
| Sulphate as $SO_4$, (mg/l) | 25 | 25 | 25 | 20 | 25 | 20 | 20 | 25 | 20 | 20 | 20 | 20 |
| Mercury (mg/l) | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil |

The samples were colourless and odourless. Free Chlorine, Total Chlorine, and Ammonia were below detection limit.
**At all the location noise found within the prescribed limit.**
Prescribed permissible limits are:-

| | | |
|---|---|---|
| pH | : | 6.5-8.5 |
| Total Dissolved Solids, mg/l | : | 2000 |
| Total Hardness, mg/l | : | 600 |
| Chlorides as $CaCO_3$, mg/l | : | 1000 |
| Sulphate as $SO_4$, mg/l | : | 400 |
| Mercury, mg/l | : | No Relaxation |

## Table-7.6(2)
## THE PHYSICO-CHEMICAL QUALITY OF HAND PUMP LOCATED NEAR NFL BOUNDARY

| Parameter | April 2022 | | May 2022 | | June 2022 | | July 2022 | | August 2022 | | September 2022 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of Sampling | 06.04.2022 | 25.04.2022 | 05.05.2022 | 22.05.2022 | 08.06.2022 | 29.06.2022 | 05.07.2022 | 26.07.2022 | 06.08.2022 | 30.08.2022 | 06.09.2022 | 27.09.2022 |
| pH | 7.5 | 7.5 | 7.6 | 7.5 | 7.5 | 7.61 | 7.5 | 8.12 | 7.5 | 7.8 | 7.80 | 8.00 |
| Total Dissolved Solids,( mg/l) | 290 | 290 | 290 | 288 | 300 | 277 | 250 | 260 | 240 | 290 | 284 | 300 |
| Hardness(Total) as $CaCO_3$,( mg/l) | 252 | 250 | 250 | 252 | 250 | 240 | 200 | 120 | 135 | 140 | 140 | 130 |
| Chlorides as $CaCO_3$, (mg/l ) | 16 | 16 | 16 | 16 | 35 | 30 | 50 | 140 | 165 | 190 | 220 | 240 |
| Sulphate as $SO_4$, (mg/l) | 15 | 16 | 15 | 14 | 20 | 25 | 30 | 25 | 30 | 20 | 30 | 20 |
| Mercury (mg/l) | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL |

The samples were colourless and odourless. Free Chlorine, Total Chlorine, and Ammonia were below detection limit.
**At all the location noise found within the prescribed limit.**
Prescribed permissible limits are:-

| | | |
|---|---|---|
| pH | : | 6.5-8.5 |
| Total Dissolved Solids, mg/l | : | 2000 |
| Total Hardness, mg/l | : | 600 |
| Chlorides as $CaCO_3$, mg/l | : | 1000 |
| Sulphate as $SO_4$, mg/l | : | 400 |

## Table-7.6(2)
## THE PHYSICO-CHEMICAL QUALITY OF HAND PUMP LOCATED NEAR NFL BOUNDARY

| Parameter | October 2022 | | November 2022 | | December 2022 | | January 2023 | | February 2023 | | March 2023 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of Sampling | 04.10.2022 | 28.10.2022 | 03.11.2022 | 29.11.2022 | 06.12.2022 | 27.12.2022 | 03.01.2023 | 31.01.22023 | 07.02.2023 | 28.02.2023 | 07.03.2023 | 28.03.2023 |
| pH | 8.10 | 8.20 | 8.20 | 8.00 | 8.00 | 7.95 | 7.70 | 7.80 | 7.60 | 7.80 | 7.70 | 8.00 |
| Total Dissolved Solids,( mg/l) | 318 | 330 | 330 | 350 | 330 | 340 | 320 | 330 | 332 | 340 | 346 | 358 |
| Hardness(Total) as $CaCO_3$,( mg/l) | 140 | 120 | 120 | 130 | 120 | 120 | 120 | 126 | 116 | 122 | 120 | 140 |
| Chlorides as $CaCO_3$, (mg/l ) | 200 | 220 | 220 | 200 | 177.5 | 177.5 | 177.5 | 180 | 177.5 | 142 | 132 | 142 |
| Sulphate as $SO_4$, (mg/l) | 20 | 20 | 20 | 25 | 20 | 20 | 20 | 25 | 25 | 20 | 20 | 20 |
| Mercury (mg/l) | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL |

The samples were colourless and odourless. Free Chlorine, Total Chlorine, and Ammonia were below detection limit.

**At all the location noise found within the prescribed limit.**

Prescribed permissible limits are:-

| | | |
|---|---|---|
| pH | : | 6.5-8.5 |
| Total Dissolved Solids, mg/l | : | 2000 |
| Total Hardness, mg/l | : | 600 |
| Chlorides as $CaCO_3$, mg/l | : | 1000 |
| Sulphate as $SO_4$, mg/l | : | 400 |
| Mercury, mg/l | : | No Relaxation |

## Table-7.6(3)
## THE PHYSICO-CHEMICAL QUALITY OF HAND PUMP LOCATED OPPOSITE STORES

| Parameter | April 2022 | | May 2022 | | June 2022 | | July 2022 | | August 2022 | | September 2022 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of Sampling | 06.04.2022 | 25.04.2022 | 05.05.2022 | 25.05.2022 | 08.06.2022 | 29.06.2022 | 05.07.2022 | 26.07.2022 | 06.08.2022 | 30.08.2022 | 06.09.2022 | 27.09.2022 |
| pH | 7.6 | 7.5 | 7.5 | 7.5 | 7.80 | 7.70 | 7.80 | 8.00 | 8.10 | 8.40 | 8.30 | 8.40 |
| Total Dissolved Solids,( mg/l) | 282 | 292 | 290 | 288 | 350 | 343 | 380 | 370 | 380 | 386 | 400 | 390 |
| Hardness(Total) as $CaCO_3$, ( mg/l) | 250 | 254 | 254 | 254 | 290 | 280 | 250 | 230 | 140 | 150 | 160 | 140 |
| Chlorides as $CaCO_3$, (mg/l ) | 16 | 16 | 16 | 18 | 45 | 50 | 85 | 13 | 14 | 17 | 140 | 190 |
| Sulphate as $SO_4$, (mg/l) | 14 | 15 | 14 | 15 | 25 | 20 | 25 | 25 | 20 | 25 | 25 | 25 |
| Mercury (mg/l) | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL |

The samples were colourless and odourless. Free Chlorine, Total Chlorine, and Ammonia were below detection limit.

**At all the location noise found within the prescribed limit.**

Prescribed permissible limits are:-

| | | |
|---|---|---|
| pH | : | 6.5-8.5 |
| Total Dissolved Solids, mg/l | : | 2000 |
| Total Hardness, mg/l | : | 600 |
| Chlorides as $CaCO_3$, mg/l | : | 1000 |
| Sulphate as $SO_4$, mg/l | : | 400 |
| Mercury, mg/l | : | No Relaxation |

## Table-7.6(3)
## THE PHYSICO-CHEMICAL QUALITY OF HAND PUMP LOCATED OPPOSITE STORES

| Parameter | October 2022 | | November 2022 | | December 2022 | | January 2023 | | February 2023 | | March 2023 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of Sampling | 04.10.2022 | 28.10.2022 | 03.11.2022 | 29.11.2022 | 06.12.2022 | 27.12.2022 | 03.01.2023 | 31.01.2023 | 07.02.2023 | 28.02.2023 | 07.03.2023 | 28.03.2023 |
| pH | 8.10 | 8.00 | 8.20 | 8.10 | 7.90 | 7.85 | 7.50 | 7.60 | 7.50 | 8.10 | 8.00 | 7.80 |
| Total Dissolved Solids,( mg/l) | 370 | 410 | 410 | 400 | 385 | 400 | 412 | 430 | 432 | 422 | 420 | 425 |
| Hardness(Total) as $CaCO_3$, ( mg/l) | 120 | 140 | 140 | 150 | 130 | 132 | 136 | 132 | 132 | 120 | 132 | 132 |
| Chlorides as $CaCO_3$, (mg/l ) | 130 | 135.5 | 135.5 | 142.4 | 135.5 | 135.5 | 130.2 | 137.5 | 140 | 142 | 136 | 142 |
| Sulphate as $SO_4$, (mg/l) | 25 | 20 | 20 | 25 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mercury (mg/l) | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL |

The samples were colourless and odourless. Free Chlorine, Total Chlorine, and Ammonia were below detection limit.

**At all the location noise found within the prescribed limit.**

Prescribed permissible limits are:-

| | | |
|---|---|---|
| pH | : | 6.5-8.5 |
| Total Dissolved Solids, mg/l | : | 2000 |
| Total Hardness, mg/l | : | 600 |
| Chlorides as $CaCO_3$, mg/l | : | 1000 |
| Sulphate as $SO_4$, mg/l | : | 400 |
| Mercury, mg/l | : | No Relaxation |

## Table-7.6(4)
## THE PHYSICO-CHEMICAL QUALITY OF HAND PUMP NEAR RAW WATER STORAGE TANK

| Parameter | April 2022 | | May 2022 | | June 2022 | | July 2022 | | August 2022 | | September 2022 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of Sampling | 06.04.2022 | 25.04.2022 | 05.05.2022 | 22.05.2022 | 08.06.2022 | 29.06.2022 | 05.07.2022 | 26.07.2022 | 06.08.2022 | 30.08.2022 | 06.09.2022 | 27.09.2022 |
| pH | 7.5 | 7.5 | 7.5 | 7.5 | 7.7 | 8.0 | 8.1 | 8.2 | 8.11 | 8.3 | 7.10 | 8.20 |
| Total Dissolved Solids, ( mg/l) | 290 | 288 | 286 | 290 | 320 | 300 | 250 | 225 | 256 | 290 | 310 | 390 |
| Hardness (Total) as $CaCO_3$, ( mg/l) | 248 | 256 | 248 | 252 | 270 | 250 | 220 | 176 | 120 | 130 | 140 | 120 |
| Chlorides as $CaCO_3$, (mg/l ) | 17 | 18 | 18 | 18 | 45 | 70 | 85 | 117 | 140 | 190 | 210 | 220 |
| Sulphate as $SO_4$, (mg/l) | 14 | 15 | 15 | 16 | 35 | 30 | 25 | 20 | 25 | 20 | 25 | 20 |
| Mercury (mg/l) | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL |

The samples were colourless and odourless. Free Chlorine, Total Chlorine, and Ammonia were below detection limit.

**At all the location noise found within the prescribed limit.**

Prescribed permissible limits are:-

| | | |
|---|---|---|
| pH | : | 6.5-8.5 |
| Total Dissolved Solids, mg/l | : | 2000 |
| Total Hardness, mg/l | : | 600 |
| Chlorides as $CaCO_3$, mg/l | : | 1000 |
| Sulphate as $SO_4$, mg/l | : | 400 |
| Mercury, mg/l | : | No Relaxation |

## Table-7.6(4)
## THE PHYSICO-CHEMICAL QUALITY OF HAND PUMP NEAR RAW WATER STORAGE TANK

| Parameter | October 2022 | | November 2022 | | December 2022 | | January 2023 | | February 2023 | | March 2023 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of Sampling | 04.10.2022 | 28.10.2022 | 03.11.2022 | 29.11.2022 | 06.12.2022 | 27.12.2022 | 03.01.2023 | 31.01.2023 | 07.02.2023 | 28.02.2023 | 07.03.2023 | 28.03.2023 |
| pH | 8.00 | 8.10 | 8.10 | 8.40 | 8.00 | 7.80 | 7.60 | 7.65 | 7.60 | 7.90 | 7.60 | 7.80 |
| Total Dissolved Solids, ( mg/l) | 410 | 420 | 420 | 425 | 412 | 400 | 415 | 400 | 403 | 392 | 388 | 378 |
| Hardness (Total) as $CaCO_3$, ( mg/l) | 110 | 120 | 120 | 110 | 100 | 120 | 122 | 132 | 130 | 132 | 130 | 142 |
| Chlorides as $CaCO_3$, (mg/l ) | 177 | 135.5 | 135.5 | 145.07 | 135.5 | 135.5 | 135.5 | 130 | 132 | 130 | 132 | 130 |
| Sulphate as $SO_4$, (mg/l) | 25 | 20 | 20 | 25 | 20 | 20 | 20 | 25 | 25 | 20 | 20 | 20 |
| Mercury (mg/l) | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL | NIL |

The samples were colourless and odourless. Free Chlorine, Total Chlorine, and Ammonia were below detection limit.\

**At all the location noise found within the prescribed limit.**

Prescribed permissible limits are:-

| | | |
|---|---|---|
| pH | : | 6.5-8.5 |
| Total Dissolved Solids, mg/l | : | 2000 |
| Total Hardness, mg/l | : | 600 |
| Chlorides as $CaCO_3$, mg/l | : | 1000 |
| Sulphate as $SO_4$, mg/l | : | 400 |
| Mercury, mg/l | : | No Relaxation |

## 7.6 POLLUTION CONTROL AND TESTING LABORATORY IN PACL

A well-equipped laboratory with qualified and trained manpower and also with modern analytical instruments is in round the clock functioning in PACL. A list of instruments and other lab equipments available if PACL lab is given below in table no. 7.7(1).

**Table – 7.7(1)**

**LIST OF INSTRUMENTS IN POLLUTION CONTROL LABORATORY**

| Sl. No. | Name of Equipment / Instrument | Ind./ Imported | Quantity (Nos.) | Year of Mfg. |
|---|---|---|---|---|
| 1. | Gas Chromatograph | Indigenous(AIMIL / NUCON) | 01 | 2018 |
| 2. | Gas Chromatograph | Indigenous-do- | 01 | 2018 |
| 3. | DR 6000 Spectrophotometer | Imported(HACH) | 01 | 2018 |
| 4. | Balance Electrical | Indigenous | 01 | 2005 |
| 5. | DR 3900 Spectrophotometer | Imported(HACH) | 01 | 2016 |
| 6. | Electronic Balance ME204 | Imported (Mettler) | 01 | 2014 |
| 7. | Electronic Balance ME204 | Imported (Mettler) | 01 | 2017 |
| 8. | Electronic Balance ML 204T | Imported (Mettler | 01 | 2018 |
| 9. | pH Meter | Indigenous | 01 | 2017 |
| 10. | Conductivity Mtere | Imported(HACH) | 01 | 2013 |
| 11. | Turbidity Meter | Indigenous | 01 | 2019 |
| 12. | AVIO 200_ICP-OES | Imported PERKINELMER | 01 | 2019 |
| 13. | Muffllle Furnace PT-350 | Indigenous | 01 | 2019 |
| 14. | Hot Air Oven ACM-22066T | Indigenous | 01 | 2019 |
| 15. | Bomb Calorimeter-Digital | Indigenous | 02 | 2019 |
| 16. | High volume Samplers APM-430 | Indigenous | 03 | 2017 |
| 17. | Handy Sampler APM-821 | Indigenous | 01 | 2019 |
| 18. | Stack Kit VSS1 | Indigenous | 01 | 2019 |
| 19. | Flue Gas Analyser & Stack Monitoring Testo-340 | Indigenous | 01 | 2019 |
| 20. | Portable Oxygen Gas Analyser 101-HH | Indigenous | 01 | 2017 |
| 21. | Sound Level Meter | Testo 815 | 01 | 2022 |

## 7.8 NOISE LEVEL MONITORING INSIDE THE PLANT

Noise level monitoring is carried out on monthly schedule at various plant locations to check and control noise pollution. Observations are recorded. Average noise levels measured at five locations of plant boundaries are given below.

| Sl. No | Location | Noise Level dB(A) |
|---|---|---|
| **1** | Near Gate No-1 (North West) | 62.0 |
| **2** | Near Gate No-2 (West direction) | 60.0 |
| **3** | North West Boundary | 60.0 |
| **4** | Railway Siding (Eastern boundary) | 62.0 |
| **5** | South Side Corner | 60.0 |

At all the location noise found with in the prescribed limit.

# CHAPTER-8

## ENERGY CONSUMPTION FOR POLLUTION CONTROL

### 8.1 ENERGY CONSUMPTION FOR POLLUTION CONTROL

Energy consumption for running liquid and air pollution control equipments and for solid waste handling in both units are monitored and records are maintained on daily and monthly basis. Consumption reports are sent to PPCB on monthly basis.

The energy consumption for water and air pollution control equipment and for solid waste handling for Unit-I and Unit-II are given in Table-8.1.1

**Table – 8.1.1**

**ENERGY CONSUMPTION FOR POLLUTION CONTROL FOR THE PERIOD APRIL 2022 TO MARCH 2023 (IN KWH UNIT)**

| MONTH | Solid Waste Pollution Control Equipments | | | Liquid Effluents Pollution Control Equipments | | | Air Pollution Control Equipments | | |
|---|---|---|---|---|---|---|---|---|---|
| | U – 1 | U – 2 | TOTAL | U – 1 | U – 2 | TOTAL | U – 1 | U – 2 | TOTAL |
| April 22 | 3240 | 8300 | 11540 | 312 | 5870 | 6182 | 15867 | 35600 | 51467 |
| May 22 | 5352 | 8420 | 13772 | 150 | 6030 | 6180 | 16890 | 36800 | 53690 |
| June 22 | 4944 | 8480 | 13424 | 240 | 6110 | 6350 | 16524 | 38000 | 54524 |
| July 22 | 5880 | 9000 | 14880 | 156 | 6180 | 6336 | 17709 | 38800 | 56509 |
| August 22 | 5496 | 8800 | 14296 | 102 | 6084 | 6186 | 19860 | 37000 | 56860 |
| September 22 | 0 | 9460 | 9460 | 34554 | 6184 | 40738 | 19123 | 37960 | 57083 |
| October 22 | 0 | 9500 | 9500 | 40813 | 6190 | 47003 | 23925 | 37800 | 61725 |
| November 22 | 0 | 9480 | 9480 | 41852 | 6184 | 48036 | 19800 | 37760 | 57560 |
| December 22 | 0 | 9370 | 9370 | 36978 | 6176 | 43154 | 16961 | 37680 | 54641 |
| January 23 | 0 | 9400 | 9400 | 43242 | 6180 | 49422 | 16715 | 37880 | 54595 |
| February 23 | 0 | 9390 | 9390 | 39352 | 6186 | 45538 | 19832 | 37720 | 57552 |
| March 23 | 0 | 9530 | 9530 | 55322 | 6202 | 61524 | 21787 | 37960 | 59747 |
| **Total** | 24912 | 109130 | 134042 | 293073 | 73576 | 366649 | 224993 | 450960 | 675953 |
| **Average** | 2076 | 9094.17 | 11170.2 | 24422.8 | 6131.33 | 30554.1 | 18749.4 | 37580 | 56329.4 |

# CHAPTER-9

## BY-PRODUCT RECOVERY

9.1 Hydrochloric Acid, Sodium Hypo Chlorite and Spent $H_2SO_4$ are established by-products in a chlor-alkali plant, caustic soda being the principal product.

9.2 Sulphuric Acid is used for drying Chlorine .The dilute spent $H_2SO_4$ generated from the plant is sold as a by-product.

## CHAPTER-10

## AFFORESTATION

### 10.1 GENERAL

Ecological degradation has assumed alarming proportions as the rapid pace of environmental destruction through deforestation and pollution etc. is affecting the lives of millions of people all over the country.

Primo Chemicals Ltd. being environmentally conscious have been taking all precautionary measures right from the design stage for the prevention of water and environmental pollution due to the effluent and wasteful products from their factory and are contributing their mite to combat this problem by planting trees on a massive scale in and around Naya Nangal.

**10.2** The management of M/s Primo Chemicals Ltd. is alive to the necessity of the conservation of natural resources. In its continued efforts, Primo Chemicals Ltd. has planted the following trees and shrubs in its drive for afforestation.

### POSITION OF PLANTATION IN PACL FACTORY / COLONY

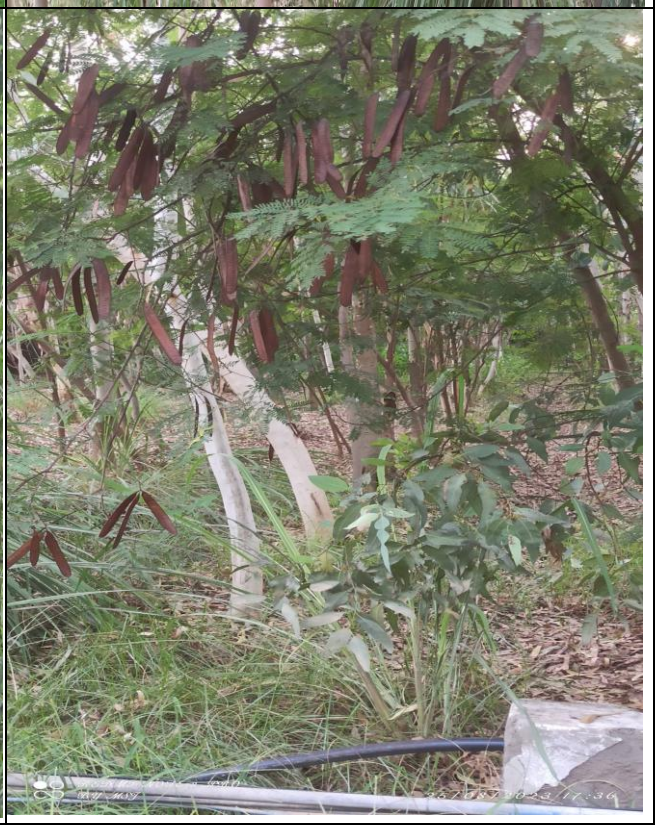
| Sl. No. | Variety | No. of Trees |
|---|---|---|
| **1.** | Phycus | 2844 |
| **2.** | Phycuspanda | 2405 |
| **3.** | Conocarpus | 50 |
| **4.** | Golden Bamboo | 3168 |
| **5.** | Guava | 240 |
| **6.** | Arjun | 181 |
| **7.** | Sita Ashoka | 14 |
| **8.** | Putranjeeva | 75 |
| **9.** | Foxtail Palm Small | 25 |
| **10.** | Ashoka Pendula | 75 |
| **11.** | Ashoka Pendula Big | 228 |
| **12.** | Silveroak | 523 |
| **13.** | Jamun | 236 |
| **14.** | Kachnaar | 53 |
| **15.** | Alstonia | 85 |
| **16.** | Traveller Palm | 12 |
| **17.** | Heavycus | 2317 |
| **18.** | Bottle Brush | 228 |
| **19.** | Chakrassia | 286 |
| **20.** | Guller | 200 |
| **21.** | Siris | 200 |

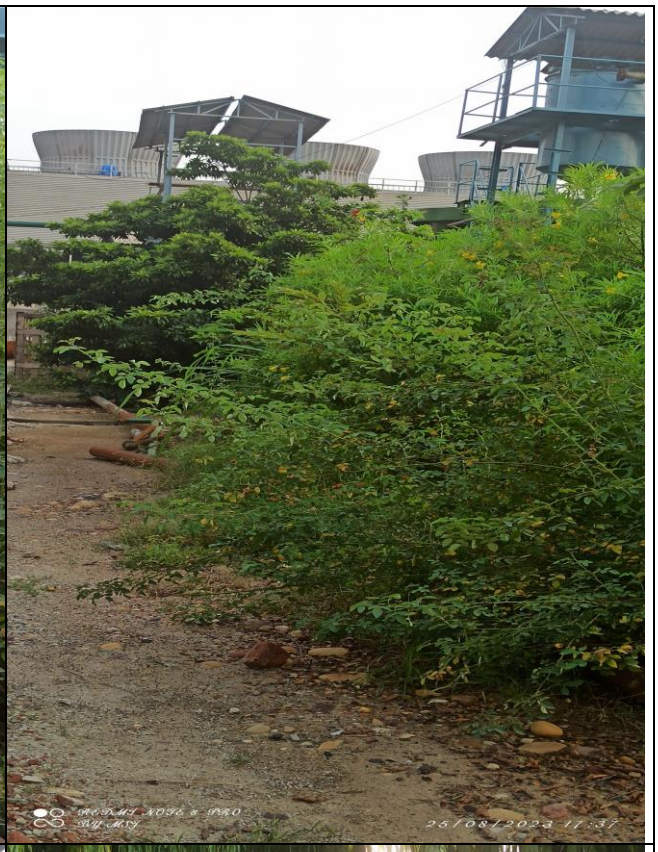
| | | |
|---|---|---|
| **22.** | Pilkhan | 363 |
| **23.** | Molsarry | 423 |
| **24.** | American Dek | 915 |
| **25.** | Tipori | 16 |
| **26.** | Buddha Bamboo | 588 |
| **27.** | Uniprus Green | 50 |
| **28.** | Bottlepalm | 207 |
| **29.** | Aamrass | 50 |
| **30.** | Golden Cyprus | 111 |
| **31.** | Cigium Dwaraf | 254 |
| **32.** | Bluepine | 50 |
| **33.** | Neem | 62 |
| **34.** | Bismarkia Palm | 21 |
| **35.** | Foxtail Palm Small | 35 |
| **36.** | Celendra | 22 |
| **37.** | Timber Verity | 100 |
| **38.** | Tikoma | 536 |
| **39.** | Ferm | 50 |
| **40.** | Eucallypus | 1161 |
| **41.** | Phycuspanda Big | 800 |
| **42.** | Phycus Big | 793 |
| **43.** | Golden Bamboo | 110 |
| **44.** | Lady Palm | 124 |
| **45.** | Ashoka  Pondula | 477 |
| **46.** | Bottle Palm | 88 |
| **47.** | Kanak Champa | 375 |
| **48.** | Australian Kiker | 77 |
| **49.** | Batsin Dek | 78 |
| **50.** | Cassia Glauca | 59 |
| **51.** | Chandni | 16 |
| **52.** | Amaltas | 60 |
| **53.** | Tad Palm | 100 |
| **54.** | Palmeria Champa | 60 |
| **55.** | Coral Tree | 4 |
| **56.** | Kaneer | 42 |
| **57.** | Lejestonia | 37 |
| **58.** | Boganvillia | 85 |
| **59.** | Saru | 5 |
| **60.** | Morpankhi | 9 |
| **61.** | Nauleena | 4 |
| **62.** | Sabool | 1147 |
| **63.** | Aaricapalm | 45 |

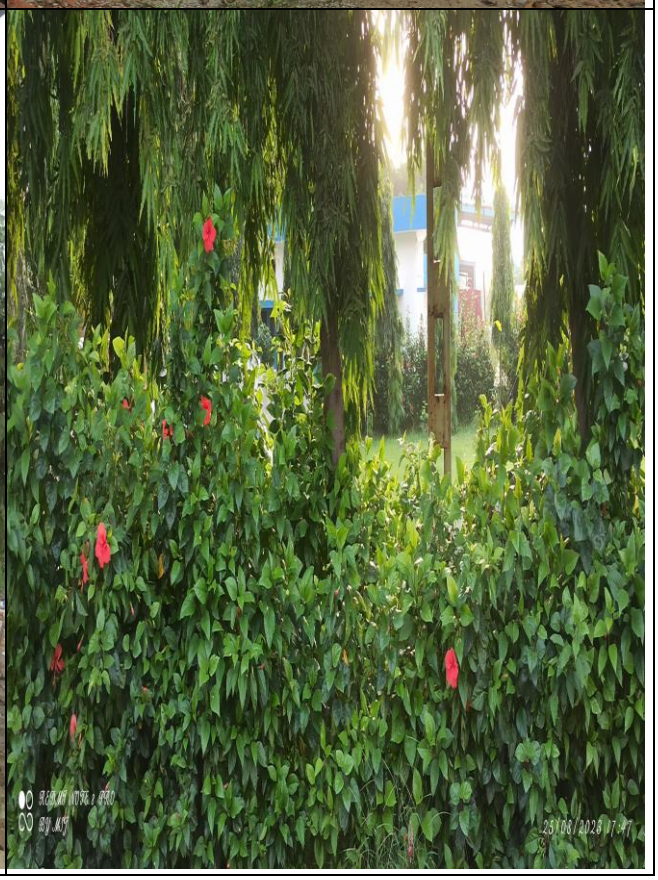
| | | |
|---|---|---|
| **64.** | Cassia Siammia | 32 |
| **65.** | Aerucarria | 6 |
| **66.** | Raat Ki Rani | 3 |
| **67.** | Pipal | 4 |
| **68.** | Mango Tree | 13 |
| **69.** | Bamboo Palm | 12 |
| **70.** | Cyprus | 76 |
| **71.** | Gulmohri | 2 |
| **72.** | Lejstorimma | 8 |
| **73.** | Rubber Plant | 12 |
| **74.** | China Palm | 28 |
| **75.** | Phonix Palm | 1 |
| **76.** | Champa | 2 |
| **77.** | Cheel | 2 |
| **78.** | Phycus Palm | 3 |
| **79.** | Gulmohar | 4 |
| **80.** | Sehtoot | 28 |
| **81.** | Sagwan | 3 |
| **82.** | Phalsa | 90 |
| **83.** | Phycus Star Lite | 4 |
| **84.** | Trisool Champa | 14 |
| **85.** | Palmeria Champa | 14 |
| **86.** | Desi Bamboo | 622 |
| **87.** | Areca Palm | 124 |
| **88.** | Bela Proom | 59 |
| | **Total** | **24220** |

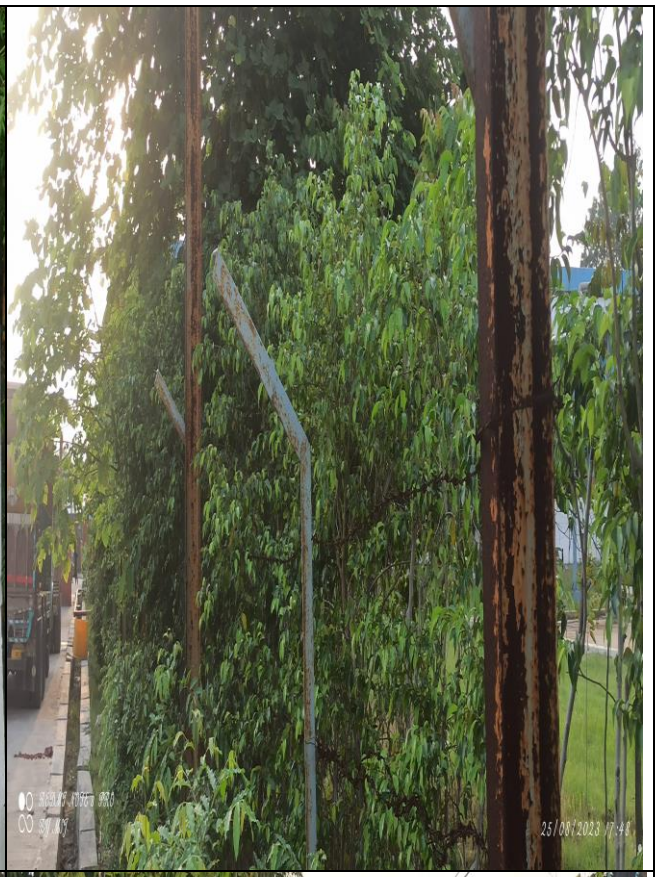
## 10.3 Green Field Development Photographs



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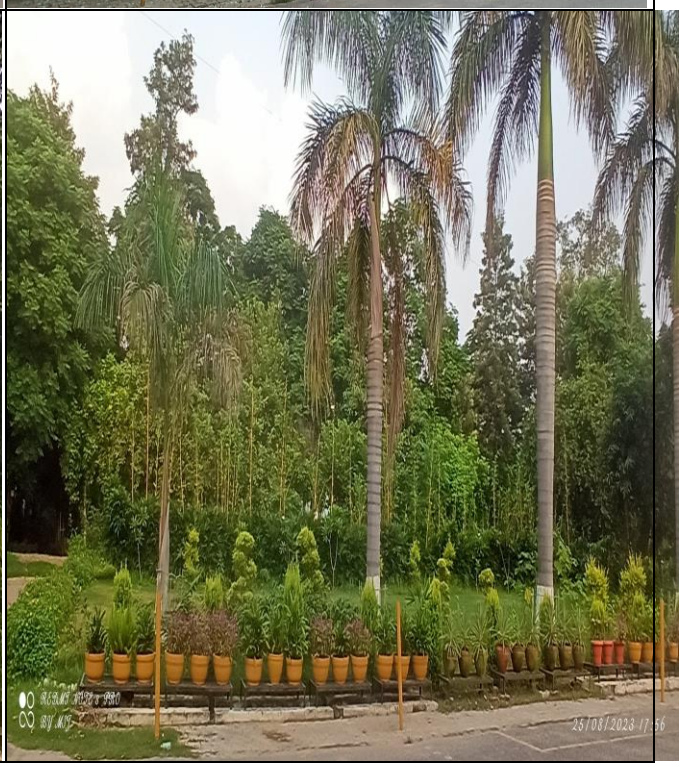
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# POLLUTION CONTROL