PRIMO CHEMICALS LTD

FORMERLY KNOWN AS

PUNJAB ALKALIES AND CHEMICALS LTD.

NANGAL-UNA ROAD, NAYA NANGAL.
PUNJAB

ENVIRONMENTAL STATEMENT

FOR THE YEAR 2023-2024

MEL/PCL/ES 2024/ 01 **September, 2024**

PREPARED BY

MANTEC CONSULTANTS PVT. LTD.

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(See Rule 14)

Environmental Audit & Environmental statement for the financial year ending the 31st March 2024

PART-A

1.	Name and address of the owner / occupier of the industrial operation or process	:	Sh. Naveen Chopra Managing Director M/s Primo Chemicals Ltd. formerly known as Punjab Alkalies and Chemicals Ltd. Naya Nangal, District – Ropar Punjab
2.	Industry Category Primary-(STC Code) Secondary (SIC Code)	:	Large 2812
3.	Production Capacity Unit – I Unit - II	:	 70 TPD Caustic Soda 370 TPD Caustic Soda
4.	Year of Establishment	:	Plant commissioned in 1984
5.	Date of the last Environmental Statement submitted	:	September, 2023

PART-B

WATER AND RAW MATERIAL CONSUMPTION

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

Process : 154241
Cooling : 233374
Domestic : 27375

Name of Products	Process water consumption per unit Of product output	
	During the Previous Financial Year (2022-2023)	During the Current Financial Year (2023-2024)
	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 (2022-2023)	During the Current Financial Year (2023-2024)
Salt	Caustic soda	1.59	1.59
Soda Ash	Caustic soda	0.0050	0.0043
Barium Carbonate	Caustic soda	0.0086	0.0071
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 (2022-2023)	During the Current Financial Year (2023-2024)
(a)	From process		
(i)	Used/Spent Oil(Category 5.1)	NIL	0.65 MT
(ii)	Spent Acid/Sulphuric Acid (Category17.2)	2686.160 MT	2370.506 MT
(iii)	Bio Medical Waste	20.770 Kg	32.395 Kg
(iv)	MEE Sludge(Category 35.3)	108.601 MT	71.814 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 (2022-2023)	During the Current financial year (2023-2024)
(a) From process	**2735.874**	**2364.14**
(b) From pollution control facilities (from tanks/vessels)	Nil	Nil
(c) (1) quantity recycled or re-utilized within the unit (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	1046.959	1046.959
Brine Sludge from Brine sludge Pits, MT	0.000	1017.825	1017.825
Precipitation Tanks / Vessels, MT	0.000	185.349	185.349
Sludge from salt saturator MT	0.000	114.007	114.007
Total Solid waste Generated, MT	**0.000**	**2364.14**	**2364.14**

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, stable bleaching powder and anhydrous Aluminium chloride . The tail chlorine gas from all the sections of plant such as chlorine liquefaction, chlorine storage, chlorine filling etc. are neutralized in the sodium hypoplant (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 effluent 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.
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 and producing the quantity of effluent.
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, FSSC 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 26 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 2023-2024, 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.
- New Products- Stable bleaching Powder and anhydrous Aluminium Chloride.
- 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 2023-2024 has been detailed.

- The industry has well take care the area of development of vegetation. The management has planted about 32500 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)

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

3.2.12 Stable Bleaching Powder SBP Production Process

Basic Chemical reaction:

$$\mathbf{2Ca(OH)_2 + 2Cl_2 \longrightarrow CaOCl_2 + CaCl_2 + H_2O}$$

Process

Hydrated Lime, confirming to grade A as per IS: 1540-2 (1990), is reacted with liquid Chlorine obtained directly from Caustic Soda Plant. Reaction takes place in specially designed batch reactors under vacuum and at elevated temperature.

Hydrated Lime is charged into the reactor in predetermined quantity by electrically operated material handling system.

Liquid Chlorine is charged into the reactor in a predetermined rate. Water vapors generated during the reaction gets evaporated and vented out.

A specially designed screw conveyor is provided in the reactor vent, to prevent loss of solid powder along with water vapor. This screw conveyor returns the solid dust, going out of reactor, back into the reaction zone.

After Chlorine addition of predetermined quantity, the reactants are further cooked for completion of reaction and drying.

SBP Product formed is then cooled, tested for quality and transferred to product silos; using another set of electrically operated material handling system.
From the product silos, SBP product is size graded by a vibroseive. Undersize material is packed in bags as product while while oversized material is snt to a pin pulveriser. After size reduction, it is also packed in bags as product.

SBP product packed in bags is stored first in an intermediate day storage yard and then transferred to the main product storage shed.

3.2.13 Anhydrous Aluminium Chloride

Process reaction:

$2Al + 3Cl \longrightarrow 2AlCl_3$

Empirical Weight- 2x27 + 3x71 ⟶ 2x133.5
54 213 ⟶ 267
Theoretical Weights- 202.25 + 797.75 ⟶ 1000 -1046442Kcal/MT

Expected Weights- 208 + 810

Gaseous Chlorine is reacted with molten Aluminium (M.P. 660^{o}C) in specially designed reactor to form Aluminium Chloride in gaseous phase (Sublimation Point 181^{o}C). The chlorine gas is bubbled through graphite sparging tubes. Reaction takes place at about 750^{o}C. Heat liberated due to exothermic reaction is removed partially in melting solid

Aluminium, some part is removed due to sublimation of Aluminium Chloride and balance heat is removed by radiation from the molten Aluminium Surface and reactor walls.

Vapours of Aluminium Chloride lose their heat of sublimation from the wall of the condenser and get deposited there. Periodic pounding of the condenser wall from outside discharges this deposited solid product. It is conveyed to vibroseives for size gradation by series of screw conveyors anf bucket elevators. It is then stored in respective silos under dry air blanketing.

Unreacted Chlorine and uncondensed gases are efficiently scrubbed in wall- designed scrubbers.

To start one reactor, approximately 5.0 – 6.0 MT of Aluminium has to be melted inside the reactor. Entire start up procedure of the reactor needs three to four days and production is stabilized in about three days.
The manufacturing section consisting of reactor, condenser and guard condenser is modular in nature.

The reactor has to be operated 24hours a day, 7days a week, and 365days a year without a shut down. Each reactor is expected to manufacture about 2100 MT of the product in its lifetime. The reactor replacement takes about 45-60days time.

During the closing down the reactor, aluminium accumulated inside the reactor solidifies. Melting into ingots can reuse this aluminium.

The product is very sensitive to the moisture. Exposure to even atmospheric moisture (Humidity) can reduce purity, causing the release of of corrosive HCL fumes. It is essential to have control over the humidity (low humidity is desirable), particularly in packing area.

CHAPTER -4

PRODUCTION IN THE YEAR OF 2023-2024

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 2023-24
1.	Caustic Soda Lye Gross (Net Production)	MT	118898.503/ (115400.892)
2	Liquid Chlorine	MT	93199.350
4	Hydrochloric Acid	MT	57723.484
5	Hydrogen Gas	Nm^3	33291581.200
6	Sodium Hypochlorite	MT	15186.068
7	SBP	MT	3829.410
8	Caustic Soda Flakes	MT	6887.350
9	$AlCl_3$	MT	690.185

CHAPTER-5
MATERIAL BALANCE

5.1 SODIUM HYDROXIDE UNIT

5.1.1 Input / Output Statement for the Year 2023-2024

Annual Input				Annual Output		
Sl. No.	**Input**	**Unit**	**Quantity**	**Output**	**Unit**	**Quantity**
i.	Salt	MT	189018.342	NaOH	**MT**	118898.503
ii.	Soda Ash	MT	517.200	Cl_2 (gas)	**MT**	105344.074
iii.	Barium Carbonate	MT	838.600	H_2	**Nm3**	33291581.200
iv.	Flocculants	KG	2460.000	Liquid Chlorine	**MT**	93199.350
v.	Sodium Bi-Sulphite	MT	196.745	Sodium Hypo	**MT**	15186.068
vi.	Alpha Cellulose	MT	24115.000	Hydrochloric Acid	**MT**	5557723.484
vii	Sulphuric Acid	MT	1936.255	SBP	**MT**	3829.410
viii	Hydrated Lime	MT	3171.960	Caustic Soda Flakes	**MT**	6887.350
ix	Aluminium Ingot	MT	192.33	$AlCl_3$	**MT**	690.185

5.1.2 Material Balancing for the Year 2023-2024

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 189018.342 x 0.95 per annum= 179567.4249

Product	Calculation based on stoichiometric equation	Theoretical Production (MT)	Actual Production (MT)	Percentage Variation
NaOH	(179567.4249 x 80.016 / 116.91) x 0.95	116755.228	118898.503	(+)1.803%
Cl_2 (gas)	(179567.4249 x 70.91/116.91) x 0.95	103468.2216	105344.074	(+)1.781%
H_2	(179567.4249 x 2.016 / 116.91) x 0.95	2941.6434	33291581.200	(+)99.991%

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 2023-2024

Generation	Quantity (MT)	Utilization	Quantity (MT)
Chlorine Gas Produced	105344.074	Production of Liquid Chlorine	93199.350
Chlorine Gas From Tonner Purging	4136.150	Chlorine Gas to HCl Plant	14826.3
		Chlorine Gas From Process Neutralized in Sod hypo Plants	1454.574
Total Chlorine Generated	**109480.224**	Total Chlorine Utilized	**109480.224**

5.3 HYDROGEN BALANCE

5.3.1 Hydrogen Utilization Statement for the Year 2023-2024

Generation	Quantity(Nm^3)	Utilization (Nm^3)	Quantity(Nm^3)
H_2 Gas Produced	33291581.200	H_2 in HCl Plant	6956022.00
		H_2 Dispatched	3144417.00
		H_2 for Boilers	19872505.70
		H_2 Vent	3318636.50
Total	**33291581.200**	**Total**	**33291581.200**

5.4 HYDROCHLORIC ACID PLANT

5.4.1 Input Output Statement for the Year 2023-2024

Input	Quantity(MT)	Output	Quantity(MT)
Chlorine gas	105344.074	Hydrochloric acid	57723.484
Hydrogen gas	33291581.200	Average Conc.	31.00%
Water (DM Water)	36033.725	HCl Content (100%)	15813.361

5.4.2 Material Balancing for the Year 2023-2024

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 2023-2024

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 2023-2024

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 2023-2024

Input	Quantity (m^3)	Output	Quantity (m^3)
Water drawn from RIVER SATLUJ	414990	Water Consumed for Process	252408
Water drawn from Primo Chemicals Ltd. Colony Bore well	393383	Water Consumed for Industrial Cooling	238239
		Domestic Water Consumption Inside Plant	16425
		Domestic Water Consumption in Primo Chemicals Ltd. Housing Colony	316081
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 2023-2024 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
(2023-2024)

Sl. No.	Parameter	Concentration Values		
		Min.	**Max.**	**Avg.**
1.	pH	6.7	7.9	7.2
2.	Total Hardness as $CaCO_3$	94	116	107
3.	Chlorides as Cl	7.0	10.6	7.0

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

6.1.2 Effluent Generation

Approximately 78.836m^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, 2023	7.21	20.44	Nil
May, 2023	7.2	20.05	Nil
June, 2023	7.21	20.24	Nil
July, 2023	7.21	21.24	Nil
August, 2023	7.26	21.34	Nil
September, 2023	7.27	21.89	Nil
October, 2023	7.26	23.7	Nil
November, 2023	7.36	22.99	Nil
December, 2023	7.83	22.43	Nil
January, 2024	7.42	21.64	Nil
February, 20224	7.71	21.61	Nil
March, 2024	7.75	22.31	Nil

Table – 6.4

Treated Effluent Quality (2023-2024)

Sl. No.	Parameter	Concentration Values		
		Min.	**Max.**	**Avg.**
1	pH	7.2	7.8	7.2
2	Total Suspended solids	20	24	22
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 F-1	Hypo Stack	HCl Stack F-2
	Chlorine, mg/m^3	HCl, mg/m^3	Chlorine, mg/m^3	HCl, mg/m^3
April, 2023	2.72	2.68	2.60	2.83
May, 2023	2.60	2.68	2.60	2.83
June, 2023	2.96	3.29	3.08	3.29
July, 2023	2.96	3.29	2.92	3.04
August, 2023	2.84	3.16	2.84	3.16
September, 2023	2.96	3.04	3.08	3.16
October, 2023	0.00	3.77	3.31	3.77
November, 2023	0.00	3.65	3.55	3.50
December, 2023	0.00	3.41	3.08	3.77
January, 2024	0.00	1.83	2.66	2.43
February, 2024	0.00	1.83	2.07	2.43
March, 2024	0.00	1.83	1.77	1.83

TABLE-6.6

SOURCES OF AIR EMISSIONS AND POLLUTION LOAD IN UNIT-I & II (2023-2024)

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 F-1	HCl	0.00	2.87	0.00	2.87 X 10^-3
2.	HCl Vent F-2	HCl	0.00	3.00	0.00	3.00 X 10^-3
3.	Hypo Stack	Chlorine	1.42	2.80	1.42 X 10^-3	2.80 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 Precipitation tank Chemical tank/pits Drum filter/Decanter 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, 2023	Wet	0.000	0.000	0.000	0.000	149.227	143.213	10.555	10.525
	Dry	0.000	0.000	0.000	0.000	96.775	92.802	10.002	0.000
May, 2023	Wet	0.000	0.000	0.000	0.000	194.500	36.424	18.952	0.000
	Dry	0.000	0.000	0.000	0.000	124.480	24.202	11.641	0.000
June, 2023	Wet	0.000	0.000	0.000	0.000	137.300	100.367	9.022	11.524
	Dry	0.000	0.000	0.000	0.000	88.280	68.202	11.554	0.000
July, 2023	Wet	0.000	0.000	0.000	0.000	175.180	132.592	20.222	20.365
	Dry	0.000	0.000	0.000	0.000	112.290	85.256	25.113	12.852
August, 2023	Wet	0.000	0.000	0.000	0.000	125.351	76.111	10.222	20.355
	Dry	0.000	0.000	0.000	0.000	80.222	48.650	9.711	13.525
September,2023	Wet	0.000	0.000	0.000	0.000	44.860	73.875	26.214	27.254
	Dry	0.000	0.000	0.000	0.000	28.800	47.220	22.410	10.554
October, 2023	Wet	0.000	0.000	0.000	0.000	15.850	135.697	15.248	22.412
	Dry	0.000	0.000	0.000	0.000	10.191	88.203	19.245	15.254
November,2023	Wet	0.000	0.000	0.000	0.000	54.300	128.080	30.255	26.254
	Dry	0.000	0.000	0.000	0.000	34.692	82.250	22.369	11.854
December, 2023	Wet	0.000	0.000	0.000	0.000	225.769	153.813	29.245	0.000
	Dry	0.000	0.000	0.000	0.000	146.749	98.440	20.548	10.854
January, 2024	Wet	0.000	0.000	0.000	0.000	238.065	125.411	16.254	22.123
	Dry	0.000	0.000	0.000	0.000	154.504	80.200	6.254	12.854
February, 2024	Wet	0.000	0.000	0.000	0.000	157.680	159.036	33.658	26.487
	Dry	0.000	0.000	0.000	0.000	100.750	102.200	14.248	13.753
March, 2024	Wet	0.000	0.000	0.000	0.000	107.494	313.313	19.513	8.547
	Dry	0.000	0.000	0.000	0.000	69.226	200.200	12.254	12.507

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	1625.576	1046.959	1625.576	1046.959
Brine Sludge from brine sludge Pits, MT	0.000	0.000	1577.932	1017.825	1577.932	1017.825
Brine Sludge from precipitation Tanks / Vessels, MT	0.000	0.000	239.36	185.349	239.36	185.349
Sludge from brine saturator, MT	0.000	0.000	195.846	114.007	195.846	114.007
Total Solid Waste Generated, MT	**0.000**	**0.000**	**3638.714**	**2364.14**	**3638.714**	**2364.14**

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 2023-2024

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 40m^3/hr. After the pH is maintained at round 8, the effluent is pumped through HDPE pipeline to RO plant (capacity 300m^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

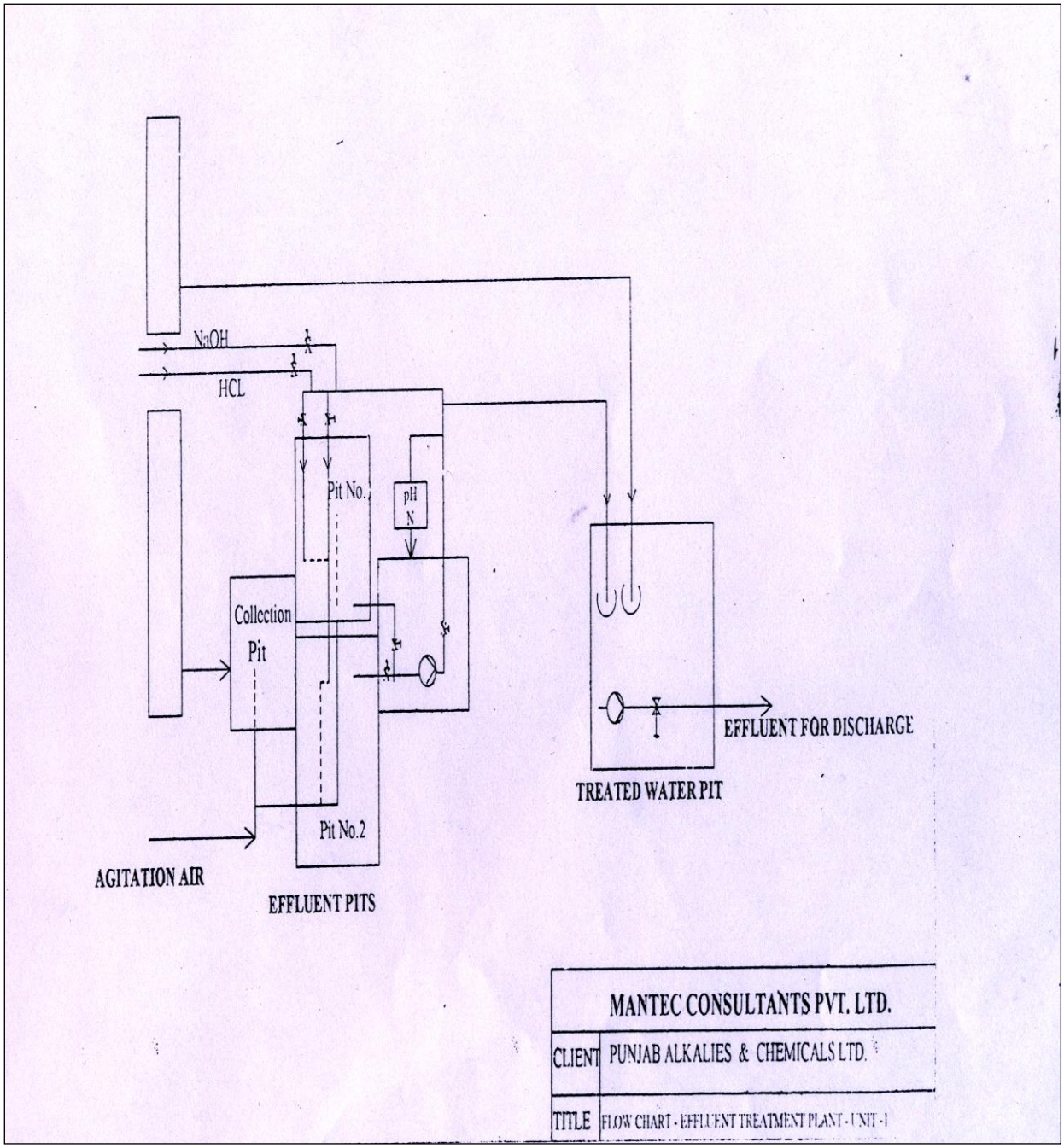


Table – 7.1

Treated Effluent Quality (2023-2024)

Sl. No.	Parameter	Concentration Values		
		Min.	**Max.**	**Avg.**
1	pH	7.2	7.8	7.2
2	Total Suspended solids	20	24	22
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, 2023	Railway siding area	34	28	24	26	0.4	162	34	Nil	Nil	Nil	Nil	Nil
May, 2023	Railway siding area	34	28	24	24	0.4	160	34	Nil	Nil	Nil	Nil	Nil
June, 2023	Railway siding area	30	28	25	28	0.3	162	36	Nil	Nil	Nil	Nil	Nil
July, 2023	Railway siding area	32	28	26	28	0.4	160	34	Nil	Nil	Nil	Nil	Nil
Aug. 2023	Railway siding area	36	28	28	26	0.5	162	36	Nil	Nil	Nil	Nil	Nil
Sep. 2023	Railway siding area	32	28	26	24	0.4	160	34	Nil	Nil	Nil	Nil	Nil
Oct. 2023	Railway siding area	30	28	24	26	0.5	162	34	Nil	Nil	Nil	Nil	Nil
Nov. 2023	Railway siding area	32	28	26	24	0.4	160	32	Nil	Nil	Nil	Nil	Nil
Dec. 2023	Railway siding area	28	28	22	24	0.2	160	30	Nil	Nil	Nil	Nil	Nil
Jan. 2024	Railway siding area	30	26	24	26	0.6	162	34	Nil	Nil	Nil	Nil	Nil
Feb. 2024	Railway siding area	28	28	22	24	0.2	162	30	Nil	Nil	Nil	Nil	Nil
March 2024	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 2023-2024

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 (NFL Side)	NIL	NIL	54.09
2.	Back Side of Electrical Sub-station	NIL	NIL	44.71
3.	South–West Corner of the Boundary	NIL	NIL	51.11

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 (NFL Side)	300 meters	E
2.	Back Side of Electrical Sub-station	250 meters	N
3.	South–West Corner of the 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 INSIDE THE PLANT AT HORTICULTURE NURSERY

Parameter	April 2023		May 2023		June 2023		July 2023		August 2023		September 2023	
Date of Sampling	04.04.2023	26.04.2023	03.05.2023	31.05.2023	07.06.2023	29.06.2023	04.07.2023	27.07.2023	02.08.2023	31.08.2023	05.09.2023	26.09.2023
pH	8.00	8.20	8.18	8.00	7.80	7.75	7.70	7.72	7.72	7.75	7.45	7.40
Total Dissolved Solids,(mg/l)	292	400	404	416	420	446	444	457	457	450	453	447
Hardness(Total) as $CaCO_3$,(mg/l)	136	140	136	140	140	148	142	142	142	140	144	140
Chlorides as $CaCO_3$, (mg/l)	137	137	132	141	148	138.05	135.05	146	146	145	143.05	141
Sulphate as SO_4, (mg/l)	20	20	20	22	20	20	20	22	22	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(1) (Contd…)
THE PHYSICO-CHEMICAL QUALITY OF HAND PUMP INSIDE THE PLANT AT HORTICULTURE NURSERY

Parameter	October 2023		November 2023		December 2023		January 2024		February 2024		March 2024	
Date of Sampling	03.10.2023	31.10.2023	07.11.2023	28.11.2023	05.12.2023	26.12.2023	04.01.2024	30.01.2024	06.02.2024	28.02.2024	05.03.2024	26.03.2024
pH	7.65	7.70	7.75	7.80	7.60	7.63	7.80	7.74	7.75	7.80	7.81	7.66
Total Dissolved Solids,(mg/l)	363	370	453	460	453	459	467	476	458	447	444	451
Hardness(Total) as $CaCO_3$,(mg/l)	146	148	134	138	132	130	120	138	136	140	138	144
Chlorides as $CaCO_3$, (mg/l)	133	139.05	141	135	141	135	141	159.75	159	159	159	177.5
Sulphate as SO_4, (mg/l)	20	22	20	22	20	20	22	20	20	20	18	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 2023		May 2023		June 2023		July 2023		August 2023		September 2023	
Date of Sampling	04.04.2023	26.04.2023	03.05.2023	31.05.2023	07.06.2023	29.06.2023	04.07.2023	27.07.2023	02.08.2023	31.08.2023	05.09.2023	26.09.2023
pH	8.10	8.20	8.10	7.90	7.85	7.80	7.60	7.56	7.63	7.80	7.59	7.60
Total Dissolved Solids,(mg/l)	361	371	369	380	384	390	388	380	376	388	383	376
Hardness(Total) as $CaCO_3$,(mg/l)	142	142	140	144	142	150	148	144	146	148	146	142
Chlorides as $CaCO_3$, (mg/l)	142	148	136	136	133	137	135	133	133	135.5	137.15	135.5
Sulphate as SO_4, (mg/l)	20	20	20	22	20	20	20	20	20	22	20	22
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 2023		November 2023		December 2023		January 2024		February 2024		March 2024	
Date of Sampling	03.10.2023	31.10.2023	07.11.2023	28.11.2023	05.12.2023	26.12.2023	04.01.2024	30.01.22024	06.02.2024	28.02.2024	05.03.2024	26.03.2024
pH	7.80	7.85	7.80	7.76	7.68	7.70	7.76	7.70	7.65	7.80	7.78	7.68
Total Dissolved Solids,(mg/l)	380	378	368	366	361	378	387	377	381	398	394	401
Hardness(Total) as $CaCO_3$,(mg/l)	136	140	138	132	130	136	140	142	150	158	146	158
Chlorides as $CaCO_3$, (mg/l)	125	135.5	128	135	128	128	135	135	135	142	140	159.75
Sulphate as SO_4, (mg/l)	20	22	20	20	22	22	20	20	22	20	16	14
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 2023		May 2023		June 2023		July 2023		August 2023		September 2023	
Date of Sampling	04.04.2023	26.04.2023	03.05.2023	31.05.2023	07.06.2023	29.06.2023	04.07.2023	27.07.2023	02.08.2023	31.08.2023	05.09.2023	26.09.2023
pH	7.96	8.00	8.00	8.07	7.10	8.20	8.00	8.11	8.07	8.20	8.32	8.00
Total Dissolved Solids,(mg/l)	430	438	431	420	726	440	442	436	432	439	444	450
Hardness(Total) as $CaCO_3$, (mg/l)	128	130	132	128	130	140	136	130	128	130	136	132
Chlorides as $CaCO_3$, (mg/l)	142	142	136	130	133	138	140	131	128	128	131.05	128
Sulphate as SO_4, (mg/l)	20	20	20	22	20	20	22	22	20	22	20	22
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 2023		November 2023		December 2023		January 2024		February 2024		March 2024	
Date of Sampling	03.10.2023	31.10.2023	07.11.2023	28.11.2023	05.12.2023	26.12.2023	04.01.2024	30.01.2024	06.02.2024	28.02.2024	05.03.2024	26.03.2024
pH	8.00	7.95	8.00	7.93	7.80	7.70	7.85	7.80	7.70	7.86	7.84	7.90
Total Dissolved Solids,(mg/l)	447	444	437	431	440	429	398	381	368	349	340	332
Hardness(Total) as $CaCO_3$, (mg/l)	136	130	130	126	124	122	112	100	98	90	88	96
Chlorides as $CaCO_3$, (mg/l)	135.05	131	106.5	124.25	128	106.05	88.75	88.75	71	88.75	53.25	71
Sulphate as SO_4, (mg/l)	20	22	20	22	22	22	22	20	20	18	18	15
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 PROCESS WATER TANK

Parameter	April 2023		May 2023		June 2023		July 2023		August 2023		September 2023	
Date of Sampling	04.04.2023	26.04.2023	03.05.2023	31.05.2023	07.06.2023	29.06.2023	04.07.2023	27.07.2023	02.08.2023	31.08.2023	05.09.2023	26.09.2023
pH	7.90	7.94	8.00	7.81	7.81	7.85	7.60	7.67	7.63	7.70	7.90	7.75
Total Dissolved Solids, (mg/l)	381	376	370	361	354	340	343	337	333	341	353	368
Hardness (Total) as $CaCO_3$, (mg/l)	148	142	140	142	140	152	150	152	148	140	142	152
Chlorides as $CaCO_3$, (mg/l)	130	130	132	134	133	124	117	133	133	135.5	139.05	142.5
Sulphate as SO_4, (mg/l)	20	20	20	22	20	22	20	22	20	22	20	22
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 PROCESS WATER TANK

Parameter	October 2023		November 2023		December 2023		January 2024		February 2024		March 2024	
Date of Sampling	03.10.2023	31.10.2023	07.11.2023	28.11.2023	05.12.2023	26.12.2023	04.01.2024	30.01.2024	06.02.2024	28.02.2024	05.03.2024	26.03.2024
pH	8.14	7.97	7.61	7.76	7.65	7.50	7.63	7.57	7.63	7.70	7.71	7.83
Total Dissolved Solids, (mg/l)	377	393	389	391	379	383	391	396	393	401	406	418
Hardness (Total) as $CaCO_3$, (mg/l)	149	159	150	156	152	154	148	146	152	164	166	158
Chlorides as $CaCO_3$, (mg/l)	142	138	138	140	139.05	142.05	142.05	139.05	142.05	177.5	177.5	195.25
Sulphate as SO_4, (mg/l)	22	22	22	22	20	22	20	22	20	20	18	16
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 Meter	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
22.	Bomb Colorimeter- Digital	Toshniwal	01	2024

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 2023 TO MARCH 2024 (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 23	0	9550	9550	63879	6220	70099	21935	38080	60015
May 23	0	9570	9570	65302	6236	71538	20611	38200	58811
June 23	0	9600	9600	46418	6260	52678	20399	39200	59599
July 23	0	9640	9640	43122	6284	49406	19659	39400	59059
August 23	0	9650	9650	39650	6290	45940	17629	39480	57109
September 23	0	9680	9680	30218	6296	36514	11547	39521	51068
October 23	0	9700	9700	32938	6300	39238	9548	39600	49148
November 23	0	9730	9730	34945	6306	41251	9902	39720	49622
December 23	0	9750	9750	22823	6310	29133	8843	39800	48643
January 24	0	9780	9780	21575	6314	27889	10403	39920	50323
February 24	0	9820	9820	9976	6330	16306	9306	39760	49066
March 24	0	9870	9870	11199	6338	17537	12158	39960	52118
Total	0	116340	116340	422045	75484	497529	171940.00	472641	644581
Average	0	9695.00	9695	35170.4	6290.33	41460.8	14328.33	39386.8	53715.1

CHAPTER-9

BY-PRODUCT RECOVERY

9.1 Hydrochloric Acid, Sodium Hypo Chlorite and Spent H_2SO_4 are established by-products in a chloro-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

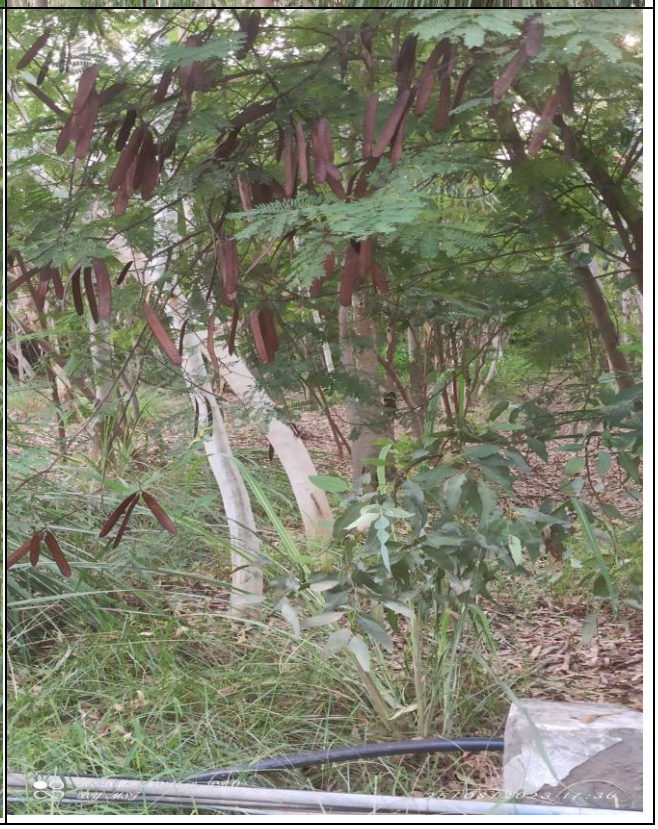
Sl. No.	Variety	No. of Trees
1.	Phycus	4160
2.	Phycuspanda	3420
3.	Conocarpus	295
4.	Golden Bamboo	4268
5.	Guava	340
6.	Arjun	181
7.	Sita Ashoka	14
8.	Putranjeeva	495
9.	Foxtail Palm Small	25
10.	Ashoka Pendula	145
11.	Ashoka Pendula Big	228
12.	Silveroak	523
13.	Jamun	236
14.	Kachnaar	53
15.	Alstonia	85
16.	Traveller Palm	12
17.	Heavycus	3737
18.	Bottle Brush	228
19.	Chakrassia	286
20.	Guller	200
21.	Siris	225

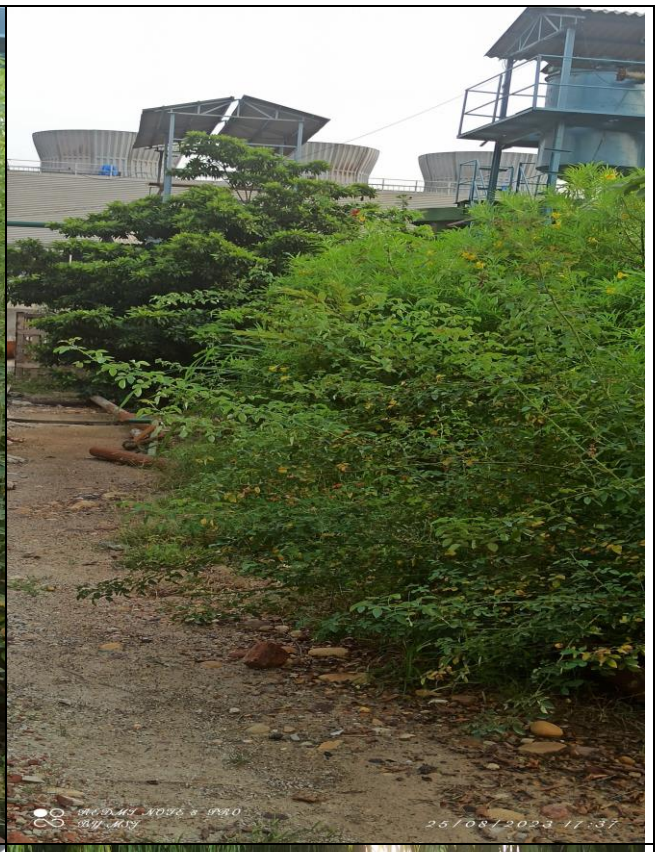
22.	Pilkhan	363
23.	Molsarry	443
24.	American Dek	915
25.	Tipori	16
26.	Buddha Bamboo	863
27.	Uniprus Green	50
28.	Bottlepalm	207
29.	Aamrass	80
30.	Golden Cyprus	111
31.	Cigium Dwaraf	254
32.	Bluepine	50
33.	Neem	62
34.	Bismarkia Palm	21
35.	Foxtail Palm Small	35
36.	Celendra	22
37.	Timber Verity	100
38.	Tikoma	536
39.	Ferm	50
40.	Eucallypus	1161
41.	Phycuspanda Big	800
42.	Phycus Big	793
43.	Golden Bamboo	110
44.	Lady Palm	375
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	96
52.	Amaltas	60
53.	Tad Palm	100
54.	Palmeria Champa	60
55.	Coral Tree	4
56.	Kaneer	42
57.	Lejestonia	37
58.	Boganvillia	95
59.	Saru	5
60.	Morpankhi	9
61.	Nauleena	4
62.	Sabool	2500
63.	Aaricapalm	45

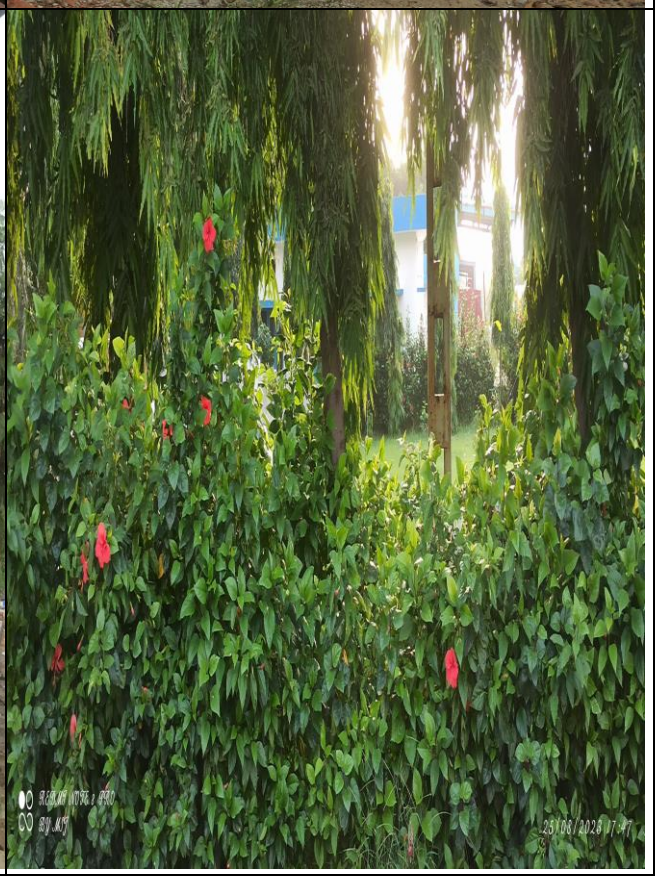
64.	Cassia Siammia	32
65.	Aerucarria	6
66.	Raat Ki Rani	3
67.	Pipal	4
68.	Mango Tree	13
69.	Bamboo Palm	22
70.	Cyprus	76
71.	Gulmohri	2
72.	Lejstorimma	20
73.	Rubber Plant	12
74.	China Palm	28
75.	Phonix Palm	1
76.	Champa	2
77.	Cheel	2
78.	Phycus Palm	3
79.	Gulmohar	4
80.	Sehtoot	38
81.	Sagwan	3
82.	Phalsa	218
83.	Phycus Star Lite	4
84.	Trisool Champa	14
85.	Palmeria Champa	24
86.	Desi Bamboo	621
87.	Areca Palm	144
88.	Bela Proom	421
	Total	**32500**

10.3 Green Field Development Photographs



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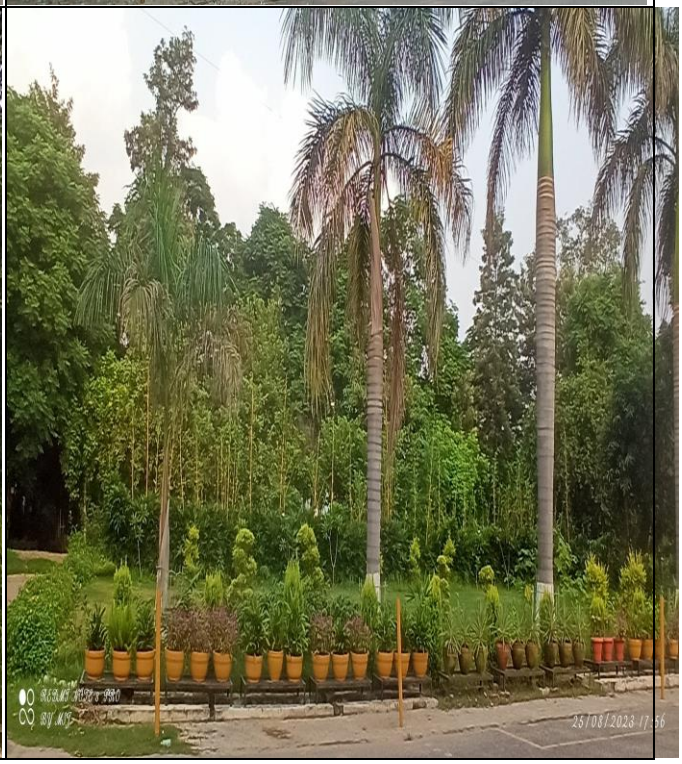
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POLLUTION CONTROL