

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE AT CHENNAI
Appeal No.69 of 2024**

M/s V.V. Titanium Pigment Pvt. Ltd.,
Represented by its Managing Director,
Mr. S. Vaikundarajan,
A-81, SIPCOT Industrial Complex,
Meelavittan Village,
South Veerapandiapuram (PO),
Thoothukudi - 628 002.

...Appellant

Vs

The Chairman,
Tamil Nadu Pollution Control Board,
No. 75, Mount Salai,
Guindy, Chennai - 600 032 and Ors

...Respondents

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TAMILNADU POLLUTION CONTROL BOARD**

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**Advocate for Respondent: TNPCB
Thiru.S.Sai Sathya Jith,
Advocate, Chennai.**

D/E

Report

Inspection of M/s Sterlite Industries (India) Ltd., Thoothukudi
- Assessment of Environmental Pollution Status -

REF.: Petitions for Special Leave Petition (Civil) Nos. 28116-28123 of 2010

(Petition under Article 136 of the Constitution of India for Special Leave to Appeal to the Supreme Court from the Judgment and Order dated 28.09.2010 in Writ Petition Nos. 15501 to 15503 of 1996, 5769 of 1997, 16861 of 1998 and connected WMPs No. 8044 to 8046 of 1999 in WP Nos. 15501 to 15503 of 1996 of the the High Court of Judicature at Madras)

M/s Sterlite Industries (India) Ltd *Petitioner*
Union of India and ORS. *Respondents*
Versus

Hon'ble Supreme Court of India



National Environmental Engineering Research Institute
(Council of Scientific & Industrial Research)
Nagpur – 440 020

**May, 2011**

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Report

Inspection of M/s Sterlite Industries (India) Limited, Thoothukudi - Assessment of Environmental Pollution Status -

1.0 Preamble

The Hon'ble Supreme Court of India, in its Order of 25th February, 2011 directed the National Environmental Engineering Research Institute (NEERI), Nagpur to conduct an independent assessment of the present situation and condition of M/s Sterlite Industries (India) Limited (SIL), Tuticorin, and its effect with reference to the environmental pollution after a joint inspection with officials from Central Pollution Control Board (CPCB), Tamil Nadu Pollution Control Board (TNPCB) and PIL Petitioners.

Accordingly, NEERI along with officials from CPCB, TNPCB and PIL Petitioners conducted the inspection of the site and surrounding areas on 6th April 2011. After inspecting the industry site, surrounding areas, habitation, studying the present wind pattern, existing stacks in the industry, and existing effluent treatment plants (ETP), the methods for sampling of emission, air quality, surface & ground water, assessment of ETPs, solid waste & soil including green belt assessment were evolved and sampling locations identified.

A 15 member NEERI team comprising 10 scientists and 5 project assistants conducted the field monitoring with reference to ambient air quality, stack emissions, assessment of effluent treatment plants, ground and surface water quality, soil and solid hazardous waste including green belt assessment using Global Positioning System (GPS). The monitoring was conducted in two phases during the period 06th - 08th April, 2011 and 19th - 23rd April, 2011. The field assessment was carried out in presence of officials from the CPCB, TNPCB and the four PIL Petitioners and their associates whose names and affiliations are as under :

NEERI	CPCB	TNPCCB	PIL Petitioners
Dr. Tapas Nandy Scientist	Mr. Sunil Dave Sr. Env. Engg.	Mr. M. Murugan DEE	Mr. V. Gopalswamy MDMK
Dr. D G. Gajghate Scientist	Dr. A. Manoharan Zonal Officer	Mr. T. S. Kumaravel AEE	Mr. K. Kanagaraj CPI-M
Dr. A. N. Vaidya Scientist	Mr. G. Thirumurthy Scientist C	Dr. T Jayasekhar Env. Scientist	Mr. A. Mohanraj CPI
Dr. L. N. Sangolkar Scientist	-	-	Mr. Kirubhanidhi NGO
Dr. P. M. Patil Scientist	-	-	Associates (6 Nos.)
Dr. R. Sivacoumar Scientist	-	-	-
Mr. A.D. Bhanarkar Scientist	-	-	-
Mr. K. V. George Scientist	-	-	-
Mr. Ritesh Vijay Scientist	-	-	-
Mr. M. Karthik Scientist	-	-	-
Project Assistants (5 Nos.)	-	-	-

The officials from M/s SIIL, present during the discussion, inspection and monitoring were as follows:

- Mr. R. Ramesh Nair, COO
- Mr. Prasad Suryarao, VP, (Operation & Commercial)
- Mr. K. Thiruppathi, Advisor
- Mrs. A. Sumathi, AGM
- Mr. R. Ramesh, AGM
- Mr. P. Subbaiah, Manager
- Mr. Lovish, Ahuja, Manager
- Mr. Vujji Jagdish, EE

In addition, the Bhabha Atomic Research Centre (BARC), Mumbai was also engaged for assessment of radon concentration at the industry site, as the issue of monitoring radon was raised by one of the PIL Petitioner, who allege M/s SIIL uses uranium tainted copper concentrate. A two member team from BARC conducted the monitoring during 21st - 22nd April, 2011.

M/s Sterlite Industries (India) Limited (SIIL) is located in Meelavittan village, of Thoothukudi Taluk under Thoothukudi District in Tamil Nadu State. The industry is

spread over an area of 102.50 ha with appropriately 20 ha built-up area as per the industry management. The existing operations include Copper Smelter Plant, Sulphuric Acid Plant, Phosphoric Acid Plant, Captive Power Plant and Continuous Copper Rod Plant. The industry also has a township covering an area of 18.61 ha with built-up area of 4.51 ha. The nearby habitation namely TV Puram, Meelavittan, Madathur, Pandarapatti and Thoothukudi town are located around 1.5, 2.0, 3.0, 2.5 and 8 kms distance respectively from the industry with an average population of 800, 1500, 2500, 1000, 400000, respectively. The location map is shown in Fig. 1.1 and the layout map of the industry is presented in Fig. 1.2.

2.0 Existing Status of M/s Sterlite Industries (India) Limited

M/s SIIL located in SIPCOT Industrial Complex on Thoothukudi-Madurai by-Pass Road (NH-45B), Thoothukudi comprises (i) Copper Smelter Project, (ii) Captive Power Plant, and (iii) Copper Rod Plant. The Copper Smelter Project with Sulphuric Acid Plant (SAP) was commissioned in October 1996, and commenced its commercial production in January 1997. The Phosphoric Acid Plant (PAP) was commissioned in May 1999, followed by the Captive Power Plant (CPP) commencing its operation in February 2002, while the Continuous Copper Rod Plant (CCRP) commenced its operation in June 2005.

2.1 Environmental Clearance of MoEF

- M/s SIIL obtained the Environmental Clearance (EC) from the Ministry of Environment & Forests (MoEF) vide letter No. J.11012/111/94-IA/II(1) dated 16.01.1995 for manufacturing the following major products at SIPCOT Industrial Complex, Thoothukudi:

Sr. No.	Major Product	Capacity (tonnes/day)
1.	Blister copper – Phase I	234
2.	Blister copper – Phase II	391
3.	Refined copper	274
4.	Sulphuric acid	1060
5.	Phosphoric acid	350
6.	Nickel sulphate	600 kg/d
7.	Anode slime	1.5
8.	Hydro-fluorosilic acid	10

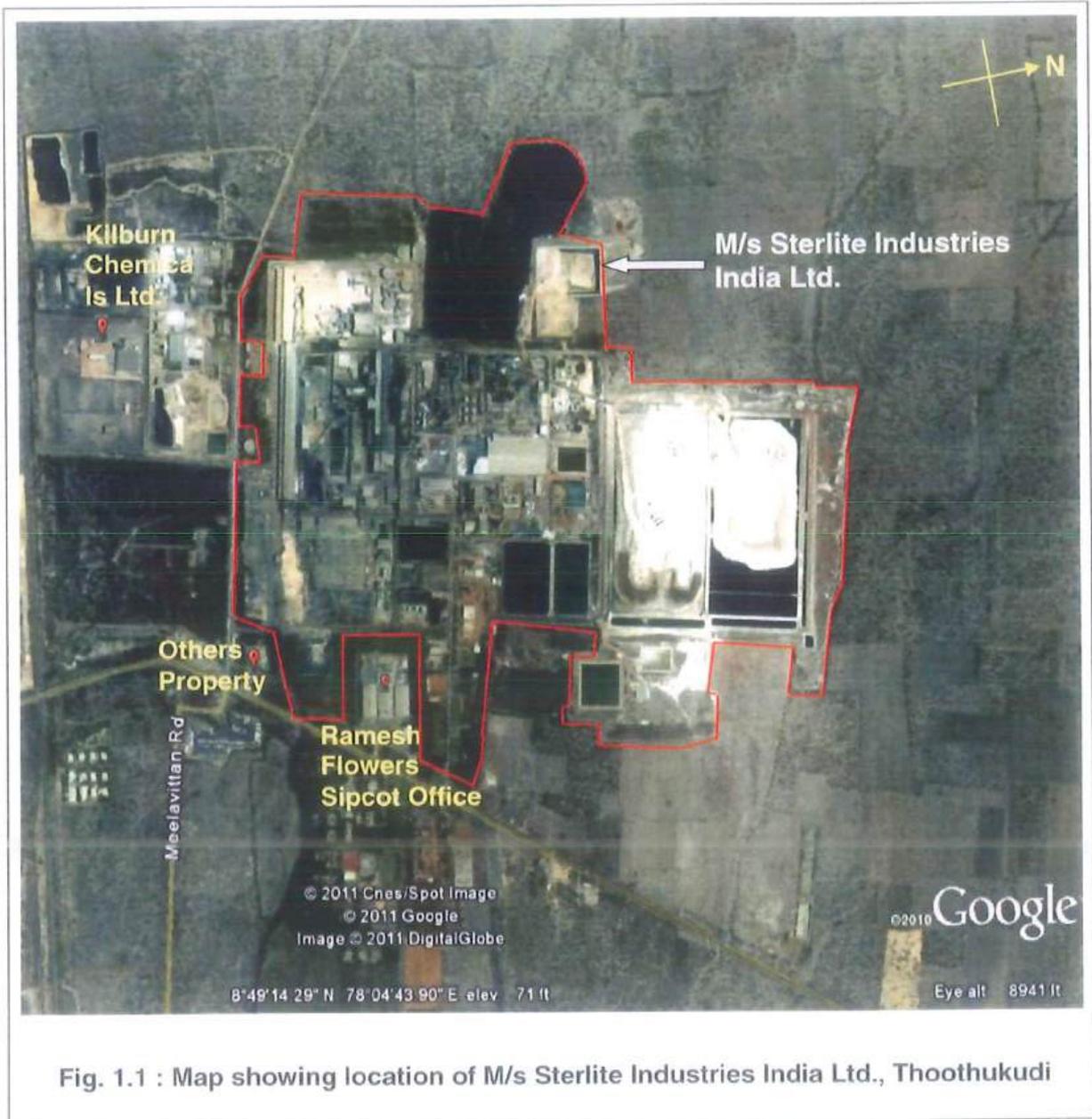
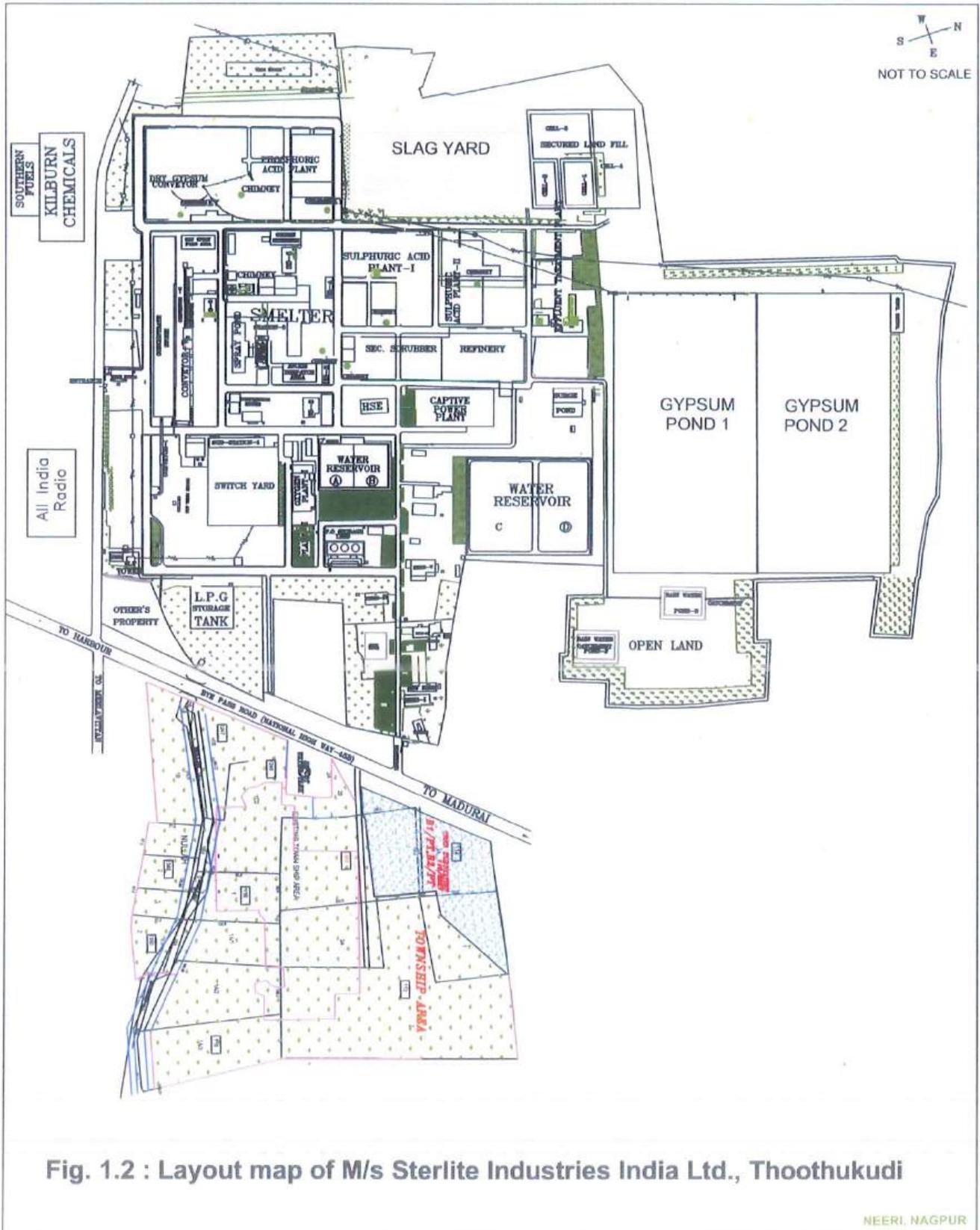


Fig. 1.1 : Map showing location of M/s Sterlite Industries India Ltd., Thoothukudi



- Later, MoEF issued No Objection vide letter *No. 11012/111/94-IA II dated 01.08.1996* for the modification in product manufacturing (deleting copper refinery unit from the initial phase), with the following conditions:
 - reducing the water consumption from 18 mld to 14 mld,
 - reducing sea disposal of treated effluent from 1.94 mld to 1.5 mld, and
 - to initiate action for achieving zero process effluent discharge into sea through recycle/reuse within the plant.
- M/s SILL further obtained expansion clearance from the MoEF vide letter *No.J.11011/82/2003-IAII(1) dated 22.09.2004* for increase in capacity of the products namely, blister copper, phosphoric acid, anode slime, sulphuric acid and hydro-fluorosilic acid, and additional product of copper cathode (875 tonnes/day) with the following conditions:
 - water requirement of 11,650 m³/day of the industry will be met from SIPCOT, Govt. of Tamil Nadu.
 - the effluent generation should not exceed 3395 m³/day. The unit should achieve zero effluent discharge, while domestic effluent should be treated in sewage treatment plant and reused for green belt development.
 - the unit should achieve SO₂ emission of 1.0 kg/tonne of sulphuric acid produced.
 - the acid mist emission should conform the prescribed standard of 50 mg/Nm³.
 - total fluoride emission should conform the prescribed standard of 25mg/Nm³ from the phosphoric acid plant.
 - green belt of adequate width and density in 8 ha area in addition to the 21 ha of area already afforested to mitigate the effects of fugitive emissions.
- In continuation, MoEF further issued clearance vide letter *No. J-11011/24/2006-IA II (1) 09.08.2007* for additional capacity for some major products as follows:

Sr. No.	Major Product	Capacity (tonnes/day)		
		22-09-2004	09-08-2007	Total
1.	Blister copper	900	300	1200
2.	Phosphoric acid	800	-	800
3.	Sulphuric acid	3150	1050	4200
4.	Anode slime	1.75	-	1.75
5.	Hydro-fluorsilic acid	25	-	25
6.	Copper cathode	875	-	875

The following specific conditions were addressed in the EC for compliance:

- total project area is 172.17 ha and no additional land will be required for the expansion project.
- online analyzers and stack emission monitoring equipments for continuous monitoring of SO₂, NO_x, SPM shall be installed and all the pollution control measures shall be inter-locked.
- recommendations made in charter for Corporate Responsibility for Environmental Protection (CREP) shall be strictly followed.
- SO₂ emission limit shall be less than 1 kg/tonne of sulphuric acid produced and acid mist limit of 50 mg/Nm³.
- total water requirement shall not exceed 10,050 m³/day and the unit should achieve zero process effluent discharge and no wastewater shall be disposed off outside the premises.
- green belt of adequate width and density around the project site shall be developed in 43 ha (~25%) out of total 172.17 ha.
- the unit shall develop rainwater structures to harvest the runoff water for recharge of ground water.

2.2 TNPCB Consent & Authorization Status

2.2.1 Copper Smelter Project

i. Consent

- The Consents to Establish under Water Act, 1974 & Air Act, 1981 were issued by the TNPCB for the Copper Smelter Project of M/s SIIL vide Proceeding Nos. T11/TNPCB/VOC/TNSEC/188/W/R/95 & T11/TNPCB/VOC/TNSEC/188/A/R/95 dated 22.05.1995 for phase I, for blister copper production of 234 tonnes/day and sulphuric acid of 638 tonnes/day excluding the products namely lube oil, transformer oil, fuel oil, wax and aromatics.

- Later, Consents to Operate were issued vide Proceeding Nos. F3/TNPCB/F.TNSEC-188/VOC/W/96 & F3/TNPCB/F.TNSEC-188/VOC/A/96 dated 14.10.1996 for blister copper production of 391 tonnes/day (restricted to 40,000 tonnes/annum) and sulphuric acid of 1060 tonnes/day with validity upto 31.03.1997. The unit was permitted to discharge treated sewage of 240 m³/day on its own land, and treated effluent of 696 m³/day for reuse in the process. Thereafter, the Copper Smelter Project operation was initiated in 1996, as per the aforereferred Consents to Operate.
- Further, the Consent validity was renewed upto 31.03.1998 vide Proceeding Nos.F3/TNPCBD/F-TNSEC188/VOC/W/97 & F3/TNPCBD/F-TNSEC188/VOC/A/ 97 dated 07.04.1997, and thereafter upto 31.03.1999 vide the Proceeding Nos. F.3/TNPCB/F.TNSEC.188/TTN/RLW/98 & F.3/TNPCB/F.TNSEC.188/TTN/RL/A/ 98 dated 31.03.1999.
- Later, the TNPCB issued Consent vide Proceeding Nos. F1/TNPCBD/F-188/TTN/W/99 & F1/TNPCBD/F-188/TNN/A/99 dated 20.05.1999 for the manufactured products as follows with validity up to 30.11.1999:

Blister copper (Anode)	391 tonnes/day (70 tonnes/annum)
Sulphuric acid	1060 tonnes/day
Phosphoric acid	350 tonnes/day
Hydro-fluorosilic acid	10 tonnes/day

The condition for maximum daily discharge of process effluent was increased from 696 m³/day to 1692 m³/day to be treated and completely reused in the process. However, there was no increase in discharge of treated sewage (240 m³/day). The limit of SO₂ emission prescribed was 4 kg/tonne of concentrated (100%) sulphuric acid production, and acid mist of 50 mg/Nm³.

- The consent was not renewed after 30.11.1999 till 19.04.2005 by the TNPCB. As per the management of M/s SIIL, the last consent was issued after an interim order passed by the Hon'ble High Court of Judicature at Madras on 30.04.1999, with a condition that the industry must conduct a Comprehensive Environmental Impact and Risk Assessment (CEIRA) study with plant operation at full capacity and submit the report to the TNPCB. The study was conducted by NEERI in July 2003 and the report was submitted to the TNPCB on 23.07.2003. During the said period, the company had also filed an

application with MoEF & TNPCB for plant capacity expansion from 391 tonnes/d to 900 tonnes/d. Thereafter, the EC was awarded to M/s SIIL by MoEF on 22.09.2004 and subsequently the Consents from TNPCB got renewed on 19.04.2005.

- After EC of the MoEF dated 22.09.2004 for the first expansion, the TNPCB vide Proceeding Nos. T12/22276/99/RL/TTN/W & T12/22276/99/RL/TTN/A dated 19.04.2005 issued consent with validity upto 31.03.2006 for the products with capacity expansion as follows:

Main products	Copper anodes	900 tonnes/day
	Copper cathodes	875 tonnes /day
	Phosphoric acid	800 tonnes/day
Intermediate product	Anode slime (Refinery)	1.75 tonnes/day
Byproducts	Sulphuric acid	3,150 tonnes/day
	Hydroflurosilicic acid	25 tonnes/day

The process effluent limit was increased from 1692 m³/day to 3395 m³/day, to be treated and completely reused in the process. However, the discharge of treated sewage was limited to 100 m³/day. The limit of SO₂ emission prescribed was 1.0 kg/tonne of sulphuric acid production, and acid mist of 50 mg/Nm³.

- The Consent was further renewed with a validity period upto 30.09.2006 issued vide Proceeding Nos. T7/TNPCB/F.22276/RLW/2006 & T7/TNPCB/F.22276/RL/ A/2006 dated 07.04.2006.
- Later, the TNPCB issued Consent to Establish vide Proceeding Nos. T7/TNPCB/F22276/RL/TTN/W/2006 & T7/TNPCB/F22276/RL/TTN/A/2006 dated 02.11.2006 for Expansion, followed by Consent to Operate for Expansion issued vide Proceeding Nos. T7/TNPCB/F.22276/RL/TTN/W/2006 & T7/TNPCB/ F.22276/RL/TTN/A/2006 dated 15.11.2006, for the products as detailed hereunder:

Main products	Copper anodes	1,200 tonnes/day
	Copper cathodes	875 tonnes /day
	Phosphoric acid	800 tonnes/day
Intermediate product	Anode slime (Refinery)	1.75 tonnes/day
Byproducts	Sulphuric acid	4,200 tonnes/day
	Hydroflurosilicic acid	25 tonnes/day

The Consent Orders for expansion operation stipulated the following conditions with validity upto 31.03.2007:

- sewage generation of 100 m³/d to be treated in sewage treatment plant and disposed for greenbelt development inside the premises.
 - process (trade) effluent generation of 4,080 m³/d (maximum) to be treated and complete recycle/reuse achieving zero liquid effluent discharge.
 - disposal of solid wastes as per Hazardous Waste (Management & Handling) Rules, 2003.
 - achieving the stipulated emission standards and discharge through stacks.
- Further, renewal of the Consent to Operate was issued vide the following Proceeding Nos. and validity period:

TNPCB Proceeding	Validity Upto
No. T7/TNPCB/F.22276/RL/TTN/W/2007 dated 07.05.2007 No. T7/TNPCB/F.22276/RL/TTN/A/2006 dated 07.05.2007	30-09-2007
No. T7/TNPCB/F.22276/URL/TTN/W/2008 dated 19.01.2009 No. T7/TNPCB/F.22276/URL/TTN/A/2008 dated 19.01.2009	31-03-2009
No. T7/TNPCB/F.22276/URL/TTN/W/2009 dated 14.08.2009 No. T7/TNPCB/F.22276/URL/TTN/A/2009 dated 14.08.2009	31-12-2009

- Thereafter, the TNPCB did not renew the Consents due to non-compliance of the following conditions:
 - Under Water Act, 1974
 - i. The unit shall take expedite action to achieve the time bound target for disposal of slag, submitted to the Board, including BIS clearance before arriving at disposal to cement industries, marine impact study before arriving at disposal for landfill in abandoned quarries.
 - ii. The unit shall take expedite action to dispose the entire stock of the solid waste of gypsum.
 - Under Air Act, 1981
 - i. The unit shall improve the fugitive control measure to ensure that no secondary fugitive emission is discharged at any stage, including at the points of material handling and vehicle movement area.

ii. Authorization

As per the Authorization, issued by the TNPCB vide Proceeding No. T7/TNPCB/F22575/RL/TTN/HWM/2008, the activities of handling and management of hazardous wastes by the industry, as per the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008, are presented the Annexure I. M/s SILL is authorized to operate a facility for collection, storage, transport and disposed of hazardous waste situated in the premises. The Authorization is valid for a period of 5 years from the date of issue.

2.2.2 Captive Power Plant (Diesel Based)

i. Consent

- The Captive Power Plant (Diesel Based), is functioning since 2002, as per "Consent to Operate" issued, vide the TNPCB Proceeding Nos. T9/TNPCB/F1288/TTN/W/2002-2 & T9/TNPCB/F1288/TTN/A/2002-2 dated 23.03.2002.
- Presently, as per Consent to Operate for Expansion, issued vide TNPCB Proceeding Nos. T9/TNPCB/F1288/TKD/W/2003, & T9/TNPCB/F1288/TKD/A/2003, dated 1.1.2004, the production of Power is 4x6.3 MW (25.2 MW) and 3x8 MW (24 MW). The Consent Orders include,
 - sewage generation of 0.5 m³/d, and to be treated disposed through septic tank and soak pit arrangement
 - process (trade) effluent generation of 27m³/d to be treated and reuse for slag granulation in Copper Smelter Project.
 - achieving stipulated emission standards and discharge through stacks.
- Further, the Consent for Operation was issued vide Proceeding Nos. T7/TNPCB/F-1288/RL/TTN/W/2010 & T7/TNPCB/F-1288/RL/TTN/A/2010 dated 09.06.2010 extending the validity upto 31.03.2011, and thereafter no extension has been granted.

ii. Authorization

As per the Authorization, issued vide Proceeding No. HWM/25859/01/TTN dated 29.07.2004, the following hazardous wastes are to be collected, stored and disposed through authorized recyclers:

(i) Category No. 3.1: Oil containing washing water and sludge of 4 tonnes/day.

(ii) Category No. 5.1 : Spent oil of 1 m³/day.

The Authorization was valid for a period of 5 years from the date of issue.

2.2.3 Continuous Copper Rod Plant

i. Consent

The Continuous Copper Rod Plant located within the premises of Copper Smelter Project, is in operation since 2005, as per the Consent to Operate issued vide the TNPCB Proceeding Nos. T12/10909/05/RL/TTN/W & T12/10909/05/RL/TTN/A dated 30.5.2005. The products manufactured as per the consent are Continuous Copper Wire Rod of 410 tonnes/day, with byproducts of Copper Mill Scale of 0.8 tonnes/day, and Lumps of 0.2 tonnes/day. The Consent Orders include,

- sewage generation of 3 m³/d to be treated through and disposal of the sewage treatment plant provided in the Copper Smelter Project and disposal for greenbelt development.
- no generation of process (trade) effluent.
- emission discharge from melting furnace through a vent.

Further, the Consent for Operation was issued vide Proceeding Nos. T7/TNPCB/F-10909/RL/TTN/W/2010 & T7/TNPCB/F-10909/RL/TTN/A/2010 dated 09.06.2010 extending the validity upto 31.03.2011, and thereafter no extension has been granted.

ii. Authorization

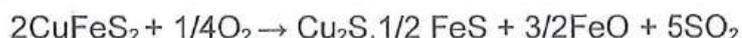
As per Authorization, issued vide Proceeding No. T7/TNPCB/F-23868/HWM/TTN/RL/2006 dated 21.6.2006, the hazardous waste under Category No. 5.1, (Used/spent oil of 10 m³/m) is to be collected, stored and disposed through authorized recyclers. The Authorization was valid for a period of 5 years from the date of issue.

I. GENERAL INVENTORY DETAILS

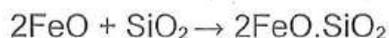
3.0 Manufacturing Process

3.1 Copper Smelter

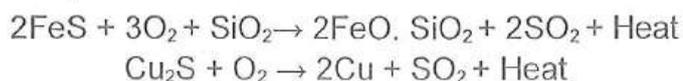
The Smelter is based on IsaProcess™ technology from MIM, Australia. The ISA™ furnace is a vertical shaft type furnace completely lined with refractory. The copper concentrate imported contains about 25-35% copper, 28-32% sulphur, iron 25-30% in the form of CuFeS_2 and 7-10% moisture. The same is blended with bought out concentrates from other sources and treated to get optimum results. The wet copper is charged along with quartz and limestone into the molten bath. A central lance going through the top of the furnace into the bath injects air, oxygen and fuel into a molten bath of ferro-sand and matte.



As a result of the chemical reactions that take place in the bath, the copper concentrate gets converted into two products – Matte, a mixture of sulphide (containing copper and iron), and ferro sand (iron silicate). The products are tapped periodically from the bottom of the furnace through a air cooled copper tap hole into a rotary holding furnace, where the ferro sand separates out due to differential density and the same is discarded. The reactions for ferro sand formations are as follows:



The copper matte is converted into blister copper in the pierce Smith converter in two stages. In converter, air is blown to the liquid matte and quartz added as flux to produce blister copper (98.5% Cu) and ferro sand (7-10% Cu). In the first stage, called Slag Blow, most of the iron and a small quantity of sulphur are oxidised and removed. In the second stage, called Copper Blow, sulphur is removed to get Blister Copper. The sulphur is removed at high temperature as sulphur dioxide by blowing air into the molten matte.



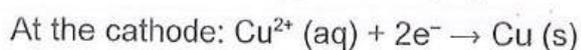
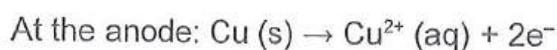
The ferro-sand from the converters is treated in ferro sand cleaning furnace for recovery of copper and reducing copper below 0.5% in ferro sand.

Blister Copper is further refined in Anode Furnace by supplying controlled air for oxidizing remaining sulphur as sulphur dioxide and then by reduction to approximately 99.7% Cu purity.

3.2 Electro Refinery

The fine refined copper (99.7% Cu) is cast as anode and dispatched to refinery for electro refining to produce copper cathode of 99.99% copper purity. During electrolysis, direct current is passed from the rectifier and copper ion from anode dissolves in electrolyte and gets deposited on the stainless steel cathode on a seven days cycle as sheet. Additives reagents like Glue, Thio Urea, HCl etc are added to circulating electrolyte to improve the quality of the cathode deposit. To arrest the floating slime in the electrolyte a polishing filter continuously filters around 30% of the electrolyte in circulation.

The cathodes are harvested by lifting from the electrolytic cell and striped by cathode striping machine to strip off from the mother blanks and washed by high pressure jet water washing chamber. The mother blanks are placed back in the electrolyte cells for start of new cathode cycle. Anode scrap (about 50 kg) is removed from the cells and washed in anode scrap washing machine for washing of anode slime at the end of Anode Cycle. The washed scrap anodes are recycled back to smelter.



Slime Treatment: During electro refining process, the insoluble part of anodes, which consists of copper and precious metals settle down at the bottom of cells as anode slime. After each anode cycle of 21 days, the electrolyte cells are washed with water and the anode slimes are collected and sent to slime treatment plant where copper content is removed by leaching operations and copper free slimes are filtered and stored for recovery of precious metals like nickel, selenium, tellurium, silver, gold, etc. The leached slime is exported for recovery of precious metals.

Gas Treatment: Off gases like SO₂ gases produced at various stages of smelter, holding furnace, converter and anode furnace ad converted into Sulphuric Acid. The SO₂ generated from Slag cleaning furnace is scrubbed (alkali) and routed to stack.

3.3 Sulphuric Acid Plant

The sulphur dioxide gases generated in the smelting process (ISA and converter) is collected and ducted to the Sulphuric Acid Plant 1 & 2. The sulphuric acid plant is based on the absorption process known as DCDA (Double Conversion Double Absorption). The SO₂ gases are cooled and cleaned in the gas cleaning plant comprising gas cooling tower, scrubbing system and wet electrostatic precipitators. The cleaned SO₂ gas is catalytically oxidized by vanadium pentoxide catalyst to form sulphur trioxide (SO₃) gas and absorbs it in water to form sulphuric acid. The scrubber is provided to treat the tail gas and routed to stack.

A portion of the weak acid from circulation system of the scrubber is continuously bled to the wastewater treatment plant. The gypsum formed in neutralization of acid generates as a solid waste.

3.4 Phosphoric Acid Plant

The Sulphuric acid is reacted with rock phosphate in the Phosphoric Acid Plant to produce phosphoric acid, the process used is known as Hemi-hydrate Di Hydrate Process sourced from Hydro Agri International, UK. The off gases evolved during reaction and during flash cooling are scrubbed with water. The conversion of phosphoric acid into calcium sulphate (gypsum) is as follows:



The resultant hydrofluorosilicic acid is filtered in a silica filter to remove silica content and filtered acid sent for storage. The gases evolved during concentration are scrubbed in fluorine scrubbing system. There are series of reactors where the cakes from press filters are treated with sulphuric acid to extract the P₂O₅ present in the cake.

3.5 Copper Rod Plant

Copper cathodes along with pure in-process scrap from rod plant are melted in a vertical shaft furnace to melt the material at 1100 °C. LPG free from sulphur is used as fuel. The molten copper is transferred to the casting wheel through a

holding furnace, which acts as buffer between melting and continuous copper wire rod making machine. The metal gets solidified as the wheel is cooled with water jet sprays. The continuously cast copper bar is fed into the rolling mill consisting of a unique combination of 2-roll and 3-roll configuration designed to produce rods in different sizes. Online pickling, drying and waxing ensure that the rod is free of oxide scales.

3.6 Captive Power Plant

The captive power plant in Sterlite consists of two sections CPP1 and CPP2. CPP1 is having 4 diesel engine generators each of 6.15MW capacity and CPP2 is running with 3 diesel engines each with 7.65MW capacity. CPP supplies the major part (47.55MW) of power in the mother plant and also supplies the steam recovered from the exhaust gases to the main plant through its Waste Heat Recovery Boiler system (WHRB). The CPP1 has WHRB of capacity 2MT/hr (3 Nos.) and CPP2 has WHRB of capacity 3MT/hr (4 Nos.).

3.7 Oxygen Plant

There are two captive oxygen plants feeding the required oxygen for copper smelting. Atmospheric air contains 20.9 % oxygen, which is compressed and subjected to cooling cycles with the help of expansion turbines below cryogenic temperature. The liquid air is separated in the distillation column based on the difference in boiling point of oxygen and nitrogen. Since boiling point of nitrogen is lesser than oxygen, nitrogen boils first and is sent back to atmosphere. The liquid oxygen which settles at the distillation column is vaporized and then sent to smelter in gaseous form at 95 % purity levels for copper smelting process.

4.0 Raw Material Consumption and Product Details

The raw and allied materials consumption in the manufacture of Copper Anode and other allied products are presented in Annexure I. The details regarding consumption of raw material and products for the period 2004-05 to 2010-11 and April 2011 are given **Table 4.1**. The production during the inspection period in April 2011 is presented in **Table 4.2**.

Table 4.1 : Raw Material Consumption and Product Details

Year	Raw Material (tonnes)			Products (tonnes)			
	Copper concentrate	Lime stone	Rock phosphate	Copper anode	Copper cathode	Sulphuric acid	Phosphoric acid
2004-05*	606116.05	20357.3	346075	177020	-	546539	104903
2005-06*	928363.2	23482.13	577038.1	273048	98796	844485	171891
2006-07*	1038580	31301.4	572805.4	313014	150565	946539	172117
2007-08*	1081942	45269.56	507038.1	323354	162940	1027759	152401
2008-09*	1047300	25123.1	563370.1	302688	139705	987511	163818
2009-10*	1133851	17270.14	601687.9	332118	154177	1036353	194721
2010-11 [#]	1052432	14838.41	532699.54	302170.79	139974.971	968760.28	154231.82
April 2011 [#]	80005.385	815.00	33766.77	23807.003	10220.445	72083.45	9051.532

Source : * CPCB Inspection & Monitoring Report of M/s SILL, Tuticorin, January 2011

[#] M/s SILL, Thoothukudi

Table 4.2 : Production During April 2011

Sr. No.	Date	Copper anode	Copper Cathode	Sulphuric acid	Phosphoric acid
1.	06-04-2011	975.275	532.944	2270.640	387.200
2.	07-04-2011	1019.160	336.969	2856.791	506.162
3.	08-04-2011	700.533	524.456	2471.421	352.236
4.	16-04-2011	903.077	388.869	2167.697	0
5.	17-04-2011	654.172	325.385	2851.301	0
6.	18-04-2011	832.020	378.195	2365.472	274.050
7.	19-04-2011	925.225	228.428	2596.326	381.486
8.	20-04-2011	930.541	239.773	2438.142	537.619
9.	21-04-2011	885.935	269.493	2332.401	619.888
10.	22-04-2011	804.004	389.943	2352.653	567.880
11.	23-04-2011	410.050	357.864	969.000	504.702

Quantity of copper concentrate imported in April 2011 was 109806.848 tonnes.

5.0 Water Requirement

M/s SILL has obtained permission from SIPCOT to draw water to the tune of 15,890 m³/day. However, as per the Environmental Clearance (EC) of the MoEF (No.J-11011/24/2006-IA II (1) 09.08.2007), the conditions stipulated delineates that the total water requirement of M/s SILL shall not exceed 10,050 m³/day for the total production of 1200 tonnes copper anode per day. As per the industry management, the monthly water consumption for the year 2010-11 is given in **Table 5.1**. Also, the water requirement of captive power plant (CPP) (Consent No. Water Act : 19852 dt. 01/01/2004 & Air Act 15900 dt. 01/01/2004) and the continuous copper rod plant (CCRP) (Consent No. Water Act : 20405 dt. 30/05/2005 & Air Act 16442 dt. 30/05/2005) is given in **Tables 5.2 and 5.3**, respectively. Further, the daily water consumption of smelter project including SAP and PAP and also CPP, CCRP and refinery for the month of April 2011 is presented in **Table 5.4**.

The water consumption data reveals that the total water consumption is in the range 5187 to 7842 m³/day during April 2010-March 2011, and in the range 5056 to 8036 m³/day during April 2011.

6.0 Wastewater Generation

The major sources of wastewater generation from copper smelter project in M/s SILL includes the following:

- Smelter secondary gas cleaning & scrubber effluents
- Gas cleaning & sulphuric acid plant floor washings
- Cathode copper plant electrolyte bleed off
- Phosphoric acid plant filter wash & gypsum drain
- Cooling tower blow down
- Boiler blow down & demineralization plant backwash

In addition, effluent is also generated from power plant. The pump seal water and floor washings from the ETPs, and leachate from secured landfill also contribute to other wastewater sources. No effluent is generated from the continuous copper rod plant.

The quantity of wastewater generated from various sources in the month of April 2011 is presented in **Table 6.1**. The total wastewater generation from various

**Table 5.1 : Monthly Raw Water Consumption during 2010-11 in
M/s SILL, Thoothukudi**

[Smelter Project]

Sr. No.	Year 2010-11	Water consumption, m ³				Average consumption, m ³ /day
		Process	Cooling	Domestic	Total	
1.	April 2010	61345	158329	8065	227739	7591
2.	May	56439	160868	6896	224202	7232
3.	June	51855	132845	6250	190951	6365
4.	July	41678	112055	7055	160788	5187
5.	August	57977	178533	6581	243091	7842
6.	September	52629	170490	5007	228126	7604
7.	October	50478	140604	5961	197043	6358
8.	November	56642	135471	4752	196865	6562
9.	December	62500	144021	4502	211023	6807
10.	January 2011	60298	139801	6787	206885	6674
11.	February	59564	7363	114247	181174	6471
12.	March	74228	143666	9316	227210	7329

Water consumption quantity rounded off to unit place.

**Table 5.2 : Monthly Raw Water Consumption during 2010-11 in
M/s SILL, Thoothukudi**

[Captive Power Plant (CPP)]

Sr. No.	Year 2010-11	Water consumption, m ³				Average consumption, m ³ /day
		Process	Cooling	Domestic	Total	
1.	April 2010	0	5850	1400	7250	242
2.	May	0	5611	1474	7085	229
3.	June	0	4744	1618	6362	212
4.	July	400	4829	1792	7021	226
5.	August	408	6583	1570	8561	276
6.	September	206	6094	1228	7528	251
7.	October	312	6444	1153	7909	255
8.	November	180	6140	470	6790	226
9.	December	127	2755	252	3134	101
10.	January 2011	37	1577	1022	2636	85
11.	February	19	1268	1443	2730	97
12.	March	50	2951	1673	4674	151

Water consumption quantity rounded off to unit place.

**Table 5.3 : Monthly Raw Water Consumption during 2010-11 in
M/s SILL, Thoothukudi**

[Continuous Copper Rod Plant (CCRP)]

Sr. No.	Year 2010-11	Water consumption, m ³			Average consumption, m ³ /day
		Cooling	Domestic	Total	
1.	April 2010	1936	973	2909	97
2.	May	2573	962	3534	114
3.	June	2545	885	3429	114
4.	July	1131	825	1956	63
5.	August	1098	943	2041	66
6.	September	700	732	1432	48
7.	October	710	606	1316	42
8.	November	455	1439	1894	63
9.	December	308	2468	2775	90
10.	January 2011	883	2403	3285	106
11.	February	2777	918	3694	132
12.	March	1725	2291	4016	130

Water consumption quantity rounded off to unit place.

**Table 5.4 : Daily Raw Water Consumption* during April 2011 in
M/s SILL, Thoothukudi**

Sr. No.	April 2011	Water consumption, m ³ /d						
		Smelter	SAP	PAP	CPP	Refinery	CCR	Total
1.	01-04-2011	2192	3010	1663	229	316	17	7427
2.	02-04-2011	2025	2381	2064	230	304	20	7024
3.	03-04-2011	2126	3088	1891	257	220	17	7499
4.	04-04-2011	2176	3250	1845	2689	309	17	7868
5.	05-04-2011	2491	3024	1613	265	353	206	7952
6.	06-04-2011	2039	2970	1589	194	253	122	7167
7.	07-04-2011	2289	3186	1692	173	328	166	7834
8.	08-04-2011	2114	3193	1909	213	274	137	7840
9.	09-04-2011	2108	3326	1880	212	369	141	8036
10.	10-04-2011	2062	2459	1991	240	310	153	7214
11.	11-04-2011	1795	2366	1723	216	311	146	6557
12.	12-04-2011	2244	2601	1884	174	255	132	7290
13.	13-04-2011	1990	2211	1057	180	310	123	5871
14.	14-04-2011	2271	2811	176	199	166	127	5750
15.	15-04-2011	1943	2268	251	232	266	96	5056
16.	16-04-2011	2172	2384	268	208	242	149	5423
17.	17-04-2011	2167	2689	514	166	295	144	5975
18.	18-04-2011	2329	2619	1192	225	168	143	6676
19.	19-04-2011	2659	2759	1490	235	299	224	7666
20.	20-04-2011	2015	2894	1760	225	224	126	7244
21.	21-04-2011	2095	3145	1560	185	246	7	7238
22.	22-04-2011	2027	3027	1525	157	176	8	6920
23.	23-04-2011	1854	2429	1516	115	399	7	6320
24.	24-04-2011	2001	2460	1959	125	269	4	6818
25.	25-04-2011	2118	2276	1727	176	312	6	6615
26.	26-04-2011	2192	2535	272	192	216	9	5416
27.	27-04-2011	2451	3090	128	160	359	12	6200
28.	28-04-2011	2236	3309	2062	112	277	14	8010
29.	29-04-2011	2266	3340	1149	97	259	15	7126
30.	30-04-2011	2427	2685	2051	106	280	16	7565
Range, m³/day		1795- 2659	2211- 3340	28- 2064	97- 269	166- 399	4- 224	5056- 8036

* Includes water consumption in process, cooling water makeup and domestic.

Table 6.1 : Daily Wastewater Generation during April 2011 in M/s SILL, Thoothukudi

Sr. No.	April 2011	Wastewater generation, m ³ /d									Total
		GCP	Refinery	SGS	Pump seal water	Floor washing	Leachate from SLF	Cooling tower blow down	Boiler blow down	DM plant backwash	
1.	01-04-2011	682	49	596	175	2	28	54	38	39	1663
2.	02-04-2011	498	22	307	175	2	17	44	41	19	1125
3.	03-04-2011	664	41	523	175	2	26	108	28	54	1621
4.	04-04-2011	581	31	448	175	2	22	263	55	68	1645
5.	05-04-2011	687	10	385	175	2	23	135	61	34	1512
6.	06-04-2011	576	35	564	175	2	25	177	50	39	1643
7.	07-04-2011	628	0	589	175	2	26	269	45	24	1758
8.	08-04-2011	618	27	405	175	2	22	248	32	38	1567
9.	09-04-2011	602	27	359	175	2	21	190	46	44	1466
10.	10-04-2011	475	27	376	175	1	18	98	45	0	1215
11.	11-04-2011	445	33	299	175	1	16	26	32	39	1066
12.	12-04-2011	553	33	502	175	2	23	127	44	39	1498
13.	13-04-2011	541	37	380	175	2	20	14	39	69	1277
14.	14-04-2011	636	37	476	175	2	24	44	23	39	1456
15.	15-04-2011	630	40	462	175	2	24	17	33	3	1386
16.	16-04-2011	674	34	522	175	2	26	91	34	39	1597
17.	17-04-2011	603	45	378	175	2	21	129	35	4	1392
18.	18-04-2011	705	46	481	175	2	26	478	34	4	1951
19.	19-04-2011	676	47	535	175	2	26	378	32	39	1910
Contd...											

20.	20-04-2011	660	41	538	175	2	26	559	34	4	2039
21.	21-04-2011	667	48	512	175	2	25	646	54	35	2164
22.	22-04-2011	649	42	465	175	2	24	667	38	54	2116
23.	23-04-2011*	259	51	237	175	1	11	517	27	34	1312
24.	24-04-2011	689	42	482	175	1	18	172	34	34	1647
25.	25-04-2011	575	41	439	175	2	21	107	33	0	1393
26.	26-04-2011	657	38	365	175	3	17	137	28	35	1455
27.	27-04-2011	788	46	570	175	2	26	62	21	30	1720
28.	28-04-2011	711	47	560	175	2	23	307	20	4	1849
29.	29-04-2011	657	43	526	175	1	22	239	24	35	1722
30.	30-04-2011	676	41	528	175	2	24	205	31	39	1721
Range, m ³ /day		259-788	0-51	237-596	175	1-2	11-28	14-667	20-61	0-68	1125-2164

* Please indicate the reason for low generation

sources during the monitoring period, 6th - 8th April 2011 and 19th - 23rd April 2011 was in the range 1312 to 2164 m³/day.

In addition, sanitary wastewater (sewage) is also generated within the industry premises and the quantity are as follows:

- Copper smelter project area : 100 m³/day
- Captive power plant area : 0.5 m³/day
- Continues copper rod plant area : 3.0 m³/day

7.0 Effluent Treatment Facilities

7.1 Sewage Treatment

Sewage generated from the aforementioned plant areas are treated through septic tanks and two sewage treatment plants (STPs) provided within the premises. The STPs comprise of collection tank, anaerobic reactor, sand filter and treated effluent collection tank. The treated effluent from STP is reused for green belt development.

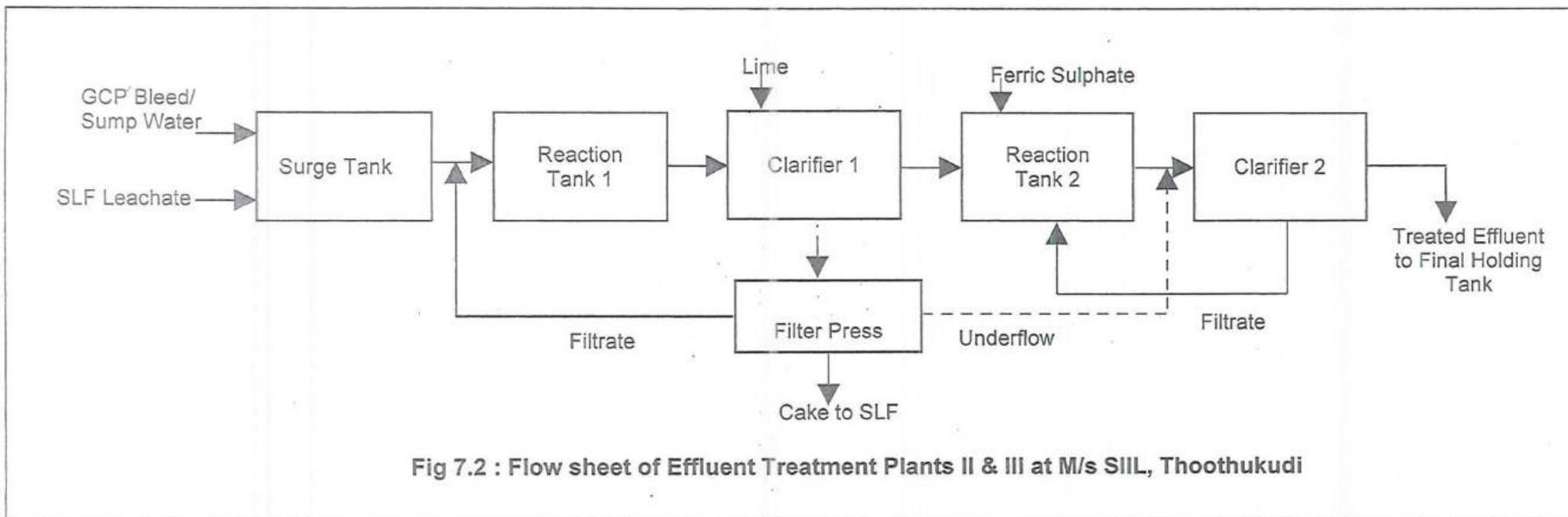
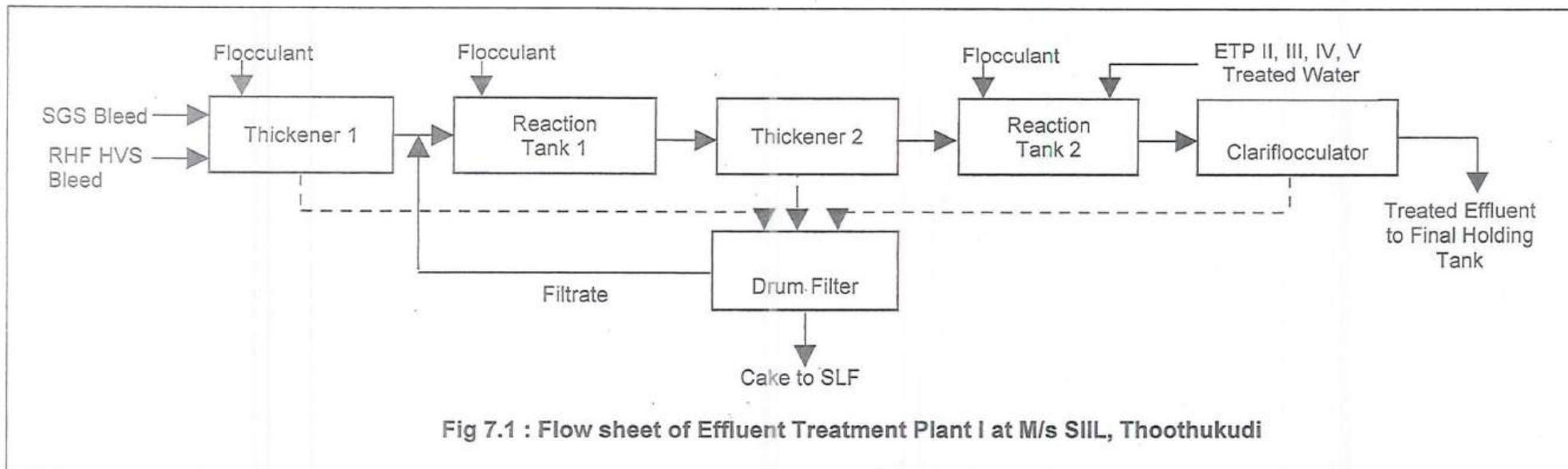
7.2 Process Effluent Treatment

M/s SILL has provided five effluent treatment plants (ETPs) for process effluents from Copper Smelter Project, inclusive of the SAP comprising the following sources:

- Smelter secondary gas cleaning & scrubber effluents
- Gas cleaning & sulphuric acid plant floor washings
- Cathode copper plant electrolyte bleed off

In addition, floor washings and pump seal water of ETPs, and leachate from SLF are also treated in the ETPs. The treatment flow sheet of the five ETPs are presented in Figs. 7.1 through 7.4.

Effluent treatment plant – I [Fig. 7.1] : Slurry from secondary gas scrubbers I & II, and rotary holding furnace-hygiene ventilation system scrubber is received in thickener 1 where coagulants are added. The overflow containing less than 0.5% solids is routed to reaction tank 1 where again coagulants are added followed by thickener 2. The overflow from reaction tank 1 and treated effluents from ETPs - II,III,IV & V are routed to reaction tank 2 and then finally to clari-flocculator. The treated effluent from clari-flocculator is stored in final holding



tank (FHT). Underflow of thickener 1, 2 and clari-flocculator is pumped to drumfilter via the drum filter slurry tank. The filtrate from drum filter is taken back to reaction tank 1 and the dewatered cake is disposed off in secure landfill (SLF).

Effluent treatment plants as above -II & III [Fig. 7.2] : The effluent from gas cleaning plant (GCP) and leachate from the SLF are collected in surge tank. From the surge tank, the effluent is routed for primary clarification in ETP IV. The supernatant after clarification is routed to flash mixer, where lime solution is added to increase the pH from 1.5 to 3.5-4.5. Thereafter, the content enters reaction tank 1 where again lime solution is added to maintain the pH in the range 4.0-5.0. The solution is reacted with ferric sulphate to convert soluble arsenic to solid ferric arsenate $[\text{Fe}_2(\text{SO}_4)_3]$.

Ferric arsenate solid liquid separation takes place in the clarifier. The overflow from reaction tank 1 goes to the conventional clarifier 1 where coagulant is added to promote settling of solids. The overflow from clarifier 1 is taken to reaction tank 2. Calcium arsenate precipitation takes place in reaction tank 2. The removal of the soluble arsenic is removed by reacting the solution with ferric sulphate solution and calcium hydroxide conditions which maximizes arsenic precipitation. The precipitate consists primarily of calcium arsenate, ferric arsenate, metal hydroxides and gypsum.

The clarifier 2 underflow is returned to reaction tank 1. The overflow from clarifier 2 is taken to a final effluent holding tank and then routed to reaction tank 2 of ETP I. The underflow from clarifier 1 is taken to filter press and the filtrate back to reactor 1 for recirculation. The dewatered cake is disposed off in SLF.

In the case of ETP 3, the entire process is similar except that the underflow from clarifier 1 is taken to the drum filter.

Effluent treatment plant -IV [Fig. 7.3] : The effluent from GCP stored in the raw effluent holding tank is pumped to flash mixer 1 where coagulant is added followed by clarification in primary clarifier. The underflow solids from the clarifier is filtered in the filter press and the cake is recycled to concentrate warehouse (smelter) and filtrate taken back to flash mixer 1.

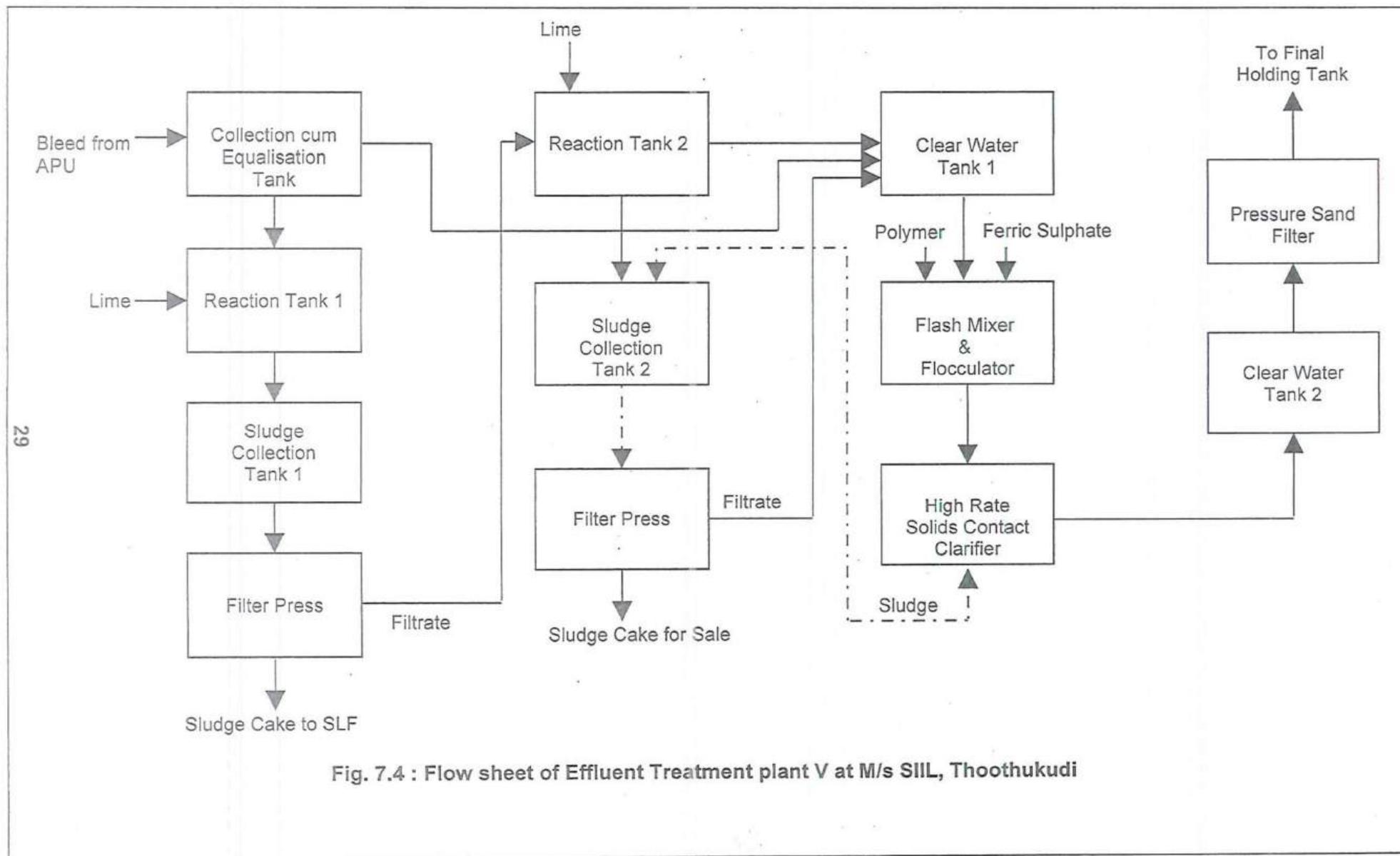
The clear effluent from primary clarifier is taken to reactor 1 where 10% sodium sulphide solution is dosed followed by routing to reactors 2 and 3. Sulphide treated effluent from reactor 3 goes to secondary clarifier through flash mixer 2 where coagulant is dosed. The solids from secondary clarifier underflow are disposed off in SLF after filtration through filter press and the filtrate taken back to flash mixer 2.

The reaction tanks being sealed, H_2S is released which is scrubbed in alkali scrubbers by spraying sodium hydroxide. During scrubbing, sodium hydroxide absorbs H_2S forming Na_2S which is recycled to sodium sulphide tank for reuse.

After removal of arsenic and most of the other heavy metals, what remains is weak sulfuric acid with high sodium content. This weak acid is neutralized with lime in the lime neutralizer. The neutralized liquid is taken to lime clarifier. The underflow from lime clarifier is taken to drum filter for filtration and the cake is disposed off in SLF and the filtrate is taken back into lime neutralizer for recycling. The clear treated effluent is routed to final holding tank and then pumped to reaction tank 2 of ETP I for recycling.

Effluent treatment plant -V [Fig. 7.4] : Effluent from acid purification unit (APU) containing heavy metals is collected in an effluent collection cum equalization tank. The equalized effluent is transferred to reaction tank 1 where lime solution is added to adjust the pH to 3.5 for precipitation of arsenic. The bottom sludge is taken by gravity into sludge pit 1 from where it is pumped to filter press and the sludge cake disposed off in SLF.

The filtrate from the filter press is taken to reaction tank 2 where lime solution is added to increase the pH in the range 9 -10 to ensure precipitation of heavy metals. The bottom sludge is taken by gravity to sludge pit 2 from where it is pumped to filter press and the nickel bearing sludge cake is bagged for sale. The filtrate from filter press is taken to clear water tank 1 followed by routing to flash mixer where ferric sulphate and polymer are added to further precipitate heavy metals. The overflow from the flash mixer flows by gravity to the central well of high rate solids contact clarifier (HRSCC). Settled sludge in HRSCC is transferred to sludge pit 2 by gravity. It is pumped to filter press and the sludge



cake is disposed off in SLF. The filtrate from filter press is taken in clear water tank 1 for recirculation. The clear overflow from HRSCC is collected in a clear water tank 2 from where it is pumped to pressure sand filter for removal of any residual suspended solids and turbidity, and then to final holding tank (FHT).

7.3 Advanced Treatment (Membrane System) for Treated Effluent from ETPs

The treated effluent from ETP I-V are post-treated in advanced treatment system comprising pretreatment followed by ultrafiltration (UF) and 2 stage reverse osmosis system (RO) including reject management through force circulation evaporator (IV effects) [Fig. 7.5].

The pretreatment to membrane system include chemical treatment consisting of flash mixer followed by clariflocculator. Coagulants namely, lime, soda ash and ferrous chloride are dosed in flash mixer followed by settling in clariflocculator. The supernatant is collected in collection tank and pumped to dual media and pressure sand filter for removal of suspended solids and organic matter, if any. The settled sludge from clariflocculator is pumped to filter press for dewatering and dewatered cake finally disposed off in SLF.

The pretreated effluent is pumped to UF for removal of residual suspended solid and organic matter. The UF rejects are taken back to flash mixer for further treatment and the permeate pumped to 2 stage RO system for removal of dissolved solid (TDS). The RO II rejects was concentrated in force circulation evaporator. The evaporator concentrate is centrifuged and salt disposed off in SLF. The permeate from RO I and II along with condensate from evaporation system is recycled/reused in process.

7.4 Treatment Facility for Wastewater Streams from Utilities

Wastewater streams from utilities namely cooling tower, blow down, pump house backwash water, ISA DM & refinery DM regeneration water are collected in collection tank 1 and routed to the clarifier where coagulant (alum) and coagulant aid (polyelectrolyte) are added for removal of suspended solids present in low concentration. The settled sludge from the clarifier is routed to sludge drying beds and dried sludge disposed off in SLF.

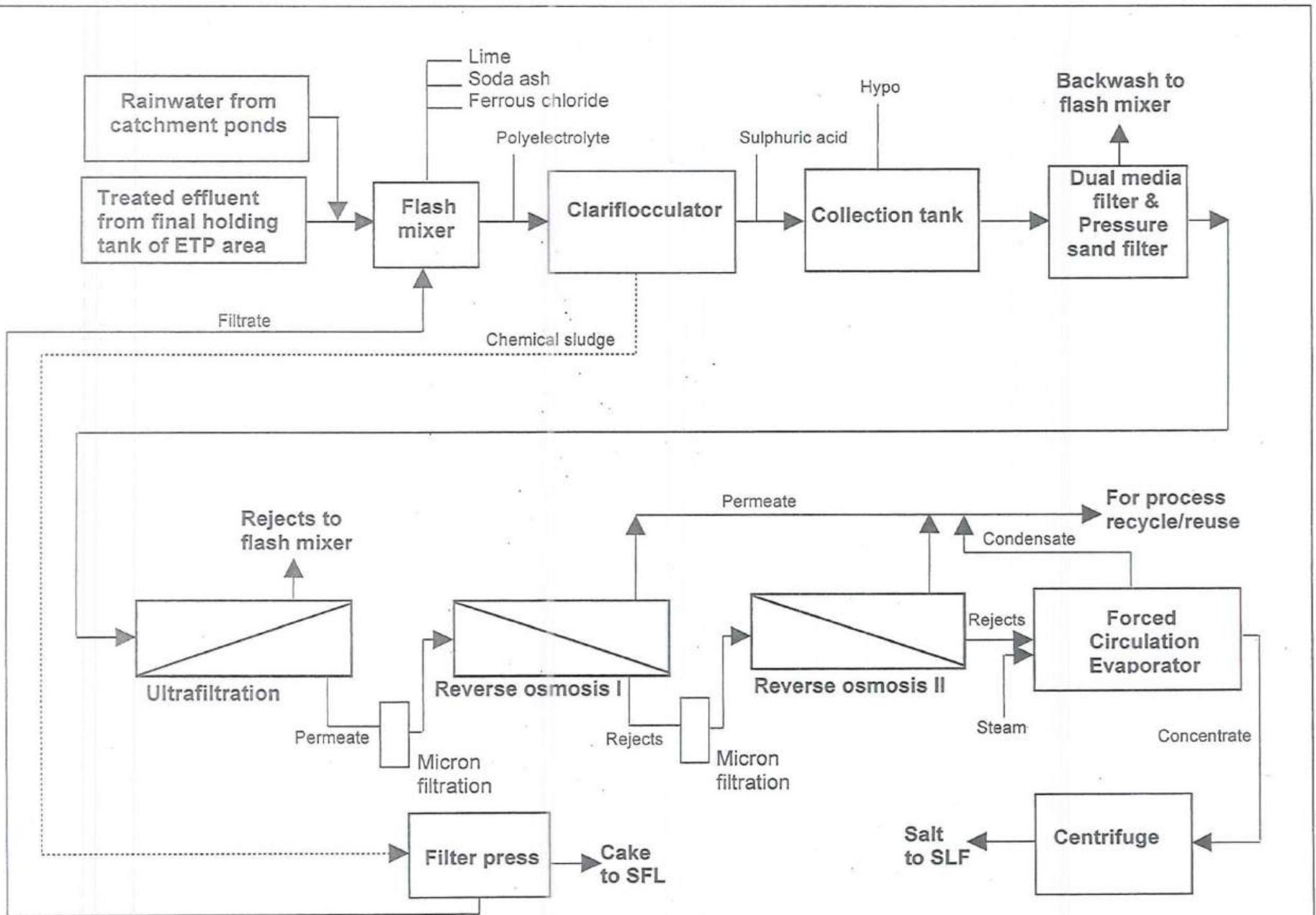


Figure 7.5 : Schematic of Advanced Treatment System for Water Recovery from ETPs Treated Effluent

The supernatant is collected in the collection tank 2 where addition of sodium hypochlorite solution is practiced. The chemically treated effluent is then pumped to pressure sand filter and activated carbon column for removal of residual suspended solid, trace organic matter and free residual chlorine. The pretreated effluent is treated in ultra filtration unit (UF) for removal of turbidity and residual organic matter. The UF permeate is then pumped to RO for removal of TDS and recovery of renovated water. The RO permeate along with condensate from evaporator is recycled/reused for process use. The UF rejects are taken back to collection tank 1 for further treatment, and RO rejects are concentrated in evaporator. The concentrate from evaporators is spray dried through sprayers and dried salt is disposed off in SLF [Fig. 7.6].

II. ASSESSMENT OF EXISTING STATUS OF ENVIRONMENTAL POLLUTION

8.0 Water Environment

During inspection, various sites were visited inside the industry premises, namely, tippler area, fork lift area, cooling pond, control room, copper smelter, sulphuric acid plant, refinery plant, continuous copper rod plant, effluent treatment plants, spray ponds, secured landfill, gypsum pond area, slag yard, garbage area, rainwater catchment reservoirs, etc. Based on the site inspection and identification of sampling locations by NEERI and the PIL petitioners, effluent (wastewater) samples were collected from effluent treatment plants (I-V), spray pond, surge pond, RO system, rainwater catchment reservoirs and stagnant water inside the ETP area. Ground water samples were collected from piezometric monitoring wells located around SLF, slag yard and gypsum ponds.

Ground water samples from borewells/open dugwells from the adjoining villages namely Swaminathan, Kayalurani, TV Puram, Meelavittan and Silverpuram located within an aerial distance of 1.4 – 5.3 km from M/s SILL were also collected. Surface water samples were collected from the nullah (odai) flowing adjacent to the boundary wall of M/s SILL.

Samples were collected in 2 litre fresh clear white plastic bottles. Preservatives were added in the samples for conducting analyses at NEERI, Nagpur. The water/wastewater samples were analysed for pH, total dissolved solids (TDS),

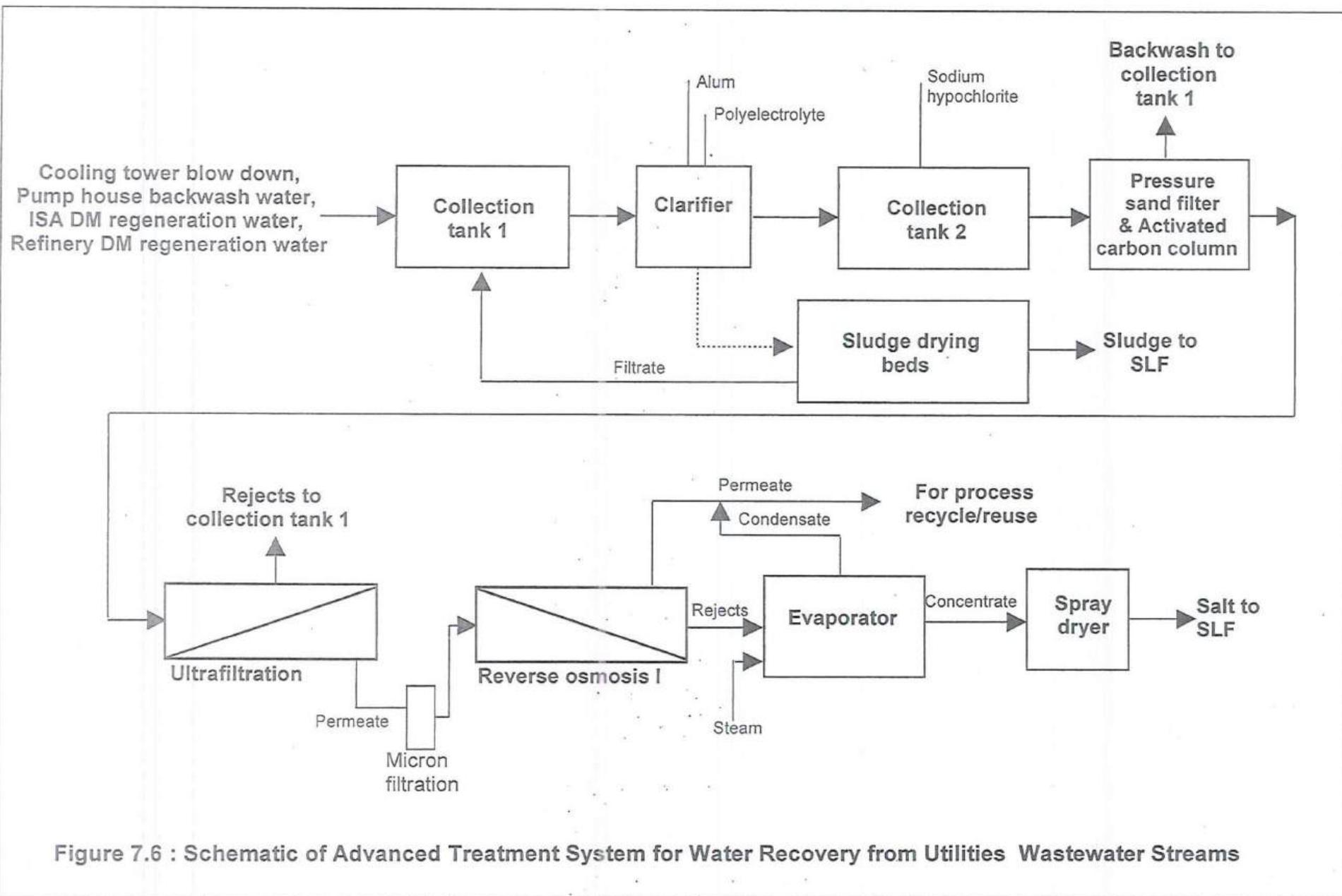


Figure 7.6 : Schematic of Advanced Treatment System for Water Recovery from Utilities Wastewater Streams

suspended solids, sulphates, chlorides, sodium, potassium, calcium, magnesium, hardness, dissolved phosphates, fluorides, biochemical oxygen demand (BOD), chemical oxygen demand (COD), arsenic and heavy metals. All the analysis were conducted in accordance within Standard Methods for Examination of Water & Wastewater, 21st Edition, 2005 (APHA, AWWA, WPCF).

8.1 Adequacy Assessment of Effluent Treatment Facilities

To assess the performance of the ETPs, influent and effluent samples were collected from the effluent treatment plants (ETPs I-V). The location of the ETPs in the plant premises is presented in **Fig. 8.1**. Influent and effluent grab samples from the five ETPs were collected including the final combined treated effluent from the final holding tank. The influent and effluent characteristics of the ETPs are presented in **Table 8.1**. The final holding tank containing treated effluent from the five ETPs meets the stipulated discharge norms as per the TNPCB Consent except for the parameters TDS, sulphates and fluoride. The final combined treated effluent is partially recycled back for reuse within the industry for various purposes (slag granulation, in gas cleaning plant and preparation of coagulant/flocculant solution in ETPs).

Samples were also collected from the spray pond where the treated effluent is used for slag granulation, and also from the surge pond where the final treated effluent collected, stored and routed for further treatment through advanced treatment system. In addition, a sample was also collected from a stagnant pool near ETP drum filter as identified by one of the petitioner during the inspection. The characteristics of the aforereferred samples are presented in **Table 8.2**.

8.2 Water Quality of Catchment Rainwater Reservoir

Two catchment rainwater reservoirs of 25,000 m³ capacity each have been provided to collect the storm water runoff from the plant area. Storm water drains have been provided within the industry premises to collect and convey the runoff into sumps and pumped to the reservoirs. One reservoir is designated for runoff collected from gypsum pond area and other to cater the runoff from remaining process and storage areas. Samples collected from the rain water catchment reservoirs are presented in **Table 8.3**, and the sampling locations are shown in **Fig. 8.1**.

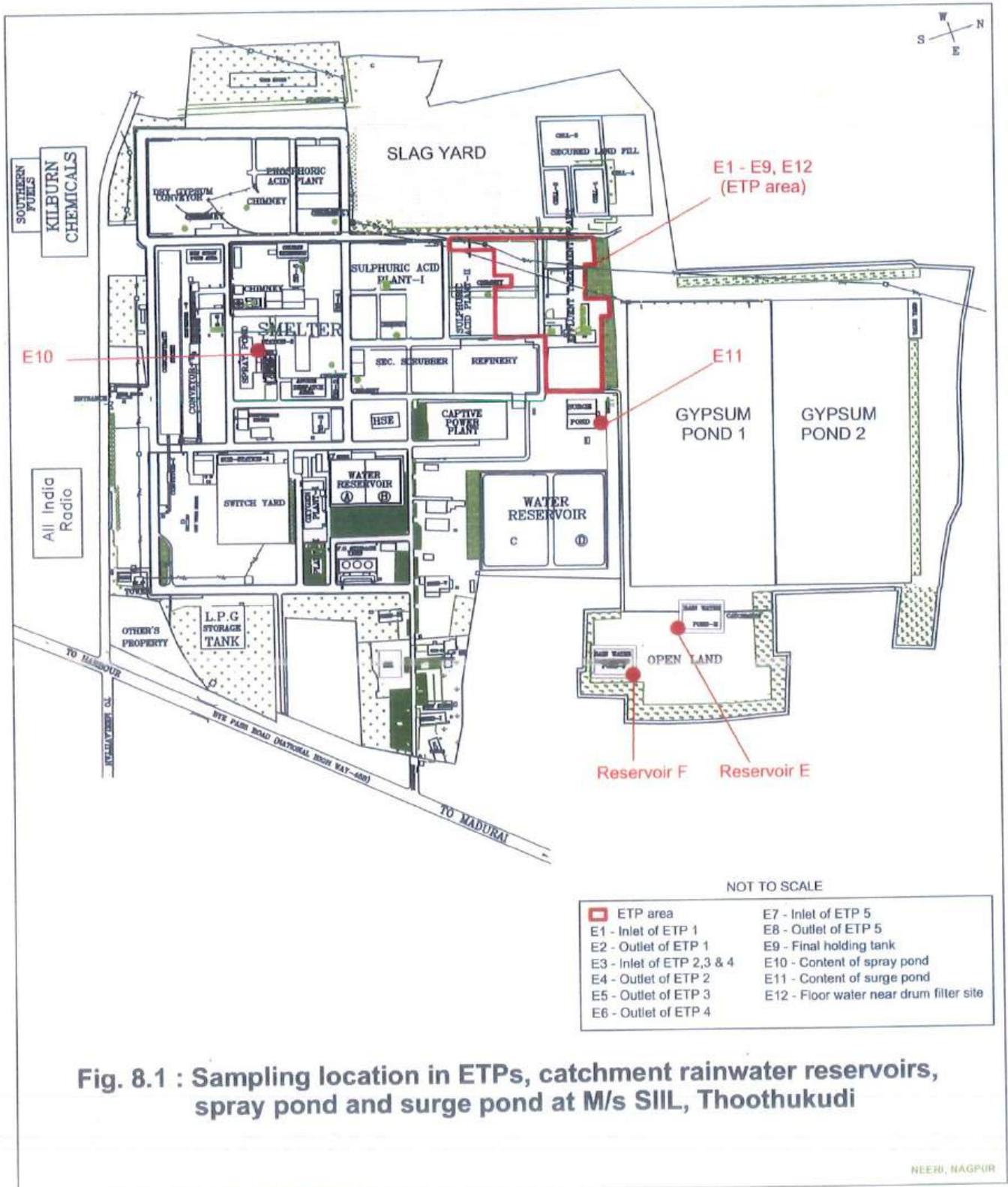


Table 8.1 : Characteristics of Effluents at various stages of Effluent Treatment Facilities at M/s SIIL, Thoothukudi
(Date of sampling: April 7-8, 2011)

Sr. No.	Parameters	Sample Source									Standards*
		E1	E2	E3	E4	E5	E6	E7	E8	E9	
1.	pH	9.4	5.9	1.2	6.3	6.3	6.4	2.0	8.2	6.5	5.5-9.0
2.	Suspended solids	5930	BDL	65	8	4	15	1986	4	12	30
3.	Total dissolved solids	3442	3978	4748	4994	4902	1811	6259	6202	4934	2100
4.	Chlorides as Cl ⁻	240	210	422	807	709	344	750	996	866	1000
5.	Sulphates as SO ₄ ²⁻	1200	1200	2300	2230	1278	1442	3854	3830	2470	1000
6.	Dissolved phosphates as PO ₄ ³⁻	BDL	BDL	0.08	2.5	2.6	2.5	BDL	BDL	2.2	5.0
7.	Calcium as Ca	665	492	84	596	512	634	541	658	412	-
8.	Magnesium as Mg	297	158	72	254	210	186	312	203	142	-
9.	Fluorides as F ⁻	1.5	0.6	438	5.0	4.8	4.4	BDL	BDL	3.7	2.0
10.	Sodium	108	752	481	894	914	872	BDL	773	419	-
11.	Potassium	6	30	50	70	20	19	BDL	93	5	-
12.	Chemical oxygen demand as O ₂	25	4	156	60	BDL	20	BDL	16	BDL	250
13.	Biochemical oxygen demand as O ₂	10	BDL	71	10	BDL	BDL	BDL	BDL	BDL	20
14.	Arsenic	0.093	BDL	502.128	0.159	0.165	0.133	396	0.010	0.061	0.2
16.	Heavy metals										
	Cadmium	0.128	BDL	51.08	BDL	BDL	BDL	BDL	BDL	BDL	2.0
	Cobalt	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-
	Chromium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.0
	Copper	7.023	0.051	0.692	0.064	0.049	0.144	300	0.112	0.817	3.0
	Iron	1.222	0.017	4.776	0.247	0.171	0.461	899	0.513	0.145	-
	Manganese	BDL	BDL	0.050	0.567	0.570	0.570	BDL	0.412	0.523	-
	Nickel	BDL	0.602	BDL	0.052	0.043	0.036	8870	0.001	0.823	3.0
	Lead	1.747	BDL	9.860	BDL	BDL	BDL	10	BDL	BDL	0.1
	Zinc	0.331	BDL	63.04	0.772	0.742	0.531	BDL	0.659	0.611	1.0

All parameters except pH are expressed in mg/l; BDL- Below detectable limit.

*Stipulated Standards as per TNPCB Consent.

Sample Source: E1 - Inlet of ETP 1.

E5 - Outlet of ETP 3. ✓

E9 - Final Holding Tank.

E2 - Outlet of ETP 1. ✓

E6 - Outlet of ETP 4. ✓

E3 - Inlet of ETP 2,3 & 4.

E7 - Inlet of ETP 5.

E4 - Outlet of ETP 2. ✓

E8 - Outlet of ETP 5. ✓

**Table 8.2 : Characteristics of Effluents from various Sources
at M/s SILL, Thoothukudi
(Date of sampling: April 7-8, 2011)**

Sr. No.	Parameters	Sample Source		
		E10	E11	E12
1.	pH	5.9	7.3	7.2
2.	Suspended solids	24	93	96
3.	Total dissolved solids	4319	3565	1811
4.	Chlorides as Cl ⁻	140	685	1114
5.	Sulphates as SO ₄ ²⁻	2253	1008	122
6.	Dissolved phosphates as PO ₄ ³⁻	2.2	4.0	4.0
7.	Calcium as Ca	440	476	152
8.	Magnesium as Mg	162	137	61
9.	Fluorides as F ⁻	3.5	1.2	1.2
10.	Sodium	1073	317	211
11.	Potassium	30	4	4
12.	Chemical oxygen demand as O ₂	8	BDL	BDL
13.	Biochemical oxygen demand as O ₂	BDL	BDL	BDL
14.	Arsenic	0.175	BDL	0.003
15.	Heavy metals			
	Cadmium	BDL	BDL	BDL
	Cobalt	BDL	BDL	BDL
	Chromium	BDL	BDL	BDL
	Copper	0.149	0.037	BDL
	Iron	1.629	3.297	0.617
	Manganese	0.343	0.179	0.119
	Nickel	0.108	BDL	BDL
	Lead	BDL	BDL	BDL
	Zinc	1.476	1.355	0.170

All parameters except pH are expressed in mg/l; BDL- Below detectable limit.

Sample Source Location: E10 – Content of Spray Pond.

E11 – Content of Surge Pond.

E12 – Floor water near Drum Filter site.

Table 8.3 : Characteristics of Samples from Catchment Rainwater Storage Reservoirs M/s SILL, Thoothukudi
(Date of sampling: April 8, 2011)

Sr. No.	Parameters	Sample Source	
		Reservoir E	Reservoir F
1.	pH	7.7	7.6
2.	Suspended solids	6	28
3.	Total dissolved solids	2239	2539
4.	Chlorides as Cl ⁻	183	211
5.	Sulphates as SO ₄ ²⁻	860	900
6.	Dissolved phosphates as PO ₄ ³⁻	2.9	2.1
7.	Calcium as Ca	500	520
8.	Magnesium as Mg	26	24
9.	Fluorides as F ⁻	0.7	0.9
10.	Sodium	424	334
11.	Potassium	10	5
12.	Chemical oxygen demand as O ₂	8	BDL
13.	Biochemical oxygen demand as O ₂	BDL	BDL
14.	Arsenic	BDL	BDL
15.	Heavy metals		
	Cadmium	BDL	BDL
	Cobalt	BDL	BDL
	Chromium	BDL	BDL
	Copper	0.276	0.581
	Iron	1.616	3.781
	Manganese	0.079	0.095
	Nickel	BDL	BDL
	Lead	BDL	BDL
	Zinc	0.058	0.336

All parameters except pH are expressed in mg/l; BDL-- Below detectable limit.

The runoff collected from gypsum pond area is directly reused in the phosphoric acid plant for silica slurry preparation and gypsum filter wash enabling enhancing the recovery of the product acid. The runoff collected from the plant area excluding gypsum pond area is then subjected to treatment through advanced treatment system comprising filtration followed by ultrafiltration and reverse osmosis system. The design capacity of the RO system is 2000 m³/day. The recovered treated water (80% recovery) is recycled for cooling water make up within the plant.

8.3 Advanced Treatment System (UF & RO) Treated for Effluent from ETPs

The treated effluent from ETPs is recycled/reused directly for various uses within the industry. However, due to high concentrations of TDS in the treated effluent, the possibility of pollutants build-up is envisaged specifically the dissolved solids. This results in scaling and clogging problems in the end use units requiring frequent maintenance. In view of this, the industry has implemented advanced treatment system comprising ultrafiltration (UF) and reverse osmosis system (RO) for recovery of process grade water for recycle/reuse. The design capacity of RO system is 1650 m³/day. Evaluation of the RO systems was carried out, and the performance of the RO system implemented for ETP treated effluent and rainwater runoff is presented in **Table 8.4**. The characteristics of the permeate from RO system indicate that the recovered water is meeting the stipulated norms with respect to all the analysed parameters. The effluent water balance and rainwater balance is presented in **Figs. 8.2 and 8.3**, respectively.

8.4 Temporary Storage Ponds for RO rejects

During heavy rains in November 2010, the storm water runoff from the catchment area was collected and treated along with treated effluent from ETPs through the RO system for recovery of reusable water. But due to the inadequate capacity of the evaporation system, the rejects generated from the RO system were stored in temporarily constructed storage ponds.

The bottom of the ponds, constructed of the earthen material, is covered with 300 mm thickness of clay overlaid with 1 millimetre high density polyethylene (HDPE) liner over which the rejects are stored. 18 ponds each of 50 x 20 meter

Table 8.4 : Characteristics of Samples from RO System at M/s SILL, Thoothukudi
(Date of sampling: April 22, 2011)

Sr. No.	Parameters	Sample Source						Standards*
		ETP RO System			Catchment Rainwater RO System			
		Feed	Permeate	Rejects	Feed	Permeate	Rejects	
1.	pH	6.8	6.5	6.7	6.8	6.7	6.8	5.5-9.0
2.	Suspended solids	24	BDL	68	223	BDL	397	30
3.	Total dissolved solids	3856	193	10567	2190	203	3596	2100
4.	Chlorides as Cl ⁻	337	36	1056	302	31	582	1000
5.	Sulphates as SO ₄ ²⁻	916	43	3024	523	22	964	1000
6.	Dissolved phosphates as PO ₄ ³⁻	2.5	BDL	7.2	1.8	BDL	3.5	5.0
7.	Calcium as Ca	423	18	1023	271	12	476	-
8.	Magnesium as Mg	258	15	589	118	7	223	-
9.	Fluorides as F ⁻	0.6	BDL	3	0.1	BDL	0.6	2.0
10.	Sodium	716	15	1854	224	5	426	-
11.	Potassium	283	2	774	156	0.8	305	-
12.	Chemical oxygen demand as O ₂	5	BDL	12	12	BDL	32	250
13.	Biochemical oxygen demand as O ₂	22	BDL	53	37	BDL	54	20
14.	Arsenic	0.1	BDL	0.2	0.01	BDL	0.05	0.2
15.	Heavy metals							
	Cadmium	BDL	BDL	BDL	BDL	BDL	BDL	2.0
	Cobalt	BDL	BDL	BDL	BDL	BDL	BDL	-
	Chromium	BDL	BDL	BDL	BDL	BDL	BDL	2.0
	Copper	1.2	BDL	3.1	0.6	BDL	1.5	3.0
	Iron	2.2	0.17	1.9	1.2	0.2	3.5	-
	Manganese	BDL	BDL	BDL	BDL	BDL	BDL	-
	Nickel	0.01	BDL	0.02	BDL	BDL	BDL	3.0
	Lead	0.02	BDL	0.05	BDL	BDL	BDL	0.1
	Zinc	0.35	BDL	0.72	0.03	BDL	0.08	1.0

All parameters except pH are expressed in mg/l; BDL- Below detectable limit.

*Stipulated Standards as per TNPCB Consent.

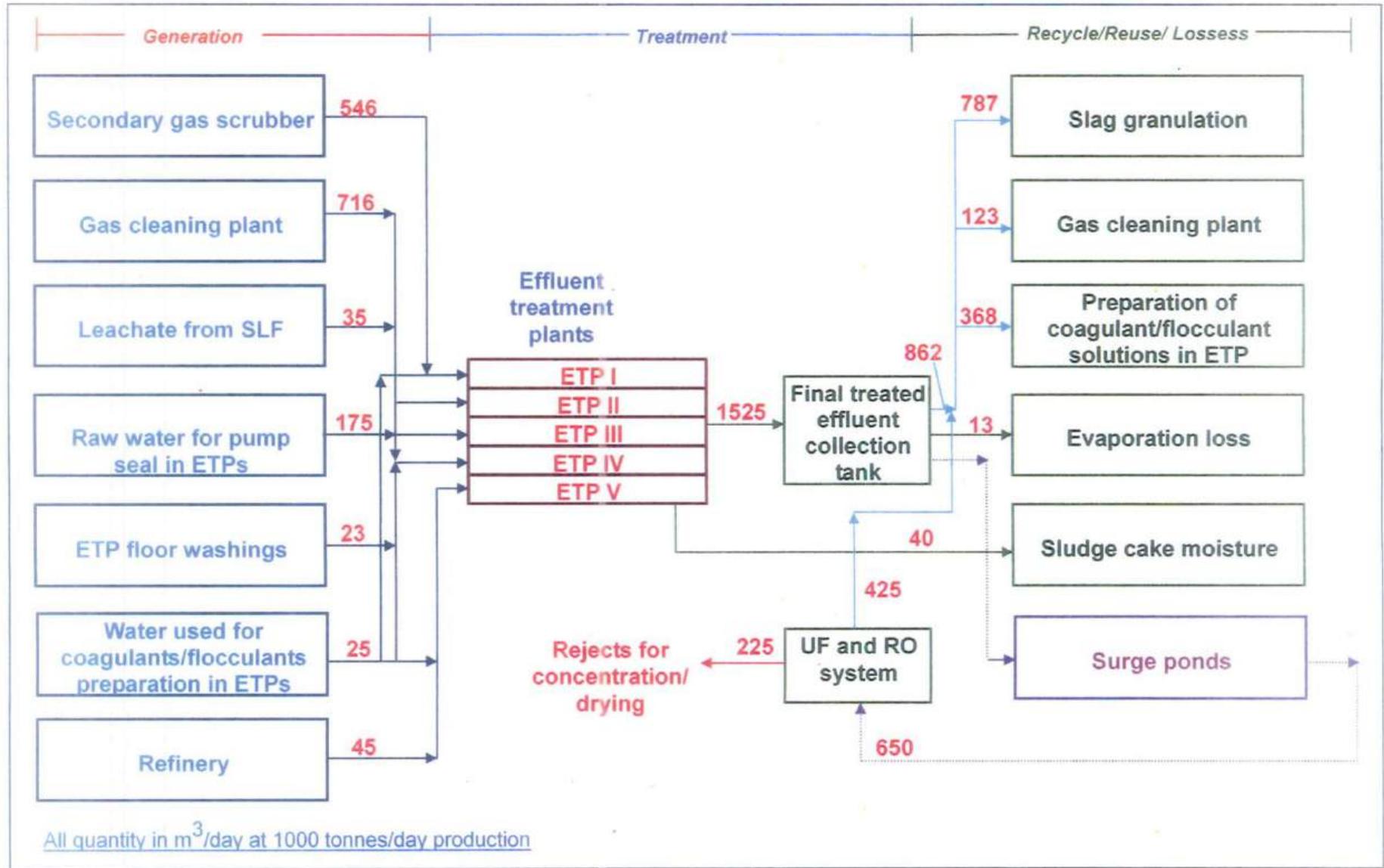
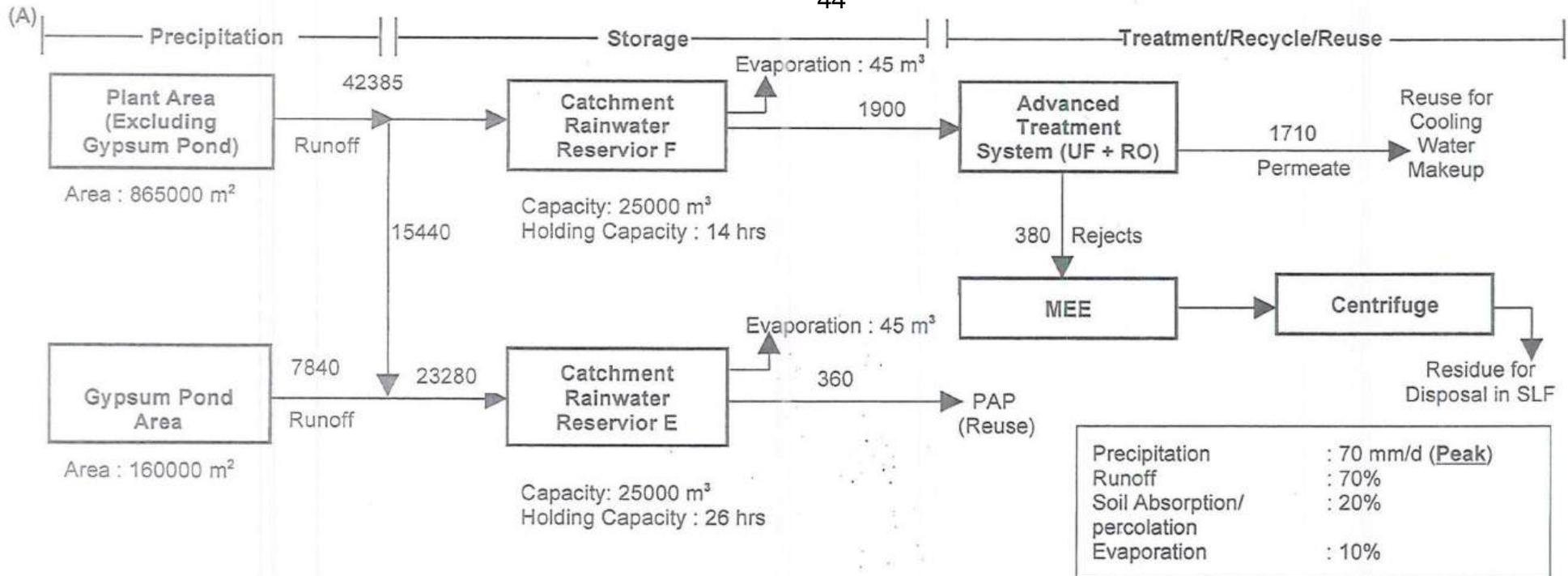


Fig. 8.2 : Effluent Water Balance : Generation-Treatment-Recycle/Reuse-Losses

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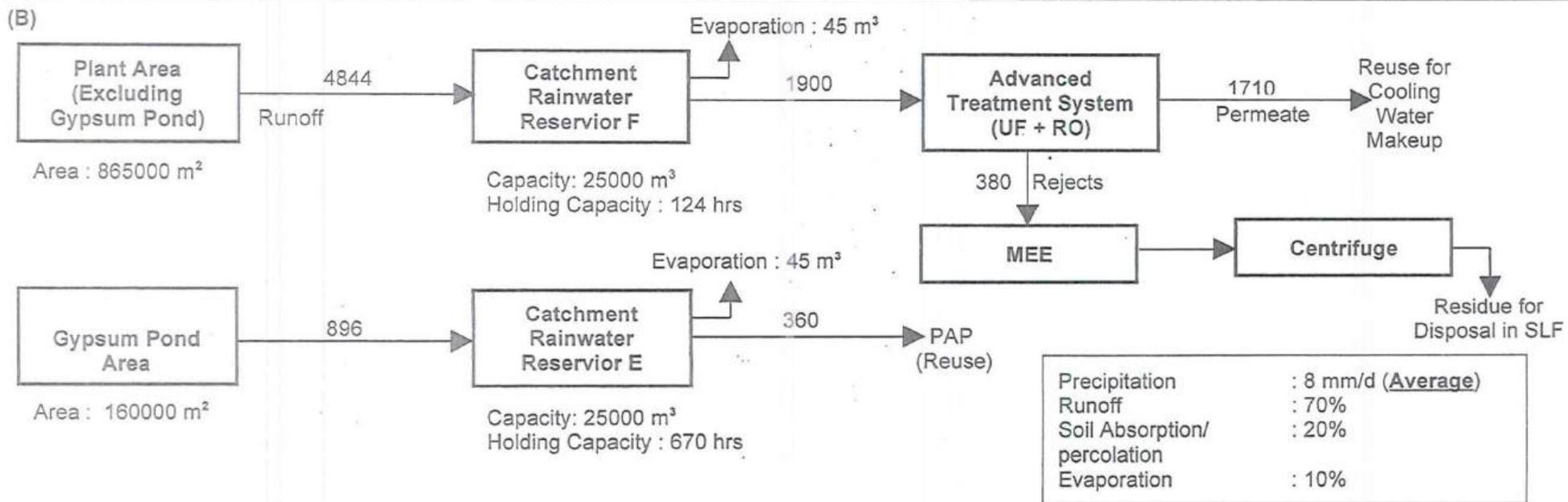


Fig 8.3 : Rainwater Balance – Peak Precipitation (A) ; Average Precipitation (B)

dimension contain about 12,000 m³ of RO rejects. Random samples from 2 ponds were collected for characterization and is presented in **Table 8.5**. The characteristics of samples indicate that the effluent stored in these ponds are RO rejects.

8.5 Ground Water Quality

8.5.1 Piezometric Wells

Ground water samples from piezometric wells installed near the secured landfill facility, slag yard and gypsum pond were collected and analysed. The sampling locations are presented in **Fig. 8.4**. The piezometric wells around SLF are located on the east, west, north, northeast and south of SLF. The characteristics of the ground water samples around SLF and slag yard are presented in **Table 8.6**. Four samples were collected from the piezometric wells located on the east, west, north and south of gypsum pond. The characteristics of the samples are presented in **Table 8.7**.

8.5.2 Bore Wells & Dug Wells from Surrounding Areas

Ground water samples were collected from the adjoining villages, namely, TV Puram, Meelavittam, Silverpuram, Swaminathan and Kayaloorani located about 1.4 - 5.3 km aerial distance from M/s SILL. The sampling locations are presented in **Fig. 8.5**. The characteristics of the ground water samples are presented in **Table 8.8**.

8.6 Surface Water Quality

Assessment of surface water quality was conducted through collection of water samples from the nullah (odai) flowing adjacent to the boundary wall of M/s SILL. The direction of flow of the stream follows the gradient from northwest to southeast. The sampling locations are presented in **Fig. 8.5**. The physico-chemical characteristics of the samples collected are presented in **Table 8.9**.

8.7 Observations

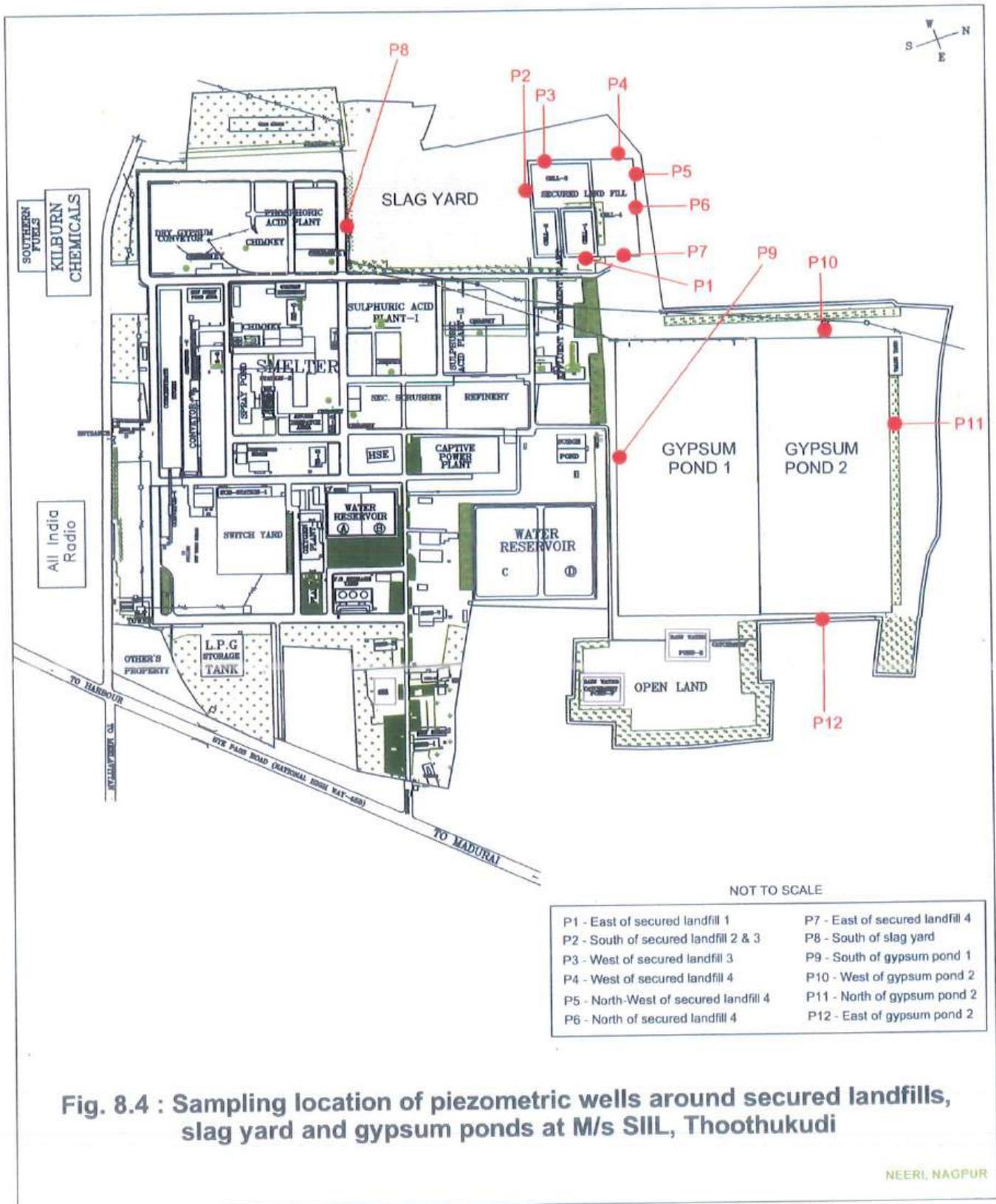
- The performance assessment of the five ETPs indicates that the characteristics of the treated effluent from the ETPs meet the stipulated regulatory norms except for the parameters, namely, total dissolved solids (TDS), sulphates, and fluoride.

**Table 8.5 : Characteristics of RO rejects from Temporary Storage Ponds
at M/s SILL, Thoothukudi
(Date of sampling: April 21, 2011)**

Sr. No.	Parameters	Sample Source	
		R2	R3
1.	pH	6.6	6.5
2.	Suspended solids	BDL	BDL
3.	Total dissolved solids	20202	17839
4.	Chlorides as Cl ⁻	5575	4150
5.	Sulphates as SO ₄ ²⁻	3400	4500
6.	Dissolved phosphates as PO ₄ ³⁻	8.8	15.4
7.	Calcium as Ca	520	576
8.	Magnesium as Mg	340	410
9.	Fluorides as F ⁻	12.6	8.93
10.	Sodium	9325	7391
11.	Potassium	295	148
12.	Chemical oxygen demand as O ₂	73	BDL
13.	Biochemical oxygen demand as O ₂	18	BDL
14.	Arsenic	7.22	40.8
15.	Heavy metals		
	Cadmium	0.07	0.05
	Cobalt	BDL	BDL
	Chromium	BDL	BDL
	Copper	0.28	0.11
	Iron	0.16	0.28
	Manganese	0.61	1.67
	Nickel	0.11	0.09
	Lead	BDL	BDL
	Zinc	0.1	0.19

All parameters except pH are expressed in mg/l; BDL- Below detectable limit.

Sample Source Location: R2 - Temporary RO reject storage pond 2.
R3 - Temporary RO reject storage pond 3.



**Table 8.6 : Characteristics of Samples from Piezometric Wells around Secured Landfills and Slag Yard
at M/s SILL, Thoothukudi
(Date of sampling: April 7-8, 2011)**

Sr. No.	Parameters	Sample Source							
		P1	P2	P3	P4	P5	P6	P7	P8
1.	pH	7.4	7.3	7.7	7.7	7.6	7.7	7.6	7.6
2.	Suspended solids	93	91	7	17	34	BDL	BDL	16
3.	Total dissolved solids	2186	3360	1778	1746	1980	1384	1680	2526
4.	Chlorides as Cl ⁻	715	495	153	143	199	141	149	238
5.	Sulphates as SO ₄ ²⁻	320	610	640	512	660	228	440	920
6.	Dissolved phosphates as PO ₄ ³⁻	3.0	2.9	2.8	2.4	1.9	2.0	2.1	2.7
7.	Calcium as Ca	284	439	220	116	144	168	204	400
8.	Magnesium as Mg	93	156	113	156	140	115	76	82
9.	Fluorides as F ⁻	1.0	1.8	1.6	1.4	1.0	1.3	1.4	1.9
10.	Sodium	372	444	202	290	420	178	281	325
11.	Potassium	7	15	4	4	7	4	3	4
12.	Chemical oxygen demand as O ₂	BDL	BDL	BDL	BDL	18	BDL	BDL	BDL
13.	Biochemical oxygen demand as O ₂	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.	Arsenic	0.006	0.006	0.009	0.009	0.005	0.005	0.009	0.007
15.	Heavy metals								
	Cadmium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	Cobalt	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	Chromium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	Copper	0.029	0.050	0.019	0.038	0.029	0.016	0.012	0.033
	Iron	0.973	1.351	1.048	1.580	1.71	1.126	0.836	1.728
	Manganese	0.074	BDL	0.020	0.024	0.048	BDL	BDL	0.086
	Nickel	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	Lead	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.080
	Zinc	1.873	1.183	1.704	2.765	2.744	1.621	1.613	2.813

All parameters except pH are expressed in mg/l; BDL- Below detectable limit.

Sample Source Location: P1 – East of Secured Landfill 1.
P4 – West of Secured Landfill 4.
P7 – East of Secured Landfill 4.

P2 – South of Secured Landfill 2 & 3.
P5 – North-West of Secured Landfill 4.
P8 – South of Slag Yard.

P3 – West of Secured Landfill 3.
P6 – North of Secured Landfill 4.

Table 8.7 : Characteristics of Samples from Piezometric Wells around Gypsum Ponds at M/s SILL, Thoothukudi
(Date of sampling: April 7-8, 2011)

Sr. No.	Parameters	Sample Source			
		P9	P10	P11	P12
1.	pH	7.3	7.6	7.5	7.6
2.	Suspended solids	96	10	BDL	82
3.	Total dissolved solids	2958	2185	1150	1812
4.	Chlorides as Cl ⁻	765	158	145	153
5.	Sulphates as SO ₄ ²⁻	702	575	186	422
6.	Dissolved phosphates as PO ₄ ³⁻	4.0	2.3	1.8	2.2
7.	Calcium as Ca	413	232	164	232
8.	Magnesium as Mg	126	77	122	9
9.	Fluorides as F ⁻	1.1	1.6	1.3	1.5
10.	Sodium	360	273	218	204
11.	Potassium	9	4	5	4
12.	Chemical oxygen demand as O ₂	10	BDL	BDL	BDL
13.	Biochemical oxygen demand as O ₂	BDL	BDL	BDL	BDL
14.	Arsenic	BDL	BDL	BDL	0.005
15.	Heavy metals				
	Cadmium	BDL	BDL	BDL	BDL
	Cobalt	BDL	BDL	BDL	BDL
	Chromium	BDL	BDL	BDL	BDL
	Copper	BDL	0.035	0.018	0.027
	Iron	0.939	2.146	1.267	1.689
	Manganese	0.093	0.031	BDL	0.024
	Nickel	BDL	BDL	BDL	BDL
	Lead	BDL	BDL	BDL	BDL
	Zinc	1.043	2.683	1.733	1.733

All parameters except pH are expressed in mg/l; BDL- Below detectable limit.

Sample Source Location: P9 – South of Gypsum Pond 1.
P10 – West of Gypsum Pond 2.
P11 – North of Gypsum Pond 2.
P12 – East of Gypsum Pond 2.

Table 8.8 : Characteristics of Ground Water around M/s SILL, Thoothukudi
(Date of sampling: April 6 & 7, 2011 – Samples G1 to G5, G7 and April 21, 2011 – Sample G6)

Sr. No.	Parameters	Sample Source							Standards	
		G1	G2	G3	G4	G5	G6	G7	D [#]	P [#]
1.	pH	7.5	7.4	7.5	7.4	7.0	7.0	7.9	6.5-8.5	NR
2.	Suspended solids	BDL	BDL	BDL	92	BDL	BDL	BDL	-	-
3.	Total dissolved solids	3351	3645	315	1417	2277	3212	3360	500	2000
4.	Chlorides as Cl ⁻	1233	1052	30	615	465	852	385	250	1000
5.	Sulphates as SO ₄ ²⁻	518	460	47	140	700	395	800	200	400
6.	Dissolved phosphates as PO ₄ ³⁻	2.9	3.2	3.1	4.5	4.1	2.0	3.1	-	-
7.	Calcium as Ca	245	428	64	80	155	480	305	75	200
8.	Magnesium as Mg	225	228	23	112	90	267	97	30	100
9.	Fluorides as F ⁻	0.7	0.7	0.9	0.7	0.9	0.8	1.2	1.0	1.5
10.	Sodium	619	800	42	328	460	560	465	-	-
11.	Potassium	15	27	3	13	14	59	9	-	-
12.	Chemical oxygen demand as O ₂	18	BDL	14	24	20	20	32	-	-
13.	Biochemical oxygen demand as O ₂	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-
14.	Arsenic	BDL	BDL	0.001	0.002	0.002	BDL	BDL	0.01	0.05
15.	Total hardness as CaCO ₃	1562	2020	254	562	760	1940	666	300	600
16.	Heavy metals									
	Cadmium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.003	NR
	Cobalt	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-	-
	Chromium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.05	NR
	Copper	BDL	BDL	BDL	0.011	BDL	BDL	BDL	0.05	1.5
	Iron	0.128	0.173	0.749	10.16	0.712	BDL	0.244	0.3	1.0
	Manganese	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.1	0.3
	Nickel	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.02	NR
	Lead	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.01	NR
	Zinc	0.230	0.233	0.203	0.745	0.729	0.15	0.170	5.0	15

All parameters except pH are expressed in mg/l; BDL- Below detectable limit; NR – No relaxation.

*IS:10500 – Indian Standard for Drinking Water (Second Revision of IS:10500), January, 2005.

[#]D – Requirement (Desirable limit); [#]P – Permissible limit in the absence of an alternate source.

Sample Source: G1 – Borewell in Saminathan village.

G3 – Borewell near H. No. 3/38 in TV Puram village.

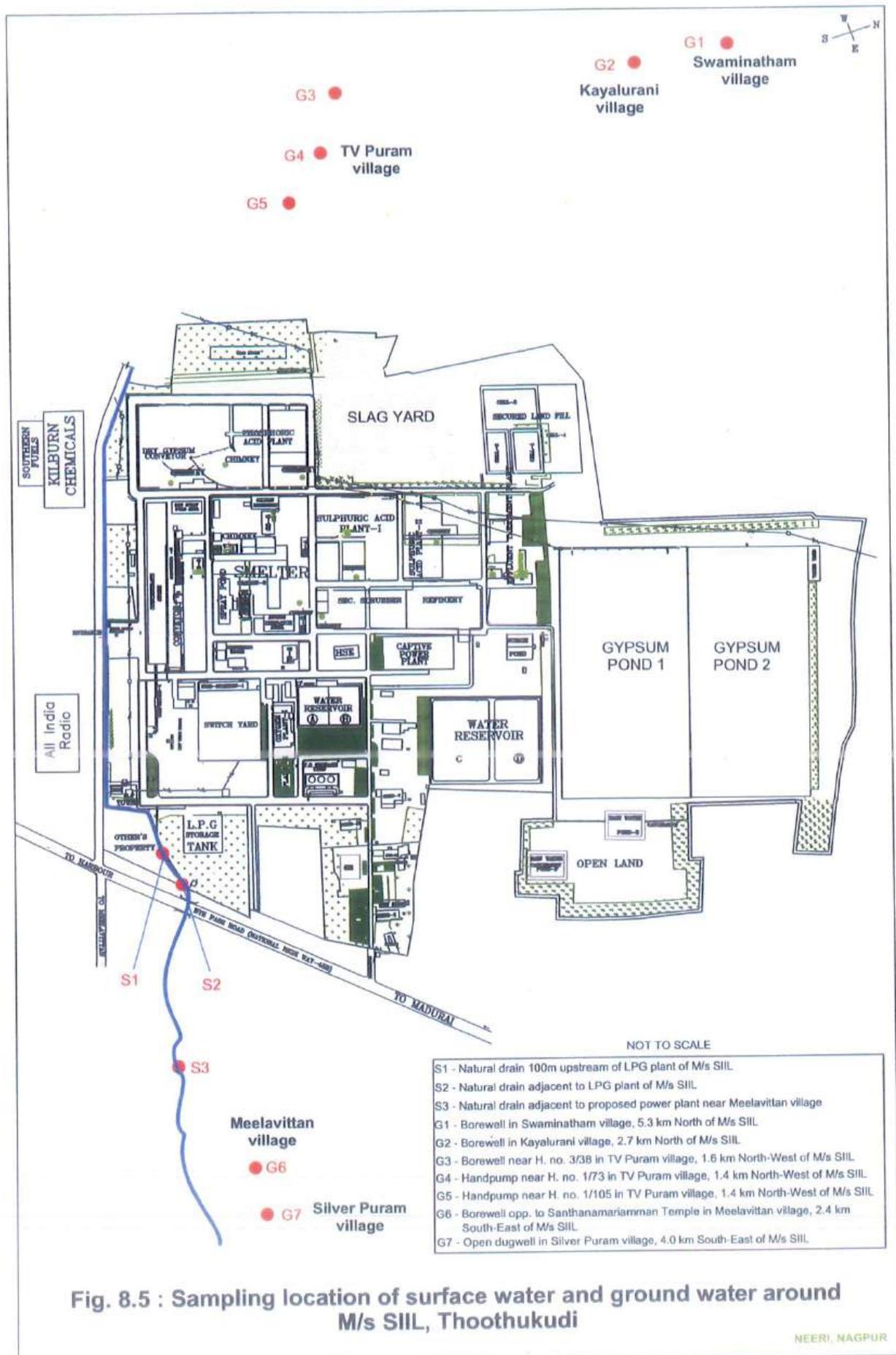
G5 – Handpump near H. No. 1/105 in TV Puram village.

G7 – Open dugwell in Silver Puram village.

G2 – Borewell in Kayaloorani village.

G4 – Handpump near H. No. 1/73 in TV Puram village.

G6 – Borewell opposite to Santanamari Amman Temple in Meelavittan village.



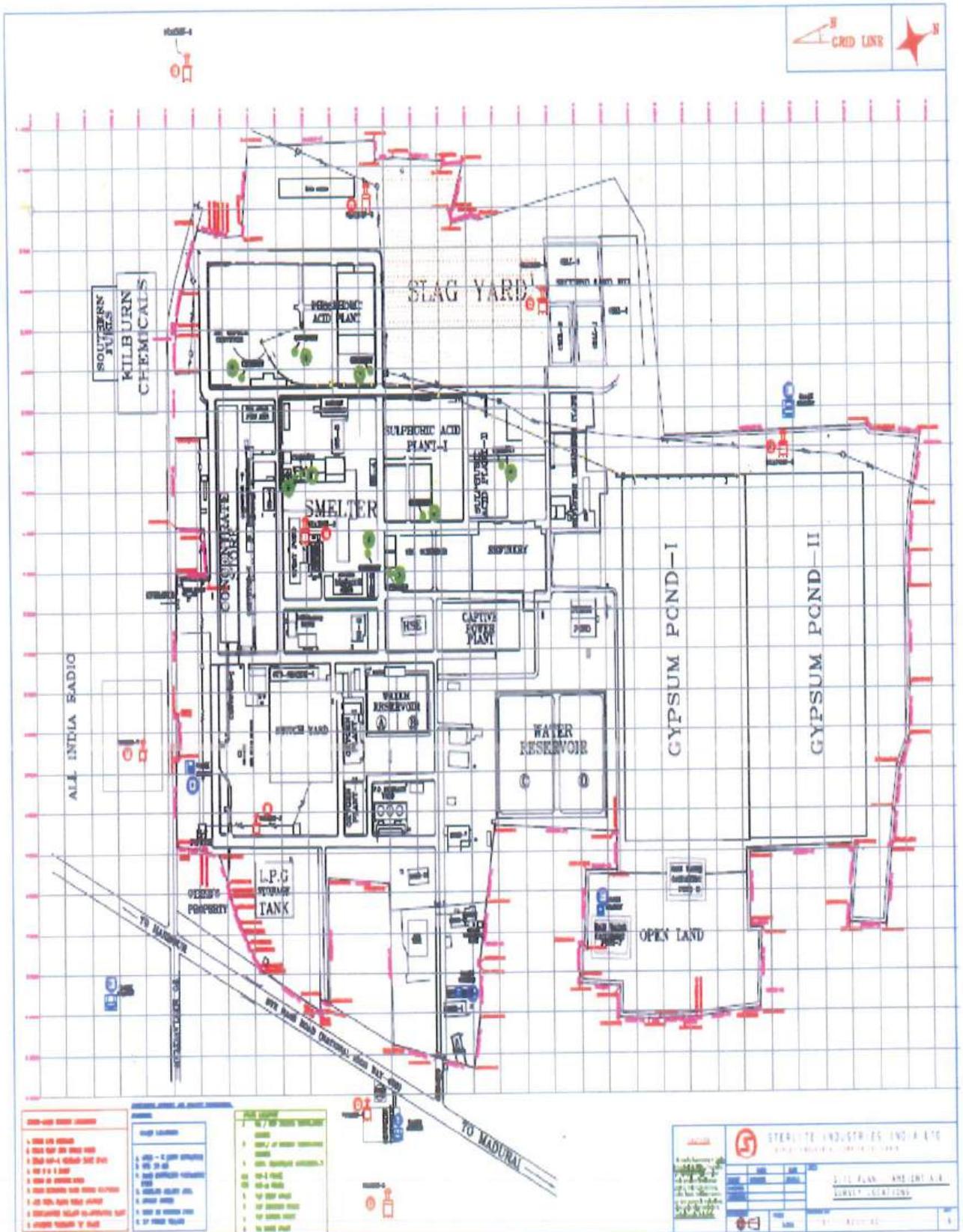


Fig. 9.1 : Sampling location for ambient air quality monitoring stations in and around M/s SILL, Thoothukudi

Table 8.9 : Characteristics of Surface Water around M/s SILL, Thoothukudi
(Date of sampling: April 6, 2011)

Sr. No.	Parameters	Sample Source		
		S1	S2	S3
1.	pH	7.7	7.4	7.5
2.	Suspended solids	40	36	36
3.	Total dissolved solids	2210	2062	800
4.	Chlorides as Cl ⁻	385	465	125
5.	Sulphates as SO ₄ ²⁻	594	570	260
6.	Dissolved phosphates as PO ₄ ³⁻	2.9	3.1	2.6
7.	Calcium as Ca	284	272	126
8.	Magnesium as Mg	109	130	124
9.	Fluorides as F ⁻	1.7	1.7	1.4
10.	Sodium	290	320	193
11.	Potassium	4	5	4
12.	Chemical oxygen demand as O ₂	48	40	70
13.	Biochemical oxygen demand as O ₂	10	8	15
14.	Arsenic	0.012	0.009	0.010
15.	Total Hardness as CaCO ₃	1166	1220	832
16.	Heavy metals			
	Cadmium	BDL	BDL	BDL
	Cobalt	BDL	BDL	BDL
	Chromium	BDL	BDL	BDL
	Copper	0.025	0.029	0.021
	Iron	2.392	2.971	2.373
	Manganese	0.115	0.184	0.070
	Nickel	BDL	BDL	BDL
	Lead	BDL	BDL	BDL
	Zinc	2.236	2.165	1.698

All parameters except pH are expressed in mg/l; BDL– Below detectable limit; NR – No relaxation.

Sample Source: S1 – Natural drain 100 meters upstream of LPG Plant of M/s SILL.

S2 – Natural drain adjacent to LPG Plant of M/s SILL.

S3 – Natural drain adjacent to proposed Power Plant near Meelavittan village.

- The assessment of the UF and RO system indicates that the permeate (treated water) from RO system meets the stipulated limits of the TNPCB Consent for all the parameters monitored.
- The effluents generated from various unit processes after treatment in ETPs and advanced treatment system are completely recycled/reused within the industry achieving zero liquid effluent discharge conforming to the stipulated condition of the EC (MoEF) and the Consent to Operate (TNPCB).
- The management of rejects generated from the RO system comprises concentration through thermal evaporation system followed by spray drying. The dried solids are disposed off in secured landfill facility (SLF).
- However, as observed during inspection, the capacity of the evaporation system is inadequate to handle the total quantity of rejects generated daily resulting in non-optimal capacity utilization of the RO system. Thus, the RO system is operated at sub-optimal capacity.
- The recycle/reuse of the final treated effluents from ETPs with high TDS concentration demand frequent maintenance due to scaling and clogging problems at the end use facilities.
- To prevent surface and ground water contamination from storm water runoff of the plant area, adequate storm water drains have been provided. Two reservoirs, each of approximately 25000 m³ capacity are designated, one for runoff from gypsum pond area and the other for runoff collected from the remaining process/storage areas of the plant.
- The storm water runoff thus collected from plant area excluding gypsum pond area is subjected to treatment through media filtration, followed by UF and RO system for recovery of process grade water, and is being recycled/reused within the industry for cooling water makeup.
- The rainwater balance indicate that the holding capacity of the existing rain water catchment reservoirs (2 nos.) are inadequate to accommodate the quantum of runoff from the area during peak precipitation. Therefore, it is recommended for additional capacity buildup creating facility for adequate storage.
- As observed during monitoring, silt was deposited in the storm water drains. Since the run off is from industrial area, it must be ensured that the

deposited silt is periodically removed from the storm water drains and disposed off in SLF.

- It must be ensured that the RO rejects stored in the temporary storage ponds must be taken for concentration and drying followed by disposal in SLF in a time bound manner.
- M/s SIIL is located about 12 kilometres from the sea (Bay of Bengal). The ground level of the industrial area of M/s SIIL (Longitude 78.07 degrees and Latitude 8.82 degrees) is between 15 – 17 meters above mean sea level with elevation decreasing from NorthWest to SouthEast direction. The slope becomes gentle towards Thoothukudi [1].
- The regional foliation can be observed in NW-SE direction. It is in this direction, which provides pathways for streams. The entire area is drained by streams, which are almost parallel and drain from north west to south east direction and many of these ends up in small tanks. All these streams are ephemeral in nature. The Meelavittan and Silverpuram villages fall under the geological formation which is tertiary formation consisting of calcareous sandstone and shale limestone [2].
- The characteristics of surface water samples collected from the nullah (Odai) do not indicate high concentration of any major pollutants. Since, no discharge from the industry was observed during inspection, and also that the sample collected was stagnant water in the nullah, the concentration level observed for the major pollutants cannot be attributed to the direct discharge from the industry.
- A chemical industry (M/s Kilburn Chemical Ltd.) is also located adjacent to the nullah. Since, this industry established in 1999 manufactures titanium dioxide, ferrous-sulphate and hydrochloric acid, a visit was made along with the CPCB and TNPCB personnel on 7th April 2011 for a prima-facie assessment of the pollution control status of the industry. The inspection team observed that the industry is storing acidic effluent in unlined under ground tanks with all possibility of ground water contamination, no effluent treatment facility was operational, ferrous-sulphate was stored in open area, raw ore spread in open area whereby any surface runoff may contaminate the surface and ground water. As per the Consent, the industry utilizes the effluent for irrigation on its own land.

➤ The groundwater characteristics from borewells and dugwells located in villages around M/s SILL do not indicate presence of marker pollutants namely arsenic, zinc and fluoride in concentrations exceeding the IS Drinking Water Standards (2005).

1. Groundwater modelling study of an aquifer around SIL, Thoothukudi, Tamil Nadu, National Geographical Research Institute, Hyderabad, 2008.
2. Balsubramaniam, A. R., Thirugnana Sambandam, R. Chellaswamy and V. Radhakrishnan, Numerical modeling for prediction and control of saltwater encroachment in the coastal aquifers of Thoothukudi, Tamil Nadu, Technical Report, 1993.

9.0 Air Environment

The monitoring of ambient air quality was carried out for assessment based on 24 hourly variation in air quality, and the compliance status at defined receptors and the representative sites which are expected to be affected due to emissions from the industrial activities. Similarly, source emissions monitoring was also carried out to assess the performance of the control equipments attached to the various unit operations.

9.1 Ambient Air Quality

9.1.1 Design of Ambient Air Quality Monitoring Network

The ambient air quality depends upon the emission scenario, meteorological conditions and the background concentrations of the pollutants. The air environment survey was carried out through reconnaissance followed by ambient air quality monitoring programme and micro-meteorological study.

The studies on air environment consist of assessment of existing status of ambient air quality and collection of meteorological data influencing the air quality status of the region. Representative selection of sampling locations is primarily guided by the emission scenario, topography and micro-meteorology of the region. An ambient air quality monitoring (AAQM) network consisting of nine sampling locations was scientifically designed using the following criteria:

- Location of M/s SILL, and magnitude of emissions due to various industrial activities.
- Persistence of wind direction and speed.
- Major air pollution parameters.
- Representation of regional background.

9.1.2 Ambient Air Quality Monitoring

To establish the ambient air quality status in the study area during 19th-23rd April, 2011, nine AAQM locations were identified using the above network design criteria. For this purpose, an ambient air quality monitoring network consisting of five AAQM locations inside the industry premises and four locations around the industry were selected to assess the air quality status in the region. The selected AAQM sampling locations are shown in **Fig. 9.1**. The longitude and latitude of these locations are given in **Tables 9.1 and 9.2**. The various pollutants such as Respirable Suspended Particulate Matter (PM₁₀), Fine Respirable Particulate Matter (PM_{2.5}), Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Ammonia (NH₃), Fluoride and Hydrogen Sulphide (H₂S) were analysed during ambient air quality monitoring. The Standard Methods used for sampling and analysis of different pollutants during the study period are summarized in **Table 9.3**.

9.1.3 Micro-meteorology

The micro-meteorological conditions at the site regulate the transport and diffusion of air pollutants released into the atmosphere. The principal meteorological variables are horizontal convective transport (average wind speed and direction), vertical convective transport (atmospheric stability, mixing height) and topography of the area. A weather station was installed at Staff Quarters, one of the AAQM sampling locations, to monitor wind speed, wind direction, temperature and humidity on hourly basis during air quality monitoring survey.

The wind speed and direction were plotted in the form of a windrose as shown in **Fig. 9.2**. Wind pattern during April 19-23, 2011 indicates that predominant wind directions were from Southeast (14.17%) followed by South (13.33%), South of Southwest (10%), Southwest (8.33%) and South of Southeast (6.67%). The other wind directions were from North (5%) followed by Northeast (5%), North of Northeast (4.17%), West (4.17%), Northwest (3.33%), East (2.5%), West of Southwest (1.67%), West of Northwest (1.67%), North of Northwest (1.67%), East of Northeast (0.83%) and East of Southeast (0.83%).

**Table 9.1 : Location of Ambient Air Quality Monitoring Stations
Inside Industry Premises**

Sr. No.	Station	Latitude	Longitude
		North	East
1.	LPG Storage	8° 49' 02"	78° 04' 91"
2.	East RHF Spray Pond	8° 49' 09"	78° 04' 72"
3.	SAP-G Storage Tank (Phosphoric Acid Plant)	8° 49' 22"	78° 04' 55"
4.	SLF 2 & 3 Ramp	8° 49' 35"	78° 04' 62"
5.	West of Gypsum Pond	8° 49' 61"	78° 04' 80"

Table 9.2 : Location of Ambient Air Quality Monitoring Stations Around Industry

Sr. No.	Station	Latitude	Longitude
		North	East
1.	Blessing Ware House TV Puram	8° 49' 22"	78° 04' 28"
2.	All India Radio Relay Station	8° 48' 90"	78° 04' 78"
3.	Meelavittan Village Co-operative Bank	8° 48' 84"	78° 06' 16"
4.	M/s. Sterlite Township "D" Block	8° 48' 99"	78° 05' 14"

Table 9.3 : Analytical Techniques Used for Ambient Air Quality Monitoring

Parameter	Technique / Method	Min. Detectable Limit, $\mu\text{g}/\text{m}^3$	Absorption Wavelength, λ max
Sulphur Dioxide (SO_2)*	Colorimetric (West and Gaeke method)	4	550 nm
Nitrogen Oxide (NO_2)*	Colorimetric (Modified Jacob & Hocheiser method)	3	540 nm
Ammonia (NH_3)*	Nessler's Reagent	5	410 nm
Hydrogen Sulphide (H_2S)*	Gravimetric	1	670 nm
Flouride**	Zirconium-SPADNS reagent	1	570 nm
Particulate Matter (size less than 10 μm) or (PM_{10})*	Gravimetric	1	-
Particulate Matter (size less than 2.5 μm) or ($\text{PM}_{2.5}$)*	Gravimetric	1	-

* Source: Ministry of Environment and Forests, New Delhi, November, 2009.

** Source: ASTM Standards on Methods of Atmospheric Sampling and Analysis, 2nd Edition, 2002.

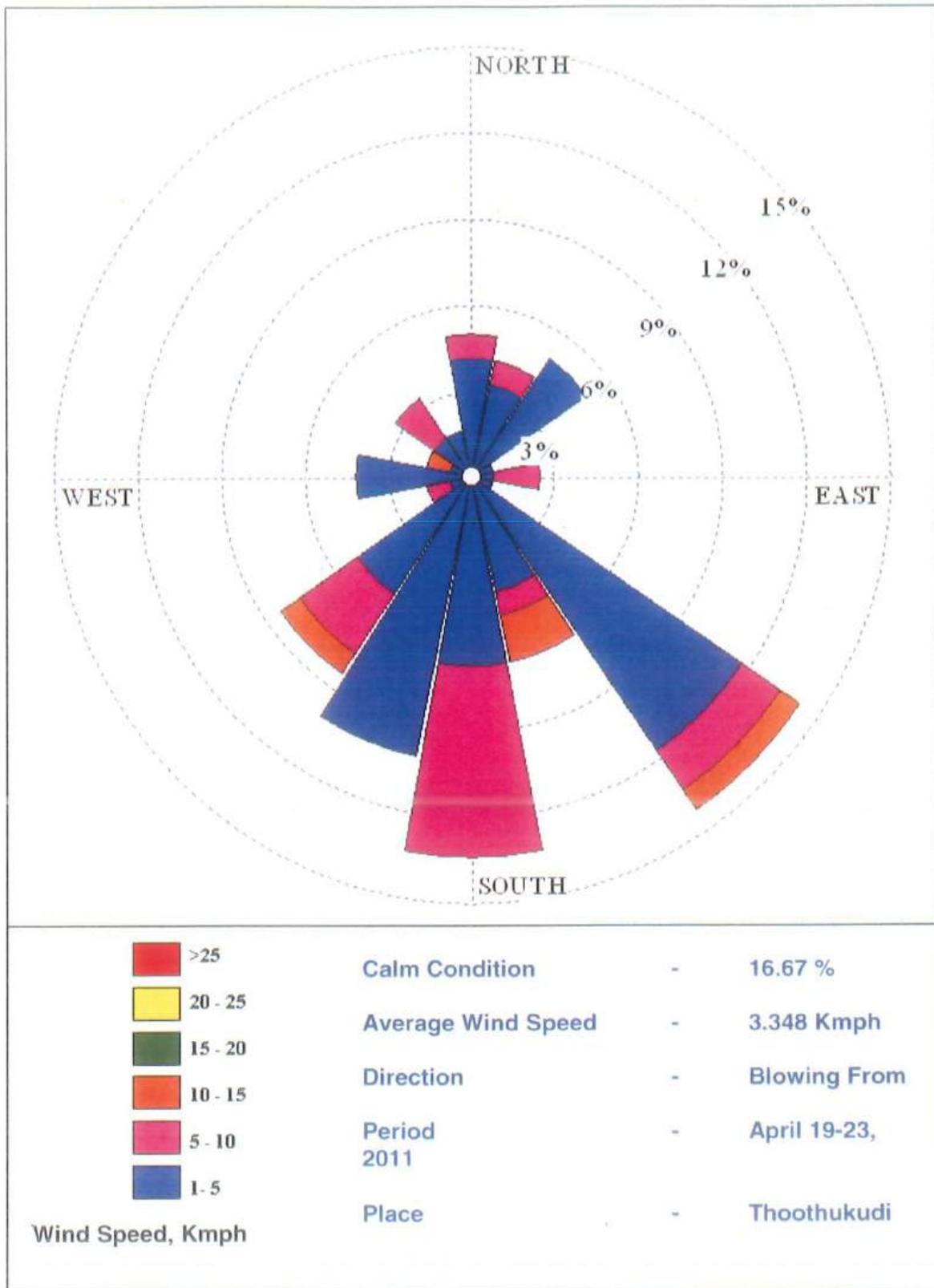


Fig. 9.2 : Wind Rose Pattern at M/s SILL, Thoothukudi (April 19-23, 2011)

The most prevailing wind speed class of 1 - 5 kmph occurred for about 61.7% of the time followed by 5 - 10 kmph for about 17.5%, 10 - 15 kmph for about 4.2% of the study period. The calm conditions (≤ 1 kmph) were present for about 16.67%. The average wind speed during the study period was 3.348 kmph.

The average temperature recorded during the study period varied between 26 and 30 °C with a maximum temperature of 38 °C. The average humidity (%) varied in the range of 73 - 91. The maximum value of humidity (%) varied in the range 99 - 100 and the minimum value of humidity (%) varied in the range 38 - 57 (Table 9.4). During the monitoring period, rainfall of 11.7 mm was recorded during 21.00 - 22.00 hours on 20th April, 2011.

9.1.4 Ambient Air Quality Status

At the sampling locations, PM₁₀, PM_{2.5} as well as gaseous pollutants like SO₂, NO₂, NH₃, Fluoride and H₂S were monitored continuously on 24 hourly basis during the period 19th - 23rd April, 2011.

I. Inside Industry Premises

i. Respirable Suspended Particulate Matter (PM₁₀)

The maximum PM₁₀ concentration (141 µg/m³) was recorded at East RHF Spray Pond whereas, minimum PM₁₀ concentration (44 µg/m³) was recorded at LPG Storage (Table 9.5). The concentrations of PM₁₀ randomly exceeded the Standard limit (100 µg/m³) [Annexure-I] at east RHF spray pond, SLF 2 & 3 ramp and west of gypsum pond. This may be due to the inplant fugitive emissions, raw material storage and handling activities, dust emanating from copper concentrate in the copper smelter plant, handling of gypsum by conveyor belt near gypsum pond and movement of the vehicles on the unpaved roads inside the plant.

ii. Fine Respirable Particulate Matter (PM_{2.5})

The maximum PM_{2.5} concentration (113 µg/m³) was recorded at SLF 2 & 3 Ramp, where as the minimum PM_{2.5} concentration (29 µg/m³) was recorded at LPG Storage. The concentrations of PM_{2.5} exceeded the Standard limit (60 µg/m³) at SLF 2 & 3 Ramp due to secondary fugitive emissions (Table 9.5).

Table 9.4 : Meteorological Data at M/s SILL, Thoothukudi

Date	Wind Speed, kmph			Wind Direction, Degree			Temperature, °C			Humidity, %		
	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
April 19, 2011	1.1	5.5	3.1	22	360	190	24	38	30	38	100	73
April 20, 2011	1.1	10.4	3.5	22	292	177	23	37	29	41	99	74
April 21, 2011	0.7	9.0	4.5	22	292	159	23	34	27	54	100	85
April 22, 2011	0.4	8.6	4.5	45	360	206	24	33	28	57	100	81
April 23, 2011	0.4	8.3	3.1	22	360	164	23	35	26	54	100	91

*Rainfall of 11.7 mm was recorded during 21.00 - 22.00 hours on April 20, 2011.

Table 9.5 : Ambient Air Quality Status Inside Industry Premises

Averaging Time: 24 hours Unit: $\mu\text{g}/\text{m}^3$

Sr. No.	Station	Date	PM ₁₀	PM _{2.5}
1.	LPG Storage	19.4.2011	77	57
		20.4.2011	67	38
		21.4.2011	44	29
		22.4.2011	59	29
2.	East RHF Spray Pond	19.4.2011	116	No monitoring
		20.4.2011	141	No monitoring
		21.4.2011	94	No monitoring
		22.4.2011	93	No monitoring
3.	SAP-G Storage Tank (Phosphoric Acid Plant)	19.4.2011	77	60
		20.4.2011	97	35
		21.4.2011	50	35
		22.4.2011	51	37
4.	SLF 2 & 3 Ramp	19.4.2011	130	74
		20.4.2011	48	113
		21.4.2011	69	30
		22.4.2011	54	34
5.	West of Gypsum Pond	19.4.2011	74	No monitoring
		20.4.2011	117	No monitoring
		21.4.2011	72	No monitoring
		22.4.2011	77	No monitoring
Standards for industrial, residential, rural and other areas including ecologically sensitive areas			100	60

Table 9.6 : Ambient Air Quality Status Inside Industry Premises

Averaging Time: 24 hours Unit: $\mu\text{g}/\text{m}^3$

Sr. No.	Sampling Station	SO ₂	NO ₂	NH ₃	Fluoride	H ₂ S
1.	LPG Storage	4-11	3-10	5-35	2-3	1-3
2.	East RHF Spray Pond	4-17	3-7	5-15	2-4	2-3
3.	SAP-G Storage Tank (Phosphoric Acid Plant)	29-72	3-9	5-8	4-5	1-4
4.	SLF 2 & 3 Ramp	4-41	3-5	5-16	3-5	1-2
5.	West of Gypsum Pond	4-35	3-5	5-12	3-4	1-3
Standard for industrial, residential, rural and other areas including ecologically sensitive areas		80	80	400	-	-

iii. Sulphur Dioxide (SO₂)

The maximum sulphur dioxide concentration (72 µg/m³) was observed at SAP-G storage tank (Phosphoric Acid Plant) whereas, the minimum sulphur dioxide concentration (4 µg/m³) was observed at LPG storage, east RHF spray pond, SLF 2 & 3 ramp and west of gypsum pond. At all the locations, the concentrations of sulphur dioxide are below the National Standard (80 µg/m³) for industrial, residential, rural and other areas including ecologically sensitive areas (Table 9.6).

iv. Nitrogen Dioxide (NO₂)

The maximum nitrogen dioxide concentration (10 µg/m³) was observed at LPG storage whereas, minimum nitrogen dioxide concentration (3 µg/m³) was observed at east RHF spray pond, SAP-G storage tank (Phosphoric Acid Plant), SLF 2 & 3 ramp and west of gypsum pond. The data reveals that the concentrations of NO₂ at all the locations are below the National Standard of 80 µg/m³ for industrial, residential, rural and other areas including ecologically sensitive areas (Table 9.6).

v. Ammonia (NH₃)

The maximum ammonia concentration (35 µg/m³) was observed at LPG storage whereas, minimum ammonia concentration (5 µg/m³) was observed at east RHF spray pond, SAP-G storage tank (Phosphoric Acid Plant), SLF 2 & 3 ramp and west of gypsum pond. At all the locations, the concentrations of ammonia are below the National Standard (400 µg/m³) for industrial, residential, rural and other areas including ecologically sensitive areas (Table 9.6).

vi. Fluoride

The maximum fluoride concentration (5 µg/m³) was observed at SAP-G storage tank (Phosphoric Acid Plant) whereas, minimum fluoride concentration (2 µg/m³) was observed at LPG storage and east RHF spray pond (Table 9.6). There is no Standard stipulated for fluoride parameter.

vii Hydrogen Sulphide (H₂S)

The maximum hydrogen sulphide concentration (4 µg/m³) was observed at SAP-G storage tank (Phosphoric Acid Plant) whereas, minimum hydrogen sulphide concentration (1 µg/m³) was observed at LPG storage, SLF 2 & 3 ramp and west of gypsum pond (Table 9.6). No limit is specified in the Standards for hydrogen sulphide.

II. Outside Industry Premises (Surrounding Areas)

i. Respirable Suspended Particulate Matter (PM₁₀)

The maximum PM₁₀ concentration (87 µg/m³) was recorded at All India Radio Relay Station whereas; minimum PM₁₀ concentration (30 µg/m³) was recorded at Sterlite Township "D" Block. The Standard limit of PM₁₀ concentration for industrial, residential, rural and other areas including ecologically sensitive areas is 100 µg/m³. At all the locations, the PM₁₀ values are within the limits (Table 9.7).

ii. Fine Respirable Particulate Matter (PM_{2.5})

The maximum PM_{2.5} concentration (52 µg/m³) was recorded at Blessing Ware House TV Puram whereas, minimum PM_{2.5} concentration (23 µg/m³) was recorded at All India Radio Relay Station. The Standard limit of PM_{2.5} concentration for industrial, residential, rural and other areas including ecologically sensitive areas is 60 µg/m³. At all the locations, the PM_{2.5} values are within the limit (Table 9.7).

iii. Sulphur Dioxide (SO₂)

The maximum sulphur dioxide concentration (10 µg/m³) was observed at All India Radio Relay Station whereas, the minimum sulphur dioxide concentration (4 µg/m³) was observed at Meelavittan village Co-operative Bank, Sterlite Township "D" Block and Blessing Ware House, TV Puram. At all the locations, the concentrations of sulphur-dioxide are below the National Standard (80 µg/m³) for industrial, residential, rural and other areas including ecologically sensitive areas (Table 9.8).

Table 9.7 : Ambient Air Quality Status around Industry Premises

Averaging Time: 24 hours		Unit: $\mu\text{g}/\text{m}^3$	
Sr. No.	Station	PM ₁₀	PM _{2.5}
1.	All India Radio Relay Station	31-87	23-35
2.	Meelavittan Village Co-operative Bank	46-60	No monitoring
3.	Sterlite Township "D" Block	30-40	No monitoring
4.	Blessing Ware House, TV Puram	38-71	24-52
Standard for industrial, residential, rural and other areas including ecologically sensitive areas		100	60

Table 9.8 : Ambient Air Quality Status around Industry

Averaging Time: 24 hours		Unit: $\mu\text{g}/\text{m}^3$				
Sr. No.	Sampling Station	SO ₂	NO ₂	NH ₃	Fluoride	H ₂ S
1.	All India Radio Relay Station	4-10	5-8	5-20	3-5	1-2
2.	Meelavittan Village Co-operative Bank	4-5	4-41	5-8	3-5	1-2
3.	Sterlite Township "D" Block	4-6	4-9	5-16	2-4	1-1
4.	Blessing Ware House, TV Puram	4-6	3-10	5-19	5-6	2-8
Standard for industrial, residential, rural and other areas including ecologically sensitive areas		80	80	400	-	-

iv. Nitrogen Dioxide (NO₂)

The maximum nitrogen dioxide concentration (41 µg/m³) was observed at Meelavittan village Co-operative Bank whereas, minimum nitrogen dioxide concentration (3 µg/m³) was observed at Blessing Ware House, TV Puram. The data reveals that the concentrations of nitrogen dioxide values at all the locations are below the National Standard of 80 µg/m³ for industrial, residential, rural and other areas including ecologically sensitive areas (Table 9.8).

v. Ammonia (NH₃)

The maximum ammonia concentration (20 µg/m³) was observed at All India Radio Relay Station whereas, minimum ammonia concentration (5 µg/m³) was observed at Meelavittan village Co-operative Bank, Sterlite Township "D" Block and Blessing Ware House, TV Puram. At all the locations, the concentrations of ammonia are below the National Standard (400 µg/m³) for industrial, residential, rural and other areas including ecologically sensitive areas (Table 9.8).

vi. Fluoride

The maximum fluoride concentration (6 µg/m³) was observed at Blessing Ware House, TV Puram whereas, minimum fluoride concentration (2 µg/m³) was observed at Sterlite Township "D" Block (Table 9.8). No Standard is stipulated for fluoride.

vii. Hydrogen Sulphide (H₂S)

The maximum hydrogen sulphide concentration (8 µg/m³) was observed at Blessing Ware House, TV Puram whereas, minimum hydrogen sulphide concentration (1 µg/m³) was observed at All India Radio Relay Station, Meelavittan village Co-operative Bank and Sterlite Township "D" Block (Table 9.8). No Standard is stipulated for fluoride.

viii. Toxic Metals

The PM₁₀ samples collected at 3 sites each from inside and outside the industry premises were analyzed for arsenic, lead and nickel using ICP-AES, and the results are presented in Table 9.9. The data reveals that the concentration of the metals are below the stipulated CPCB Standards.

Table 9.9 : Toxic Metals Concentration in PM10 Collected at Inside and Around the Industrial Locations

Averaging time: 24 hours		Unit: ng/m ³		
Sr. No.	Sampling Station	Arsenic	Lead	Nickel
Inside Industry Premises				
1.	LPG Storage	0.01-0.10	0.2-06	0.02-0.03
2.	East RHF Spray Pond	0.2-0.40	2.69-3.17	0.05
3.	SAP-G Storage Tank	0.08-0.15	0.20-0.36	0.02
Around the Industry				
4.	All India Radio Relay Station	0.02-0.09	0.1-0.22	0.03-0.04
5.	Sterlite Township "D" Block	0.05-0.12	0.1-0.5	0.03-0.08
6.	Meelavittan village Cooperative Bank	0.02-0.05	0.04-0.25	0.03
CPCB Standards (µg/m₃)		-	1	-

9.1.5 Observations

- AAQM was carried out with respect to SO₂, NO₂, NH₃, Fluoride, H₂S, PM₁₀ and PM_{2.5} for 24 hourly basis continuously during 19th-23rd April, 2011 (4 days) inside the industry premises and surrounding areas.
- The 24 hourly average values of SO₂, NO₂ and NH₃ at 5 sites inside the industry premises and 4 sites around the industry were within the ambient air quality stipulated Standards.
- Inside the industry premises, the concentrations of PM₁₀ randomly exceeded the stipulated Standard (100 µg/m³) based on 24 hrs averaging time at East RHF spray pond (2 days), SLF 2 & 3 Ramp (1 day) and West of gypsum pond (1 day). Similarly, the concentrations of PM_{2.5} also occasionally exceeded the stipulate Standard (60 µg/m³) based on 24 hrs averaging time at SLF 2 & 3 Ramp (2 days).
- The randomly high concentrations of PM₁₀ and PM_{2.5} at specific locations inside the industry premises may be due to in plant fugitive emissions, raw materials storage & handling activities, occasional dust from concentrate in copper smelter plant, handling of gypsum by conveyor belt and movement of vehicles on unpaved roads.
- At all locations outside the industry premises (surrounding areas), the concentrations of PM₁₀ and PM_{2.5} were within the stipulated norms.

9.2 Source Emission Measurements

Sampling of particulate matter, sulphur dioxide (SO₂), fluoride and acid mist were collected in respective media and analysis carried out as prescribed in Standard Methods (Table 9.10).

Since the regulatory limit of emission of sulphur dioxide is related to production of sulphuric acid, the daily production and consumption details of various products and raw materials during the monitoring period are given in Table 9.11.

The physical characteristics of the stacks attached to the production units namely, Copper Smelter plant, Sulphuric Acid plant (SAP), Phosphoric Acid Plant (PAP) and Waste Heat Recovery Boiler (WHRB) are given in Table 9.12.

Table 9.10 : Source Emissions Monitoring- Reference Methods

Parameter	Reference Method
Particulate Matter (PM)	IS: 11255 (Part I)-1985
Sulphur dioxide (SO ₂)	IS: 11255 (Part I)-1985
Acid mist	EPA - Method 8
Total Fluoride	EPA - Method 13A (SPAND Zirconium lake)

Table 9.11 : Details of Product and Raw Materials Consumption

Date	Production (tonnes/d)							Consumption (tonnes/d)		
	Copper Anode	Cathode	Copper wire Rod 8 MM	Sulphuric Acid	Phosphoric Acid	Silicic Acid	Granulated Slag	Gypsum	Rock Phosphate	Copper Concentrate
18-Apr-11	832	378	265	2365	274	14	1671	1052	1052	1052
19-Apr-11	925	228	255	2596	381	10	1598	1873	1873	1873
20-Apr-11	931	240	25	2438	538	21	1581	2954	2954	2954
21-Apr-11	886	269	0	2332	620	18	1496	3031	3031	3031
22-Apr-11	804	390	0	2353	568	7	1427	2976	2976	2976
23-Apr-11	410	358	0	969	505	37	694	2783	2783	2783

Table 9.12 : Physical Characteristics of Stacks

Parameters / Stack	Copper smelter	SGS-1	SGS-2	SAP-1	SAP-2	Phosphoric Acid Plant	Phosphoric Acid Boiler	WHRB
Height (m)	60	72	70	60	60	60	71	74
Top Diameter (m)	2.5	1.95	2.2	1.6	1.6	1.9	1.3	1.0
Height of monitoring port (m)	21	16	25	34	34	26.5	22.5	25
Dia. at Port hole	2.64	3.59	2.5	3.37	3.37	1.9	2.5	1.0
Pollution Control unit	Venturi Scrubber	Venturi Scrubber	Multi Scrubber	Tail Gas Scrubber	Tail gas Scrubber	Fluorine Scrubber	Stack Arrangement	Stack Arrangement

Table 9.13 : Emissions from Copper Smelter Plant

Date of sampling	Plant / Unit	Emissions (mg/Nm ³)	
		PM	SO ₂
20 th -April 2011	ISASMELT Furnace	14	108
20 th April 2011	Secondary Gas Scrubber -2	22	121
21 st April 2011	Secondary Gas Scrubber -1	19	148
Regulatory Limit as per TNPCB Consent		23	NP

NP- Not prescribed

Table 9.14 : PM and Acid Mist Emissions from Sulphuric Acid Plant

Date of sampling	Plant / Unit	Emissions (mg/Nm ³)	
		PM	Acid Mist
20 th April 2011	Sulphuric Acid Plant-2	12	4
21 st April 2011	Sulphuric Acid Plant-1	13	4
Regulatory Limit as per TNPCB Consent		23	50

9.2.1 Copper Smelter

The emissions of particulate matter (PM) from copper smelter plant conforms to the stipulated regulatory Standards (Table 9.13).

9.2.2 Sulphuric Acid Plant

The emissions of particulate matter (PM) from sulphuric acid plant also conforms to the stipulated regulatory Standards (Table 19.14).

Sulphuric acid plant is permitted to operate at a maximum emission rate of 1kg SO₂ emission per tonne of sulphuric acid produced as per the TNPCB consent. The emission of SO₂ from SA plant is given in Table 9.15. Based on the worst case scenario, the minimum quantity of acid production during monitoring period (April 19-21, 2001) i.e., 2332 tonnes per day of sulphuric acid production (Table 9.11) for regulatory compliance determination was considered. Thus, SO₂ emission rate is estimated at 0.36 kg per tonne of sulphuric acid production, which is within the stipulated regulatory limit of 1kg per tonne of sulphuric acid production.

9.2.3 Phosphoric Acid Plant

The emissions of Particulate Matter (PM) and Fluoride from phosphoric acid plant are within the stipulated regulatory Standards (Table 9.16).

9.2.4 Waste Heat Recovery Boiler

The emissions of particulate matter from waste heat recovery boiler was found to be more than the stipulated regulatory limit (Table 9.17).

9.2.5 Observations

The monitoring data is based on short term assessment. In any industrial system, there are always fluctuations, and therefore the instant value does not always represent the emission performance over long period. The high concentration of particulate matter not meeting the regulatory limit from the stack of waste heat recovery boiler during the monitoring period was because of the super heater of the boiler had gone through soot blowing operation which is practiced once a shift, and not a continuous operation.

Table 9.15 : SO₂ Emissions from Sulphuric Acid Plant

Date of sampling	Plant / Unit	SO ₂ Emissions (kg/d)
20 th April 2011	Sulphuric Acid Plant-2	412
21 st April 2011	Sulphuric Acid Plant-1	425
Total		837

Table 9.16 : Emissions from Phosphoric Acid Plant

Date of sampling	Plant / Unit	Emissions (mg/Nm ³)	
		PM	Fluoride
19 th April 2011	Phosphoric Acid Plant	34	11
19 th April 2011	Phosphoric Acid Boiler	78	-
Regulatory Limit as per TNPCB Consent		150	25

Table 9.17 : Emissions from Waste Heat Recovery Boiler

Date of sampling	Plant / Unit	Emissions (mg/Nm ³)	
		PM	SO ₂
21 st April 2011	Waste Heat Recovery Boiler	190	735
Regulatory Limit as per TNPCB Consent		150	NP

NP – Not Prescribed

9.3 Assessment of Radon

An issue was raised by one of the PIL Petitioner regarding assessment of Radon concentration at the industry site as M/s SILL was alleged to use uranium tainted copper concentrate. Accordingly, the Bhabha Atomic Research Centre (BARC), Mumbai was approach for assessment of radon at plant site as NEERI neither has the expertise nor the facility to monitor radon. Two member team from BARC (Mr. S. K. Sahoo and Mr. N. S. Krishna) conducted the study at M/s SILL during April 21-22, 2011. The monitoring of radon concentration was assessed at 12 site within the industry premises. The results as received from BARC are presented in Annexure III.

The data reveals radon concentration was observed in the range 5 ± 2 to 23 ± 6 Bq/m³ monitored 1 m above ground level at 12 locations. The data sheet submitted by BARC state that there is no National or International limit on normal outdoor radon levels.

10.0 Solid and Hazardous Waste Management

10.1 Present Status of Waste Generation and their management

Based on the reconnaissance survey and the secondary data made available by M/s SILL, an inventory of solid/semi-solid wastes generated during the production of copper, sulphuric acid and phosphoric acid was assessed. As per Authorization, the details of hazardous waste generated, its quantity and collection & disposal activity are presented in Annexure IV. The hazardous waste generated during the period 2008-09 to 2010-11 as against the Authorization quantity issued by the TNPCB is presented in Table 10.1. The detailed description on present status of waste generation, hazardous waste management, analysis of relevant waste/sediment samples collected during the inspection, leaching characteristics and possible impact is presented here under.

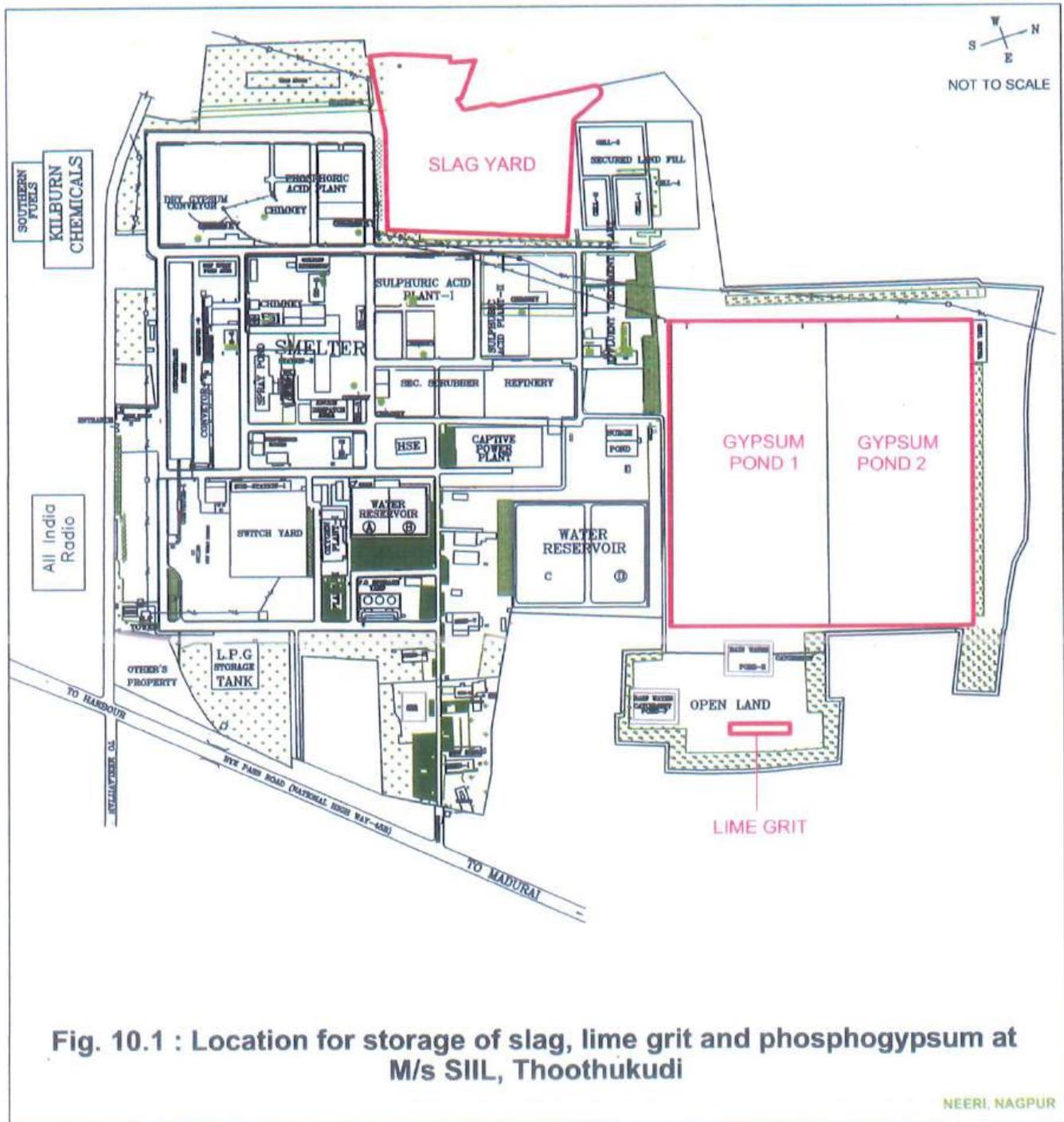
10.1.1 Granulated Slag

The granulated slag is generated from rotary holding furnace (RHF) and slag cleaning furnace (SCF). The molten slag generated from RHF and SCF is cooled and granulated with treated effluent from ETPs. Presently, the generation of granulated slag is in the range 1444-1991 tonnes/d based on last six months

Table 10.1 : Details of Hazardous Waste Generated at M/s SILL, Thoothukudi

Sr. No.	Hazardous waste stream	Authorized quantity, tonnes/annum	Quantity generated, tonnes/annum		
			2008-09	2009-10	2010-11
Copper Smelter Plant					
1.	Oil sludge	8	6.43	3.59	6.51
2.	Spent oil	20 cum	13.86 cum	27.72 cum*	11.55 cum
3.	ESP dust	32850	10010.56	12409.52	11438.34
4.	ETP cake	43800	28747	33012.14	12510.6
5.	Scrubber cake	58400	33473	37980.86	22613.99
6.	ETP slime	2190	308.31	964.9	1131.54
7.	Copper scrap with copper sulphate	800	438.24	278.45	223.29
8.	Spent catalyst	4	3.8	0	3.9
9.	DM resin	5000	7.49	14.27	29.48
Captive Power Plant					
11.	Oil sludge	1460	970.86	430.29	371.71
12.	Spent oil	365 cum	69.21 cum	58.53 cum	9.33 cum
Copper Rod Plant					
13.	Spent oil	3650 cum	2.13 cum	2.94 cum	5.04 cum

* FO storage tank maintenance/cleaning taken during 2009-2010 led to additional generation of spent oil, and was reported in the Annual Returns (Form-4) filed by M/s SILL to the TNPCB.



data. The fresh granulated slag is temporarily stored in the storage bins provided with the granulation system. The granulated slag is further transported from the storage bins by trucks and tippers to the slag storage yard the location of storage yard for slag, gypsum and lime grit is presented in **Fig. 10.1**.

As per the Hazardous Waste (Management, Handling and Trans-Boundary Movement Rules), 2008 the copper slag generated from copper smelter has been categorized as "Non-hazardous Waste" and has been de-listed from hazardous waste category. Therefore, it does not require disposal in secured landfills, and also no specified type and time for the storage of the slag is delineated in their rules.

Presently, a part of slag is sold for shot blasting applications and road making which is a worldwide practice for utilization of slag. Around 6250 tonnes/d of slag is sold, of which 5-6% is for shot blasting applications, while 2-3% and 90-92% for road making and land filling, respectively. The remaining quantity of slag is stored in slag storage yard on open land.

Earlier, studies carried out by NEERI, National Metallurgical Laboratory (NML), Jamshedpur, and Institute for Industrial Toxicology Research (IITR), Lucknow had indicated the non-leachable, non-hazardous and non-toxic characteristic of copper slag.

However, considering the concerns of the petitioners, fresh slag samples were collected during inspection from the temporary storage bins to assess the leaching potential of granulated copper slag. The slag samples were subjected to Toxic Characteristic Leaching Procedure Test (EPA Test Method 1311) in accordance to "*Test Methods for analysis of Solid Waste, Physico-chemical Method, Volume I C, USEPA*". In addition to the TCLP Test, Water Leach Test as delineated by Central Pollution Control Board (CPCB), New Delhi in "*Guidelines for Proper Functioning and Upkeep of Disposal Sites, 2005*" was also carried out.

The concentrations of various parameters in TCLP leachate, Water Leachate and the associated regulatory limits are listed in **Table 10.2**. Results indicate that, the concentrations of all the parameters in TCLP and water leachates are within the



TAMIL NADU POLLUTION CONTROL BOARD

From	To
Thiru. M. Manoharan, B.E. M.Tech., Joint Chief Environmental Engineer (M), Tamil Nadu Pollution Control Board, SIDCO Industrial Complex, Pettai, Tirunelveli – 10.	The Member Secretary, Tamilnadu Pollution Control Board, Chennai – 32.

Letter No.JCEE/TNV/F- Tech- Complaint/Video/2018 dated:- 05/06/2018

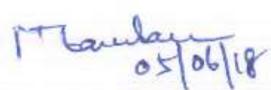
Sir,

Sub: TNPC Board – O/o JCEE (M), Tirunelveli – Industries – Complaint against the major industries in Thoothukudi – Video in the Social Media - Remarks submitted – Reg.

Ref:- Whats'app message with video received on 04/06/2018 from the Board.

With reference to the above subject matter, I submit herewith the item wise remarks for the issues and other information furnished in the video as well as the remarks on the response by Thiru. Nityananth Jayaram are submitted herewith for favour of kind perusal please

Encl: As above


 Joint Chief Environmental Engineer (M),
 Tamil Nadu Pollution Control Board,
 Tirunelveli.



STATUS REPORT ON THE ISSUES RAISED IN THE VIDEO BY 'LET US MAKE ENGINEERING SIMPLE'

A video is in circulation, uploaded by an organization viz. "Let us make Engineering Simple" titled 'Sterlite - Meiporul Kanbathu Arivu'. The item wise remarks for the issues and other information furnished in the video are submitted as follows:

1. Contention mentioned in the Video:

Ground Water samples collected and analysed in the 12 villages around the Sterlite Industries and the results are found to be far exceeding the prescribed standards, whereas the quality of the ground water, in Thoothukudi Town is found to be alright.

Remarks: TNPCB is collecting 8 Ground water Samples, from seven villages viz. Madathur, Meelavittan, Pandarampatti, Silverpuram, South Veerapandiyapuram, Kumarreddiyapuram, Kalloorani every month and analysed. The range values of the results are tabulated below:

Location of GW Sampling	Range values of Results in mg/L (period November 2017 to April 2018)		
	TDS	Chloride	Sulphate
Madathur - I,	4456-8819	575-2274	173-1678
Madathur - II,	3250-8254	472-2874	216-1947
Meelavittan,	2468-14729	546-3648	238-1026
Pandarampatti,	451-5628	24-988	05-1335
Silverpuram,	2940-24329	625-11296	11-1402
South Veerapandiyapuram,	1086-3756	144-650	237-815
Kumarreddiyapuram,	292-16436	273-3624	24-1777
Kalloorani	1786-9740	79-695	248-2195

The above result shows that the above said parameters are not meeting the drinking water standards.

2. Contention mentioned in the Video:

Storm water drain near Sterlite Industries is carrying water with pale reddish water :

Remarks: The water in the storm water drain was found in pale reddish colour. It is predominantly found to be so due to the background deposited material, likely Iron Oxide. The samples collected from the storm water drain on 02/02/2018 was found to have containing about 121 mg/L to 123 mg/L of Iron content, and hence a show cause notice was issued to M/s. V V Titanium Pigments Private Limited, which is engaged in the production of Titanium Oxide using Illuminat and Sulphuric acid as the main raw materials. During inspection on 04th June 2018 and 5th June 2018, it was observed that the industry has completely plugged the storm drain from the industry and there is no possibility of storm water or other water streams from the industry,

mixing with the water in the storm water drain near Sterlite industries. During inspection on 04th June 2018 and 5th June 2018, there was no flow in the storm water drain near the Sterlite industries; only stagnation of water was observed in front of the industry of M/s. V V Titanium Industries Pigments Limited, at two locations; one before the Western gate of the industry and one in front of the Admin gate of the industry. The samples at these locations were collected and sent to the District Environmental Laboratory, Thoothukudi for analysis. It is submitted that, cleaning/desilting the drain would ensure the free flow of water in the drain, and would be colourless.

3. Contention mentioned in the Video:

Near Sterlite Industries, chemical waste is dumped for an area of one square kilometre, covered with heaps of soil and the waste water stored contains highly acidic and very high values of TDS:

Remarks: The area shown in the video is located in the South West of M/s. V V Titanium Industries and Pigments Limited. The area is approximately measuring about 35 to 40 acres. Black and pale black coloured wastes were found dumped in about one tenth of the total area. During inspection in the after-noon on 4th June 2018, about 15 earth movers are deployed in filling and levelling the waste. Waste water stored in ponds, as depicted in the video was not noticed during inspection. However, stagnation of leaching were observed in three locations, one near a place where the wastes were found spread and being covered with soil, another one at South West corner of the land and the third one in a small Kuttai arrangement made. The samples were collected at these three locations and the TDS values were measured using hand held TDS meter, which showed values of 5392, 9317 and 17990 mg/L respectively. The samples are found to have pH values of 2.01, 1.73 and 1.24 respectively. The pH values are in complete agreement with the values reported in the video.

The black and pale black coloured waste which was found dumped is reported to be from the erstwhile industry of M/s. Kilburn Chemicals Limited, which was engaged in the manufacturing of Titanium Dioxide, and the said industry was taken over by M/s V V Titanium Pigments Private Limited (in the year 2012), and the same is termed to be the un-reacted mass containing Illuminatate, which was dumped at the private lands, till the year 2011, by M/s. Kilburn Chemicals Limited. The ownership of this land is not known; however, it is termed to be under the possession of M/s. V V Minerals, the parent company of M/s. V V Titanium Pigments Private Limited.

Four samples of the wastes were collected and sent for analysis, as to decide whether the same is a Hazardous Waste or not. In the event, if the waste is decided as a Hazardous Waste, the same need to be managed as per the provisions of the Hazardous and other wastes (Management, Handling and TransBoundary Movement)

Rules, 2016, and the area to be cleaned and the contamination to be remediated. Even if the waste is not found to be a Hazardous Waste, the pollution and the contamination caused to the land and ground water due to the dumping of the waste, due to the leachate generated, has to be remediated.

In this regard it is submitted that there is already a reference between TNPCB and the Ministry of Environment, Forest and Climate Change (MoEFCC), about this contaminated site, and MoEFCC has nominated NEERI as the agency, to carry out the study of the contaminated site. It is learned NEERI scientists are scheduled to visit Thoothukudi on 13th June, 2018, to collect samples and to commence the study about this contaminated site.

4. Contention mentioned in the Video:

The emission near SPIC/TAC is causing suffocation and headache for a day:

Remarks: In that area, the Chemical Process industries located are SPIC Limited, engaged in the production of urea fertilizer, Green Star Fertilizer Limited, engaged in the production of Compound Fertilizer and TAC limited, engaged in the production of Soda Ash and Ammonium Chloride.

The major emission sources from SPIC are from two Furnace oil fired Boilers, from where visible black smoke is noticed, Reformer, where the probable pollutant is SO₂, wherefrom no visible emission is let-out, Degaser vent, where from saturated steam is let-out, as a dense white smoke and Prilling tower, from where Ammonia and Dust are emitted. The industry has provided on-line monitoring system for dust and ammonia in the prilling tower. The level ammonia from the Prilling Tower (FN of 5th June, 2018) is 15.87 mg/Nm³ as against the standard of 300 mg/Nm³, and the level of dust, during inspection was 55.46 mg/Nm³ as against the standard of 150 mg/Nm³, as recorded in the OLMS

At M/s. Green Star fertilizers limited, the major sources of emission are from the Sulphuric Acid Plant, from where no visible emission was found discharged. The emission from the DAP and Complex fertilizer Plant stacks were not noticed, since these sections were not under operation. Exhaust in the Single Super Phosphate plant, Exhaust from the raw Grinding mill and the steam vent were noticed. Dense saturated steam was found let out from the steam vent. No visible emission were found discharged from the Stacks attached with Aluminum Fluoride Plant.

At M/s. Tutticorin Alkali Chemicals (TAC) Limited, major emission sources are the Coal fired boiler, which is provided with bag filter and no appreciable emission was noticed from this stack and the Ammonium Chloride Drier stack, which is provided with water scrubber and as such saturated steam is discharged as a dense white mass.

As such, the dense smokes depicted to be discharged from these industries are referring to the discharge of saturated steam only, but for the emission from prilling tower.

As regards the statement in the video that suffocation occurred even for a short duration of 20 seconds and headache persist for another day, it is submitted that during the inspection on 5th June, 2018, between 7.15 hours and 9.00 hours in the morning, the odour of Ammonia could be felt in a few places within the industry, in very feeble levels; however, during the visit of those industries in the afternoon between 15.30 hrs and 17.30 hours, the ammonia was not at all felt in any location.

5. Contention mentioned in the Video:

The water in the Drain in front of SPIC and TAC having very high levels of Ammonia:

Remarks: The location shown in the video is the front of SPIC and TAC, where the pipelines are shown, and water was shown in the drain is termed to have containing very high levels of Ammonia, to the tune of 153 mg/L, as against the standard of 0.5 mg/Nm³. It is submitted, that during the inspection on 05/06/2018 the drain was found dry. The pipelines are not carrying the waste water, as being perceived. But, one pipeline is carrying Ammonia, one pipeline is carrying Furnace Oil and the other one is Carrying Naptha to SPIC. In as much as the pipelines carrying the effluent from SPIC is not all passing through this area.

There is no effluent discharge by Green Star Fertilizer Limited and the Waste brine from TAC is discharged in to the salt pans of TAC.

6. Contention mentioned in the Video:

The effluent leakage from the Marine Disposal Pipeline, near the disposal point from SPIC is having very high levels of Ammonia in the order of 43 mg/L, ie about 86 times the permissible limit:

Remarks: There is no leakage noticed in the pipeline carrying the effluent into sea by the unit. In fact the marine discharge pipeline from SPIC is passing through Coast Guard Residential Campus, Sagar Sadan the guest house of the SPIC Ltd and then passes below ground from outside the campus of Sagar Sadan and reaches sea.

Presently, the effluent from SPIC is taken by Green Star fertilizers limited, for their use in the process, because of the acute water shortage. In fact, there is no appreciable

discharge of effluent in to sea after 9th April, 2018, as noted from the OLMS records. The level of Ammonia in the effluent was 8.45 mg/L, during the inspection on 5th June 2018, as against the standard of 50 mg/L. The Standard is wrongly presented as 0.5 mg/L, in the video. The Industry has been consented with discharge of 720 KLD of effluent into Sea.

7. Contention mentioned in the Video:

The discharge of effluent having very high value of Ammonia has caused the death of fish in April 2018:

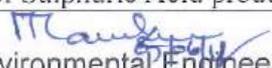
Remarks: From the data from the OLMS, there was discharge of effluent in the sea on 9th April, 2018, at the rate of 3.1 cu.m./hour, and the level of Ammonia in the effluent was 33.5 mg/L, as against the standard of 50 mg/L, as per the records of OLMS.

M. Lakshmi
25/06/18
Joint Chief Environmental Engineer (M),
Tamil Nadu Pollution Control Board,
Tirunelveli.
[Signature]
5/6/18

**Remarks on the Response of Thiru Nithyanand Jayaraman, for the video Titled
"Sterlite – Meiporul Kanpathu Arivu"**

Thiru Nithyanand Jayaraman, in response to LMES video titled "Sterlite – Meiporul Kanpathu Arivu", has mentioned the following points, why he think the assessment of Sterlite's Environmental management is wrong. The remarks on the response of Thiru Nithyanand Jayaraman, is submitted as follows:

S. No.:	Response of Thiru Nithyananth Jayaraman	Remarks
1	Sterlite does not have adequate land to operate its factory. The industry has only 102.4 Hectares.	The industry has 102.31 hectares of land for their existing plant and was allotted with 133.3 hectares of land, allotted by SIPCOT, for their Plant –II. The said allotment for Plant-II, has been cancelled by SIPCOT, vide letter dated 29.05.2018.
2	Because it does not have 172 hectares, it does not have the 65 hectares required for proper solid waste storage	
3	Sterlite's green belt is in adequate	Based on the Joint inspection on 12.09.2012 and 13.09.2012 by CPCB and TNPCB, and the report submitted before the SCI, as per the order dated 27.08.2012, in SLP(Civil) Nos:28116 to 28123 of 2010, the compliance status of GB was mentioned as follows: "Green belt of around 26 hectares has been developed to the width of 25 meters,. As per the assessment made by NEERI in Maay 2011, and march 2012, the total area to the width of 25 m is 26.36 hectares. " "It is found that for the compliance of both 26 hectares of green belt and 25% of the Total Area 172.17 Hectares, the industry has utilised a land earmarked for its expansion activities. Hence the direction has been complied".
4	Sterlite convinced TNPCB to amend the requirement of 25 m arguing that it did not have land for Green belt	
5	The Sterlite's SWM is not as per law.	The industry has not removed / constructed barriers along the Uppar River, where the Copper slag was dumped on the bank of the river. This is one of the reasons for refusal of renewal of consent.
6	Sterlite's chimney is under designed	The stack height was calculated using the formula $H=14Q^{0.3}$ where Q is the quantity of Sulphur Dioxide emitted through the stack in kg/hr and H is the stack Height, in meters. Q is estimated at the rate of 1 kg of SO ₂ per Tonne of Sulphuric Acid produced, as per the norms fixed in the consent to operate date dated 19.04.2005. whereas, the contention is based on the standard of 4 kg of SO ₂ per Tonne of Sulphuric Acid produced.
7	Production increased tenfold; but operated with the same chimney	


 Joint Chief Environmental Engineer (M),
 Tamil Nadu Pollution Control Board,
 Tirunelveli.


 5/6/18

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Direction 12

TAMIL NADU POLLUTION CONTROL BOARD

Proc No.: TS1/TNPCB/F.015301/ TTN / RL/ 2018 dated: 12.06.2018

Sub: TNPCB – Industries – M/s. V.V.Titanium Pigments Private Limited, Meelavittan Part I Village, Thoothukudi Taluk and Thoothukudi District-Complaint against the major industries in Thoothukudi in the Social Media- Certain directions under Section 33(A) of the Water (Prevention and Control of Pollution) act, 1974 as Amended - Issued – Regarding.

Ref: JCEE (M)'s Letter No.JCEE/TNV/F- Tech- Complaint/Video/2018 dt 05/06/2018

Whereas, based on the Complaint against the major industries in Thoothukudi, the area in the south west of the unit of M/s. V.V.Titanium Pigments Private Limited, Meelavittan Part I Village, Thoothukudi Taluk and Thoothukudi District was inspected on 04.06.2018 by the Joint Chief Environmental Engineer/Tirunelveli and it has been observed that, black and pale black colored wastes were dumped in the one tenth of the total area of 35-40 acres and the stagnation of the leaching has been observed one near a place where the wastes were found spread and being covered with soil, another one at South West corner of the land and the third one in a small Kuttai arrangement made.

Whereas the samples were collected at these three locations and the TDS values were measured and which showed values of 5392, 9317 and 17990 mg/L respectively and the samples are found to have pH values of 2.01, 1.73 and 1.24 respectively. The black and pale black coloured waste which was found dumped to be the un-reacted mass containing Illuminite.

Whereas, four samples of the wastes were collected and sent for analysis, so as to decide whether the same is a Hazardous Waste or not. In the event, if the waste is decided as a Hazardous Waste, the same need to be managed as per the provisions of the Hazardous and other wastes (Management, Handling and TransBoundary Movement) Rules, 2016, and the area to be cleaned and the contamination to be remediated. Even if the waste is not found to be a Hazardous Waste, the pollution and the contamination caused to the land and ground water due to the dumping of the waste, due to the leachate generated, has to be remediated.

Whereas, the Ministry of Environment, Forest and Climate Change (MoEFCC), already announced the site as contaminated and nominated NEERI as the agency, to carry out the study of the contaminated site.

Therefore, in exercise of the powers conferred under Section 33 A of Water (P&CP) Act 1974 as amended in 1988, Board issues the following direction to the unit of M/s. V.V. Titanium Pigments Private Limited, Meelavittan Part I Village, Thoothukudi Taluk and Thoothukudi District to comply the following :

1. The unit M/s. V.V. Titanium Pigments Private Limited shall **furnish the detailed proposal for reclaiming the contaminated site within two months (before 12.08.2018)** consulted with the reputed institutions such as Anna University/IIT etc.,

Failure to comply with the above said directions, will lead to issue of further directions for closure and stoppage of power supply to your construction under section 33 A of Water (P&CP) Act 1974 as amended in 1988.

The receipt of the proceeding shall be acknowledged.

Chairman (FAC)

To

The Authorized Signatory,
M/s. V.V. Titanium Pigments Private Limited,
A-81, SIPCOT Industrial Complex,
South Veerapandiapuram Post,
Thoothukudi-8.

Copy to:

1. The Joint Chief Environmental Engineer (M),
Tamil Nadu Pollution Control Board,
Tirunelveli.
2. The District Environmental Engineer,
Tamil Nadu Pollution Control Board,
Thoothukudi.
3. Technical file.

S. Sanyasi
For Chairman 13/1
Mary
13.6.18



TAMILNADU POLLUTION CONTROL BOARD

<p>From,</p> <p>A. Romalt Terric Pinto Fdo, B.Tech., M.E., District Environmental Engineer (a/c), Tamil Nadu Pollution Control Board C7 & C9, SIPCOT Industrial Complex, Meelavittan, Thoothukudi – 627 008.</p>	<p>To,</p> <p>The Member Secretary, Tamilnadu Pollution Control Board, No.76, Mount Salai, Guindy, Chennai -600 032.</p>
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Letter No. F. No. DEE/ TNPCB / TTN/ F- 0027TTN/RL /2019 Dated: 14/01/2020

Sir,

Sub: TNPCB – Thoothukudi – M/s. V.V. Titanium Pigments Private Limited located at S.No.1221,1223,1224,1225,1226,1227/Part, SIPCOT Industrial complex, Meelavittan Village, Thoothukudi District- Fresh Direction to be issued under Section-33-A of the Water (P&CP) Act,1974 as amended -Report submitted – Regarding.

- Ref:** 1. Bd's Proc. No. T4/TNPCB/F.0027TTN/RL/TTN/W/2019 dated: 27/05/2019
 2. Bd's Proc. No. T4/TNPCB/F.0027TTN/RL/TTN/A/2019 dated: 27/05/2019
 3. Board's Proc.No.TS1/TNPCB/F-015301/TTN/RL/2018 dated: 12/06/2018
 4. Unit's Lr No. VVTi /L&PR/TNPCB/2018-19 dated: 12/12/2018
 5. Board's Lr.No. T4/TNPCB/F.No.015301/2018 dated: 26/12/2018
 6. Orders of Hon'ble NGT dated: 14/11/2019 in O.A. No. 1038/2018.
 7. Bd's memo No. T4/TNPCB/F.2643/NGT1038/R. A. No. 44/2019-2 dt.09.09.2019

—000—

With reference to the Board's Proc. cited 1st and 2nd above, I submit that the unit of M/s. V.V. Titanium Pigments Private Limited located at S.No.1221,1223,1224,1225,1226,1227/Part, SIPCOT Industrial complex, Meelavittan Village, Thoothukudi District was issued with renewal of consent valid up to 31/03/2022 subject to the conditions as stated therein.

Earlier the unit was inspected by CPCB on 07.04.2011 and noticed that the industry is storing acidic effluent in unlined underground tanks with all possibility of ground water contamination, no effluent treatment facility was operational ferrous sulphate was stored in open area, raw ore spread in open area whereby any surface runoff may contaminate the surface and groundwater as per the consent, the industry utilizes the effluent for irrigation on its own land.

Further NEERI has inspected the contaminated site on 10/10/2018 based on the recommendation of MoEF & CC and report to be furnished. Also based on the JCEE(M), Tirunelveli inspection on 04/06/2018, Board vide its proceeding dated

12.06.2018 cited 3rd above has issued direction to the said unit under Section 33-A of the Water(P&CP) Act, 1974 as amended to furnish a detailed proposal for reclaiming the contaminated site within two months (before 12.08.2018) in consultation with the reputed institution such as Anna University / IIT etc.,

The unit vide its letter dated 12.12.2018 cited 4th above has informed that as directed by the TNPC Board the unit has approached Anna University for obtaining the proposal for land reclamation. It was also stated that a Technical expert team from the Anna University has visited their unit site on 10.08.2018 and have ascertained the nature of the waste found in that area, its background and opined that the same could be reprocessed as the same is only the un-reacted ilmenite and also informed that the report on the remediation process is yet to be received from Anna University.

Further Board vide its letter dated 26/12/2018 has addressed the unit to furnish the report received from the Anna University regarding the reclamation of the contaminated site. The unit is yet to furnish the report as called for.

Also CPCB, New Delhi in its Office order F. No. B-400(S)/IPC-III/2019-20 1162/dated. 04.09.2019 has evolved a policy for levying Environmental Compensation for industries wherein the following cases are considered for levying environmental compensation.

- (a) Discharges in violation of consent conditions, mainly prescribed standards/ consent limits.
- (b) Not complying with Directions issued, such as direction for closure due to non-installation of OCEMS, non- adherence to the action plans submitted etc.,
- (c) Intentional avoidance of data submission or data manipulation by tampering the Online Continuous Emission/ Effluent Monitoring systems.
- (d) Accidental discharges lasting for short durations resulting into damage to the environment.
- (e) Intentional discharges to the environment – land, water and air resulting into acute injury or damage to the environment.
- (f) Injection of treated/ partially treated/ untreated effluents to ground water.

In case of d, e and f, the Environmental Compensation may be levied based on the detailed investigations by Expert Institutions/Organizations.

Since the damage caused to the environment by the said unit has to be assessed based on the study to be carried at the contaminated site by expert institutions and recommendation to be obtained for the methodology of the remediation of the contaminated site, environmental compensation may be imposed as suggested by the Committee under the 'Category-e' ie. Intentional discharges to the environment – land, water and air resulting into acute injury or damage to the environment and

hence environmental compensation shall be collected from the unit after receipt of the study report conducted by Technical expert team from the Anna University, Chennai.

Further, the Hon'ble NGT in its order dated 14.11.2019 in O.A.No.1038/2018 has ordered in para 22 as follows:

"22. In view of water pollution caused by absence/dysfunctional CETPs/ETPs/STPs, the Tribunal has, in the case of Aryavart Foundation Vs. M/s. Vapi Green Enviro Ltd. & Ors, directed all defaulting industries, other than green and white category, connected with CETP, to make deposits with the CPCB towards interim environmental compensation, pending assessment of actual compensation and furtheraction.

(i) Large Industries – Rs. 1 croreeach

(ii) Medium Industries – Rs. 50 Lakhseach

(iii) Small Industries – Rs. 25 Lakhseach"

Hence an interim environmental compensation for an amount of Rs. 1 crore may be claimed from the unit pending assessment of actual compensation and furtheraction.

Hence it is recommended to consider the issue of fresh direction to the unit under Section 33-A of the Water (P&CP) Act,1974 as amended to the unit of M/s.V.V. Titanium Pigments Private Limited located at S.No.1221,1223,1224,1225,1226,1227/Part, SIPCOT Industrial complex, Meelavittan Village, Thoothukudi District on the following:

1. To conduct a detailed study report on the area where the unit has stored acidic effluent in unlined underground tanks with all possibility of ground water contamination and storage of ferrous sulphate in open area, raw ore spread in open area whereby any surface runoff may contaminate the surface and groundwater and to furnish proposal for reclaiming the contaminated site within three months' in consultation with the reputed institution such as Anna University / IIT etc.,
2. To remit a sum of Rs. 1 crore as an interim environmental compensation pending assessment of actual compensation and furtheraction based on the receipt of the study report for reclaiming the contaminated site.

This is submitted for information and necessary action please.



[Signature]
16/01/2020
District Environmental Engineer (a/c),
Tamilnadu Pollution Control Board,
Thoothukudi



90
0356. 8/6/2020

TAMILNADU POLLUTION CONTROL BOARD



From
Thiru. A.V.Venkatachalam, I.F.S.
Chairman,
Tamilnadu Pollution Control Board,
76, Mount Salai,
Guindy,
Chennai -32.



To
The Proprietor,
M/s. V.V. Titanium Pigments Private
Limited,
SIPCOT Industrial Complex,
Meelavittan Village,
Thoothukudi.

Letter No. T4/TNPCB/ F.2643/CEPI/EC/ TTN//2020, dated:28.01.2020

Sir

Sub: TNPCB -Industries- M/s. V.V. Titanium Pigments Private Limited,
S.No.1221,1223,1224,1225,1226,1227/Part, SIPCOT Industrial
complex, Meelavittan Village, Thoothukudi - Violation of
Environmental Standards - Levying of Environmental Compensation to
be remitted -Regarding.

Ref: 1.Hon'ble NGT in O.A.No.1038/2018 dated: 14.11.2019
2. CPCB report on Methodology for Assessing Environmental
Compensation and Action Plan to Utilize the Fund
3. DEE's Lr.No.F.No.DEE/TNPCB/TTN/CEPI/Env.Com/2019
dt:14.01.2020

This is to inform that the Hon'ble National Green Tribunal in its order dated: 14.11.2019 in Original Application No. 1038/2018 seeking remedial action against the polluting industries in the identified polluting industrial clusters has placed on record of list of 100 Polluted Industrial Areas (PIAs) monitored by CPCB during 2018 based on the CEPI score, wherein 8 Industrial Areas of TamilNadu such as Manali, Ranipet-SIPCOT Vellore, Tiruppur, Mettur -Salem, Tuticorin, Coimbatore, Cuddalore SIPCOT, Erode are covered under Polluted Industrial Areas and pronounced that,

Para 4 of the above order emphasised the following.....

".....23. In the present case, in view of massive exercise already done by CPCB, it is not necessary to require any further verification about the existence of pollution in the said PIAs. The Tribunal can direct that the polluting activities cannot be allowed to continue till adequate measures are taken as the Tribunal is bound to apply the 'Sustainable Development' 'Precautionary' and 'Polluter Pays' principle under Section 20 of the National Green Tribunal Act, 2010 to protect the environment and the victims. The statutory regulatory bodies can be required to straightaway identify the particular industrial units in the said PIAs that are causing pollution, particularly those units which fall under the red and

orange category and take action against them by way of closing the polluting activity, initiating prosecution and assessing and recovering compensation. Pending such assessment, interim compensation may be recovered on the scale adopted by this Tribunal in the case of Vapi industrial area."

Further Para 5 of the order dated: 14.11.2019 emphasised the following.....

"10. What the Tribunal has directed is inter alia to "identify the particular industrial units in the said PIAs that are causing pollution, particularly those units which fall under the 'red' and 'orange' category and take action against them by way of closing the polluting activity, initiating prosecution and assessing and recovering compensation" 9. No ground whatsoever has been shown to review the said direction. Further direction of the Tribunal is that "No further industrial activities or expansion be allowed with regard to 'red' and 'orange' category units till the said areas are brought within the prescribed parameters or till carrying capacity of area is assessed and new units or expansion is found viable having regard to the carrying capacity of the area and environmental norms....."

In para 11, Hon'ble NGT ordered that,

"The Tribunal has thus no option except to reiterate that meaningful action has to be taken by the State PCBs/PCCs as already directed and action taken report furnished showing the number of identified polluters in polluted industrial areas mentioned above, the extent of closure of polluting activities, the extent of environmental compensation recovered, the cost of restoration of the damage to the environment of the said areas, otherwise there will be no meaningful environmental governance....."

As per the direction of the Hon'ble National Green Tribunal in the matter of OA No. 593/2017 (WP (CIVIL) No. 375/2012, the Central Pollution Control Board has already formulated the methodology to assess and recover compensation for damage to the environment and utilize such amount in terms of an action plan for protection of the environment. In this regard, the following cases are considered for levying environmental compensation.

- (a) Discharges in violation of consent conditions, mainly prescribed standards/ consent limits.

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TAMILNADU POLLUTION CONTROL BOARD



- (b) Not complying with Directions issued, such as direction for closure due to non-installation of OCEMS, non-adherence to the action plans submitted etc.,
- (c) Intentional avoidance of data submission or data manipulation by tampering the Online Continuous Emission/ Effluent Monitoring systems.
- (d) Accidental discharges lasting for short durations resulting into damage to the environment.
- (e) Intentional discharges to the environment – land, water and air resulting into acute injury or damage to the environment.
- (f) Injection of treated/ partially treated/ untreated effluents to ground water.

In case of d, e and f, the Environmental Compensation may be levied based on the detailed investigations by Expert Institutions/Organizations.

Further, the Hon'ble NGT in its order dated 14.11.2019 in O.A.No.1038/2018 has ordered in para 22 as follows:

“22. In view of water pollution caused by absence/dysfunctional of CETPs/ETPs/STPs, the Tribunal has, in the case of Aryavart Foundation Vs. M/s. Vapi Green Enviro Ltd. & Ors, directed all defaulting industries, other than Green and White category, connected with CETP to make deposits with the CPCB towards interim environmental compensation, pending assessment of actual compensation and further action.

- (i) Large Industries – Rs. 1 crore each
- (ii) Medium Industries – Rs. 50 Lakhs each
- (iii) Small Industries – Rs. 25 Lakhs each”

The District Environmental Engineer/Thoothukudi/TNPCB in his report cited under reference (3) has stated that,

“The unit of **M/s. V.V. Titanium Pigments Private Limited, S.No.1221,1223,1224,1225,1226,1227/Part, SIPCOT Industrial complex, Meelavittan Village, Thoothukudi** was inspected by CPCB on 07.04.2011 and noticed that the industry is storing acidic effluent in unlined underground tanks with all possibility of ground water contamination, no effluent treatment

facility was operational ferrous sulphate was stored in open area, raw ore spread in open area whereby any surface runoff may contaminate the surface and groundwater and has not furnished proposal for reclaiming the contaminated site in consultation with the reputed institution such as Anna University / IIT etc."

and recommended to impose **Rs.100 Lakhs** as **interim Environmental Compensation**, since the unit falls under Red Large and Sl.No. (e) "*intentional discharges to the environment – land, water and air resulting into acute injury or damage to the environment.*"

In view of the above facts it is directed to remit the **interim Environmental Compensation** of amount **Rs.100 Lakhs** for the violation cited so as to comply with directions of the Hon'ble NGT order dated: 14.11.2019, as recommended by DEE.

The Environmental Compensation shall be remitted to the District Environmental Engineer, TamilNadu Pollution Control Board, Thoothukudi through DD to be drawn in favour of "TNPCB-ENVIRONMENTAL COMPENSATION FUND" Payable at Thoothukudi within 15 days.

The receipt of this letter may be acknowledged


For Chairman

Copy to:

- 1 The Joint Chief Environmental Engineer(M),
Tamilnadu Pollution Control Board,
Tirunelveli Region.
- 2 The District Environmental Engineer,
Tamilnadu Pollution Control Board,
Thoothukudi District.
- 3 File Copy.

For follow up
of action and
report

Copy received

 20/2/2020

TAMILNADU POLLUTION CONTROL BOARD



Proceedings No. T4/TNPCB/F.15301/TTN/W/2020 dated : 04.03.2020

Sub: TNPCB –Industries- **M/s V.V. Titanium Pigments Private Limited** located at SF.No.1221, 1223,1224, 1225,1226,1227/part, SIPCOT Industrial Complex, Meelavittan Village, Thoothukudi District - Direction under Section 33A of the Water (P&CP) Act, 1974 as amended – order Issued - Regarding.

- Ref:** 1.Board's Proc.No.T4/TNPCB/F.0027TTN/RL/TTN/W7A/2019 dt:27.05.2019
2.Board's Proc.No.TS1/TNPCB/F.015301/TTN/RL/2018 dt:12.06.2018
3.Board's Lr.No.T4/TNPCB/F.No.015301/2018,dated:26.12.2018
4.DEE's Letter No.F.No.DEE/TNPCB/TTN/F-0027TTN/RL/2019,dt:14.01.2020

Whereas the unit of M/s V.V. Titanium Pigments Private Limited located at SF.No.1221, 1223,1224, 1225,1226,1227/part, SIPCOT Industrial Complex, Meelavittan Village, Thoothukudi District has obtained renewal of consent vide reference (1) above cited for the period valid up to 31.03.2022.

Earlier the unit was inspected by CPCB on 07.04.2011 and noticed that the industry was storing acidic effluent in unlined underground tanks with all possibility of ground water contamination, no effluent treatment facility was operational , ferrous sulphate was stored in open area, raw ore spread in open area whereby any surface runoff may contaminate the surface and groundwater. But as per the consent, the industry should utilized the effluent for irrigation on its own land. Further NEERI inspected the contaminated site on 10/10/2018.

In this regard JCEE(M), Tirunelveli inspected the unit on 04/06/2018 and based on the report,TNPCB issued direction vide reference (2) cited to the unit under Section 33-A of the Water(P&CP) Act, 1974 as amended to furnish a detailed proposal for reclaiming the contaminated site within two months (before 12.08.2018) in consultation with the reputed institution such as Anna University / IIT etc.,

Further TNPCB vide reference (3) cited above has addressed the unit to furnish the report received from the Anna University regarding the reclamation of the contaminated site. However, the unit is yet to furnish the report as called for.

In view of the above, District Environmental Engineer, TNPCB , Thoothukudi vide reference (4) cited above has recommended to issue directions to the unit of M/s V.V. Titanium Pigments Private Limited located at SF.No.1221, 1223,1224, 1225,1226,1227/part, SIPCOT Industrial Complex, Meelavittan Village, Thoothukudi District under Section 33A of the Water (P&CP) Act, 1974 as amended in view of non compliance of direction dated:12.06.2018 in time



TAMIL NADU POLLUTION CONTROL BOARD

From

Thiru. R. Kannan, M.Tech.,
The Member Secretary,
Tamil Nadu Pollution Control Board,
76, Mount Salai, Guindy,
Chennai – 600 032.

To

The Director,
M/s.V.V. TITANIUM PIGMENTS PRIVATE
LIMITED,
Keeraikaranthattu, Tisaiyanvillai,
Tirunelveli District,
Pin: 627657

Letter No. T1/TNPCB/F.0027 TTN/RL/W&A/2022, dated: 18.04.2023

Sub: TNPCB - Industries - M/s. V.V. TITANIUM PIGMENTS PRIVATE LIMITED, S.F.No. 1221, 1223, 1224, 1225, 1226, 1227/Pt, Meelavittan Part 1 village, Thoothukkudi Taluk and Thoothukkudi District – Directions issued to the unit- Certain conditions to be complied – Regarding.

Ref: 1. Letter No.T4/TNPCB/F.2643/CEPI/EC/TTN/2020,dated:28.01.2020.
2. ProceedingsNo.T4/TNPCB/F.0027TTN/RL/TTN/W&A/2022, dated: 01/05/2022
3. Proc. No.T4/TNPCB/F.0027TTN/ W/RL/2022, dated: 24.05.2022
4. IR.No : F.0027TTN/RL/DEE/TTN/2023 dated 10/03/2023

I am to invite your kind attention to the references second cited above, wherein, consent was renewed to the unit of M/s. V.V. TITANIUM PIGMENTS PRIVATE LIMITED , S.F.No. 1221, 1223, 1224, 1225, 1226, 1227/Pt, Meelavittan Part 1 village, Thoothukkudi Taluk and Thoothukkudi District under Water (P&CP)Act and Air (P&CP)Act valid up to 31.03.2023 subject to comply with certain conditions.

Subsequently, Certain directions under Section 33(A)of the Water (Prevention and Control of Pollution) act, 1974 as amended has been issued to the unit vide reference third cited for compliance within four months time.

The District Environmental Engineer/TNPCB/Thoothukudi vide reference fourth cited has furnished the renewal inspection report based on the inspection dated: 31.01.2023. From the IR, it is observed that, the unit has not complied with certain conditions as mentioned in the renewal of consent order & direction issued.

Further, to comply with the direction of the Hon'ble NGT order dated 14.11.2019 (in O.A.No.1038/2018 seeking remedial action against the polluting industries in the identified polluting industrial clusters),the unit was directed vide reference first cited to remit the interim Environmental compensation of amount of Rs. 100 Lakhs for the violation (ie. storing acidic effluent in unlined underground tanks with all possibility of ground water contamination, no effluent treatment facility was operational, ferrous sulphate was stored in open area, raw ore spread in open area whereby surface runoff may contaminate the surface and ground water and has not furnished the proposal for reclaiming the contaminated site in consultation with the reputed institution such as Anna University/IIT etc.).

However, the unit has not remitted the environmental compensation. Meanwhile, the Hon'ble Supreme Court of India on 18.03.2020 in C.A.No.8478/2020 stayed the NGT order dated 14.11.2019 and further on 25/02/2022, the Hon'ble Supreme Court of India in C.A.No.2218-2219/2020 disposed of the above appeal stating that

"We cannot, however, lose sight of the fact that for last two years the directions issued by the Tribunal have remained stayed. Each of the appellants had requested for blanket stay of the directions issued by the Tribunal and had not confined their prayer either to the individual appellants or to the respective Members of their associations. Even then, all the concerned must have an opportunity to present their viewpoint before the Tribunal".....

"In order to facilitate the exercise, the interim order of stay granted by this Court on 18.03.2020 shall continue to operate for next Eight Weeks"

They extended the above stay only up to 25.04.2022 for the individual units to make representation.

In view of the above, the unit is hereby instructed to furnish the reply for the following **within 15 days** along with timeline for compliance:

1. As per the direction No. 2 dated 24.05.2022, the unit has not conducted a detailed study on the entire area including the areas where the Ferro Gypsum sludge is being dumped / disposed by engaging experts from Anna University/ IIT – Madras. Hence, **the unit shall furnish the proposal for conducting detailed study for entire area by engaging IITM/Anna University and to furnish a detailed technical report and proposals for reclaiming the remaining contaminated areas.**
2. The has obtained technical Report from University of Madras for reclamation of the above mentioned Contaminated site measuring approximately 04 acres only (ie., one tenth of the total area of 40 acres) where the Black and Pale black coloured wastes (ie., Untreated illuminate sludge) were found dumped. Hence, **the unit shall conduct detailed study on the entire area including the areas where the Ferro Gypsum sludge is being dumped / disposed by engaging experts from Anna University/ IIT – Madras and to furnish the proposal for reclaiming the remaining contaminated areas.**
3. Further regarding amendment for inclusion of S.F. No. pertaining to new ETP& ZLD, the unit has additionally included the S.F.No.404/1 Pt, 407/2 Pt, 408/1Pt, 409/5 Pt, 409/6 Pt, 420/1A Pt, 420/1B Pt along with existing S.F. Nos Total extent of land area previous and present is 6.62 hectare and 8.164 hectare respectively...However, in the audited balance sheet for previous and present year, the value of land is mentioned as 259.52 lakhs. Hence the value of additional land shall be incorporated in the GFA value and necessary additional consent fee shall be remitted to Board.
4. Status of installation of ETP & ZLD in the additional land to be furnished.



TAMIL NADU POLLUTION CONTROL BOARD

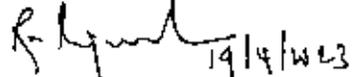
5. When, the unit installed and operates the ETP with ZLD system, the unit shall apply for CTO-Direct for change in mode of disposal of treated trade effluent. Also, ETP & ZLD cost shall be included in the GFA value while applying for CTO-Direct.
6. To furnish RoA of water samples from the newly installed piezometric wells were collected on 31/01/2023 and subsequent period to be furnished.
7. To furnish Consolidated RoA of treated effluent samples analysed after March 2022.
8. As per the suggestion of Madras University on the study conducted as per the direction dated 24.05.2022, the unit shall furnish the analysis report of soil quality.
9. To furnish Monthly Production details from March 2022 to till date.
10. To furnish Compliance of remedial measures suggested by CERG, such as Soil and ground water quality have to be analysed and documented periodically to ascertain the effectiveness of the treatment technology and reclamation program.
11. To furnish Compliance of remedial measures suggested by CERG, such as Redevelopment of the reclaimed site to be taken through phyto - stabilization by planting appropriate native plant species.
12. Year wise details in Table form:

Ascertained quantity of ferro gypsum haphazardly dumped in the contaminated site initially as on 31.03.2023 (in MT)	
Quantity disposed, so far as on 31.03.2021 (in MT)	
Quantity disposed in the year 2021-22 (in MT)	
Quantity disposed in the year 2022-23 (in MT)	
Remaining quantity to be disposed (in MT)	

13. The quantity of Untreated illuminate sludge removed and furnish the quantity to be removed if any, from the entire area of the earlier dumping.
14. Present Photographs taken in the contaminated sites.
15. Environmental statement in form- V for previous year
16. The CEPI score for Thoothukudi is 66.34 (severely polluted area) and hence to furnish
 - i. The mitigation measures to be carried out by the industry as per CPCB mechanism for environmental (air, water ,land and others) management of critically and severely polluted area dated 25.10.2019
 - ii. Implementation of short term and long term action plan by the unit for improvement of Pollution Control Measures.

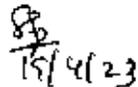
17. The unit shall remit the environmental compensation of **Rs. 100 lakhs** as per the Letter No.T4/TNPCB/ F.2643/ CEPI/ EC/TTN/2020, dated: 28.01.2020, if not so furnish the action taken by the unit for compliance of the Hon'ble Supreme Court of India order dated 25/02/2022 in C.A.No.2218-2219/2020.

The receipt of this letter shall be acknowledged.


19/4/23
For Member Secretary

Copy to:

1. The Joint Chief Environmental Engineer, (M)
Tamilnadu Pollution Control Board
Tirunelveli.
2. The District Environmental Engineer,
Tamilnadu Pollution Control Board
Thoothukudi.


15/4/23
Requested to follow up with
the unit and report to Board



TAMIL NADU POLLUTION CONTROL BOARD



Proceeding No. T1/TNPCB/F.0027 TTN/RL/ 2023, dated: 07.06.2024

- Sub:** TNPCB – Industries – M/s. V.V. TITANIUM PIGMENTS PRIVATE LIMITED, S.F.No. 1221, 1223, 1224, 1225, 1226, 1227/Pt, Meelavittan Part 1 village, Thoothukkudi Taluk and Thoothukkudi District – Certain directions under Section 5 (a) of Environment (Protection) Act, 1986 as amended - Issued – Regarding.
- Ref:**
1. Proc No.: TS1/TNPCB/F.015301/ TTN / RL/ 2018 dated: 12.06.2018.
 2. DEE's letter No.F.No.DEE/TNPCB/TTN/CEPI/Evn.Com/2019, dt. 14.01.2020.
 3. Letter No.T4/TNPCB/F.2643/CEPI/EC/TTN/2020,dated:28.01.2020.
 4. Unit's reply dated 04.03.2020
 5. Hon'ble Supreme Court of India order dated 25/02/2022 in C.A. No.2218-2219/ 2020
 6. Proc. No.T4/TNPCB/F.0027TTN/ W/RL/2022, dated: 24.05.2022
 7. Letter No. T1/TNPCB/F.0027 TTN/RL/W&A/2022, dated: 18.04.2023
 8. IR.No : F.0027TTN/RL/AEE/TTN/2024 dated 15/03/2024
 9. Report of DEE on 10-05-2024

Whereas, Tamilnadu Pollution Control Board vide reference third cited has directed the unit of M/s. V.V. TITANIUM PIGMENTS PRIVATE LIMITED, S.F.No. 1221, 1223, 1224, 1225, 1226, 1227/Pt, Meelavittan Part 1 village, Thoothukkudi Taluk and Thoothukkudi District to remit the interim Environmental compensation of amount of Rs. 100 Lakhs for the violation ,i.e. during the inspection of CPCB on 07.04.2011, it was noticed that the industry is storing acidic effluent in unlined underground tanks with all possibility of ground water contamination, no effluent treatment facility was operational, ferrous sulphate was stored in open area, raw ore spread in open area whereby any surface runoff may contaminate the surface and groundwater and has not furnished proposal for reclaiming the contaminated site in consultation with the reputed institution such as Anna University / IIT etc., as mentioned in the DEE's letter vide reference first cited.

Whereas, the unit vide reference fourth cited has furnished reply to the direction dated 28.01.2020, stating that they took over the unit from M/s. Kilburn Chemicals Limited in 2011 and the agreement to take over the plant entered on 29.07.2011.

Whereas, Board vide reference sixth cited issued direction under section 33 A of Water (P&CP) Act for compliance of certain conditions, wherein it was informed to the unit that,

The environmental compensation already levied to the unit will be imposed as per the final order of the Hon'ble courts/NGT and will be served through separate direction/letter of the Board.

Whereas, a case (C.A. No.2218-2219/ 2020) was filed by chamber of small industry associations before Hon'ble Supreme Court of India against the NGT order dated 14.11.2019. The Supreme Court of India in its order dated 25/02/2022 in C.A. No.2218-2219/ 2020 says that

"We cannot, however, lose sight of the fact that for last two years the directions issued by the Tribunal have remained stayed. Each of the appellants had requested for blanket stay of the directions issued by the Tribunal and had not confined their prayer either to the individual appellants or to the respective Members of their associations. Even then, all the concerned must have an opportunity to present their viewpoint before the Tribunal".....

"In order to facilitate the exercise, the interim order of stay granted by this Court on 18.03.2020 shall continue to operate for next Eight Weeks"

Whereas, according to the above order, the court extended the above stay only up to 25.04.2022 for the individual units to make representation. Accordingly, the unit shall make representation before Hon'ble NGT with regard to Environmental Compensation.

Whereas, Board vide reference seventh cited instructed the unit to remit the environmental compensation of Rs. 100 lakhs as per the Letter dated: 28.01.2020, if not so furnish the action taken by the unit for compliance of the Hon'ble Supreme Court of India order dated 25/02/2022 in C.A.No.2218-2219/2020.

Whereas, the DEE vide reference eighth cited has reported that the unit was issued with direction under Section 33 A of Water (P&CP) Act1974 as amended vide reference ninth cited to furnish the detailed proposal for reclaiming the contaminated site within two months (before 12.08.2018) consulted with the reputed institutions such as Anna University/IIT etc., Also reported that during 2018 a petition stating that a dumpsite wherein chemical wastes were dumped causing pollution to Therku Veerapandiyapuram Village and polluted the ground water was filed by the Counsel for Intervener on behalf of Anti Sterlite People Committee before the NGT Committee constituted by the National Green Tribunal (Principal Bench) in Appeal No. 87/2018 filed by M/s. Vedanta Ltd against the Government of Tamilnadu. As directed by the Honourable Chairman of the Committee, the location mentioned in the affidavit was inspected by TNPCB Officials on 30/10/2018 and observed that the location of the dump site denoted/mentioned in the affidavit was the same for which directions has already been issued to M/s. V.V Titanium Pvt. Ltd. vide Proc. dated.12/06/2018 for reclaiming the contaminated site.

Whereas, the District Environmental Engineer vide reference eighth cited has also reported that the unit has not submitted the proposal for reclaiming the site within stipulated time as directed by the Board vide reference first cited. Further, till date the unit has not paid the Environmental Compensation imposed.



TAMIL NADU POLLUTION CONTROL BOARD



Whereas, in view of the above reasons, the DEE has recommended to issue a fresh direction to the unit to remit a sum of Rs. One crore as an interim Environmental Compensation and to make a representation before the Tribunal with regard to the Environmental Compensation as per SCI order dated 25/02/2022 in C.A. No.2218-2219/2020.

Whereas, the Board observed that though the unit took over the unit from other management, the liability is transformed to the new management and hence, Board has decided to issue certain directions to the unit under section 5 of the Environmental Protection Act, 1986 as amended.

Therefore, in exercise of the powers conferred under section 5 of the Environmental Protection Act, 1986 as amended, Board issues the following direction to the unit of M/s. V.V. TITANIUM PIGMENTS PRIVATE LIMITED , S.F.No. 1221, 1223, 1224, 1225, 1226, 1227/Pt, Meelavittan Part 1 village, Thoothukkudi Taluk and Thoothukkudi District for compliance:

1. The unit shall remit a sum of Rs. One crore as an interim Environmental Compensation and to make a representation before the Tribunal with regard to the Environmental Compensation as per SCI order dated 25/02/2022 in C.A. No.2218-2219/2020

Failure to comply with the above said directions, will lead to issue of further directions for closure and stoppage of power supply to your unit under 5 of the Environmental Protection Act, 1986 as amended.

The receipt of the proceeding shall be acknowledged.

To :
The Director,
M/s.V.V. TITANIUM PIGMENTS PRIVATE LIMITED,
Keeraikaranthattu, Tisaiyanvillai,
Tirunelveli District,
Pin: 627657.

Copy to:

1. The Joint Chief Environmental Engineer (M),
Tamil Nadu Pollution Control Board,
Tirunelveli.
2. The District Environmental Engineer,
Tamil Nadu Pollution Control Board,
Thoothukudi
- ✓ 3. Technical file.

For Chairperson

27/6/24

**BEFORE THE HON'BLE NATIONAL
GREEN TRIBUNAL
SOUTHERN ZONE AT CHENNAI
Appeal No.69 of 2024**

M/s V.V. Titanium Pigment Pvt. Ltd.,
Represented by its Managing Director,
Mr. S. Vaikundarajan,
A-81, SIPCOT Industrial Complex,
Meelavittan Village,
South Veerapandiapuram (PO),
Thoothukudi - 628 002.

...Apellant

Vs

The Chairman,
Tamil Nadu Pollution Control Board,
No. 75, Mount Salai,
Guindy, Chennai - 600 032 and Ors

...Respondents

TYPED SET FILED BY RESPONDENT –
TAMILNADU POLLUTION CONTROL BOARD

Thiru.S.Sai Sathya Jith,
Advocate for Respondent: TNPCB

Date:14.02.2026

Date of hearing on: 16.02.2026