Coromandel

COROMANDEL INTERNATIONAL LIMITED

FERTILIZER DIVISION

ENNORE UNIT

CHENNAI

SAFETY AUDIT REPORT

April 2024

RAMS SAFETY CONSULTANTS CHENNAI

Rams Safety Consultants

4/1, Parsn Riviera, 4th Main Road Extension

Kottur Gardens, Chennai – 600 085

Phone : 044 – 2447 1166

Mobile : 98400 78043

E-mail : ramssafety@gmail.com

Website: www.ramssafetyconsultants.com

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RAMS SAFETY CONSULTANTS CHENNAI

PREFACE

The Management of Coromandel International Limited, Ennore, Chennai commissioned the services of Rams Safety Consultants (RSC), Chennai to carry out a comprehensive safety audit of the facility as per guidelines given in IS 14489 :2018

This report has been prepared after a multi-disciplinary team deputed by RSC visited the facility and carried out the audit during the month of April 2024.

Disclaimer

Rams Safety Consultants have exercised all reasonable skills, care and diligence in carrying out the safety audit. This Safety Audit Report is not deemed to be an undertaking, warranty or certification.

RAMS SAFETY CONSULTANTS CHENNAI

R Venkatesh
Principal Consultant
Rams Safety Consultants

Place : Chennai
Date : 17.04.2024

BRIEF PROFILE OF RAMS SAFETY CONSULTANTS

Rams Safety Consultants (RSC), established in 1985, is one of the leading safety consultancy firms in India.

The main focus of RSC is to meet the specific demands of the industries in the area of safety, environment and health. RSC consists of a group of dedicated professionals having vast industrial experience with specialized knowledge in their respective fields.

RSC has successfully executed more than 1000 projects in the field of Safety Consultancy covering a wide spectrum of Industries which include Refineries, Fertilizers, Chemicals, Pharmaceuticals, and Oil & Gas Installations.

RSC's profile of services includes:

- *Carrying out third party independent Safety Audits*
- *Hazard and Operability (HAZOP) Studies*
- *Layer of Protection Analysis (LOPA) and SIL /SIS for Chemical/Petrochemical Facilities*
- *Quantitative Risk Assessment (QRA) of Chemical/Petrochemical facilities*
- *Fire Risk Analysis & Fire Safety Audits*
- *Electrical Safety Audits*
- *Process Safety Management*
- *Safety Training*
- *Preparation of On Site & Off Site emergency plans*
- *Hazardous Area Classification*

1.0 INTRODUCTION

Coromandel International Limited (CIL) selected Rams Safety Consultants (RSC), Chennai for carrying out a comprehensive safety audit of their manufacturing facility at Ennore, Chennai. RSC deputed a team of specialists consisting of Mr. R Venkatesh, Mr M S Shanmugam, Mr. G. Sreedharan, and Mr. K Ramanathan for the job. A brief profile of the RSC team is given in Chapter 9 of this report. The team visited the facility during April 3-5, 2024 and carried out the audit.

2.0 SCOPE OF WORK & METHODOLOGY

2.1 Scope of Work

To carry out a comprehensive safety audit of the entire plant and other facilities in line with the requirements of IS 14489:2018, covered under the following elements.

1. Occupational Health& Safety (OH & S) Management
2. Physical Hazard
3. Chemical Hazard
4. Fire and Explosion Hazard
5. Industrial Hygiene / Occupational Health
6. Accident/Incident Reporting, Investigation and Analysis
7. Emergency Preparedness (On-Site / Off Site)
8. Safety Inspection

2.2 Methodology

2.2.1 Audit Plan

The audit plan was finalized by the lead auditor after consultation with the client and communicated to the auditors and auditee. The plan included:

- Audit objectives and scope;
- Schedule of audit activities;
- Identification of reference documents
- Composition of the audit team
- Identification of the organizational units to be audited;
- Schedule of meetings to be held with auditee management; and
- List of documents to be perused by the audit team.

2.2.2 Questionnaire

A questionnaire/checklist seeking information about various elements of OH & S system as given in relevant Annex of IS 14489: 2018 was forwarded by the lead auditor (of RSC) the auditee management (CIL – Ennore). This questionnaire/checklist was filled in by the auditee and returned for study by the audit team before the scheduled field visit. The response to the questionnaire/checklist as filled up cells/rows in respective Column (3) by the auditee (CIL , Ennore) is given in Chapter 5 of this report titled "Occupational Health & Safety System at CIL, Ennore".

2.2.3 Opening Meeting

An opening meeting was held by the team of auditors on 03.04.2024 with the Site Management Team (including the Factory Manager) to fulfil the following purpose(s):

- Introduce the members of the audit team to the auditee's senior management;
- Explain the scope and objectives of the audit;
- Provide a short summary of the methods and procedures to be used to conduct the audit;
- Establish the official communication links between the audit team and the auditee;
- Confirm that the resources and facilities needed by the audit team are available;
- Fix a schedule of visits to individual plants / departments; and
- Discuss with the auditee's senior management the areas of concern and areas of focus suggested by the audit team;
- The objective of the Safety Audit and the support expected from the site personnel in conducting the Audit were explained to the Management team by the Lead Auditor.

2.2.4 Field Visit

Audit team carried out the field visit along with the concerned officials of the auditee.

During the course of the audit, the auditors visited all plant facilities and held discussions with persons from various functions. Plant documents including records being maintained were scrutinized where appropriate.

2.2.5 Closing Meeting

A closing meeting was held by the team of auditors on 05.04.2024 with the Site Management team where the major findings of the audit were discussed.

2.2.6 Limitations of this OH&S Audit

The Unit is under shut-down for around three months at the time of carrying out this OH&S audit. This audit has not been performed in an operational plant and hence the audit team didn't have the opportunity to validate the safety viz-a-viz the operating conditions of the plant/factory *(e.g., noise levels, hygiene conditions – control of dust & fumes, spills & leaks in equipment, vibrations in equipment, effective guarding of equipment during operation, effectiveness of housekeeping to prevent slippery surfaces in the operating floors etc.,).*

The Unit (CIL – Ennore) had carried out an independent third party OH&S audit recently (in Nov 2023) whilst the plant was in operation and the status of implementation of the recommendations from that audit have been submitted to the statutory authority (DISH). For the sake of avoiding duplication, the discussions/findings from that audit are not repeated here in this audit report.

Status of adherence to the response to the Inspection reports and/or License/Permit conditions under various statutes (e.g., PESO Licenses for Petroleum - Class B/Class C storages, CEIG for CEA Regulations 2023, Tamil Nadu Fire Services Act and Rules, DISH Inspection reports etc.,) are not discussed in this audit report.

2.3 Facilities Audited

A list of facilities visited and functional personnel with whom discussions were held is given below.

1. Sulphuric Acid Plant (SAP) 1
2. Sulphuric Acid Plant (SAP) 2
3. Phosphoric Acid Plant

4. Ammonium Phosphate Sulphate (APS) Plant
5. Water Treatment Plant (WTP)
6. Bagging Plant
7. Ammonia Terminal
8. Storage Godown (Product, Rock Phosphate, Sulphur)
9. Captive Power Plant (CPP)
10. Multiple Effect Desalination (MED) Plant
11. OHC / Security / Fire & Safety
12. Quality Control and Environmental Laboratories
13. Other Utilities/General Storages/Stores/Store Yard/Workshop/instrumentation/Engineering and Inspection Departments
14. Chemicals Storages & Pipelines
    a. LPG
    b. Sulphuric Acid Tanks
    c. Phosphoric Acid Tanks
    d. Caustic Lye
    e. High Speed Diesel
    f. Fuel Oil (FO)

2.4 Discussion and Scrutiny of Documents / Records

- Production – Acid/Fertiliser Stream/ Tech Services
- Maintenance – Mechanical, Electrical, Instrumentation, Civil
- Project
- Environment, Health & Safety (EHS) – inclusive of Process Safety Management Systems and Fire Department
- Quality Control
- Security
- Stores
- HR
- Finance /Distribution/Commercial
- Occupational Health Centre

3.0 ABOUT CIL (Ennore Unit)

Coromandel International Limited (CIL), India's second largest Phosphatic Fertilizer Player, is in the Business segments of Fertilizers, Specialty Nutrients, Crop Protection and Retail.

Coromandel International Limited, Ennore Unit is engaged in the manufacture of compound fertilizers of three grades namely 16:20:0:13 (16% Nitrogen, 20%P2O5,0%K2O,13%S),20:20:0:13 (20% Nitrogen, 20%P2O5,0%K2O,13%S) and 15:15:15:09(15% Nitrogen, 15%P2O5,15%K2O,09%S) with the trade name Paramfos & Gromor. The unit is having a facility for storing 12500 MT of Ammonia with full safety infrastructure. The factory is located at the coastal area, Ennore (next to Ennore Foundries) which is at a distance of about 5.0 Km from Thiruvottiyur & 15 km from Chennai Port.

The Ennore Unit Factory of CIL complex was commissioned in 1963. The on-site activities are primarily concerned with the production of N-P-K complex fertilizers of various grades under the trade name Gromor. Phospho- gypsum is an important byproduct.

Following are the operating units at the Coromandel complex.

Sl.No	Plant /Storage	Capacity
1.	Sulphuric Acid Plant – I & Plant -II	258000 TPA
2.	Phosphoric Acid Plant- I	66000 TPA
3.	Ammonium Phosphate Potash Sulphate Plant	400000 TPA
4.	Ammonia Storage Tank (Ammonia Terminal)	12500 MT
5.	Sulphuric Acid Tanks	7733 MT
6.	Phosphoric Acid Tanks	760 MT
7.	Captive Power Plant	4 MW
8.	Sewage Treatment Plant	10 KLD
9.	Multiple Effect Distillation (MED) Plant	1560 m^3/day
10.	Furnace Oil	44 KL
11.	High Speed Diesel (HSD)	22 KL
12.	LPG	1000 Kg
13.	By – Product (Gypsum)	492000 TPA

4.0 BRIEF DESCRIPTION OF THE FACILITY AUDITED

Major products of Coromandel International Limited (Ennore Unit) are complex fertilizers marketed in the trade name of Paramfos (16:20:00:13) and Gromor (20:20:00:13 and 15:15:15:09) containing Nitrogen Phosphorous and Potash nutrients. The plant utilizes imported liquefied Ammonia, rock phosphate and sulphur as raw materials.

4.1 Complex Fertilizer Plant

Raw Materials (Liquid Ammonia, Phosphoric Acid at 26-27% concentration, Sulphuric Acid)

The conventional process for manufacturing complex Phosphatic (NPK) Fertilizer involves the reaction between Ammonia, Phosphoric and Sulphuric Acid. The slurry thus formed containing up to 80-85% of solids is then pumped into a Rotary Drum Granulator wherein it coats the recycled fertilizer solid (of fine size) to form larger granules prior to drying and separation of appropriately sized product granules.

As technological improvement, Pipe Cross Reactor is introduced to improve efficiency, quality and throughput. It is a simple Pipe Cross Reactor into which the raw materials are directly fed. The Pipe Cross Reactor is positioned such that the spray from the outlet of the reactor falls directly onto the bed of recycled fertilizer in the Granulator. The feed of raw materials is carefully controlled using high accuracy flow meters to ensure the correct composition of the resulting fertilizers. The Pipe Reactor allows a higher temperature operation of the reacting slurry and also eliminates the problems of pumping the slurry into the Granulator. These allow better Granules and a lower ratio of recycled fertilizer material to fresh feed material. Thus, for a given capacity of the recycled fertilizer handling system the pipe reactor enables a higher throughput of product.

The discharge from the Granulator is then conventionally treated by drying in a Rotary Dryer using hot air as a drying medium, screened in industrial sieves to separate the oversize particles from the product size Granules and under size fines material. The oversize is crushed in oversize Pulverizes and compound with the under size fines to form the recycled fertilizer fed back to the Granulator. The product size granules are taken to the bulk storage and consequently to the bagging plant as and when required for bagging operations prior to dispatch from Factory.

4.2 Sulphuric Acid Plant

Raw Material (Sulphur)

The process Technology used here is that of the Double Contact Double absorption system with features incorporated for maximum energy recovery and reduced maintenance cost.

The sulfur granules are melted by the use of steam, using coils placed in the melter pit. The molten sulfur is pumped through the sulfur filter into a holding pit. The cleaned sulfur is then pumped into the sulfur burner where in the presence of oxygen from the dry air it is converted into Sulfur-DI-Oxide. The air is dried in drying tower using sulfuric acid as the medium for absorbing moisture from the air.

The heat generated in the reaction between sulfur & Oxygen is recovered as steam, at 24 bar(g) pressure at SAP 1 and 36 bar(g) pressure at SAP 2 using the waste heat boiler. The cooled gas is then catalytically converted using vanadium pent-oxide to sulfur tri-oxide. This reaction being exothermic raises the reacting gas temperature, which is then effectively recovered by superheating the steam, generated by the waste heat boiler.

After cooling, the gas is then further converted the second time to produce more sulfur tri-oxide. The resulting heat is then recovered in the Intermediate heat exchanger before being sent to the converter for the 3rd pass for more conversion to sulfur tri-oxide. The 3rd pass obtains the conversion efficiency of up to 97% and the heat of reaction of the 3rd pass is recovered in the final heat exchanger & economizer.

The cooled gas containing substantial quantities of sulfur tri-oxide is then sent to the intermediate absorption tower wherein it reacts with sulfuric acid being circulated to form oleum. Water will be mixed with oleum to make sulfuric acid in circulation tank. The gas free of sulfur tri-oxide is passed through the Mist Eliminator to ensure that droplets of sulfuric acid are removed from the gas stream.

This gas is then heated in the final and the intermediate heat exchangers to a temperature of 450 deg C before being sent into the 4th pass of the converter wherein the small quantities of sulfur tri-oxide is converted to the tri-oxide form.

The heat of reaction obtained here is also recovered in the economizer by heating the boiler feed water being sent to the waste heat boiler. The cooled gas containing the sulfur tri - oxide is then absorbed in the final absorption tower using sulfuric acid to form the additional quantities of sulfuric acid before being vented to the atmosphere through a stack.

The steam produced in waste heat boiler is super heated in the super heater placed downstream of the first pass of the converter used to generate power in Captive Power Plant (4.0 MW). The Exhaust steam is then used as the heating medium in the Multiple Effect Distillation (MED) unit. A part of the steam is also used for heating the sulfur in the melters and de- aerating the fresh boiler feed water.

The product acid from circulation tank is pumped through the product cooler before transfer to the sulfuric acid storage tanks.

4.3 Phosphoric Acid Plant

Raw Materials (Rock Phosphate, Sulphuric Acid, Water)

The process technology for the manufacturing of Phosphoric Acid is the conventional Dihydrate route. The special features of this unit include minimal power requirement, high slurry circulation conversion efficiency and the use of direct (98.5%) sulphuric acid to eliminate the maintenance prone acid dilution cooler. The imported rock phosphate stored in a closed godown, within the factory, is transported to the Grinding area. The Ball Mill with closed loop grinding arrangement is used to crush the rock phosphate to the appropriate size and then stored in an intermediate bunker.

This rock phosphate is then carefully weighed on electronic weigh feeders and fed to the Reaction Vessel (conventionally called Attack Tanks). The rock phosphate is mixed with Sulphuric Acid and cooled reaction slurry is intensely agitated using specially designed agitators in a circular Reaction Tank. This slurry passes through a series of compartments to facilitate the completion of reaction between rock phosphate and sulphuric Acid before entering an inner vessel placed within the circular tank. This vessel is designed to allow completion of the reaction before the entire slurry is pumped into Evaporative Coolers before being returned to the main tank to mix with the fresh reactants mentioned above.

A small portion of the slurry is removed for filtration of the products of reaction namely phosphoric acid and calcium sulphate dihydrate. The filtration is carried out on Belt Filter to ensure the separation of the liquid phosphoric acid from the solid calcium sulphate (otherwise known as phosphogypsum). The Phosphogypsum is washed repeatedly using fresh water to ensure complete recovery of phosphoric acid. The washings of the filter cake are recycled to the main Reaction Tank. The product phosphoric acid is transferred to storage and the washed filter cake is transported to the Gypsum handling yard.

The gases containing the fluorides are recovered using the suction fans from the various vessels of the plant and scrubbed with fresh water to ensure recovery of fluorides

containing compounds from the gases. The fluoride free gas is then vented through a high stack.

4.4 Atmospheric Ammonia Storage Facility

Atmospheric Ammonia storage facility. The tanks are of double wall double integrity cup-in-tank type design and operate at 200 to 1000 mm Wc at –33° C to –32° C temperature. Facility has been provided to receive imported ammonia from the ship pumping line.

CIL, Ennore Unit, has commissioned Ammonia unloading facilities to unload imported Ammonia from ships utilizing the minor port facilities. The ship pumps will be used to pump ammonia to the atmospheric Ammonia storage tanks via a 2 km long pipeline from the minor port to the storage tanks.

4.5 Utilities

Utilities plant consists of De-Mineralized water plant, Steam generation boilers, and power generator, and instrument air generation compressors. Utilities also handles water reservoirs.

4.6 Quantities of Hazardous Chemicals

Hazardous Material	Type of storage	Capacity (Nominal)	Number of Tanks	Max. Inventory	Hazardous Class
Ammonia	Atmospheric Pressure Type (Double Walled Refrigerated)	12500 MT	1	12500 MT	Toxic
Sulphuric Acid	Carbon Steel (CS)	1500 MT 2900 MT	2 1	4500 MT 2900 MT	Corrosive
Phosphoric Acid	Rubber Lined MS Tanks	340 MT 240 MT 90 MT	1 1 2	340 MT 240 MT 180 MT	Corrosive
Solid Sulphur	Open Yard	30000 MT		30000 MT	Flammable
Diesel (HSD)	Underground	22 KL	1	22 KL	Flammable

Hazardous Material	Type of storage	Capacity (Nominal)	Number of Tanks	Max. Inventory	Hazardous Class
Caustic Lye	Rubber Lined SS Tank (100%)	35 MT	1	35 MT	Corrosive
Liquified Petroleum Gas (LPG)	Cylinders (19.5 Kg capacity/cylinder)	19.5 Kg	50	1000 Kg	Flammable

5.0 BRIEF DESCRIPTION OF ELECTRICAL INSTALLATIONS

- The source of power supply is Tamil Nadu Electricity Board (TNEB) and partly from 4 MW Captive power unit utilizing the waste heat recovery unit (WHB) in Sulphuric Acid plant.
- Switch yard provided and is connected with 33KV feeder of Tamil Nadu Electric Board. Two numbers of 5MV transformers available inside the switch yard along with VCB
- The switch yard is protected by fencing. Cross earthing provided for the fencing Switch yard was inspected by CEA representative & the Compliance report submitted by the unit.
- The installation & their energization have been approved by the TN State Electrical Inspectorate and such approvals and copies of drawings are available.
- 5MV Transformers provided with soak pit and oil collection sump at distance provided to collect the oil in case of fire emergency.
- Lightning arresters are installed at switch yard to protect it from effects of lightning surge and connected to dedicated earth pits..
- 3.3 KV substation provided for the power supply to individual plants.
- The unit has Emergency backup D.G sets. 1000 KVAx1 and 750KVA and as standby power supply kept in auto mode. HSD is used for power generation in D.G Set
- Oil transformers are located inside fenced area outside of all substation and fire wall provided in between transformers. Cross earthing provided for the fencing. Emergency trip button provided foreach transformer.
- Transformer oil testing including DGA conducted and records available.
- Di-electric insulation painting has been done in front of electric panels (in lieu of Insulating Mats).
- The substations are having all electrical testing & measuring devices like Earth megger, insulation tester, motor checker etc. which are periodically calibrated on site by NABL approved vendor and calibration records are well maintained

- Electrical rubber gloves, eye protecting goggles etc are made available including residual voltage discharge rods for using positive isolation of HV lines.
- C license & B licensed holders are employed in the substations.
- Electrical system has protections like relays, breakers etc. for short circuit current. Relay testing carried out yearly and records available
- Infrared Thermograph is done in a scheduled manner to find out the hot spot. thermal imaging camera is available.
- Electrical repair/maintenance works are being carried out by adopting LOTO system and LOTO register is not maintained.
- Earth pits resistance checked and register is maintained. Total 180 earth pits are available and 80 Nos of earth pits converted into chemical earth pits.
- Emergency lightings provided for control rooms/substations and other buildings.
- Smoke detection system with addressable alarm panel is available for the substations.
- Fire extinguishers and fire buckets have been found kept at the entrance level of all substation and DG rooms.

Illumination

- Standard lighting systems are provided as required. Classified lighting fixtures have also been provided in the hazardous areas.
- Automatic Street light operation based on Lux level and with timer installed to prevent human intervention

Cable System

- Power & control cables have been laid in slotted cable trays (FRP).

6.0 OCCUPATIONAL HEALTH & SAFETY SYSTEM AT CIL

C-1 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT		
C-1.1 OH & S Policy		
1.	Does the organization have a health and safety policy?	Yes, the organization has an Environment, Health, Safety & Quality (EHSQ) Policy
2.	Who has signed the health and safety policy?	Executive Director has signed the H&S Policy.
3.	Whether the OH & S policy is per guidelines of the statutory provisions?	The EHSQ Policy has reportedly been prepared taking into consideration the requirements listed under Rule 62B of The Tamil Nadu Factories Rules, 1950
4.	When was the safety policy declared and adopted?	The Safety Policy has been declared and adopted in December 2009
5.	Whether the OH & S policy reviewed periodically?	The Policy has been reviewed and updated periodically. The Current OH & S Policy is dated September 2023.
6.	Whether the OH & S policy is available in local language and made known to all?	Yes. The Policy has been displayed in all notice boards inside the factory. Booklet containing Policy has reportedly been prepared and distributed to all employees individually.
7.	What was the last date of updation?	The Policy was last updated in September 2023.
8.	Does it find a place in the annual report?	Policies available in CIL is listed in the Annual Report of CIL.
C-2 OH & S ORGANIZATIONAL SET UP		
C-2.1 Safety Department		
9.	Does the factory have a safety department and what is the strength of the safety department?	Yes. Safety department includes Environment, Health, PSMS & Fire Section and is called EHS Department Total Strength of the EHS Department is 15

10.	Whether the strength and qualifications of Safety Officers are as per the statutes?	Yes
11.	Does the head of safety department/safety officer report to the Chief Executive?	Head of the EHS Department reports to the Unit Head who is the designated Factory Manager.
12.	How often are the safety officers retrained in the latest techniques of total safety management? What is the frequency of retraining?	Safety officers are sent to outside seminars conducted by reputed institutions on safety management topics. The frequency of the retraining is Annual.
13.	What additional duties the safety officer is required to do?	No additional duties are assigned to the designated Safety Officers apart from the routine safety related duties.
14.	What is the power of safety officer vis-à-vis unsafe condition or unsafe act?	Safety Officers have the authority to stop any work by withdrawing the work permit and also in case of unsafe act/unsafe practices
C 2.2 Safety Committee(s)		
15.	Does the factory have safety committee(s)? What are the types, structures and terms of reference of the committees?	Yes. Central Safety Committee is constituted with the participation of 50% Management Employees and 50% Non-Management Employees. Central Safety Committee is constituted as under Rule 61M of The Tamil Nadu Factories Rules, 1950. The committee meets periodically to discuss matters related to Safety, Health and Environment at workplace.
16.	Is the constitution of the safety committee(s) as per the statute?	Yes
17.	How are the members of safety committee(s) selected? (elected/nominated)	Employee representatives are nominated from among the employees as per The Tamil Nadu Factories Rules, 1950. Trade Union also nominates their representatives in the Safety Committee.
18.	How often are the meetings of safety committee(s) held?	Meetings are held once in every three months

19.	Are the recommendations of the committee(s) implemented?	Yes. The recommendations are taken up by concerned Managers and implemented. If the recommendations involve modifications, the same will be subjected to a Management of Change/HAZOP study and then implemented.
20.	Are the minutes of the safety committee(s) meetings circulated among the members?	The minutes of the Safety Committee meetings are sent to individual members.
21.	Are the minutes forwarded to the trade union(s) and chief executive and occupier?	Minutes of the meeting are sent to : i. Factory Manager ii. All members
22.	Whether the management and trade union play their active roles in supporting and accepting the committee(s) recommendations?	Yes. Management provides full support to implement the recommendations with acceptance by the employees
23.	How are the safety committee(s) members appraised of the latest developments in safety, health and environment?	Safety News Bulletins and pamphlets. The members are also nominated to attend outside seminars in the subject of safety.
C 2.3 Safety Budget		
27.	What is the annual safety budget?	**For the year 2023-24** Rs.65 Lakhs
28.	How much percentage is this budget of the total turnover of the company?	Information not available.
29.	How much budget has utilized till date*?(From April 2023 to March 2024)*	88 %
30.	Is the safety budget adequate?	Yes
31.	How is the safety budget arrived at?	Expenses towards regular consumption of safety items, repair of Fire & Safety vehicles, repair of fire hydrants and planned procurement of fire & safety appliances, safety training, safety audits, mock drills and public awareness programmes etc. are considered while arriving at safety budget

32.	What is the pattern of expenditure for the last five years?	2018-19 Rs.303 lakhs 2019-20 Rs.169 lakhs 2020-21 Rs. 96 lakhs 2021-22 Rs. 103 lakhs 2022-23 Rs. 110 lakhs
33.	What are the approved sanctions for the expenditure in this budget?	Approved sanctions as mentioned above (*Refer response in Q#31*)
34.	Does this budget get reflected in the annual report of the company?	No
C-3 SAFETY MANUAL		
35.	What is the periodicity of updation / review of safety manual?	IMS Manual, Centralised PSM, Administrative and Work Permit Procedure are reviewed Annually
36.	Does the safety manual adequately address all the hazards in the plant?	The safety manual addresses the hazards in the plant.
37.	Are the employee made aware of safety rules / instruction mentioned in the safety manual?	Yes Manuals on Safety are issued to all employees. Periodical awareness training is given.
C-4 STANDARD OPERATING PROCEDURES (SOP)		
38.	Are written Standard / safe operating procedures available for all operations and processes?	Yes, for each plant separate SOP is available. Separate OCP is also prepared based on the Risk Assessment and is available.
39.	Whether the written Standard / safe operating procedures are displayed or made available and explained in the local language to the workers?	Yes. Safe operating procedures are explained to the production/maintenance staff.
40.	Whether concerned section and safety department prepares standard / safe operating procedure jointly?	Yes
41.	Are standard / safe operating procedures (SOPs) reviewed and updated?	Yes, they are reviewed and updated annually.

42.	Have the workers been informed of the consequences of failure to observe the standard / safe operating procedures?	Any change in operating procedures is explained to the engineers and workmen. Training classes are conducted where engineers/workers are trained.
C-5 PLANT MODIFICATION PROCEDURES		
43.	What is the system for effecting any change in the existing plant, equipment or process?	Modifications to the existing system is subjected to change management/ HAZOP study before implementation. OEM/Licensors' recommendations are also considered.
44.	Whether the P & I diagrams and other related documents are updated accordingly?	Yes
45.	Whether hazard assessment done before implementation of modification?	Yes
C-6 WORK PERMIT SYSTEM		
46.	What types of work permits exist in the factory?	Following are the types of work permits used in the CIL, Ennore Factory: • Cold Work Permit • Hot Work Permit • Vessel Entry / Confined Space Entry Permit • Radiography Permit
47.	Are the necessary forms detailing required safety precautions have been prepared and used for each type of work-permit?	Yes Approval Forms 1. Work at Height Approval 2. Excavation Approval 3. Crane Lifting Approval 4. Electrical Isolation Slip
48.	Is the responsibility assigned to authorized person for issuing of safety work permit?	Yes, only assigned persons issue and receive the Permits.

49.	Is the copy of safe work permit sent to safety officer before execution of the job?	Yes. Hot Work Permit and Confined Space Entry permits will be issued after approval of Safety Officer/Work Permit Officer.
50.	Is validity period specified in the safety work permit?	Yes
51.	Are the records of work permit available and maintained in proper order?	Yes (maintained online)
C-6. 1 Control Measures for Work at Height		
52.	Is adequate safe access provided to all places where workers need to work?	Yes. provided where workers need to work.
53.	Are all such access in good condition?	Yes, with few exceptions
54.	Are all scaffolds are properly designed and erected?	Yes
55.	Are scaffolds inspected every day before work begins?	Yes
56.	Are ladders securely clamped or lashed in place?	Yes
57.	Are planks in good condition?	Yes
58.	Are scaffold walk away, platforms, runs or stairs free of debris, grease, any unnecessary obstruction and projecting nails?	Yes. As per Work Permit system, only after Scaffolding is certified by Mechanical Engineer the Work at Height approval is given alongwith Work Permit.
59.	Are the scaffolds higher than 20 m.? If yes, is a netting or intermediate railing provided between toe-boards and hand railings?	Yes
60.	Are folding stepladders properly used?	Yes.
61.	Are ladders set up at the proper slope of about 1:4?	Yes
62.	Do workers use hand lines to lift tools	Yes

	or materials?	
63.	Are proper ladders used around electrical hazards?	Yes
64.	On sloping roofs, are crawling boards, lifelines, safety belts and edge protection provided where needed?	Yes
65.	Whether the weak spots, skylights, or deteriorated asbestos-cement boards through which a worker might fall while working in the roof has been identified and safety net provided appropriately?	Whenever deteriorated sheets are observed, they are immediately replaced with new sheets. Cherry Pickers are used to replace the roof sheets whenever the need arises. This avoids the stepping over on the fragile roofs while replacing the sheets. Work Permit Procedure also ensures positioning of Safety Nets while doing AC sheet jobs.
66.	Are the workers being medically examined for their fitness to work at height?	Before issuing a work at height permit, worker is medically examined, and work permit is issued only after they are found fit.
C-6. 2 Work in Confined Space		
67.	Is work permit system followed for working in confined space?	Yes
68.	Whether monitoring of the atmosphere inside the confined space is carried out and ensured that there is no flammable or toxic gas in the area?	Yes
69.	Whether the person entering the confined space is using suitable personal protective equipment (PPE)?	Yes
70.	Is rescue team available in case of any emergency?	Yes . Manhole Watchers are also positioned for each Confined Space Entry job.
C-7 CONTRACTORS' SAFETY SYSTEM		
71.	Is there any system for selection of contractors?	Contractor competency to carry out job is verified before awarding the job.
72.	Are there any guidelines on contractor's safety and training?	Yes.Before doing any job inside premises contractor must go through safety induction training.

73.	Whether contract document includes necessary safety and welfare clauses as per statutes?	Yes. It is mentioned in the Purchase Order (PO) conditions.
74.	Is there any programme to ensure use of PPE by contractors personnel?	Yes. The person who issues the work permit and safety personnel ensures the usage of PPE by contractor personnel by periodical monitoring.
75.	Do the Contractors have their own safety organization	No
76.	Are the contractors reporting all accidents and injuries?	Yes
77.	Are contractor workers trained to observe safety at work place?	Yes
78.	Whether contractor workers are engaged in process / operations? If yes, are they aware of safe operating procedures?	No, contractor workers are not engaged in direct process / operations of Plants. They are utilized for cleaning and maintenance work.
C-8 PLANT DESIGN AND LAYOUT		
79.	Whether hazardous operations in the plant are segregated?	Yes.
80.	Whether occupational health & safety aspects are considered during the design?	Yes
81.	Are all the equipment provided with adequate space for working, maintenance etc.?	Yes
82.	Are the storage tanks provided with enough space / clearance between them?	Yes
83.	Whether the plant layout has taken care of the movement of firefighting equipment and emergency exits?	Yes.
C-9 MEDICAL MANAGEMENT OF ACCIDENTS		
84.	Are medical facilities available with trained first aid staff and equipment in round the clock shift for all including contractors?	Yes.

85.	Is the ambulance van available for round the clock basis with the dedicated driver?	Yes.
86.	Is there any mutual aid scheme available with the nearest hospitals to manage and treat injuries during emergency	Hospitals / Nursing Homes in Chennai have been identified as panel of Hospitals for the treatment of injured
87.	Are the workers / contractor workers aware of emergency medical facilities?	Yes
C-10 MANAGEMENT OF EMERGENCIES (NATURAL/MANMADE)		
88.	Does the system exist to detect and control the Natural/Manmade Emergencies?	On Site Emergency Plan deals with the Procedures and Systems Any information on natural calamities will be informed by the District Authorities.
89.	Are the employees aware of the measures to be taken during emergencies?	Yes. Periodical awareness training is given during Monsoon/Cyclone time. Do's and Don'ts regarding measures to be taken during emergencies are circulated through e-mail.
C-11 EMPLOYEES SELECTION AND PLACEMENT		
90.	Whether norms are available for selection of different category of employees?	Yes
91.	Whether pre-employment medical examination is being conducted for employees?	Yes
92.	Is there any procedure to evaluate safety awareness and record of the employees during their promotion?	No

C-12 SAFETY CULTURE		
C-12.1 Attitudes of Managers		
93.	Do the managers follow the plant safety rules at all times?	Yes
94.	What are the Managers attitudes towards safety reviews and audits?	The Managers have a positive attitude towards safety reviews and audits.
95.	What is the response of management to safety violation?	Warning will be given to the violators. Life Saving Rules available and consequence management system is being implemented.
96.	Whether safety related decisions are taken in consultation with the workers?	Yes (along with Trade Union Office bearers)
97.	What is the attitude of the managers towards non-use of personal protective equipment?	Non-use of personal protective equipment is discouraged.
C-12.2 Attitudes of Workers		
98.	Whether workers are aware of the consequences of their wrong actions?	Yes. Life Saving Rules available and consequence management system is being implemented.
99.	Are laid down safe working procedures followed strictly?	Yes
100.	What is the attitude of the workers towards their own mistake, which can prejudice safety?	Corrective actions will be taken by workers.
101.	Do the workers report near miss incidents and suggest safety improvements?	Yes . Unsafe conditions (USC)/Unsafe Acts (UA) and incidents are reported in online EHS Portal.
102.	Are the workers aware of the system of rewards and sanctions relating to safety matters?	Yes
103.	What is the attitude of workers towards use of personal protective equipment?	Usage of personal protective equipment is adhered to by the workers.
C-13 STATUTORY LICENSES, APPROVALS AND RECORDS		
104.	Whether all the safety related Acts / Rules (with latest amendments) applicable to your organization	Yes. The Legal requirements are identified and mapped in Coral Compliance Software. Compliance responsibilities are assigned to the

	identified, informed to all employees and complied?	users and communicated.
105.	Whether the licences have been validated?	Yes. The Licenses are reviewed monthly in OR meeting and quarterly in CIL Board Meeting.
C-14 MOTIVATIONAL AND PROMOTIONAL MEASURES FOR OH&S		
106.	Does the factory have occupational health and safety suggestion scheme?	Yes. Under the name of "Spark", suggestion scheme available and as a motivational measure best suggestions are recognized with rewards on a periodical basis.
107.	Are occupational health and safety contests organized in the factory?	Yes. Safety Week, Electrical Safety Week, Road Safety Week, Process Safety Week, Fire Safety Week , Chemical Safety Day and World Environment Day is commemorated and/or celebrated every year.
108.	Does the factory participate in National Awards?	Yes
109.	Has the factory been awarded during last five years?	National Safety Council, TN Chapter has recognized CIL Ennore for its Good Safety Management Systems and Safety Performance in the year 2022 and has given an "appreciation" award for the Year.
110.	Does the organization publish safety bulletin / newsletters?	Yes. "EHS Panorama - Quarterly News Letter" containing topics on Safety, Health & Environment
111.	Whether the safety bulletins are widely distributed?	Safety Newsletter is distributed to all employees every quarter.
112.	How is the occupational health and safety information including accident statistics disseminated in the factory? (Bulletin boards, Newsletter etc).	Displayed in Accident statistics board and newsletter
113.	What are the activities conducted during National Safety day / week?	Competitions are held in Safety Slogan, usage of PPE, Safety Quiz, Safety sketch with caption etc. every year prior to National Safety Day

		celebrations. Awards are given to winners on National Safety Day (4th March) every year.
114.	What is the percentage of Workers participating in the various safety promotional activities?	Around 60% of workers participating in the safety promotional activities.
C-15 HAZARD IDENTIFICATION AND JOB SAFETY ANALYSIS		
115.	Was an initial process hazard analysis (PHA) completed	Yes
116.	What are the stages of PHA? Whether a dedicated group is identified for PHA?	Plant visit for feasibility study will be carried out by a dedicated team. After feasibility study is completed, HAZOP study will be carried out by the team. A dedicated team is nominated for Process Hazard Analysis (PHA) studies like HAZOP. Nearly 20 Employees of CIL, Ennore have been trained in carrying out HAZOP study by an external trainer. Once in 5 Years, re-validation PHA in the form of HAZOP study is carried out for Ammonia and Sulphuric Acid storage and handling systems.
117.	Was the PHA appropriate for the complexity of the process and identify, evaluate, and control the hazards involved in the process?	Yes
118.	Does the hazard evaluation use one or more of the following PHA methodologies: What-If Analysis, Process Checklist, Hazard and Operability (HAZOP) Study, Failure Mode and Effects Criticality Analysis (FMECA), Fault Tree Analysis (FTA) or any other appropriate equivalent methodology?	Yes, HAZOP study is the study carried out for Hazard Evaluation.
119.	Does PHA assures addressing issues of inherent safety features with respect to material and their properties?	Yes

120.	Does the PHA address the hazard identification, incidents history, consequences of failures (engineering and administrative controls), human factors, consequence analysis with respect to possible safety and health effects of failure of controls?	Yes
121.	What are the stages of PHA? Whether a dedicated group is identified for PHA?	Modification schemes are forwarded by process owners to technical services for determining feasibility. After feasibility check, HAZOP study is carried out for the scheme. Recommendations of HAZOP study is incorporated in the scheme before final approval. Dedicated group is available for PHA study.
122.	Does the system exists to promptly address findings and recommendations of PHA?	Yes
123.	Are the PHA's updated and revalidated at least every five years by a qualified team to assure that the PHA is consistent with the current process?	For the Ammonia Storage and Handling systems, HAZOP study is carried out once in every 5 years by engaging the OEM (UHDE/TKIS)
124.	Whether the activities requiring Job Safety Analysis have been identified?	Yes
125.	Whether the identified jobs for Hazard Identification have been carried out by trained and experienced persons?	Yes
126.	Whether the checklists have been prepared on each Job Safety Analysis and are being used while carrying out the job?	Job safety Analysis carried out for specific job only. For others, checklist based approach is used.
C-16 PRODUCT SAFETY		
127.	Whether hazards arising from use of the products are identified?	Yes. (Final Product is non-hazardous; intermediate products are Hazardous)

128.	Whether material safety data sheet prepared for the products?	Yes
129.	Are all the products labelled and packed appropriately?	Yes (Final Product is packed and labelled)
130.	Whether safety instructions are given along with products?	Yes (Product bag has mention of safe handling and precautions)
131.	Whether policy exists for recall of products?	Yes
C-17 SAFETY TRAINING		
132.	Whether training needs have been identified?	Yes
133.	Is there any programme of induction training, its duration and topics covered?	Trainees 1 year Direct recruits 3 days induction training
134.	Whether the assessment of the trainees has been carried out?	Yes
135.	What are the infra-structural facilities available for training?	Yes, Training hall, Library, Sound system, Multi-media LCD projector are available for training.
136.	Whether training is conducted by qualified person?	Yes
137.	Whether trainers are being re-trained from time to time?	Yes
138.	Whether proper records of training program conducted are maintained?	Yes
139.	How training programs are evaluated?	After the training program feedback form must be filled by all the participant for evaluating the program.
140.	Whether schedule for training on occupational health and safety is available and maintained?	Yes
141.	Whether the training programmes are reviewed?	Yes
142.	Are all the employees periodically trained / retrained and what is the	Yes, annual

	frequency of such training?	
143.	Are the retraining needs identified whenever a new process / products and change in existing process introduced?	Yes
144.	Whether training covers top management?	Yes
145.	How many hours of safety training is given to different employees?	At least 3 Training man days /employee
C-18 CHANGE MANAGEMENT		
C-18.1 Management of Change		
146.	Are there written procedures for managing change to process chemicals, technology, equipment and procedures and changes to facilities that affect the plant process / system operation?	Yes (centralized Management of Change procedure is available)
147.	Do the procedures assure that the technical basis for the proposed change addressed prior to any change?	Yes , while raising MOC, pre-design checklist is attached to ensure the Technical basis with respect to change.
148.	Do the procedures assure that the impact of the change on safety and health addressed prior to any change?	Yes
149.	Do the procedures assure that modifications to operating procedures are addressed prior to any change?	Yes
150.	Do the procedures assure that the necessary time period for the change is addressed prior to any change?	Yes
151.	Do the procedures assure that the authorization requirements for the proposed change are addressed prior to any change?	Yes, separate management committee (internal as well as corporate) is involved in approving the change.
152.	Are employees involved in operating a process, and maintenance and	Yes

	contract employees whose job tasks will be affected by change informed of, and trained in, the change prior to the start-up of process or affected part of process / operations?	In the MOC process, a record of Training /Briefing given is attached and such training is mandated for the person who is affected by the change.
153.	Is the safety information is reviewed and updated on changes?	Yes
154.	Are the operating procedures or practices updated?	Yes (based on the MOC change, HAZOP and PIIR recommendation, periodical SOP review inputs, SOP is reviewed.)
C-18.2 Mechanical Integrity		
155.	Does the mechanical integrity program include for all mechanical equipment including pressure vessels and storage tanks, piping and components, relief devices and vent systems, emergency shutdown systems, pumps, control systems?	Yes Based on identification of safety critical equipment and risk based classification procedure, all safety critical equipment has been identified and listed and is then included in Asset Integrity Inspection program.
156.	Are there written procedures to maintain the ongoing integrity of process equipment?	Yes, Procedure available (Refer : CSD/P/PSM-11).
157.	Whether training been provided to each employee involved in maintaining the on-going integrity of process equipment?	Yes (based on the Process Safety critical position, training is given)
158.	Are inspections and tests performed on each item of process equipment included in the program?	Yes, safety critical inspection schedule is available.
159.	Does the inspection and test frequencies meet the manufacturer's recommendation and good engineering practice?	Yes, frequency of inspection is defined based on CIL internal RAGAPEP procedure.
160.	Are inspections and tests performed more frequently if determined necessary by operating experience?	Yes
161.	Are deficiencies in equipment that are outside limits corrected before	Yes

	further use so as to assure safe operation?	
162.	In the construction of new plants and equipment, whether quality assurance programme is implemented to ensure that equipment fabricated is suitable for the process?	Yes
163.	Are appropriate checks and inspections made during equipment installation stage?	Yes
164.	Are the suitability of maintenance materials, spare parts and equipment ensured during maintenance?	Yes
C-19 PHYSICAL HAZARD		
C-19.1 Housekeeping		
165.	Are all the passages, floors and the stairways in good condition?	Yes (with few exceptions)
166.	Is glass door taped or otherwise marked to make it visible to workers?	Yes (marked with colour code)
167.	Do you have the system to deal with the spillage?	Yes
168.	Do you have sufficient disposable bins clearly marked and whether these are suitably located? Are containers of refuse (waste) and trash emptied at the end of every day or soon after they are full? Are the containers or bins regularly cleaned?	Yes
169.	Are drip trays positioned wherever necessary?	Yes
170.	Do you have adequate localized extraction and scrubbing facilities for dust, fumes and gases? Please specify.	Yes
171.	Whether walkways are clearly marked and free from obstruction?	Yes
172.	Do you have any inter-departmental competition for good housekeeping?	Yes

173.	Has your organization elaborated good housekeeping practices and standards and made them known to the employees?	Yes (adopting "5S" system)
174.	Are there any working conditions, which make the floors slippery? If so, what measures are taken to make them safe?	Yes Spillages are cleaned immediately. If necessary, areas are barricaded till cleaning activity is completed.
175.	Does the company have adequate measures to suppress polluting dust arising out of materials stored on the roadside?	NA (*Materials are not stored on the roadside.*)
C-19.2 Machine and General Area Guarding		
176.	Whether machinery and equipment which can cause physical injuries to operator have been identified?	Yes
177.	Are all moving parts and point of operation of machinery adequately guarded?	Yes
178.	Are all fixed guards securely bolted in position and in good condition?	Yes
179.	Are all interlock guards for prevention of physical injury in good condition?	Yes
180.	Are all emergency stop buttons effective and clearly labelled?	Yes
181.	Are the operators for machines having moving parts aware of the danger of working with loose clothing?	Yes
182.	Are the openings where there is free fall hazard covered or fenced securely?	Yes
C-19.3 Material Handling		
183.	Are adequate equipment available for handling materials?	Yes
184.	Are the workers aware of the hazards	Yes

	associated with material being handled?	
185.	Where manual handling is necessary, are the workers been trained? Do they practice this? Are workers warned for lifting of excessive weight? Maximum weight of material for adult male and female are 55 Kg and 30 Kg respectively	Yes
186.	Do workers follow safe procedures for storage of materials?	Yes
187.	Is the register maintained to record particulars of examination of all lifting machines, tools and tackles?	Yes
188.	Are all the statutory examinations and tests carried out and certified by competent person	Yes
189.	Are the operators of crane, lifts, hoists and other mechanized operations adequately qualified?	Yes
190.	Is the safe working load clearly marked?	Yes
191.	Has the person employed to operate crane, forklift, or to give signals to crane been medically examined for eyesight and colour vision?	Yes
192.	Is the frequency of eyesight and colour vision examination as per the latest rules?	Yes
C-19.4 Electrical Safeguarding		
193.	Are licensed electricians available for electrical work?	Yes
194.	Whether area classification for electrical equipment has been carried out?	Yes
195.	Do the electrical fittings conform to area classification for electrical	Yes

	equipment?	
196.	Is a ground fault current interrupter system (ELCB) in use?	Yes (RCCB is used)
197.	Are all connections made by using appropriate plugs, receptacles or enclosures? Are fuses provided?	Yes
198.	Are there any make shift connection bare wires or damaged cables?	No
199.	Is there a system of ensuring periodical inspection of hand tools, extension boards used for electrical work?	Yes
200.	Do the workers use proper types of PPE during the working on live line?	As a policy, work is not undertaken on any live line.
201.	Is the separate work permit issued for working on high voltage line?	No /NA
202.	Whether the process (s) and equipment that generate and accumulate static charge have been identified?	Yes
203.	Whether all such equipment including pipelines for flammable materials are properly bonded and earthed?	Yes
204.	Whether earth pit resistance is measured, and the record maintained?	Yes
205.	Whether lightning arrestor has been installed and is adequate?	Yes
C-19.5 Safety in Storage & Warehousing		
206.	Whether the Material Safety Data Sheet for all chemicals is available?	Yes
207.	Are the chemicals stored as per their hazardous properties including the incompatibility?	Yes
208.	Are all containers clearly, indelibly labelled? Are all chemicals stored as per safety regulations?	Yes

209.	Whether all racks and steel cages have sufficient load bearing capacity?	Yes
210.	Is adequate natural ventilation provided to store room? Is there any emergency exit?	Yes
211.	Whether adequate firefighting arrangement existing in flammable chemical storage?	Yes
212.	Whether methodology for handling spillages of hazardous chemical available along with the equipment required handling the spillage?	Yes
213.	Whether aisles are marked and emergency exits displayed?	Yes
C-19.6 Hazard Assessment for New Equipment		
214.	What is the system for effecting any change in the existing plant, equipment or process?	As part of the MOC procedure, before undertaking any change in the existing plant/ equipment, modification schemes are forwarded by process owners to technical services for determining feasibility. After feasibility check, HAZOP study is carried out for the scheme. Recommendations of HAZOP study are incorporated in the scheme before final approval.
215.	Is there system for evaluating hazards from new equipment?	Yes
216.	Whether the P and I diagrams and other related documents are updated accordingly?	Yes
217.	Is any Job Hazard Analysis (JHA) carried out after installation of new equipment?	No (in case of any incident reported, for those cases JHA will be reviewed)

C-19.7 Hazards from Radiation Sources		
218.	Whether licences have been obtained for storage / handling of radioactive material?	NA While doing radioactivity test as per permit condition, applicable Licenses are checked.
219.	Whether approved Radiological Safety Officer appointed?	NA
220.	Whether appropriate PPEs are used against radiation hazards?	Yes
221.	Is the flooring of the radioactive material handling area amenable for proper decontamination?	NA
222.	Is the storage room of radiation source as per the licence condition?	NA
223.	Are all persons working in the facility have radiation safety training?	NA (*Those who are connected with handling of radioactive source have been trained*)
224.	Is the operators handling devices using radioactive materials qualified and possess the necessary certificate?	Yes
225.	Is the periodical radiation monitoring carried out?	Yes
226.	Are the records of inventory of radioactive material maintained in the standard format and submitted to the competent authority as per the period specified?	Yes
227.	Are emergency handling tools available?	Yes
228.	Are the personnel monitoring badges (TLD, Pocket dosimeter etc.) assigned and worn by each radiation worker?	Yes
229.	Are the radiation symbol and red light displayed as required?	Yes, radiation symbol displayed

C-20 CHEMICAL HAZARD		
C-20.1 Transportation of Hazardous Substances		
230.	What potentially hazardous materials are transported to or from the site (including wastes)	Ammonia, Sulphuric acid, Phosphoric acid, HSD, FO, Caustic Lye, Spent Catalyst, Used Oil and Used Batteries.
231.	What mode of transport are used?	Road & Pipelines Ammonia is received through ships and transferred through pipeline. Caustic lye, Sulphuric acid, Phosphoric Acis, HSD, FO are received though trucks/ road tankers. Hazardous waste is transported by designated trucks through the authorized vendor.
C-20.1 .1 Road		
232.	Does the company employ licenced vehicle of its own / outside sources?	Outsourced - Licensed Vehicles of Vendors (Fuel and Raw Materials- Chemicals) Licensed Vehicles of Transport Contractors for product dispatch
233.	Are the loading / unloading procedures in place and safety precautions displayed?	Yes.
234.	Is there a provision to check the healthiness of road tanker with respect to explosives rules?	Yes
235.	Are loaded tankers or trucks parked in a specific area on-site?	Yes
236.	Do all truck and tanker drivers carry transport emergency (TREM) card or instruction booklet?	Yes
237.	Do all truck and tanker drivers get training in handling emergencies during transport?	Yes
238.	Are all the tankers marked for proper Hazchem code?	Yes
C-20.1 .2 Rail		

239.	What hazardous materials are transported by rail?	Nil/NA Only Fertilizer (product) in Packed form is transported by Rail Wagons.
240.	Does the company have a direct siding on site?	Yes
241.	Are tankers or other wagons used in transportation?	Yes. Fertilizers in packages are transported through wagons
C-20.1 .3 Pipelines		
242.	What materials are transported to and from the site by pipelines	Liquid Ammonia
243.	Are the pipelines underground or over ground?	Underground Sub-sea pipeline
244.	Are corrosion protection measures employed in pipelines?	Yes. Pipeline end manifold of the line is protected with cathodic protection Inside plant, Ammonia lines are insulated and sealed with aluminium cladding (Cold insulation).
245.	Whether intermediate booster pumps are used?	No
246.	What is the maximum, minimum and average transfer rates?	Transfer rate Max. Min. Average Ammonia 400 MT/Hr 50 MT/Hr 300 MT/Hr
247.	Are the pipelines extended in the public domain?	Yes, Ammonia pipelines is laid on subsea and passes below the Ennore Express Highway.
248.	Are the pipelines dedicated for each type of chemicals?	Yes
249.	Are the pipelines fitted with safety equipment such as leak detectors, automatic shut-off valves etc.?	Yes, Ammonia line is provided with remote operated control valves and shut off valves. Other pipe

		lines are having manual shut off valves.
250.	What is the frequency and method of testing of the pipeline?	Periodic in-house inspection and hydro testing of pipelines are carried out.
251.	Is there written procedure for tackling leakages in pipeline?	Yes, as per On Site Emergency Plan
C-20.2 Handling of Hazardous Substances		
252.	What are the hazardous substance handled in the Factory?	Hazardous substances (Chemicals) handled in the Factory are : • Ammonia • Phosphoric Acid • Sulphuric Acid • Caustic Lye • Sulphur
253.	Whether quantity of hazardous substances is above the threshold limit specified in the Manufacture, Storage and Handling of Hazardous Substances Rule, 1989? If yes, then required documentation is available as per the rule.	Yes (Atmospheric Ammonia Storage Tank) Required documentation is available as per the MSIHC Rules including Safety Report, On Site Emergency Plan, and Safety Audits.
254.	Whether written procedure for handling the hazardous substance is available and operators are trained for handling such substances including actions required in case of leakages and spillages?	Yes
255.	Are the employees aware of the hazards arising from hazardous substances and safety precautions to be taken during handling of these?	Yes
C-20.3 Material Safety Data Sheets (MSDS)		
256.	Are the material safety data sheets available for all the chemicals handled, used and manufactured in the factory?	Yes
257.	Whether the latest MSDS are displayed at strategic locations?	Yes

<table>
<tr><td>258.</td><td>Is it available in local language?</td><td>Yes</td></tr>
<tr><td colspan="3">C-20.4 Spill Control Measures</td></tr>
<tr><td>259.</td><td>Whether spill control procedure is available?</td><td>Yes</td></tr>
<tr><td>260.</td><td>Whether spill collection pit / sump is available at the workplace?</td><td>Yes</td></tr>
<tr><td>261.</td><td>Whether methodology for recovery / disposal of collected material has been established?</td><td>Yes</td></tr>
<tr><td colspan="3">C-20.5 Storage of Hazardous Substances</td></tr>
<tr><td>262.</td><td>Whether storage vessels are identified with the capacity as required under MSIHC, Rules 1989.</td><td>Yes,
Ammonia
Atm. Storage tank 12,500 MT</td></tr>
<tr><td>263.</td><td>Give the names of storage materials in each of them</td><td>Ammonia</td></tr>
<tr><td>264.</td><td>What are the storage pressure and temperature?</td><td>
<table>
<tr><th></th><th>Pressure</th><th>Temp.</th></tr>
<tr><td>Ammonia Storage</td><td>Atmospheric</td><td>-33.4°C</td></tr>
<tr><td>Phosphoric Acid Tank</td><td>Atmospheric</td><td>Ambient</td></tr>
<tr><td>Sulphuric Acid Tank</td><td>Atmospheric</td><td>Ambient</td></tr>
<tr><td>Furnace Oil Tank</td><td>Atmospheric</td><td>60°C</td></tr>
<tr><td>Caustic Lye</td><td>Atmospheric</td><td>Ambient</td></tr>
<tr><td>HSD</td><td>Atmospheric</td><td>Ambient</td></tr>
</table>
</td></tr>
<tr><td>265.</td><td>Whether vessels are above ground / underground?</td><td>Above Ground
(only exception being HSD tank of 22KL capacity which is an underground storage tank)</td></tr>
<tr><td>266.</td><td>If any of the tanks storing flammable material, whether electrical</td><td>Yes</td></tr>
</table>

	equipment and fittings are as per electrical area classification?	
267.	Does the bunded area takes into account the total quantity of the largest tank?	Yes
268.	Whether the bund perimeter takes into consideration of trajectory of leak from tank?	Yes
269.	Are the vessels properly bonded and earthed and whether periodically checked and record maintained?	Yes
270.	Are the vessels fitted with remotely controlled isolation valves?	Yes Ammonia tanks have remote operated valve (ROV) facility
271.	Are vessels provided with emergency vent, relief valve, bursting disc, level indicator, pressure gauge and overflow line?	Yes, as per requirement
272.	Where such do vents discharge?	Vents discharge at a height at a safe location. A flare stack is provided for ammonia that may have to be vented to control pressure in the atmospheric ammonia storage tank in Ammonia Terminal. The LPG pilot is tested periodically to ensure its healthiness.
273.	Are the vessels provided with alarms for high level, high temperature and high pressure?	Yes
274.	Are standby empty tanks or any other alternate systems provided for emptying / transfer in case of emergencies?	Inventories are kept low. Hence no standby empty tank is provided. Ammonia storage tank is a double integrity Cup-In-Cup type Tank. For the Acid Tanks, in case of emergency, contents can be emptied to other operating tanks.
275.	What are the provisions made for firefighting / tackling emergency situations around the storage vessels?	Around the storage vessels, fire hydrant points with water monitors are provided. Ammonia storage area has a water sprinkler/spray system.

276.	Has any consequence analysis for loss of containment been carried out?	Yes , Consequences Analysis and Risk Analysis has been carried out by CISRA-CLRI (1994) and Lloyds Register (2020) for the Ammonia Tank.
277.	Whether the vessels are tested as per statute?	Yes
278.	Whether log sheets are filled up on daily basis for recording the parameters of these vessels?	Yes
279.	Whether monitors for detection of leakage of flammable / toxic material installed?	Yes
280.	Whether the chemicals stored are as per their compatibility?	Yes
C-20.6 Gas Cylinders		
281.	What are the various gas cylinders used in the plant?	Calibration gas cylinders Oxygen cylinders Nitrogen cylinders Acetylene cylinders LPG Cylinders
282.	Are valid licenses available for storing all these cylinders?	Yes (for LPG cylinders' storage. The other cylinders' stock is maintained less than the threshold limit requiring license.
283.	Are the cylinders stored and segregated as per their compatibility?	Yes
284.	What are the measures taken for combating any emergency in the cylinders storage area?	Fire extinguishers are provided. Action plan as mentioned in the On-Site emergency plan will be followed for combating any emergency.
285.	Whether integrity test certificates are obtained from the suppliers of the cylinders?	Yes
286.	Are the cylinders chained and secured properly along with the valve caps and proper identification colour code?	Yes
287.	Are the cylinders protected from heat or sun and rain?	Yes

288.	Whether monitors for detection of leakage of flammable / toxic gas installed?	Yes (for LPG, in the storage shed)
C-20.7 Labeling and Colour Coding		
289.	Are all the containers, vessels and storage tanks labeled for its content and capacity?	Yes
290.	Whether the pipelines are colour coded as per IS 2379?	Yes
291.	Is any plant specific colour code followed?	Yes. The colour coding of pipelines is done as per plant specific requirement.
292.	Whether the colour codes are displayed conspicuously in the working areas?	Yes
C-20.8 Hazardous Waste Management		
293.	Is identification done for various types of hazardous wastes?	Yes. They are categorized according to Hazardous Wastes (Management & Handling) Rules,
294.	Are these quantities less than those specified by the Hazardous Wastes (Management & Handling) Rules, 1989?	No. They are as specified in Authorization issued by TNPCB under Hazardous and Other Wastes Management Rules, 2016.
295.	What are their disposal modes?	Hazardous Wastes are sent to CPCB/ TNPCB Authorized Recyclers for recycling.
296.	What are the systems / measures adopted for controlling air / water / land pollution?	Hazardous wastes are stored in secured shed with containment to contain any spillage.
297.	Whether the solid waste like combustibles, plastic, metals etc. segregated?	Yes. Solid wastes are segregated at source into Biodegradable wastes, plastic wastes and Metal wastes and managed according to the Rules under Environmental Protection Act.

C-21 FIRE AND EXPLOSION HAZARD		
C-21.1 Organisational Set-Up for Fire Fighting		
298.	What is the total strength of fire station and fire crew?	Total Strength of Fire Station and Fire Crew - 6 persons
299.	How many fire crews are available in each shift?	One Fire Crew is available in each shift. All the Security Guards are trained in Fire Fighting and will double up as Fire Crew in case of Fire Emergencies.
300.	Is there fire squad identified in each shift?	Yes, Fire squad identified in each shift
301.	Standing fire order is available with latest revision	No
302.	How is the communication with fire station?	1. Landline phones 2. Mobile phones. 3. Walkie-Talkie sets
303.	Are fire safety inspections carried out?	Yes
304.	Is emergency procedure available for leakage or combustion of flammables?	Yes
305.	What measures are available to control the fire load in the plant area?	Housekeeping, Segregation/separation distances, Control of Ignition Sources, Limiting the Inventory
306.	Whether technical knowledge and skills of the manager and staff responsible for overall fire safety of the plant is adequate?	Yes
307.	How many major and minor incidents / fires were there in the factory during the last five years? Give department / plant wise.	
308.	Have all the fires / incidents been investigated and corrective actions taken? Give break-up.	Yes. The data and reports are available in the Online Platform (mySetu)
309.	Adequacy of protective clothing (coat, trouser, gloves, boots and helmets)	Adequate (3 Nos fire suits available)

310.	Availability of SCBA for firefighting operations and spare cylinders (at least 2 for each SCBA	SCBA – 11 Nos available Spare cylinders for SCBA – 7 Nos available (proposed to be increased)
311.	Adequacy of hose, nozzles, ladders, lighting equipment and pumps;	Adequate
312.	Communication facility at fire station, walkie talkie sets during firefighting.	Yes, available Communication is ensured by following ways: 1. Landline phones 2. Mobile phones. 3. Walkie-Talkie sets
C-21.2 Built in Safety in Civil Design and Construction		
313.	Whether the two safe means of escape available? Are they in separate directions?	Yes
314.	Is emergency exits provided to the building handling flammables?	Yes
315.	Whether emergency lights are provided?	Yes
316.	Whether fire / smoke detectors are installed in fire prone areas?	Yes
317.	Whether fire call points are provided in different areas?	Yes
318.	Whether Fire hydrants are provided near the buildings?	Yes
319.	Is ventilation system in plant handling flammables is adequate to prevent formation of flammable mixtures?	Yes
320.	Is adequate separation is provided between combustible / flammable materials and other material to restrict the fire growth?	Yes
321.	Access routes for fire fighting operations is available for areas having high fire load	Yes
322.	Whether building changes interferes with fire detection and / or fire suppression systems?	No

323.	Whether building changes cause unreasonable fire loading / openings in the fire rated walls?	No /NA (fire rated walls not provided in the facility)
C-21.3 Built in Safety in Electric Circuits and Equipment		
324.	Are the electrical equipment in areas where flammables mixture is likely to be present of flame-proof type?	Yes
325.	Are lightning arrestors are provided to the buildings / structures storing flammable materials?	Yes
326.	Whether adequate bonding and grounding of electrical equipment / pipelines provided?	Yes
C-21.4 Explosive Substances		
327.	Whether necessary license / approval taken from concerned statutory bodies?	NA (Not Applicable)
328.	Whether systems for explosion suppression, high speed fire detection with deluge, sprinklers, explosion venting etc. are provided?	NA
329.	Whether explosion resistant walls or barricades are provided around explosive storage?	NA
330.	Whether explosive substance storage areas are restricted for entry?	NA
331.	Whether only trained persons are handling explosive substances?	NA
332.	Whether explosive substances are stored and transported in approved containers only?	NA
333.	Whether electrical fixtures in areas handling explosives are explosion proof type?	NA
334.	Whether adequate measures are taken to prevent source of ignition where expl substances are handled?	NA

C-21.5 Fire Safety in Handling Flammable and Explosive materials		
335.	Whether emergency procedure is available for control of leakage?	Yes
336.	Whether emergency measures are displayed locally in case of accidental spillage / leakage?	Yes
337.	Whether facility is provided for safe drainage of combustible or flammable liquids in case of leakages?	Yes
338.	Whether highly flammable liquids are stored under inert atmosphere?	No highly flammable liquid are stored in the Factory.
339.	Whether flammable storage tanks are provided with flame arrestors?	Yes
340.	Whether suitable PPEs are provided?	Yes
C-21.6 Fire Detection and Alarm System		
341.	What type of fire detection and alarm system provided?	Conventional and addressable fire/smoke detection systems are provided MCC rooms, DG rooms, Electrical Substation, and Office building.
342.	Whether all fire prone areas of the plant are covered with fire detection system?	Yes
343.	Whether fire detection equipment and smoke alarms in good operating condition?	Yes
344.	Whether the number of fire call points are adequate and free from obstruction?	Yes
345.	Whether regular inspection / maintenance / testing of fire detection and alarm system carried out and records maintained?	Yes, fire detection equipment and smoke alarms are tested once in 6 months.
346.	Whether any atmospheric monitoring is carried out for explosive mixture of gases or vapours?	Yes (as part of Ambient Air and VOC monitoring system)
347.	Whether emergency power supplies are provided to fire detection and fire alarm system?	Yes

348.	Whether smoke detectors are located considering ventilation pattern?	Yes
349.	Whether annunciation of fire is local or in the control room or in both places?	Yes, Annunciator provided in control room and designated places (local hooter).
350.	Whether fire panel is constantly attended?	Yes
C-21.7 Passive and Active Fire Protection System		
351.	What are the passive fire protection measures available? (barriers, doors, dampers etc.)	Yes
352.	Are the areas requiring fire barriers identified?	No/NA
353.	Whether the fire barrier provided is of adequate ratings?	No/NA
354.	Whether ventilation ducts in flammable areas have been provided with isolation dampers of suitable fire rating?	No/NA
355.	Whether sprinklers / deluge are installed wherever necessary?	Yes (installed on top of Ammonia storage tank)
356.	Whether regular inspection / maintenance / testing of fire protection system carried out and records maintained?	Yes
C-21.8 Fixed Fire Extinguishing System		
357.	What are the sources of firewater and whether they are dedicated to the fire extinguishing system?	External source for Firewater.
358.	Whether the capacity of dedicated water reservoir is adequate to supply to hydrants for minimum 2 hours?	Yes
359.	Whether un-interrupted power supply is provided to the firewater pumps?	Yes. Reliable power is available for Motor driven Fire Hydrant pumps. Diesel engine driven pumps are available as standby.

360.	Whether the extinguishing medium selected is appropriate to the class of fire (water, gaseous, foam, dry powder)?	Yes
361.	Whether fire hydrants layout is available?	Yes
362.	Whether additional (over minimum requirement) fire hoses, nozzles are available?	Yes
363.	Whether the hydrants lines are kept pressurized?	Yes (8 kg/cm^2 pressure)
364.	Whether regular inspection / maintenance / testing of fixed fire extinguishing systems carried out and records maintained?	Yes
C-21.9 Portable Fire Extinguishing System		
365.	Whether suitable type and numbers of fire extinguishers provided?	Yes
366.	Whether the fire extinguishers are located at conspicuous position and easily accessible? Are they fully charged and tagged?	Yes (Signboards displayed for easy identification)
367.	Whether fire extinguishers periodically inspected, tested, refilled and records maintained?	Yes
368.	Whether defective / unchecked fire extinguishers present at site?	No, these are immediately discarded
369.	Whether additional fire extinguishers are available?	Yes (as per IS 2189 requirements)
C-21.10 Fire Fighting Equipment and Facilities		
370.	Whether fire tenders (water / foam) are available?	Yes (1 No. of water & foam tender)
371.	Whether the fire-fighting system and equipment approved, tested and maintained as per relevant standard?	Yes

372.	Whether the SCBA / fire suit provided to fire fighting team for immediate action?	Yes
373.	What is system for maintenance / recharge of SCBA?	Self-Contained Breathing Apparatus (SCBA) inspected once in week. If the drop in cylinder pressure is observed to be more than 20 %, recharging of the breathing air is done.
374.	Is proper access available for fire fighting equipment?	Yes
375.	Whether fire hose cabinets are in good condition, easily visible, and accessible?	Yes
376.	Whether drill tower is available? Are fire personnel carrying out regular fire drill?	Wet/ dry drill conducted once in week. Fire drill is carried out once in two months.
377.	What is the communication facility at fire station? Is it adequate?	1. Internal Telephone, external land phones 2. Mobile phone 3. Walkie- talkie sets. Yes, the communication facility is adequate. It may be noted that there is no separate fire station, it is integrated with the Shift Safety Officer
C-21.11 Fire Drill		
378.	Whether mock fire drills are conducted? What is the frequency of drills?	Fire Drills are conducted once in 2 months.
379.	Whether fire drills are also performed in night shift?	Yes
380.	Whether feedback of fire drill is documented?	Yes
381.	What is the system of mutual-aid scheme?	Formal Mutual Aid Scheme exists with Piramal Pharma Ltd (Ennore).
C-21.12 Fire Fighting Training		
382.	Whether there is a system of providing fire-fighting training to plant personnel?	Yes
383.	What is the frequency and duration of	Once /month and duration of the training is 2

	such training? Whether training records are maintained?	hrs. Training records are maintained in computerised system.
384.	Whether fire squads are identified for different areas for first-aid fire fighting and rescue, and suitably trained?	No separate fire squads. Plant personnel have been trained in First aid firefighting and rescue.
385.	Are all personnel conversant with the fire prevention and protection measures?	Yes
386.	Whether the fire staff are sent for refresher / advanced training courses?	Yes
C-21.13 Static Electricity and Lightning		
387.	Whether all vessels and pipes are provided with suitable bonding and grounding?	Yes, the equipment are properly bonded and earthed. Continuity of bonding is ensured.
388.	Whether arrangement has been made for grounding the tanker containing flammable liquid during loading / unloading?	Yes. Earthing clamp provided for flammable liquid unloading area.
389.	Whether spark resistant tools are provided?	Yes. Non sparking tools are used in flammable handling area.
390.	Whether lightning protection is provided and is adequate?	Yes. Lightning arrestors are installed at vulnerable locations of various plants and are located and installed as per guidelines given in IS: IEC 62305.
391.	Whether antistatic clothing, hand gloves and footwear are provided?	NA/ No (not required)
C-21.14 Pressure Relief System		
392.	Whether the listing of all ‘pressure plants’ [as defined under Factories	Yes (listed)

	Act] has been done?	
C-22 INDUSTRIAL HYGIENE / OCCUPATIONAL HEALTH		
C-22.1 Ventilation, Illumination, Noise, Vibration, Heat stress and Non-ionizing Radiations		
C-22.1.1 *Ventilation*		
393.	Whether any ventilation study has been carried out?	No All the main plant facilities are of open type construction and as such good natural ventilation. Closed premises like Control Rooms, Offices, Lab. etc. are equipped with air conditioners or other air handling equipment. The ventilation in different areas is generally observed to be satisfactory.
394.	Whether natural ventilation is adequate or not?	Yes, natural ventilation is adequate.
395.	Whether dust / fumes / hot air is generated in the process?	Yes, in the manufacturing of Sulphuric Acid, Phosphoric Acid and the final product APS plants. However, proper control measures like, Dust and Fume Scrubbers, Mist Eliminators, Start-up Scrubber, etc., have been installed and are working satisfactorily.
396.	Is there any exhaust ventilation system in any section of the plant?	Refer response in the above-mentioned Q#395.
397.	Is periodic / preventive maintenance of ventilation system carried out and record is maintained?	Yes. Preventive maintenance and cleaning of exhaust fans/blowers are carried out regularly.
398.	Does any ventilation system re-circulate the exhausted air in work areas?	No
399.	Is the work environment assessed and monitored for chemical and physical hazards?	Yes
400.	Whether PPE are provided to workers exposed to dust / fumes and gases?	Yes. Dust mask and canister masks are provided to the workers for respiratory protection.

C-22.1.2 *Illumination*		
401.	Whether illumination study has been carried out for the assessment of illumination level?	Yes. A study on illumination levels has reportedly been conducted. In addition, in house illumination survey is done once in six months and corrective actions are taken.
402.	Is there any system of periodical cleaning and replacing the light fittings / lamps in order to ensure that they give the intended illumination levels?	The electrical department takes up the jobs of cleaning the electrical fitments and lamps regularly.
403.	Are the workers subject to periodic optometry tests and records maintained?	Vision test is carried out for crane operators, riggers, mobile equipment operators and other drivers as per TN Factories Rules 1950. For other workers optometry test is done once in two year. Records are maintained at the OHC for the optometry tests.
404.	Are emergency lighting available at first aid center.	Yes
C-22.1.3 *Noise*		
405.	Whether any noise study conducted?	Yes, Noise levels are monitored periodically.
406.	Are there any machines / processes generating high noise?	Yes. Compressors , Blowers, Turbines and Diesel Generators.
407.	Whether engineering and administrative controls been implemented to reduce noise exposure below the permissible limits?	Yes. PPEs like high quality ear plugs and earmuffs are provided to the workers working in high noise areas. Following engg. control methods are adopted: • Complete DG house has been provided with acoustic enclosure • Silencers provided for steam lines • Enclosures for machines • Covered rooms
408.	Is there a system of subjecting all those employees to periodic	Yes

	audiometric test who work in high-level noise areas?	
409.	Whether the workers are made aware of the ill effects of high noise	Yes
410.	Whether ear muffs / plugs are provided and used?	Yes. High quality imported ear plugs and earmuffs (3M make) are provided and used.
C-22.1.4 *Vibration*		
411.	Are there equipment which contribute excess level of vibrations and whether they are identified?	Yes, identified.
412.	Whether any vibration study has been carried out?	No
413.	Are the measures taken to combat vibration to acceptable levels?	Any problem identified is notified to the respective maintenance departments (Electrical, mechanical, production). Any perennial issues on equipment are handled and resolved on a priority basis
414.	What is the frequency for measurements of vibration?	NA (no specified frequency).
415.	Are the records of measurements and maintenance of equipment / system maintained?	Not maintained
C-22.1.5 *Heat Stress / Cold stress (Extremes of Temperature)*		
416.	Are there sources from equipment increasing the heat load in work places?	Yes, while working near Converter and Heat Exchangers in Sulphuric Acid Plant.
417.	Whether evaluation of heat stress is carried out?	No
418.	Whether natural ventilation is adequate to minimize the heat stress in work environment?	Yes
419.	Are resources available to deal with very hot or very cold conditions (drinking water, lined gloves, insulated boots)?	Yes
420.	Do workers know the symptoms of heat cramps / heatstroke or frost bite	Yes

	/ hypothermia?	
421.	Are the personal protective equipment suitable for reducing the effects of heat stress available?	Yes (Cotton Suit is provided)
C-22.1.6 *Non-ionising Radiations*		
422.	a) Does the work involve likely exposure to non-ionising radiations (ultraviolet, infrared, radiofrequency, microwaves, lasers, etc.)	No
423.	Whether risk assessment have been done for all work areas involving presence of non-ionising radiations?	NA
424.	Are the work areas displayed with relevant safety signs?	NA
425.	Are the employees aware about the hazards of non-ionising radiations?	NA
426.	Does written procedures exists for working in non-ionising radiations?	NA
427.	Is the work environment monitored periodically for physical hazards and control measures initiated whenever deviation from permissible values is observed?	NA
428.	Whether suitable personal protective equipment are provided to workers exposed to non-ionising radiations?	NA
C-22.2 Work Place Monitoring for Hazardous Chemicals		
429.	a) Whether the dust, fumes, smoke aerosols and mist are monitored as per statute and records maintained?	Yes, and records are maintained.
430.	What are the types of detectors used for monitoring concentration of hazardous chemicals?	Fixed detectors and portable gas detectors are used.
431.	Is any alarm system installed for any leakage of hazardous chemicals?	Yes, Ammonia detectors are installed (19 Nos. of Ammonia sensors)
432.	Are antidotes available for toxic chemicals?	Yes (in OHC)

433.	Are control measures initiated whenever deviation from permissible values is observed?	Yes
C-22.3 First Aid Facilities and Occupational Health Centre (OHC)		
434.	Are adequate numbers of first aid boxes provided? Give location details?	Yes, 21 Nos of First Aid boxes kept at various locations.
435.	Are qualified / trained first aiders available in each shift?	Yes
436.	How many qualified / trained first aiders are available at each plant / department?	Three in each shift.
437.	How many persons are trained / given refreshers training in first aid in a year?	Plant personnel have been trained in First Aid by faculty from authorised organizations. 180 Nos. of Employees and 30 Nos. of Contract Workmen are trained.
438.	Whether occupational health center is provided?	Yes, Occupational Health Centre has been provided.
439.	Does OHC conform to the provisions of the existing statutes?	Yes. It conforms to the stipulations listed in The Tamil Nadu Factories Rules, 1969
440.	Are the Medical Attendants / Doctors available in each shift?	Male nurse is available in each shift. Full time Medical Officer is available in General Shift.
441.	What facilities are available for transportation of the injured to hospital?	Ambulance available for shifting the injured to hospital.
442.	Are the names of the trained first aiders displayed?	Yes
443.	Are the name of nearest hospitals and its telephone number available in OHC?	Yes. Hospitals / Nursing Homes in Chennai have been designated as panel of hospitals for the treatment of injured.
444.	Does the plant have any special preventive medicine program?	Yes. Weekly special health clinic and Wellbeing Clinic
445.	Is ambulance posted in proper place and is it available whenever required?	Yes
446.	Are sufficient numbers of anti-dotes available in case of any emergency?	Yes

447.	Are fire safety measures provided in first aid centre?	Yes
448.	Are emergency lighting arrangements available at first aid centre?	Yes
C-22.4 Periodic Medical Examination		
449.	Whether the periodical medical examination of employees, required under relevant statute is carried out?	Yes
450.	Whether it is ensured that contractors employee are medically examined during pre-employment as well as during the course of employment?	Yes
451.	During the periodical medical examination of the workers, are they examined as per the hazardous process in which they work? (First schedule of The Factories Act, 1948.	Yes
452.	Are the records of all such examination maintained?	Yes
C-22.5 Personal Protective Equipment (PPE) and Emergency Equipment		
453.	Whether list of required PPE for each hazardous activity is available?	Yes
454.	Whether feedback from workers obtained during selection of PPE?	Yes
455.	Have the workers been trained in proper use of PPE including BA sets?	Yes
456.	What is the system of procurement, inspection issue, maintenance and replacement of PPE?	Sample PPE is issued to the employees for feedback. After getting feedback from the employee's procurement of PPE conforming to National/ International standards will be done. Maintenance of the PPE will be as per requirement /need basis (by user department and/or safety department) New/replacement PPE will be issued against damaged /worn out PPE

457.	Whether qualitative and quantitative fit-check for respirators is ensured prior to use?	Yes
458.	What are the arrangements for safe custody and storage of PPE?	All the employees are given safe lockers for storing their PPE. Emergency PPEs are kept in each plant in the custody of plant engineers.
459.	Are the contractor's workers provided with the required PPE?	Yes.
460.	Do the PPE conform to any standard?	Yes. All PPEs conform to applicable BIS/ International Standards
461.	Are sufficient eye wash fountains and safety showers available?	Yes. Total 30 Nos of Eye wash fountains and safety showers are available in the Factory .
462.	Whether appropriate respiratory protective devices are available in accordance with the hazard potential?	Yes
463.	Are the staff members trained in the right uses of respiratory protective devices?	Yes
C-22.6 Occupational Diseases		
464.	Whether pre-employment medical check-up data available?	Yes
465.	During the medical check-up, is any person found having occupational diseases mentioned in 3rd schedule of *The Factories Act*, 1948?	No
466.	Whether the medical practitioner informed the Chief Inspector of Factories about the occurrence of the occupational disease?	NA (there have been no reported occurrence of Occupational Disease.)

C-23 ACCIDENT / INCIDENT REPORTING, INVESTIGATION AND ANALYSIS		
C-23.1 Accident Reporting and Database Management		
467.	What is the procedure for accident / incident / dangerous occurrence reporting?	The accident/ incident/ dangerous occurrence report form shall be done online through mySetu software.
468.	Whether the accident data for the last *five* years for reportable and non-reportable accidents are available?	Yes.
C-23.2 Accident Investigation		
469.	Are all the accidents investigated?	Yes
470.	Whether accident investigation procedure is documented?	Yes
471.	Whether accident investigation reports are submitted to top management?	Yes
472.	How are the findings from accident investigation reports communicated to workers?	Discussed through the Central Safety Committee. Communicated through One Point Lesson (OPL) displays.
C-23.3 Analysis of Accidents		
473.	a) Whether accident analysis is done as per IS 3786?	Yes
474.	Whether root causes of accidents are analysed?	Yes
475.	Is the accident statistics effectively utilized? If yes, how?	Accidents are discussed in Safety Committees and workers are apprised of accidents, their causes and remedial measures. Accident statistics are effectively used for dissemination of corrective and preventive actions and accident rate has come down over the years.
476.	What nature of injuries occurred during the last five years?	Nature of injures are mainly minor cut injuries and lacerations/abrasions.
C-23.4 Implementation of Recommendations		
477.	How does the management ensure implementation of the	The accidents are discussed in the accident Investigation committee and person responsible

	recommendations to avoid recurrence of accidents and incidents?	for implementation of recommendations is specified.
C-23.5 Reporting and Investigation of Near-miss Incidents		
478.	Are all near-miss incidents reported and investigated?	Yes
479.	Is there any system of classifying and analyzing the near-miss incidents?	Yes
C-24 EMERGENCY PREPAREDNESS		
C-24.1 Site Specific Details		
480.	Are the site area maps (including layout, access roads and assembly points) available in control room / emergency control centre?	Yes
C-24.2 Duties and Responsibilities of Key Personnel		
481.	Is the hierarchy of emergency response personnel right from site emergency controller downward, and alternative officials identified?	Yes
482.	Are the duties and responsibilities assigned to the designated officials during emergency, both during and outside normal working hours clearly identified and understood by them?	Yes
C-24.3 Identification of Emergencies and Accident Scenario		
483.	Are the possible accident scenarios leading to emergency identified and known to the operating personnel?	Yes
484.	Are approved emergency preparedness plans (on-site and off-site) in place?	Yes
C-24.4 Declaration and Termination of Emergency		
485.	Is the list of designated officials who are to be communicated about declaration and termination of emergency available in the control room / emergency control centre?	Yes
486.	Are the methods of communication	Yes

	(siren, public address system etc.) for declaration and termination of an emergency known to all the workers?	
C-24.5 Resources-evacuation / Transport		
487.	Are the following resources (equipment, personnel and procedures) required to handle emergency available? 1) Communications, 2) Public announcement systems 3) Monitoring of hazardous releases into the environment, 4) Emergency shelters at the facility, 5) Emergency exits with proper illumination, with uninterrupted power supply , 6) Direction for emergency exit / escape route marked in haulage / Alleyways, 7) Transport for evacuation of plant personnel, 8) Medical care including administration of antidotes, and 9) Security / maintenance of law and order.	1. Communications - Walkie-Talkies, Internal & External Telephones & Mobile phone. 2. Monitoring of hazardous releases into the environment- Ammonia detectors. Portable LEL and Multigas detector 3. Emergency shelters at the facility – NO/NIL (Safe Assembly points) 4. Emergency exits, proper illumination with uninterrupted power supply- Emergency lighting available 5. Direction for emergency exit / escape route marked in haulage / Alleyways –Marked and displayed. 6. Transport for evacuation of plant personnel – Car, Van and pickup vehicle 7. Medical care including administration of antidotes and – OHC available and manned round the clock 8. Security / maintenance of law and order- Security staff available round the clock
C-24.6 Communication Facilities		
488.	Does the emergency control centre have direct communication links with the fire station and the plant control room?	Yes (with Plant Control Rooms)
489.	Are there adequate alarm points from which an emergency alarm can be raised?	Yes (Alarms can be raised only from the Security Office which is manned 24 Hours)
490.	Is there infrastructure available for ensuring backup electric power supply for communication links where required?	Yes, UPS and DG sets are available.

C-24.7 Medical Care		
491.	Is the procedure for emergency medical care available?	Yes
492.	Whether the system has been tested at regular frequency through mock drill / exercises for its adequacy?	Yes
493.	Does the system of periodic replacement of antidotes and medicines required in emergency exist?	Yes
C-24.8 Updation of Emergency Plan		
494.	Is the emergency plan updated based on the feedback from the periodic drills / exercises?	Yes
495.	Are the contact details of all concerned officials kept updated in the emergency plan?	Yes
C-24.9 Periodic Drills / Exercises		
496.	Are mock-exercises conducted at stipulated intervals?	Yes, Onsite Mock drills are conducted once in 6 months.
497.	Are the scenarios varied in the mock-exercises to ensure that all possible factors including meteorological conditions, affected plant personnel covered?	Yes
498.	Whether emergency preparedness Plans have been tested and reviewed at regular frequency through mock drill for its adequacy	Mock exercises are conducted for On-site emergency scenarios once in 3 months (as per CIL Corporate guidelines).
C-24.10 Training of Plant Personnel		
499.	Are the plant personnel trained in handling emergency equipment?	Yes
C-24.11 Public Awareness Programmes		
500.	Are public awareness programs conducted for the people around the site regarding the actions to be taken in case of off-site emergency?	Yes As part of CSR awareness program, briefing was given. Leaflet on “Do’s and Don’t’s during

		emergency" reportedly made available to Public. A video film about creating awareness on emergency situations is under preparation.
C-24.12 Mutual-aid Programme		
501.	Are the types of accidents where external organizations would be involved in remedial actions identified? Are their responsibilities defined?	Yes
502.	Is the plant responsible for rendering mutual aid assistance to any other external organizations? Does this assistance effect the plant's emergency preparedness?	Yes No
503.	Whether the communication channels for mutual assistance identified and known with and between two organizations?	Communication will be through Landline and Mobile Phones
C-24.13 Emergency Control Centre		
504.	Is the emergency control center located beyond the effective distances of identified emergency scenarios?	Yes
505.	If the emergency control center is located within the effect distance, is it suitably protected that it will be available in case of emergency?	Alternate emergency control centre has also been identified.
C-25 SAFETY INSPECTION		
C-25.1 Inspection Programme		
506.	Are checklists available for inspections?	Yes , checklists will be prepared for inspections covering the below : a) Handling, Storage & Transport of HazChem; b) Electrical hazards; c) Fire safety; d) Hand and portable power tools; e) Machine hazards; f) Lifting equipment; g) Ladders and scaffolding;

		h) Environmental Monitoring; j) Civil structure; k) House keeping; m) Emergency equipment; and n) Gas cylinder and other pressure vessels
C-25.2 Safety Related Deficiency (SRD) Report		
507.	Are SRDs generated based on the area wise checklists?	No
508.	What is the procedure for resolving the SRDs?	NA
509.	Whether the procedure exists for notification and root cause analysis of non-conformities and action taken on them?	Yes (as per ISO 45001)
C-25.3 Safety Inspection Records		
510.	Are the safety inspection records maintained?	Yes
C-25.4 Methodology and Inspection Team		
511.	Is there written procedure for safety inspection?	Yes
512.	Whether safety inspection is carried out by a designated team?	No.
513.	What is the frequency of safety inspections?	NA (Need based)
514.	Whether an inspection report is generated?	Yes (whenever inspection is done)
C-25.5 Compliance of Recommendations		
515.	To whom the recommendations are submitted	To the respective process owners, Unit Head, EHS Head
516.	Are recommendations of safety inspections complied in time?	Yes
517.	Is compliance of recommendations sent to top management?	Yes
518.	Is compliance of recommendations reviewed by safety committee?	Yes
519.	Does top management follows-up the compliance?	Yes

7.0 AUDIT FINDINGS (PLANTS' /AREA WISE)

7.1 Observations

Atmospheric Ammonia Terminal

Liquid Ammonia is stored in the tank at -33 °C and slightly above atmospheric pressure (i.e., 200 – 800 mmWC g).

Atmospheric Ammonia Storage Tank (AAST) was designed as API - 620 APPENDIX 'R(1990). The design pressure is +1050- & -50-mmWC(g) and design temperature is -34 °C.

The AAST is Double Wall Double Integrity type tank with Insulation in the outer tank. Double Wall Double Integrity Type Tank consists of two tanks with annulus space between them. The Inner Tank acts as primary containment and the outer tank acts as secondary containment. The annulus space is filled with vapour. The Level Transmitter in the annulus space indicates the liquid level in the annulus which helps to identify the built up of Liquid ammonia due to damage in the inner tank.

The Outer Tank Shell is insulated with Poly Urethane Foam (PUF) of 100 mm thick and the bottom is insulated with foam glass of 150 mm thick. The Tank has suspended roof insulated with mineral wool of 250 mm thick. The Insulation help in reducing the vaporisation rate (i.e., Boil -off Rate) due to heat ingression from the surrounding.

The entire operation is controlled through Distributed Control System. It is computerized control system and used to enhance reliability with remote monitoring and supervision.

Ship unloading interlock and monitoring parameters are checked before every ship unloading and joint check list available. DCS interlock and trip conditions are checked every year and records are maintained.

Water Sprinklers are provided at critical areas and sprinkler above pumps were tested during the audit and operation observed to be satisfactory.

This Ammonia storage tank condition assessment has been performed in 2022 by M/s Vysus Consulting India Pvt Limited in line with API 579-1 and certified to fit for use under the current design/operating parameters till the next inspection interval of 5 years for External inspection and 10 years for internal inspection.

APS Plant

Measured quantities of sulphuric acid, anhydrous ammonia and phosphoric acid are fed to the pipe reactor. The pipe reactor reactants are sprayed through the built-in nozzle of the pipe reactor into granulator. Sparger ammonia is introduced in the granulator for further ammoniation. The granules are dried in a drier, screened and product sent to godown. The oversize is fed to the pulveriser and recycled to the granulator. The fines are also recycled. Filler material is added to the fines conveyor. Arrangements have been provided to combat the pollution due to dust and fumes. The pipe reactor has been provided with elaborate instrumentation for safe operation

7.2 Recommendations

S. No.	Recommendation
Atmospheric Ammonia Terminal (AAT)	
1.	Ship unloading is avoided during rough sea conditions and wind speed above 25 knots Similarly it should be ensured that the hose joint at the mooring point is not disturbed during rocking of the ship.
2.	Periodical inspection and checking of the Ammonia unloading line below the highway shall be carried out. It shall also be ensured that the protective hume-pipe is in good condition.
3.	In the ammonia compressor room, LT compressor "Caution - auto start" display should be provided to warn the working personnel.
4.	Fire hydrant monitors are provided in four corners of the tank , approach to the monitors is to be free from obstruction for emergency.
5.	Wind rose diagram may be displayed at control room for seasonal guidance.
6.	Ammonia line drain points shall to be provided with plugs (wherever missing) as an additional precaution.
7.	Cryogenic hand gloves should be maintained or purchased for use during ammonia leak attending times.
8.	Flame proof electrical fittings are recommended for battery room, where there is likelihood of presence of hydrogen. The integrity of flameproof fittings in other areas should be maintained by proper inspection and periodical maintenance.
9.	Cracks were observed at a few places and steel rods exposed in the pipe rack

S. No.	Recommendation
	support in the AAT area which may lead to further corrosion and deterioration of the support structures. The same may be rectified/attended to.
10.	Foliage adjacent to and under the AAT pipe rack may be pruned /cleared off at frequent intervals.
11.	More than 100 kg of LPG stored in any one place calls for a license from the Explosives Inspectorate. The company should make note of this aspect while storing more number of LPG cylinders in the flare stack area even for a short period of time. Anything temporary requires additional precautions. The Unit should use their licensed LPG storage shed for storing the extra LPG cylinders and draw from there the required number of cylinders as and when needed.
12.	Cables gland gaps were observed in the Transformer, and gates were left open. Nearby panel door found open. The gates and panel door shall be kept in closed position.
13.	It is suggested that thermography analysis of the tank bottom area to done again (in some area, chillness was observed during the audit inspection).
14.	Ammonia pumps coupling guards are inadequate. To be covered with mesh type guards.
15.	In the Tank top area, paint coating is observed to be peeled off in the top rail and mid rail is corroded. Cleaning and re-painting of the hand rail structure shall be done.
16.	Dedicated water line for eye wash shower in the tank top area is suggested (it was observed that water was not available in the shower line during audit inspection).
17.	Cryogenic hand gloves should be maintained or purchased for use during ammonia leak attending times.
18.	Gap in the trench near ladder in the ammonia compressor room shall be covered.
19.	In the mechanical maintenance room, eye shield and quench pot shall be provided for the bench grinder.
20.	Fire hydrant monitors are provided in four corners of the tank , approach to the monitors shall be always kept free from obstruction for use in case of an emergency.
21.	The exhaust pipeline of the diesel engines in the Fire Water Pump House (FWPH) is to be insulated/lagged fully.
22.	Smoke detectors are provided in the FWPH but any alarm in that area may fail to attract the attention, this alarm may be repeated in some manned area.
Sulphuric Acid Plants (SAP) – I & II	
23.	MSDS to be displayed in Sulphur Yard area.
24.	The License details to be displayed in the sulphur yard area.
25.	Sulphur feed conveyor pull cords shall be checked jointly by Electrical, Production and Safety Departments and check list of the same to be maintained.

S. No.	Recommendation
26.	Skirt rubber in the sulphur feed conveyor is to be maintained well to avoid spills. Damage is observed in conveyor belt, this shall be attended to. (Refer IS 7155 - code of practice for conveyor safety)
27.	The earthing of HSD tank (in SAP – II) was observed to be dis-connected during the time of the audit , the same shall be rectified.
28.	The unused mono-rail structure (above the HSD Tank) shall either be removed or periodical inspection and maintenance done and records maintained as per applicable statutes.
29.	Strike bars may be provided as a safeguard for all pipe racks, cable trays and conveyor galleries, on either side, at road crossings. This is to avoid inadvertent hitting by the mobile crane's boom, if it is not lowered sufficiently.
30.	The Unit should carry out a survey to identify the areas requiring improvement and to take corrective action to provide proper covers for the drains/gutters. The covers should fit flush, to avoid accidents. The covers of the sulphur pits may be checked at regular intervals for possible thinning.
31.	Heat is perceived to be more in the MCC room of SAP-II , consider re-positioning of the exhaust fans which have been removed.
32.	First- Aid Box shall be provided in the MCC room of SAP-II.
33.	Identification display of the UPS room shall be updated (display reads as battery room now).
34.	Storage of any other items shall not be permitted in the battery room (appears to be presently used as a make shift storage for Janitorial equipment)
35.	The interconnecting steps between the SAP I control room and the emergency exit(s) may be marked by reflective paint /sticker to alert the personnel about the difference in floor levels.
36.	Handrails shall be provided in the CPP sump pumps' area.
37.	CPP substation panel shifting job is in progress. Removed panel cavity shall be barricaded.
Phosphoric Acid Plant (PAP)	
38.	A rung of the ladder bottom in the PAP reactor area is observed to be corroded, the same shall be rectified.
39.	Scaffolding used for more than 15 days shall be refitted and freshly certified.
40.	Sulphuric acid tanks' pump shall be run on spill back to avoid top layer dilution.
Ammonium Phosphate Sulphate (APS) Plant	
41.	Corrosion observed in a few handrails and mild rails. Hoist area handrails and structures appear to be corroded , remedial action and painting shall be done.

S. No.	Recommendation
42.	Safe access shall be ensured in the Dolomite discharge chute
43.	The electrical insulation mats in MCC Room (wherever removed now), shall be re-positioned.
44.	Ammonia sensor shall be provided near PCR Unit.
45.	Grating shall be provided in the pipeline openings (e.g., PCR UnIt – Ammonia Line)
46.	Guarding standardization (especially for pump coupling guards) across the facility to be done.
47.	Since no PSV has been provided on the upstream of liquid ammonia line between the quick closing and isolation valves, as a protection against overpressure due to entrapped liquid ammonia expanding, operating instructions should clearly state that at the time of shut down no liquid ammonia should be allowed to get entrapped between these valves. The line should be drained and depressurised.
48.	Acid Bricks are observed to be in damaged condition in PA Tank No. 8 ; the same to be replaced.
49.	Slurry formation inside dike in the PA Tank area to be cleaned.
Sulphuric Acid Storage Tanks	
50.	Spill and drain collection systems for dyke walls and loading areas shall be done.
51.	Precautions in handling Sulphuric Acid shall be displayed prominently. SA loading/ unloading safe procedures shall be displayed.
High Speed Diesel (HSD) Storage (underground – 22 KL capacity)	
52.	The statutory information like, the license particulars and the caution boards indicating 'No Unauthorized Entry' etc., should be displayed in the licensed premises.
53.	Since the contractors' work sheds are located just opposite to this storage and hot works maybe carried out by the contractors outside their sheds, proper safety precautions must be taken to avoid accidents.
LPG Cylinders Storage Area	
54.	Licence details are to be displayed prominently.
55.	The vegetation obstructing the fire extinguisher shall be removed.

8.0 AUDIT FINDINGS – MECHANICAL MAINTENANCE & INSPECTION

This section covers the study of existing systems, procedures and programmes for safe work environment in Mechanical maintenance department at Coromandel International Limited, Fertiliser Factory at Ennore. Field assessment of the facility / equipment, perusal of records, site visit and discussion with plant personnel were carried out. The adequacy of statutory compliance of pressure vessels, safety valves, storages, pipelines, lifting machine and tackles was also checked during audit.

During audit the following plants / areas are visited: Sulphuric acid 1 and 2, Phosphoric acid, Ammonia storage, APS, Captive Power Plant, bagging, Work shops , contractor working area, desalination plant, water treatment

Synopsis

Compliance

- Storage tanks, pipelines covered by Chief Controller of Explosives / PESO were tested periodically by competent person; test and inspection records maintained. Valid licenses are available.
- Lifting machines such as chain blocks, tackles are inspected and tested; test certificates are obtained as per Tamil Nadu Factories Rules (TNFR), 1950.
- Safety belts and conveyor belts are inspected by competent person; certificates are maintained. Competent person is authorized.
- Hired mobile cranes are having valid test certificates.
- Pressure vessels and safety valves are also tested periodically; records maintained.
- Stability certificate for list of buildings issued by competent person; records maintained. Valid up to year 2025.

Standard Practices

- Materials are identified and stored neatly in main stores
- Machines are well maintained with standard maintenance practices and adequately guarded.
- Critical pipe lines are inspected and records maintained.
- Jobs are carried out with valid work permits.
- Safety trips in conveyors are provided and found working.
- Required PPEs issued for safe work.
- Contract workmen are issued with photo ID card. Their face recognition data are also captured in the entrance gate.

Sl.No	Observations	Recommendation
Pressure Vessels and Safety Valves		
1.	Inventory of Pressure Vessels with ID no. and location available. There are 34 pressure vessels in Ammonia terminal and water treatment plants put together.	
2.	Pressure vessels are designed as per standard code of practice; drawings, fabrication details are in record.	
3.	The inspection and testing of pressure vessels in the factory is done by competent person.	
4.	Inspection schedule prepared and test carried out. Last inspection schedule during the year 2022. Ultrasonic thickness readings taken during inspection.	Thickness reading of pressure vessels should be recorded with location details on the geometric drawing of pressure vessels. The nozzles thickness reading should also be recorded. The readings should be compared to original thickness and corrosion allowance as per design. These practices will be useful for safety of equipment and future reference.
5.	List of safety valves available and tested periodically and recorded.	Consider fixing aluminum tags for safety valves with details of test date at site for the knowledge of the operator.
6.	Hydraulic pump for pressure testing and test bench facilities for testing safety valves are available	
Lifting Machine and Tackles		
7.	Inventory available with SWL, quantity and certificate no., location of machines etc with safety department.	
8.	All lifting machines are marked with SWL.	
9.	Test certificates are obtained for all lifting machines and tackles from competent authority as per TNFR. In general, the lifting machines are kept in satisfactory conditions.	
10.	Details of inspections carried out are not recorded along with Test Certificate (TC).	Procedure should be established for maintenance of lifting machines and tackles; history should be available for

Sl.No	Observations	Recommendation
		each machine. All test details done like test weight, condition of chain / rope, lifting hook, working of trips etc., should be recorded.
11.	Records of Inspection/checklist of EOT /Mobile cranes were not evidenced during the audit.	All safety features of EOT/mobile cranes should be periodically checked. Ensure they are working and maintain record. For EOT cranes the structures also should be inspected and certified as safe for operation. Consider standard code of practices for inspection and operation procedures. (Safe use of cranes : IS 13367).
12.	Storage of chain blocks and tackles in Workshop is neat and in order.	
13.	Working Mobile cranes are identified with nos.; test date were not displayed on the machines.	Safe working load should be displayed on hydra boom at different points.
14.	Dead weights are available for load test of cranes	
Storage Tanks		
15.	**Storage tanks in service:** Sulphuric acid tanks – 4 (SAP 1) Sulphuric day tank – 1 (APS) Phoshoric acid tanks – 2 (PAP) Phosphoric day acid tanks – 2 (APS) Diesel underground tank – 1 Furnace oil tank – 1 Atmospheric Ammonia Tank – 1 Caustic Lye Tank – 1 (WTP); day tanks in SAP 1&2	A list of storage tanks should be prepared covering all storage and process tanks inside the factory with details of complete specification, location, schedule of inspection etc.,
16.	Safety instructions near phosphoric acid storage tanks, sulphuric acid export pumps were not available.	Safety instructions in local language near hazardous chemicals storage area should be displayed. This is required to caution people working in that area.
17.	Atmospheric Ammonia storage tank was last inspected in March 2022; inspections of the tank, nozzles and insulation were carried out. The thickness readings and other tests conducted were recorded.	During periodic inspection of Atmospheric Ammonia Tank, thickness readings should be recorded on the geometric drawing of Ammonia Tank. This procedure will ensure where exactly the thickness readings were taken.

Sl.No	Observations	Recommendation
18.	Sulphuric acid storage tanks are inspected with schedule prepared and thickness of shell, nozzles are recorded on the geometric drawing of tanks.	
19.	All the four phosphoric acid tanks are on line; MOC of tanks are MSRL; the tanks are inspected periodically.	
20.	Diesel (HSD) tank (underground) and Furnace oil tanks (above ground) are having required licenses under The Petroleum Rules (PESO) .	Consider use of standard code of practices for inspection and testing of storage tanks.
21.	In general, all hazardous chemical storage tanks are provided with required bund walls (secondary containment)	
Pipelines		
22.	Pipelines' drawings and P&I diagrams are available in the Drawing (Projects) Office.	
23.	Critical pipe lines are identified, inspected and tested as per schedule and records maintained. Ammonia pipe lines are tested with isometric drawings; thickness and location details are mentioned in drawings. Undersea ammonia pipe line tested in July '22 with ammonia; records maintained.	
23.	Pipelines in all plants are well supported. Pipe lines crossing roads above ground are well supported.	Consider checking missing pipe supports periodically (the discharge support of pipe line of pumps in desalination plant, phosphoric acid export pumps discharge header and scrubber pump discharge support in SAP2 were observed to be missing).
24.	Pipelines are dedicated for each type of chemicals.	Field Identification of pipelines by service, flow direction etc., should be carried out in all plants to avoid mistake while carrying out maintenance jobs.
25.	Pipe line MOC selected as per duty conditions (sulphric acid, phosphoric acid, ammonia)	

Sl.No	Observations	Recommendation
26.	Sulphuric acid pipe line flanges are provided with flange guards.	Flange guards are to be fixed back wherever it has been taken out for maintenance activity..
Machinery and Guarding		
28.	Inventory of equipment is available for all plants and the layout was found satisfactory.	
29.	The equipment are labelled & identified at site.	
30.	Maintenance schedule for each machine is strictly followed and records maintained.	
31.	Vibrations monitored in panel for critical machines.	
32.	Maintenance schedule of CPP Turbine is based on running hours; records maintained for the jobs carried out.	
33.	CPP maintenance schedule covers auxiliary equipment. Jobs done are documented.	
34.	Couplings, belt and chain drives, rotating shafts are provided with guards.	
35.	The above systems and procedures adopted for safe working of machines are appreciated.	Random internal audit system should be developed to ensure that the maintenance jobs are carried out as per checklist and schedule.
Access for Work		
36.	Staircases, ladders and platforms are available for access to different floors and they are maintained satisfactorily.	
38.	For temporary work platform for maintenance, steel scaffolding is used.	Necessary guarding and caution boards should be provided for work on scaffoldings.
39.	Trained contractor erects the scaffolding. Checklist for safety of scaffolding is available; before starting work the scaffolding was cleared for safety; this method is appreciated.	
40.	Required PPEs are used by contract workmen during work on scaffolding.	

Sl.No	Observations	Recommendation
41.	Condition of the scaffolding materials was found satisfactory where maintenance work in progress in plants. However, condition of the scaffolding materials near pipe bridge and storage area found corroded.	The scaffolding materials such as pipes should be cleaned and painted; clamps should be lubricated. Corroded materials should be discarded.
Utilities		
42.	Utilities cover Boilers, Water Treatment Plant and Cooling towers.	
43.	Package boiler (Nestler make), 2 Waste heat recovery boilers (SAP 1 and SAP 2) are in operation.	
44.	Jobs list for each boiler prepared before shutdown; all the jobs carried out and record maintained. This is appreciated.	
45.	The boilers are inspected and tested as per Boilers' Act and valid test certificates are maintained.	Boiler numbers (ID details) shall be displayed near the boilers; Consider displaying Test date and next due dates near the boiler
47.	Trainings are conducted on the topics of Boiler operation and Maintenance.	
48.	Water treatment plant maintained satisfactorily.	
Lubrication		
49.	Lubrication schedule is clubbed along with preventive maintenance; daily lubrication also carried out with oilers.	
50.	The lubricant details are provided in the Plants.	
51.	All plants have separate lubrication storage facilities.	
Corrosion Protection		
52.	Details of painting shall be captured in the Work Oeder.	The work order should mention clear specification of paint, number of coats, thickness of each coating etc., Tools to be used for cleaning the surface should be included in the work order; this will ensure that the surface cleaning is effective.
53.	Damaged roof sheets of godowns are replaced with use of cherry picker	

Sl.No	Observations	Recommendation
	and by issuing work permit at height permit, necessary PPEs. This practice is appreciated.	
Workshop and Tools		
54.	The layout of machines in the Workshop appear to be as per good practices.	
55.	Tool room facility available; tools arrangement is in order.	Inventory of tools should be maintained; inspection procedure should be developed; carryout periodic inspection and record should be maintained. Damaged tools should be taken out of use.
56.	Electrical tool connections are provided with ELCB.	Portable electrical tools should be inspected by electrical maintenance and subsequently should be tagged with details for safe usage.
Personal Protective Equipment (PPE)		
57.	Helmets and shoes are given to all employees; other PPEs are issued as per working environment.	
58.	PPEs training given to all employees and contract work men.	
59.	Standard PPEs are procured in consultation with safety department.	
60.	Safety belts are identified and tested periodically by a competent person as per statutes. Records are maintained.	
Work Permits		
61.	The following four category of work permits are issued based on the nature of the job: • Hot Permit • Cold Permit • Vessel entry (confined space) • Radiography Along with the permit the following approval sheets are also attached before starting the jobs: - Work at height - Crane lifting - Electrical isolation - Excavation - General Approval	The permit formats are exhaustive covering all safety precautions. This is appreciated.

Sl.No	Observations	Recommendation
62.	During audit, an electrical job was in progress near the entrance of main Lab. without electrical isolation approval.(deviation)	A random check (work permit audit) should be carried out on permits to avoid any deviation from safety.
Training		
63.	Training in subjects proposed by the maintenance and safety are conducted by training section.	The following subjects may be included for training: • Inspection procedures for lifting machines during annual test. • Conveyors safety IS 7155 : 2023 • Surface cleaning of structures and painting procedures • Relevant IS codes for maintenance activities.
64.	Training calendars and the topics/ subjects covered are available for the current year and the sessions are conducted as scheduled.	
65.	Training and retraining done for subjects like first aid.	
Material Handling		
66.	Different grades of fertilizers are stored in silo, godown in bagging plant. Rock phosphate stored in godown.	
67.	Sulphur stored in open yard with boundary wall; fire hydrant facility provided.	
68.	The solid materials are moved through front end loaders and conveyors.	
69.	Sulphuric acid and phosphoric acid loading and unloading take place when required.	Hazardous liquid unloading and unloading areas should be identified. Safety instructions in local language should be displayed.
70.	Furnace oil, diesel and caustic soda are unloaded near the tanks.	
71.	Bags are stacked / loaded into lorries / wagons.	Contract work men engaged should be trained in safe lifting and handling of bags.

9.0 PROFILE OF AUDITORS

Sl. No.	Name	Discipline/ Specialization	Experience in Brief
1.	**R Venkatesh** B.E (Mech) ., M.E (Ind Safety Engg)	Principal Consultant Lead Safety Auditor, Process Safety Management, IS 14489 Elements	Total 28 + Years in Technical Safety and Process Safety Management. Above experience includes 15 years in Petrochemicals, Oil & Gas (Reliance Petroleum E&P - Upstream, Chevron/Caltex Gas India) and Specialty Chemicals as HSE Engineer/HSE Corporate Manager. Safety Audit, HAZOP, QRA, Process Safety Assessment experience for the past 8 years as Head of Rams Safety Consultants Major Training/Certifications • DNV- ISRS systems (in Paris, France), • IMS Lead Auditor (OHSAS 18001, ISO 14001, ISO 22001) in Peterborough, UK • Leading for Safety by BSC UK, in Peterborough/London – UK • Technical Operational Excellence (HSE, Reliability and Efficiency) Audits of Chevron in Asia Pacific Countries (Singapore, Thailand, Philippines) • TapRoot® - certified training for Incident Investigation Leader in Bangkok, Thailand
2.	**M S Shanmugham** B E (Mech) M Tech (Chem Engg)	Senior Consultant Auditor for Mechanical Maintenance & Inspection	32 years of Maintenance and Piping experience in a Compound Fertilizer Factory. He has extensive experience in the erection of piping in Ammonia Plant, Sulphuric Acid Plant, Phosphoric Acid Plant and NPK Plant. He was involved in the erection of Sulphuric Acid, Phosphoric Acid and NPK Plants. He was also involved in the construction of Atmospheric Ammonia Storage System. For the last 20 years associated with Rams Safety Consultants in Maintenance Safety and Piping Safety for nearly 100 audits .

Sl. No.	Name	Discipline/ Specialization	Experience in Brief
3.	**G Sreedharan** B S (Chem) DIS	Senior Consultant Auditor for Process Plant (Fertiliser Plant, Utilities) General Safety, Fire Protection, & Environment. IS 14489 Elements	35 + Years in Plant Operations and Safety Management. Experience includes 15 years in Petrochemicals as Head of Safety, Environment & Fire Department (Manali Petrochemicals Limited, Chennai). Experience in Operations, Commissioning of Process Plants (Urea Plant & Utilities, DAP) in SPIC Last 12 Years as Safety Audit Team Member for a number of assignments (more than 50 industries), notable among them in the Fertilizer Industry being : Indo Gulf, Kanpur Fertilizers, Paradeep Phosphates, MCF.
4.	**K Ramanathan** B S (Chem) DIS – RLI, Chennai Certified as First Class Boiler Operator	Consultant Auditor for Process Plant (Ammonia Storage Terminal, Acid Plants), General Safety	Total 38 Years experience in large Nitrogenous and Phosphatic Fertilizer complex Safety and Environment Department – 19 years. (as HOD for the last 3 years prior to his retirement) Ammonia Plants as Operator and Operation Engineer for 12 years Acid Plants 'Operations– 2 years Ammonia Storage Terminal (Importation) – 2 years (Tuticorin Harbour) LPG Storage Terminal – 1 year as Commissioning Engineer . Post retirement, he is associated with Rams Safety Consultants as a Consultant - Auditor and was Team member for Safety Audits of a number of Industries including for Mangalore Chemicals & Fertilizers, Panambur, Mangalore