

**BEFORE THE NATIONAL GREEN TRIBUNAL SOUTHERN ZONE BENCH AT
CHENNAI**

APPLICATION No. 195 of 2023 (SZ)

IN THE MATTER OF

Tribunal on its own motion- Suo Motu Based on the
News Item published in The Express News Newspaper,
Tamil Nadu, Chennai District,
Dated 27.12.2023,
"Ammonia Gas Leak from fertilizer
Manufacturing unit triggers panic
In Chennai's Ennore"

.... Applicant`

Versus

The Principal Secretary to Government of Tamil Nadu
Health and Family Welfare Department
Govt. Secretariat, Fort. St. George
Chennai, Tamil Nadu – 600 009 and 10 others

.... Respondents

AFFIDAVIT/ REPORT FILED BY THE 7th RESPONDENT

DATE: 05.02.2024



M/S PRASAD VIJAYAKUMAR (Ms. No. 1254/1999)

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Chennai- 600 104

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COUNSEL FOR RESPONDENT No. 7

BEFORE THE NATIONAL GREEN TRIBUNAL SOUTHERN ZONE BENCH AT
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Chennai, Tamil Nadu – 600 009

2. The Principal Secretary to Government of Tamil Nadu

Department of Environment,
Climate Change & Forests,
Govt. Secretariat, Fort. St. George
Chennai, Tamil Nadu – 600 009

3. The Chairman,

Tamil Nadu Pollution Control Board,
No. 76, Anna Salai, Guindy,
Chennai, Tamil Nadu- 600 032.

4. The District Collector,

Chennai District,
District Collectorate Office,
No. 62, Rajaji Salai, 4th Floor,
Chennai- 600 001.

5. Tamil Nadu Coastal Zone Management Authority,

Rep. by its Member Secretary,
No.1, Jeenis Road, Panagal Building,
Ground Floor, Saidapet,
Chennai- 600 015.

6. The Chief Inspector of Factories,

Office of the Chief Inspector of Factories,
Chepauk, Chennai- 600 005.

7. Coromandel International Limited,

Rep. by its Authorised Signatory,
Post Box NO. 2, Ennore Express Highway Road,
Ennore, Chennai- 600 057.

8. Directorate of Industrial Safety and Health,

Rep by its Director,
T.S. No 47/1, SIDCO Industrial Estate,
(Near Metro Water Roundtana),
Guindy, Chennai- 32

9. Tamil Nadu Maritime Board

Rep by its Vice Chairman & Chief Executive Officer
No. 171, South Kesavaperumal Puram,
Off Greenways Road, Raja Annamalaipuram
Chennai - 600 028

10. Fisheries and Fisherman Welfare Department

Rep by its Additional Chief Secretary to Government,
3rd Floor, Integrated Animal Husbandry and Fisheries Building,
Nandanam, Chennai - 600 035.

11. Inspectorate Dock Safety,

3rd Floor, Anchor Gate Building,
Rajaji Salai, Chennai- 600 001

...Respondents

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It is certified that all the documents contained in the above annexure are true copies

Date: 05.02.2024

V. S. S.
COUNSEL FOR RESPONDENT NO. 1

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...Respondents



AFFIDAVIT/ REPORT FILED BY THE 7th RESPONDENT

I, M. Vetrivel, S/o Late A.C. Mani , aged about 41 years, do hereby solemnly and sincerely affirm and state as follows:

1. It is respectfully submitted that I am the Assistant General Manager – Production in Ennore Unit of the 7th Respondent herein and as such I am well acquainted with the facts of the case. I am duly authorised by the Respondent No. 7 herein to swear to this Affidavit.
2. It is respectfully submitted that I have gone through the Suo Moto Notice issued by this Hon'ble Tribunal and I deny the allegations made in the annexed news report therein except those that are specifically admitted hereunder.

1. INTRODUCTION TO RESPONDENT No. 7 M/S. COROMANDEL INTERNATIONAL LIMITED

1.1) It is submitted that the Respondent no. 7 Coromandel International Limited (hereinafter the "Company") is amongst India's pioneers and leading Agri Solutions provider, offering diverse products and services across the farming value chain especially fertilizers. It operates in two major segments: Nutrient and other allied businesses and Crop Protection. The Company is the second largest manufacturer and marketer of Phosphatic fertiliser in India majorly covering Southern region and ensuring prosperity of the farmer in line with vision and mission of the company.

1.2) It is submitted that the Company was incorporated as Coromandel Fertilisers Limited in the year 1961. In 2003, the Ennore Unit, which was previously with the farm division of EID Parry Limited merged with Coromandel Fertilisers Limited, followed by a name



change to Coromandel International Limited in September 2009. The company has 3 fertiliser manufacturing facilities with capacity of 3.6 million MT per annum located in Visakhapatnam, Kakinada and Ennore. The Company's manufacturing facilities were certified for various management and safety systems and such as Process safety management system (PSMS) 19 elements, ISO Standards (9001, 14001, 45001 and 50001). The ISO Unit safety certifications are annexed herewith as ("Annexure- A1"). The manufacturing facilities are operating in highest standards of safety and environment management. All the stack are continuously monitored with online continuous emission monitoring station (OCEMS) which is directly connected to State and Central Government pollution control Stations. The Company has been working on occupational health and safety as well as behavioural based safety and has been consistently winning high performance awards at national and International forums. Recently the company received the Sword of Honor from British Safety Council for the safety systems. The Sword of Honor award received from British Safety Council is annexed herewith as ("Annexure - A2") The company has implemented 5S and TQM practices for continual improvement and has also received the 5S Model Plant Award from ABK- AOTS and CII EXIM Business Excellence Award. The list of awards received by the company is annexed herewith as ("Annexure - A3").

2. DESCRIPTION OF ENNORE AMMONIA UNIT

2.1) It is submitted that the Company's Ennore Unit is located on Express Highway at Kathivakkam Village, Ennore. The Ennore Unit is in operation from the year 1963 however the Ennore Ammonia Storage facility is in operation from 1996. The complex fertilizer, Ammonium Phosphate Potash Sulphate is produced in this Unit which is widely used by farmers in many Indian States. The unique product named Paramfos

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(16:20:00:13) is being produced only at Ennore Unit and is supplied across the Nation with highest quality meeting the farmer's expectation.

2.2) Paramfos consists of primary nutrient content such as Nitrogen (16%), Phosphorous (as P2O5) (20%) and Secondary nutrient content Sulphur (13%). The entire nitrogen nutrient is available in ammoniacal form which results in slow releasing of nutrient to the crops. The slow release of nutrients helps in reducing insects attack on crops. The water soluble P2O5 content is around 19.5% out of 20% which is higher than the FCO norm of 17%. These nutrient contents help for the nourishment of greenish content in the plants. . It also contains additional secondary nutrient of Sulphur (13%) which improves the plant protein. This product can be used for all crops and mainly used for Paddy, Ragi, Sugarcane, Ground Nut and Maize. Due to the presence of Sulphur content, it can also be used for oil crops. Hence, Paramfos is a major fertiliser that is being used across India for agriculture and has a market coverage of 20% in the State of Tamil Nadu, 50% in the State of Karnataka, 15% in Andhra Pradesh and Telangana and 15% in West Bengal and Maharashtra.

2.3) It is submitted that the Company's Ennore Unit operates two Sulphuric acid plants of capacity 2,58,000 TPA, one Phosphoric plant of capacity 66,000 TPA, Ammonium Phosphate Potash Sulphate (Complex fertiliser) of capacity 4,00,000 TPA. Sulphur, Rock phosphate and Liquid Ammonia are the main raw materials used in this unit which are imported. The liquid ammonia is imported and supplied through a dedicated minor port. The minor port is under the control of the State Government and named as Ennore Minor Port which is being operated under the directions and supervision of the Respondent No.9, Tamil Nadu Maritime Board. The Unit also has an Ammonia Storage Facility of 12,500 MT capacity which was set up in 1996.

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2.4) It is submitted that the Company has obtained necessary environmental clearances, licenses, certifications and had obtained periodical safety reports after inspection of Unit from various authorities. The list of compliance reports, licenses, certifications etc for operation of the Unit are as follows:-

S.No	Licenses/Certificates	Issued Date	Issuing Authority	Validity
1	CTO for Ammonia Storage Tank and Subsea Pipeline(Air & Water Act)	12-05-2023	TNPCB	31-03-2028
2	No Increase in Pollution Load Certificate for the production enhancement of Ammonium Phosphate Potash Sulphate from 300000 MTPA to 400000 MTPA	21-07-2023	TNPCB	Lifetime validity
3	CTO for Manufacturing of Complex Fertilizer, Sulphuric Acid and Phosphoric Acid	20-10-2023	TNPCB	31-03-2028
4	Navigational Safety and Port Committee (NSPC) Compliance Certificate for Ennore Minor Port	26.04.2023	DG Shipping	07.12.2027
5	International code for the security of ships and of Port Facilities (ISPS) for Ennore Minor Port	08.03.23	DG Shipping	24.11.2027
6	Factory Licenses	31.10.2023	DISH	31.12.2024



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7	Pressure vessel Inspection	27.01.2023	DISH	29.02.2024
8	Statutory Safety Audit report	29.12.2023	DISH	31.12.2024
9	Safety Report	21.07.2023	DISH	30.06.2024
10	Latest Mock Drill Report Submission	15.09.2023	DISH	31.03.2024
11	Fire NOC	18.02.2023	Fire Dept	31.03.2024

2.5) It is submitted that the Unit was certified with ISO standards such as 14001:2015 (EMS), 45001:2018 (OH&S Management), 50001:2018 (EnMS) and implemented Process Safety Management System (PSMS- 19 elements).

2.6) It is submitted that the Unit emissions are continuously monitored through Online Continuous Emission Monitoring Station (OCEMS). OCEMS System comprises of all the equipment necessary to determine the concentration of gaseous emission and/or particulate matter and/or emission rate using analytical measurements and a computer program to provide results in units of the applicable emission limits or standards. The data generated is gathered and sent directly to TNPCB Care Air Centre. OCEMS data shall be used as tool to monitor performance of pollution control systems as well as to generate alarms on exceedances with respect to notified standards (for manual measurement). OCEMS data would help regulatory bodies in close surveillance on industries based on alarm system.

2.7) It is submitted that the Unit's air quality is continuously monitored through Continuous Ambient Air Quality Monitoring Station (CAAQMS). The Unit has taken all scientific measures to monitor the ammonia in ambient air in the tank farm area and



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during unloading areas regularly. The Unit has also installed 2 Nos. of CAAQMS at strategic locations covering the residential areas and the same has been connected with Care Air Centre of Respondent No.3 TNPCB for continuous monitoring, as per the additional condition No.9 mentioned in the Consent Order dated 20.10.2023 for Fertilizer issued by TNPCB. The emission levels are always maintained much below the permissible limit of the Pollution Control Board Emission Norms.

2.8) It is submitted that in 2022, the Ammonia Storage tank was decommissioned for inspecting integrity as per internal inspection schedule once in 10 - 12 years by the experts in the field M/s ThyssenKrupp UHDE India Private Ltd. ("Thyssenkrupp")TKUHDE. A technical audit was also conducted for the entire Ammonia handling facility by Thyssenkrupp in 2020-21 and the jobs recommended by them to be carried out were also completed during the tank decommissioning. All improvement jobs suggested by Thyssenkrupp relating to First Isolation Valve installation & upgradation, Safety Relief Valve (SRV) and Vacuum Relief Valve (VRV) renewal, flare capacity upgradation, ammonia sensors installation, additional emergency staircase, Fire Hydrant (FH) pump capacity upgradation and Control room Safety measure improvements were carried out. The condition assessment of Ammonia Storage Tank Report of ThyssenKrupp validated by competent authority, Vysus Group is annexed herewith as ("Annexure - A4"). The Company also undertook several key projects for the upgradation of the Unit such as installation of Additional Instrument Air system, upgradation of Fire Water Network, Upgradation of Flare, installation of emergency escape ladder and installation of Remote operation facility of Ammonia Terminal Control system and the details of the key projects implemented is annexed herewith as ("Annexure -A5")

M. R. S.



2.9) The Company submits that high level safety practices are being followed in storage installation area during the loading and unloading operation which are vulnerable from the point of release of Ammonia, viz:

- a) 35 No's of Safety Relief Valves are installed in the ammonia storage and handling system to relieve the pressure from the pipeline and equipment when pressure exceeds the predetermined values. All safety relief valve outlet are connected back to the Ammonia Storage tank.
- b) Total of 138 Nos of alarms are configured in the Distributed Control System (DCS) to monitor the process parameters and to take necessary action accordingly.
- c) Total of 51 Trips and Interlocks are configured in the Distributed Control System (DCS) to prevent process abnormalities.
- d) The Unit has upgraded a flare system capacity from 1000 kg/hr to 3700 kg/hr which is designed to handle ship unloading operation, , even in the absence of two ship unloading compressor.
- e) In case of main power failure, the Unit has 750 kVA Diesel Generator (DG) and 4000 kVA Rental Diesel Generator (DG) set in Ammonia Terminal as emergency power supply to continue the Ammonia Terminal Operation safely even during the unloading of the vessel. .

2.10) The Unit has one dedicated reciprocating instrument air compressor with receiver in the Ammonia Terminal as emergency backup in case of non-availability of main Unit instrument air supply for safe operation of control systems in place.



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2.11) To detect any leakages, ammonia sensors are installed in 19 strategic locations based on Fire and Gas Mapping study in the ammonia terminal.

2.12) Ammonia Terminal DCS is remotely connected to other Plants DCS system. In case of emergency, the Ammonia Terminal operation can be remotely handled from other Plants.

2.13) Apart from the above safety system and practices in place, the Company has conducted various technical studies and audits of ammonia storage and handling facilities and with the actions taken, we have fully complied with all the recommendations:

- 5 Year Hazard and Operability (HAZOP) Study by OEM M/s TKUHDE.
- Quantitative Risk Assessment (QRA) by M/s Lloyds Services.
- Fire and Gas (F&G) Mapping Study M/s MS Chola Risk Services
- Technical Audit for Ammonia Storage tanks and Associated facilities by OEM M/s TKUHDE.

2.14) It is respectfully submitted that the Unit has never had an offsite emergency since its inception. The Unit has the highest Safety records for the last two decades and has had **no fatalities** in operation during this period. The Unit has never experienced any abnormalities in the ammonia operation and always taken precautionary measures to ensure safe operation. The details of the Unit with pictures are annexed herewith as ("Annexure - A6").



3. DETAILS OF PORT INFRASTRUCTURE.

3.1) It is submitted that the Ennore Minor Port was constructed in the year 1996 to unload liquid ammonia from ship. The minor port is under the control of the Tamil Nadu Maritime Board. The construction of the minor port was executed by M/s NKT Engineering- Denmark (Currently acquired by M/s. National Oilwell Varco (NOV). The port infrastructure consists of Four Point Mooring System, pipeline end manifold (PLEM), Unloading Hoses and Two HDPE Pipelines. The pictures of Minor port is annexed herewith as ("Annexure - A7")

3.2) It is submitted that the Ammonia terminal facility comprises of a Pipeline End Manifold (PLEM) and a Four Point Mooring system (also called Conventional Buoy Mooring system or Multiple Buoy Mooring System) for the vessels berthing, located about 1.8 Kms from the coastline at a depth of 15m. The 2 HDPE pipelines "NKT Pipeline") of 8" diameter run from the Pipeline End Manifold (PLEM) at the mooring point to the Ammonia Storage Tank situated ashore within the factory premises. The vessel is piloted to the mooring buoys and after mooring the vessel in the designated place. The flexible rubber hose from the PLEM assembly is properly secured to the vessel manifold. After proper testing, the discharge of Ammonia cargo happens between the vessel and the storage tank at the shore.

3.3) The first ammonia ship was unloaded in 1996. Till now totally 210 Ships have been handled and 1,208,530 MT of ammonia unloaded so far safely. On an average about 8 shipments were handled per annum with average discharge quantity of 6000 MT per shipment.

NKT

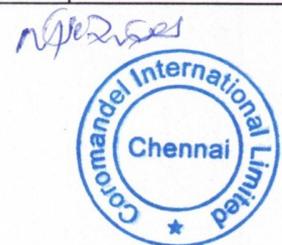


4. DESCRIPTION OF THE PIPELINE.

4.1) It is submitted that the NKT pipeline was designed and commissioned by M/s NKT Flexibles, Denmark. The pipeline is made of steel wire impregnated, multi layered (10 layers) polyethylene pipe. At the time of installation, the coastal line profile at Ennore, was with 50m of beach. The Pipeline was laid in the coastal sand bed. The pipeline is designed for 25 kg/cm² against the operating pressure of 6 kg/cm² and the manufacturer has given average life expectancy of the pipeline for 50 years. The pipeline is of international standards and is designed for the burst pressure of 131 kg/cm².

4.2) The picture of the cross section showing multiple layer of NKT pipeline is annexed herewith as ("Annexure - A8"). The details of the layers present in the NKT Subsea pipeline are as follows:-

S. No	Item	Material	Layer thickness, mm	Outer diameter, mm
1	Pipe Inner	HDPE	18.0	220.0
2	Bedding tape	Polyester	0.3	220.5
3	6" steel tapes	Fine grain	4.8	230.1
4	PVC - tape	PVC	0.6	231.3
5	PP - Yarn	PP	1.5	234.3
6	72 Steel wire 6.00	St 34	6.0	246.3
7	Asphalt	Asphalt	0.0	246.4



8	Bedding tape	Crepe tape	0.5	247.4
9	Bedding tape	Polyester	0.1	247.5
10	Outer Sheath	MDPE	7.0	261.5

Pipeline Properties:

▪ Pipe Inner Diameter	184.0 mm
▪ Pipe overall diameter	261.5 mm
▪ Design Pressure	2.5 MPa
▪ Minimum Bending radius at service	2.6 m
▪ Minimum Bending radius at storage	2.2 m
▪ Stress in Pressure Armor at PD	68 N / mm ²
▪ Burst Pressure	13.1 MPa
▪ Stress in tensile Armor at PD	35 N / Sq. m

4.3) It is submitted that the Company is constantly evaluating the Ennore Minor Port assets and taking necessary asset upgradation and improvement to ensure the safe ship unloading operation. The following are the asset upgradation and reliability study carried out at Ennore Minor port offshore facility from time to time.

S.No.	Year	Job description	Agency	Remarks
1	2009	Bathymetry and side scan survey of EMP	Indomer Coastal Hydraulics	The study has confirmed the draft and the coordinates required for positioning the vessel accurately.

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2	2010	New NKT corridor structure was designed	IIT Madras – Prof. Narasimha Rao	The report of the agency was implemented as a mitigation plan to avoid boulders entry into the pipeline area near the splash zone. This is in response to PWD program of deploying boulders to check sea erosion.
3	2010	NKT corridor structure fabrication & erection	Geo Foundation (Civil) and C&D (Mech)	The study conducted by the agency was used to strengthen the mechanical structure on the shore side as per the direction of study with Anode in place to resist marine corrosion.
4	2010	NKT Shore pipeline repair work	NKT Flexibles, Denmark	Shore pipeline minor damage was identified through visual inspection and corrected by OEM (NKT, Denmark)
5	2012	Complete renewal of Pipeline End Manifold (PLEM) & isolation valves	NKT Flexibles, Dunlop &	Implemented.
6	2012	Renewal of all 5nos. of Ammonia unloading hoses	Great offshore	Implemented.




7	2018	Renewal of Ammonia shipment unloading hose no. 5 (Type 514 AM)	Continental UK and Itajai Marine	Implemented. .
8	2022	Fit For Service for entire subsea assets in Ennore Minor Port	Coromandel & IRS	Implemented to validate the asset fitness for ship unloading activity as per the original designer, that is, DNV recommendation
9	2023	Renewal of all 5 nos. of Ammonia unloading hoses	Dunlop & Itajai Marine	Implemented recently on 11.03.2023

5. AMMONIA UNLOADING OPERATION

5.1) It is submitted that Ammonia is unloaded from vessel through subsea pipeline system to the storage tank. Since the ammonia is a cryogenic liquid, it should be operated either in negative Temperature (-33 Deg.C) or under pressure to maintain the ammonia in liquid form otherwise it will vaporise immediately (Gaseous Form). The Subsea Pipeline system consists of two 8" Pipeline stretching for the length of 2.1 km (approx.). Since the pipeline temperature is near to ambient sea temperature, Liquid ammonia (at -33 Deg.C) will vaporise immediately and the pressure in the pipeline will be increased. Hence it is mandatory to reduce the pipeline temperature near to -33 Deg.C to have a control on the vaporisation rate. The process of reducing the pipeline temperature near to -33 Deg.C is called Precooling Operation.

M. S. S. S.



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5.2 Precooling operation

5.2.1) It is submitted that to reduce the pipeline temperature, liquid ammonia will be pumped slowly from the storage tank to one of the subsea pipelines and collected back to the tank through another subsea pipeline. (i.e., Through Valve arrangement, two pipeline will make a U- loop so that liquid ammonia will be given in one end and collected back in another end). The ammonia return to the tank in vapour form and tank pressure will be maintained by running the compressors and flare operation controlled through real time Distributed control system. By circulating ammonia, pipeline temperature is slowly reduced to the range of -12 to -16 Deg.C. The time required to reach the mentioned temperature will be typically 36 hours of operation. Hence, Precooling Operation will be carried out two days prior to the vessel unloading. The Process Safety Management (PSM) Standard Operating Procedure for Pre- Cooling and vessel Unloading Preparations is annexed herewith as ("**Annexure - A9**")

5.2.2) Before commencing precooling operation, all preventive (Alarms, Trips and Interlocks, Emergency Power Back up, Flare etc) and mitigative systems (Ammonia Sensors, Fire Hydrant System etc) in the ammonia terminal is being checked for operational readiness and NKT Pipeline Pressure is always ensured at 2 kg/cm²(g) to confirm its integrity. The trip and interlock stimulation report taken on 21.12.2023 before pre-cooling is attached herewith as ("**Annexure -A10**").

5.3 Vessel Unloading Operation

5.3.1) It is submitted that once the temperature has reduced in the subsea pipeline system, the vessel unloading will be commenced by connecting unloading hose to vessel manifold. The ammonia will be transferred to storage tank through two precooled subsea pipelines (through Valve arrangement). Based on the pipeline negative temperature, the



M. Jeyaraj



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ammonia will be transferred to the tank at low rate initially and the tank pressure will be controlled by compressors and flare. As the pipeline temperature keeps reducing, the flow rate will be increased gradually and attain constant flow rate of 350 MTPH. The unloading operation will be usually 1 – 2 days based on the ship quantity.

5.3.2) It is submitted that the unit has dedicated Distributed Control System, Alarms, Interlocks and Trips to monitor all the following critical parameters for safe operation of ship unloading and all other Ammonia handling and storage systems. Some of these parameters are:

1. Ammonia Tank Pressure and Temperature
2. Compressor Pressure
3. Flare Pilot Temperature
4. Ammonia Pumps Discharge Pressure
5. NKT Pipeline Pressure and Temperature
6. Ambient Ammonia

5.3.3) The Unit is also having additional facilities such as fire water sprinkler system, dedicated 4 MW Diesel Generator Sets to handle vessel unloading operation during power blackout and Instrument Air Compressor, Remote Distributed Control System. Dedicated Ammonia sensors are provided inside the Ammonia Storage Complex to sense any leakage in the system. The Map showing Ammonia Sensor Locations in the Unit Layout is annexed herewith as ("Annexure - A11").

5.3.4) All the above critical parameters have been monitored on a real-time basis through advanced distributed control systems and always ensured that the parameters are well within the design limits.

M. D. S.



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Besides the hardware, the ammonia control room is staffed by technically competent managers, shift officers, safety officers and field operators who handled the emergency situation very well as per the emergency response procedure laid out by the Unit. In the instant case, following were the sequence of activities that took place before giving clearance for ammonia ship to reach Ennore port.

- a. Post cyclone impact assessment by external agency.
- b. Obtained weather condition clearance for handling ammonia vessel from Maritime Board approved pilot.
- c. Pre-inspection of subsea pipeline system and unloading facilities carried out by external agency.
- d. Assessed the integrity of Interlock by the Instrumentation & Operation team.
- e. Pre-arrival intimation given to Maritime Board, PCB, Indian Coast Guard, Coastal Security Guard, Immigration Dept., Intelligence Bureau and Dy. Commissioner of Police.
- f. Availability of key personnel on call for any emergency in the Unit.
- g. Continuous monitoring of line pressure 24/7 from the commencement of pre-cooling operation.

The above activities clearly establish that the safety precautions have been diligently carried out by the Unit and pre-cooling operations commenced by sending liquid ammonia in lower dose as a precautionary step to unload the ammonia from the vessel. In the given instance, the vessel has been stopped at Vizag and the entire pre-cooling operation also stopped with minor leakage of ammonia which remained in the pipeline thereby avoiding any major damage to the environment or human life.

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6. INSPECTION PRIOR TO INCIDENT DATE

6.1) The Company submits that it has been operating the Unit and carrying out the ammonia unloading through sub-sea pipeline for the past 27 years without any accident or leakage, either within the Unit or in the offshore area. The Company further submits that it has always been proactive and gives utmost priority to safety standards and take adequate precautions especially during monsoon/cyclone period. It is important to note that the Unit does not carry out ammonia unloading activity during the "monsoon restriction period".

6.2) Each time before commencing the ammonia unloading operations, the Unit does a complete inspection of the offshore ammonia unloading facility. In December '23, Chennai witnessed cyclone "Michaung". The Unit as a precautionary measure appointed a marine contractor viz. M/s. Itajai Marine Service, Chennai to inspect the offshore pipeline systems to assess any impact in the unloading systems including boulder movements near the shore. The report submitted by the agency clearly confirms that the shore adjacent to the ammonia pipelines is free of any boulders post inspection and the said report is attached herewith as ("Annexure- A12"). The key_observations are as under:

- a. The boulders and debris found near the NKT corridor area were cleared manually.
- b. All anodes fixed on the beams observed before the cyclone were found intact.
- c. No major beam or metal structure damages when compared to pre-cyclone inspection were observed.



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- d. The NKT pipeline was observed to be covered with sand till 6th pile from the road.
- e. The distance between both NKT pipelines observed over the visible portion till splash zone remains the same.

Thus, it is clearly demonstrated from the above that the Unit has taken adequate precautions especially with regard to heavy movement of the boulders after the recent cyclone. As a matter of routine, the Company carries out inspection of the pipeline system before carrying out the pre-cooling operations and in the given instance, the routine inspection was carried out on 21st December'23. While the Company has carried out physical inspection of unloading systems with external experts, it also verified the pipeline pressure which has been maintained at 2kg/cm², a standard protocol deployed to ascertain the integrity of the pipeline. It is further submitted that the entire safety protocols have been drawn up in consultation with ammonia handling experts and have been in vogue for many years. The fact that the Unit has safely executed as many as 210 shipments from the year 1996 onwards stands testimony to the safety standards.

6.3) It is important to point out that the presence of heavy boulders on the shore were due to deployment by Public Works Department to avoid land erosion. The Company in order to safeguard the pipeline from damage that can potentially be caused by the movement of the heavy granite boulders, had constructed a steel corridor structure as per the recommendations of ex-professor of IIT, Chennai, who also designed the steel structure. The Company respectfully submits that it has taken proactive steps to protect the subsea pipeline.

N. G. Ramesh



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6.4) It is pertinent to mention that the subsea pipeline is made of 10 layered non-corrosive material which has been designed for 25 kg/cm² pressure against the operating pressure of 6 kg/cm² and predominantly buried for the entire length beneath the seabed (approx. 1.5 metres) except for exposed area near the shore which has been suitably barricaded as explained above.

7. INCIDENT DETAIL

7.1) It is submitted that, the Unit has two loading Pumps, viz. Pump-A and Pump-B. These pumps are used to supply ammonia to the pipeline during the pre-cooling operation.

7.2) It is submitted that as part of ammonia unloading operation on 28th December 2023, pre-cooling operations was started in Ammonia pipeline on 26th December.2023 at 20:00hrs as per the Standard operating procedure (SOP). At around 23:22 hrs, ammonia supply pipeline (South) pressure started dropping suddenly from 3.8 kg/cm² to lower levels. After noticing sudden pressure drop, the precooling operation was stopped immediately thereby stopping further transfer of Ammonia.

7.3) The ammonia pre-cooling supply line pressure dropped from 3.8 kg/cm² to 0 kg/cm² at 23:22 hours on 26.12.23. Subsequently, Pump-A got tripped at 23:23 hours due to low discharge pressure interlock, activated at 4.2 kg/cm². Pump-B was continuing to run as it was maintaining sufficient discharge pressure due to partial opening of discharge valve.

M. P. S. S.



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7.4) The field Operator, upon receipt of information from the panel operator, immediately responded by closing the discharge valve of Pump-A at 23:24 hours, before restarting the Pump-A to facilitate recirculation and to remove vapor locking. The Operator diligently activated the recycle operation to safeguard the Pumps from failure only after closing the discharge valve. By closing the discharge valve of Pump-A, the Operator has ensured that no further ammonia flow happened into the pipeline from 23:24 hours onwards. The said activity was clearly explained to the Technical Committee appointed by Respondent No. 3 TNPCB during their investigation and the same was also individually confirmed by the field Operators and their statement was duly submitted to the technical committee. The quick action of the Operations team within the shortest possible time from the observation of the pressure drop with help of Distributed Control System has resulted in controlling the flow of ammonia in the pipeline, thereby minimizing the possible leakage of ammonia into the atmosphere.

8. IMMEDIATE ACTION TAKEN.

8.1) It is submitted that during the emergency, Shift Executive immediately communicated to the police officials about the safety precautions to be followed during incident. The police officials assembled near the pipeline area who communicated to the nearby community to use wet cloth to mitigate exposure to ammonia. The Company's shift vehicle was sent outside and was used to transfer approximately 60 people to safe locations for 2 hours. The police officials arranged for ambulances and evacuated the people to safe locations. Some people who needed medical attention were also admitted to the nearby hospitals such as Akash Multi Speciality Hospital (Tiruvottiyur) and Government Stanley Hospital. The details of the people who were admitted in the Hospital date wise is as follows:-

[Handwritten signature]



Date	Name of the Hospital	No. of Admissions	No. of Discharged	Condition on Discharge
27-12-2023	Government Stanley Hospital, Chennai	07	-	-
	Akash Multi-Speciality Hospitals, Tiruvottiyur - Chennai	45	-	-
28-12-2023	Government Stanley Hospital, Chennai	0	07	Stable
	Akash Multi-Speciality Hospitals, Tiruvottiyur - Chennai	02	38	Stable
29-12-2023	Akash Multi-Speciality Hospitals, Tiruvottiyur - Chennai	0	05	Stable
30-12-2023	Akash Multi-Speciality Hospitals, Tiruvottiyur - Chennai	0	03	Stable
04-01-2024	Akash Multi-Speciality Hospitals, Tiruvottiyur - Chennai	0	1	Stable
	Total	54	54	



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8.2) It is respectfully submitted that there was no casualty or death that resulted from this accident and the discharge summary of the patients who were admitted in Akash Multi Speciality Hospitals periodically is annexed herewith as ("**Annexure -A13**"). It is respectfully submitted that the total cost for treatment of the affected people was borne by the Company and no affected individual had to bear any expense.

8.3) It is submitted that the Ammonia leak detectors installed within the Unit premises confirmed that the ammonia levels were within the limits in the entire Unit area. It should be noted that when the Company officials tested the ammonia levels at 12:30 AM, ammonia levels were significantly low to almost zero thereby confirming that exposure was only for a limited duration of less than one hour against the potential hazardous exposure period of 8 hours. The fall in ammonia levels were further confirmed by PCB officials who have inspected the site at 2:30 AM and entire area came to normalcy by 3 AM with nil reading across the Unit and shore locations. Seven out of the eight locations measured by PCB officials showed a zero ppm level in ambient air. The Report of the Online Pollution Monitoring Portal dated 28.12.2023 showing the amount of Ammonia present in the air periodically as on 26.12.2023 is annexed herewith as ("**Annexure - A14**") and the Report of the Online Pollution Monitoring Portal dated 28.12.2023 showing the amount of Ammonia present in the air periodically as on 27.12.2023 is annexed herewith as ("**Annexure - A15**"). The chart showing Ammonia PPM levels as captured from the sensors in the Ammonia Storage tank area from 26.12.2023 to 27.12.2023 is annexed herewith as ("**Annexure - A16**").

9. SUBSEQUENT DEVELOPMENTS

9.1) It is submitted that the Pollution control board issued notice to the Company vide proceedings No.T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated 27.12.2023 which is

M. J. Ramesh



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annexed herewith as ("Annexure - A17") and, after inspection of the site, directed the Company as follows:-

1. The unit shall suspend the operation of Ammonia offshore pipeline activity for precooling and ammonia transfer immediately and shall resume the same only after obtaining approval of Indian Register of Shipping (IRS) and the Tamil Nadu Maritime Board.
2. The unit shall precisely identify the location and the extent of damage that happened to the offshore pipeline and rectify the same early.
3. The unit shall ensure that no ammonia leak occurs during the pipeline rectification operation.
4. The unit shall restart the APPS plant and other allied units only after ensuring that all the ammonia pipeline inside the plant are intact and safe and shall obtain NOC from DISH before restarting the plant.

9.2) It is submitted that the company immediately on receipt of the report gave a reply dated 29.12.2023 annexed herewith as ("Annexure - A18") of the compliance status as follows:-

1. The Company suspended the Ammonia precooling and unloading activity from vessel to unit immediately and the vessel was cancelled and the same was informed to the authorities.



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2. The company is planning to identify the ammonia pipeline damage location and assessing by engaging competent and expert personnel and further inspection and maintenance scope and procedure will be arrived and reported at the earliest.
3. The company is planning for the maintenance procedure by deploying highest preventive and mitigative measures to avoid any further ammonia leakage during the rectification operation by involving the expert team and ensure that no ammonia leak takes place.
4. The Unit operation was suspended in phased manner. The company is planning for Unit inspection for entire ammonia related process equipment and pipeline by competent person. Once inspection completed, the report will be submitted to DISH and requesting NOC for restarting the plant. Once the NOC is obtained, the same will be informed to the Pollution Control Board.

10. INSPECTION CARRIED OUT AT AMMONIA STORAGE FACILITY BY M/S. THYSSENKRUPP UHDE

1. The Unit has engaged Thyssenkrupp, UHDE to perform detail process audit of ammonia storage facilities, Pre cooling & Ammonia Ship Unloading operation. The technical team has visited the site and carried out the detailed audit between 18.01.24 & 22.01.24.
2. The technical audit team has carried out the audit and verified the following
 - a. Reviewed the design condition of the submarine pipeline including pump design condition and precooling line capacities.
 - b. Compliance of Precooling operation dt. 26.12.23 with respect to standard operating procedures
 - c. Verification of trips and interlock healthiness

M. P. S.



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- d. One to One discussion with Plant operation team
 - e. Field observation on precooling line condition and assessing the present condition of the submarine pipeline and its content.
 - f. Recommendation of safe removal of aqueous ammonia from submarine pipeline.
3. Conclusions of Thyssenkrupp UHDE Technical audit report dated 30.01.24
- a. The chances of line pressurization beyond design condition are not a credible scenario. Even if the line temperature before starting of precooling is ambient, the likely increase in line pressure is well below the line design pressure value.
 - b. The pre-cooling operation & shutdown was performed as per established SOP.
 - c. The process scheme has been developed for removal of aqua ammonia from subsea pipeline along with dilution of aqua ammonia with fresh water, which is the preliminary activity is to be carried out before attempting for maintenance.
 - d. There is no ammonia emission in plant area during incident.
 - e. Root cause of subsea failure will be verified and confirmed based on inspection report.

The Report of Thyssenkrupp, UHDE is attached herewith as ("Annexure - A19").

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11. INSPECTION OF SUB-SEA PIPELINE

11.1) It is submitted that in compliance with the direction issued by the Pollution Control Board vide proceedings No.T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated 27.12.2023, the Company had stopped all the Ammonia offshore pipeline activity for precooling and transfer of ammonia. The Company was also directed to identify the location and the extent of damage that happened to the offshore pipeline and to rectify the same. However, the Company is not able to conduct inspection of the offshore pipeline due to the protests by nearby villagers in front of the offshore pipeline and the officers of the Company are physically prevented from inspecting the pipeline.

11.2) Even though unit has identified a qualified agency to inspect the subsea pipeline, due to the public gathering and blockage in and around the surrounding areas of the offshore pipeline, the Company is unable to carry out the inspection till date. The Company has already written to Respondent No. 3 TNPCB, Respondent No. 8 Directorate of Industrial Safety and Health (DISH), Respondent No. 9 Tamil Nadu Maritime Board (TNMB) and Tamil Nadu Police and sent reminders to extend necessary support for safe execution of the pipeline inspection activity. The letters to various authorities are attached herewith as ("Annexure - A20").

12. CONCLUSION

12.1) It is respectfully submitted that the sequence of events above show that the incident was an accident which took place despite all necessary permissions, licenses and compliances obtained by the Company and despite best measures and safety protocols being in place and were due to factors beyond the control of the Company. It is further



submitted that there were no fatalities or casualties and the emergent action of the company in turning off the pre-cooling operations within minutes after the leak resulted in no fatalities. The Company also took immediate steps in assisting all the citizens in the nearby areas and giving them immediate medical and financial assistance. It is also pertinent to mention here that it is first time in the history of the Company's operation in Ennore such an accident has occurred.

12.2) It is further submitted that the Company manufactures fertilizers to cater to the demand of the farming community and if the supply of the same is affected it would adversely impact the agricultural produce and would have cascading effect on the Indian economy and the well-being of the farmers. In the recent times, the demand-supply gap for fertilisers in India have increased, thereby leading to increased dependency on imports.

12.3) It is respectfully submitted that the Company is keen on protecting the environment and maintaining good relationship with the local community to foster sustainable growth for the entire region while ensuring safety and harmony. It is submitted that the Company is concerned about the incident and has been taking all remedial measures including providing medical support to the affected people.

12.4) It is pertinent to mention that the Unit carries out many CSR activities including running of a medical out-reach centre to support the medical needs of the neighbouring community. The support includes nominal medical consultation fee (Rs.10/- per consultation) and providing medicines at subsidised rates. On an average the total No. of consultations in the medical centre in a year will be around 12,000 Nos. In addition to the above, the Unit has been conducting periodical medical camps at the medical centre to review the health of the community people. Also, as part of the CSR activity, a Project



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named "Nallam" has been rolled-out to cater to the nutrition need of women and children in the neighbourhood.1

12.5) Considering the excellent safety track record of the Company, adequate safety mechanisms put in place, and operating the ammonia operations with all the requisite licenses, permits and approvals, it is respectfully submitted that any adverse order by this Hon'ble Tribunal would be counter productive rather than benefiting society at large.

13) The Company reserves its right and craves leave to file a further report/ counter if necessary and/or if directed by this Hon'ble Tribunal.

In view of the above submissions, it is therefore respectfully prayed that this Hon'ble National Green Tribunal may be pleased to close O.A. No. 195 of 2023 and pass such order or further orders as this Hon'ble National Green Tribunal may deem fit and proper and thus render justice.

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DEPONENT

Solemnly affirmed and signed

this the 5TH day of February 2024

and signed in my presence

[Handwritten signature]
24/3/2018

ADVOCATE, CHENNAI

No. 7, Law Chambers
High Court Buildings,
Ch-104



VERIFICATION

I, M. Vetrivel , son of Late A.C. Mani, aged about 41 years, the Assistant General Manager – Production, Ennore Unit of the Respondent No. 7 do hereby verify that the contents of the above paragraphs of the affidavit are based on record and true to the best of my knowledge and belief.

Verified on this the 5TH day of February 2024 at Chennai.



Counsel for Respondent No. 7

DEPONENT



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MANAGEMENT SYSTEM CERTIFICATE

Certificate no.:
10000370399-MS-C-RvA-IND

Initial certification date:
16 July 2013
(based on OHSAS 18001)

Valid:
16 July 2022 – 15 July 2025

This is to certify that the management system of
Coromandel International Limited
Compound Fertiliser Factory, Ennore Express Highway, Ennore, Chennai - 600057, Tamil Nadu, India

has been found to conform to the Occupational Health and Safety Management System standard:
ISO 45001:2018

This certificate is valid for the following scope:

Manufacture of sulphuric acid, phosphoric acid, ammonium phosphate, potash sulphate and by-product gypsum

Provision of ammonia storage and handling (onshore)

Place and date:
Barendrecht, 14 July 2022

For the issuing office:
DNV - Business Assurance
Zwolsseweg 1, 2994 LB Barendrecht,
Netherlands



Erie Koek
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.

ACCREDITED UNIT: DNV Business Assurance B.V., Zwolsseweg 1, 2994 LB, Barendrecht, Netherlands - TEL: +31(0)102922689. www.dnv.com/assurance



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MANAGEMENT SYSTEM CERTIFICATE

Certificate no.:
12639-2007-AE-IND-RvA

Initial certification date:
02 August 2001

Valid:
16 July 2022 – 15 July 2025

This is to certify that the management system of
Coromandel International Limited
Compound Fertiliser Factory, Ennore Express Highway, Ennore, Chennai - 600057, Tamil Nadu, India

has been found to conform to the Environmental Management System standard:
ISO 14001:2015

This certificate is valid for the following scope:
Manufacture of sulphuric acid, phosphoric acid, ammonium phosphate, potash sulphate and by-product gypsum

Provision of ammonia storage and handing (onshore)

Place and date:
Chennai, 14 July 2022

For the issuing office:
DNV - Business Assurance
ROMA, No. 10, GST Road, Alandur, Chennai -
600 016, India



Sivadasan Madiyath
Management Representative



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MANAGEMENT SYSTEM CERTIFICATE

Certificate no.:
C557442

Initial certification date:
05 May 2023

Valid:
05 May 2023 – 04 May 2026

This is to certify that the management system of

Coromandel International Limited

Unit Name: Ennore, Post Box No.:2, Express Highway Road, Ennore, Chennai - 600057, Tamil Nadu, India

has been found to conform to the Energy Management System standard:
ISO 50001:2018

This certificate is valid for the following scope:

**Manufacture of Sulphuric Acid, Phosphoric Acid, Ammonium Phosphate Potash sulphate and by product Gypsum.
Ammonia Storage and Handling (Onshore)**

Place and date:
Barendrecht, 05 May 2023

For the issuing office:
DNV - Business Assurance
Zwolsseweg 1, 2994 LB Barendrecht,
Netherlands



Erie Koek
Management Representative

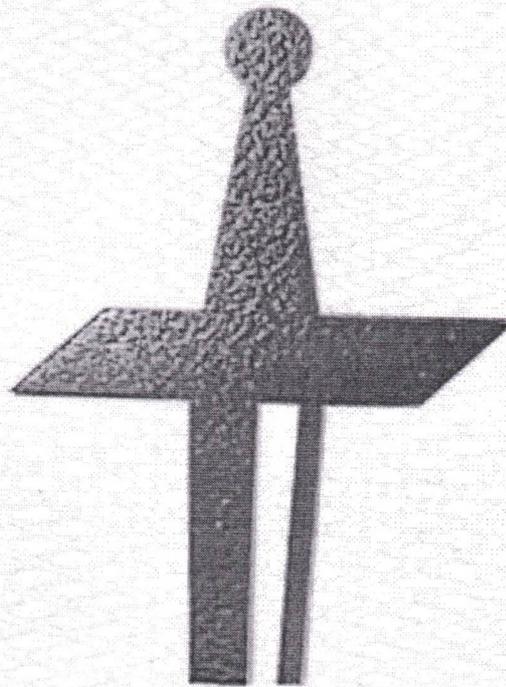
Lack of fulfillment of conditions as set out in the Certification Agreement may render this Certificate invalid.

ACCREDITED UNIT: DNV Business Assurance B.V., Zwolsseweg 1, 2994 LB, Barendrecht, Netherlands - TEL: +31(0)102922689. www.dnv.com/assurance

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Sword of Honour — 2023 —



This is to certify that

Coromandel International Limited, Vizag

has been awarded the British Safety Council Sword of Honour for 2023.
In winning this award they have demonstrated an outstanding commitment
to health and safety management during the last twelve months.

Peter McGettrick
Chair of The Board of Trustees
24 November 2023

Mike Robinson
Chief Executive
24 November 2023



Because
Experience
Counts

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Coromandel International Limited, Ennore

1.List of EHS Awards:

S.No	Award Details	Year	Issued by
1	Great Place to work Certification	Dec 2022- Dec 2023	Great Place to Work institute, India
2	Silver Category & Sectorial Third topper in Chemicals Industry category in CII-SR EHS Excellence Awards 2022	2022	Confederation of Indian Industry
3	Bronze award in CII-SR EHS Excellence Awards	2021	Confederation of Indian Industry
4	3-star rating' in CII- SR EHS Excellence Awards	2019	Confederation of Indian Industry
5	3-star rating' in CII- Southern Region EHS Awards	2018	Confederation of Indian Industry
6	4- star rating' in CII- Southern Region EHS Awards	2017	Confederation of Indian Industry

2.List of CSR Awards:

S.No	Award Details	Year	Issued by
1	Golden Peacock Award	2023	Institute of Directors, India
2	Golden Peacock Award	2021	Institute of Directors, India

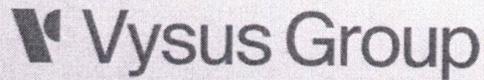
3.List of TQM Awards:

S.No	Award Details	Year	Conducted by
1	Kaizen Convention Outstanding award	2019	14th KAIZEN convention
2	Kaizen Convention Excellent	2019	14th KAIZEN convention
3	Kaizen Convention Outstanding award	2019	14th KAIZEN convention
4	SGA (Small Group Activity)Diamond	2020	4th national convention at Bangalore
5	SGA (Small Group Activity)Diamond	2020	ABK-AOTS DOSOKAI 4th SGA
6	Continues Improvement Third Position	2020	CII - Confederation of Indian industry
7	Innovative QCC- Rhodium	2022	ABK-AOTS DOSOKAI
8	Innovative QCC- Platinum	2022	ABK-AOTS DOSOKAI
9	Best Kaizen Platinum	2022	CII - Confederation of Indian industry
10	1st Six-Sigma Competition - Rhodium	2022	ABK-AOTS DOSOKAI

Report for:
Report reference:
Date:
Release:

THYSSENKRUPP INDUSTRIAL SOLUTIONS (INDIA) PRIVATE LIMITED
VG/CILE/CAR/004/2022
29 September 2022
Rev 01

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A4



Condition Assessment of Ammonia Storage Tank T- 1001 COROMANDEL INTERNATIONAL LTD. (Ennore Unit)

ThyssenKrupp Industrial Solutions (India)
Private Limited

Report Information

Condition Assessment of Ammonia Storage Tank T-1001: COROMANDEL INTERNATIONAL LTD.
(Ennore Unit)

Report reference: VG/CILE/CAR/004/2022	Date: 29 September 2022	Release: Rev 01
Prepared by: Balasaheb Gopale Integrity Specialist	Reviewed by: Shivakumar Kulkarni Director	Approved by: Shivakumar Kulkarni Director

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Vysus Group contact: Balasaheb Gopale Integrity Specialist M: +91 9 665 310 368 balasaheb.gopale@vysusgroup.com	Vysus Group entity and address: VYSUS CONSULTING INDIA PVT LTD REGUS SUBURB CENTRES PRIVATE LIMITED, LEVEL NO: 1, TIFFANY HIRANANDANI ESTATE, OFFICE NO: 126, THANE 400607, MAHARASHTRA.
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Revision	Prepared by	Reviewed by	Approved by	Date	Comments
00	BVG	SLK	SLK	29 Sep 2022	Issue for Review
01	BVG	SLK	SLK	7 Oct 2022	Client Comments Incorporated Issued for Acceptance

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List of Abbreviations

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BS	British Standard
Cl	Chlorine
IS	Indian Standards
LPT	Liquid Penetrant Testing
MMPA	Million Metric Tonnes Per Annum
NDT	Non-Destructive Testing
UTT / UFD	Ultrasonic Thickness Testing / Ultrasonic Flaw Detection
VI	Visual Inspection

Executive Summary

Coromandel International Limited, India's second largest Phosphatic fertilizer player, is in the business segments of Fertilizers, Specialty Nutrients, Crop Protection and Retail. The Company manufactures a wide range of fertilizers and markets around 4.5 million tons making it a leader in its addressable markets.

Client Named "ThyssenKrupp Industrial Solutions (India) Private Ltd, Mumbai" contracted Vysus Group to perform Fitness for Service (FFS) of Ammonia Storage Tank T-1001 at Coromandel International Ltd, Ennore Plant. All the site Inspection was performed by the client and inspection report was shared to perform Fitness for Service of the tank.

Tank Details:

- Equipment : Above Ground Storage Tank
- Tank No : T-1001
- Volume : 18362.1 M³
- Design Pressure : + 1050 mm WC and - 50 mm WC
- Design Temperature IN/OUT : - 34°C
- Operating Pressure : 200 - 800 mm WG
- Operating Temperature IN/OUT : - 32.5 °C
- Corrosion Allowance : Nil
- Tank OD : 34600 mm
- Joint Efficiency : 0.85 / 1
- Insulation : 100 mm
- Operating Medium / Fluid : Ammonia (Gas or Liquid)
- Year of Commissioning : 1996
- Manufacturions Code : API 650

1 Scope of Work

The detailed scope of services is to perform fit to use assessment (Fitness-for-Service Assessment) of Ammonia Tank at CIL Ennore site

2 Suspectable Corrosion Mechanism

The corrosion associated with ammonia storage tanks mostly depends on the storage temperature and the conditions to which the tank components are exposed. General material degradation could occur for parts like roof, due to the external atmospheric contact, and this type of damage could result only in forms of rusting and in severe cases in the forms of pits. For other parts, general corrosion could not be a concern at -33°C. The corrosion rate is negligible at such a low operating temperature of -33°C, where the liquid ammonia tanks operate.

2.1 General Corrosion

External corrosion of the tank due to atmospheric condition is prevalent in the tank roof, but it can be mitigated by an appropriate coating. The roof may require frequent inspection and repair of coating, as necessary, without interrupting the service, if possible.

Internal corrosion for the roof which is predominantly exposed to ammonia vapours, and to some extent to atmospheric air ingress arising during safety valve nozzle change-over, can lead to uniform corrosion.

Though internal corrosion is not expected in ammonia service, a minimal corrosion rate can be expected for shell and bottom plate also.

2.2 Stress Corrosion Cracking

Stress corrosion cracking is a phenomenon which can occur in metals exposed to a combination of stress and corrosive environment. Liquid ammonia in the presence of oxygen can cause SCC in carbon steels. The probability of SCC increases with increasing yield strength of the plate material, increasing strength of the weld metal and local hardness in the welds.

The stress levels required to initiate such cracking are high and are not experienced during normal operations. However, the residual welding stress levels in high and medium strength materials or welds with over matched strength, together with the applied stresses, can be enough to initiate SCC, if oxygen is present in sufficient quantities.

Stress corrosion cracking has been reported in some of the storage tanks operating at -33°C. Based on experiences from findings and extensive international research work, it appears that the commissioning and to an even greater extent re-commissioning are critical phases in the formation

of cracks. This is primarily due to the potential for increased oxygen levels inside the tank and temperature variations causing increased stress levels.

The main conclusions concerning SCC in ammonia tanks from worldwide studies combined with practical experience are:

- SCC is difficult to initiate at -33°C.
- SCC initiation requires applied and/or residual stress levels greater than the yield strength of the material.
- SCC initiation requires the presence of oxygen.
- The presence of water inhibits the formation and growth of SCC.
- Where SCC is found in low temperature tanks, the defects in general are very small (less than 2 mm deep). However, a few exceptions with larger defects have also been reported.
- Commissioning and in particular re-commissioning is a critical period for the formation and growth of SCC.
- Knowledge and experience of SCC has led to improved operation of ammonia storage tanks. Due to this, recent experience indicates that SCC occurs less frequently, even in tanks where extensive cracking was detected earlier.

The dependency of SCC on water content and oxygen concentration in ammonia is shown in Figure

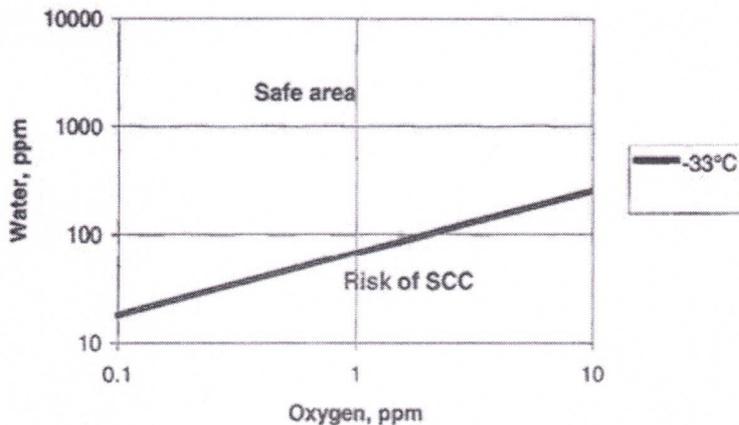


Figure: Relation between water and oxygen concentration in ammonia and risk of SCC

The initial cracking potential has been considered as "LOW" with the above listed points and also as per the operational history provided. It is to be noted that SCC is the main internal degradation mechanism which needs to be taken into consideration when planning and executing an inspection

programme for ammonia storage tanks. Inspection needs to be performed for all stressed locations mainly at the weld joints of shell and bottom plate to shell (corner joint).

2.3 Corrosion Under Insulation

CUI results from the collection of water in the vapour space (or annulus space) between the insulation and the metal surface. Sources of water may include rain water, cooling water tower drift, deluge systems, etc.

CUI causes wall loss in the form of localized corrosion. CUI generally occurs in the temperature range between -12°C and 175°C (10°F and 350°F), with the temperature range of 100°C to 121°C (212°F to 250°F) being the most severe environment. In the current case, this tank can be considered as located in areas with high annual rainfall, marine locations hence more prone to CUI. But since the operating temperature is lower than CUI susceptible temperature range, the same should not be a concern in normal operation.

External inspection of insulated systems should include a review of the integrity of the insulation system for conditions that could lead to CUI and for signs of occurrence of CUI, i.e., rust stains or bulging. However, external indicators of CUI are not always present. Mitigation of CUI is accomplished through good insulation practices and proper coatings. Proper installation and maintenance of insulation simply prevents ingress of large quantities of water. The coating system applied for insulated components also shall be as per the requirements of international codes and standards. A high-quality immersion grade coating is recommended. For guidance refer to NACE SP0198 can be referred.

3 Methodology

As part of the condition assessment of above Static Equipment's, client had performed below test / examinations as a part of condition assessment.

3.1 Visual Testing

Visual Testing (VT) or Visual Inspection is the oldest and most basic method of inspection. It has been carried as the process of close inspection over the equipment / piping shell and surfaces using the naked eye to look for any flaws or suspected indications. No special equipment except the naked eye of an experienced inspector was used in identifying the critical / susceptible locations for further testing and assessment. The visual testing has been carried out by API certified inspector.

Visual Inspection will be carried out by our specialized and trained personnel and will coordinate with client, Asset Integrity Manager, scaffolding personnel and others. He will enter the vessel only after gas free certificate is issued and vessel is cleaned and buffed with proper air circulation and if

required a scaffolding to be erected for access to the vessels parent material and will inform the NDT Team which discipline to be used inside and outside the vessels.

3.2 MFL (Magnetic Flux Leakage)

MFL equipment is used to scan large areas such as floors and can quickly detect anomalies such as underfloor corrosion. MFL is the "best" method to evaluate a tank bottom condition quickly and cost effectively. MFL technology induces a magnetic field into the steel plates and then evaluates any disturbance in the magnetic field.

3.3 Bubble leak testing or vacuum box testing

Bubble leak testing or vacuum box testing is an integral part of a tank inspection process as recommended by API and other international standards to establish the condition of a tank bottom plate weld or shell to bottom plate weld.

3.4 Ultrasonic Thickness Gaging (subjected to Accessibility)

Thickness measuring is essential across many industries to monitor corrosion, erosion and damage. Ultrasonic thickness measurement (UTM) is commonly used, and the method can be applied to a wide range of structures and components. Detection of metal loss caused by corrosion, erosion or damage is vital to ensure the continued safety and operation of the inspected item/structure. It can also help determine if repair work or replacement is needed or if the item/structure should be retired. Ultrasonic thickness measurement data gives customers the necessary information required to determine if the tested item has the adequate metal thickness for which it was designed.

3.5 Shear Wave Ultrasound

UT Shear Wave sends an ultrasonic beam into the test area at an angle. The sound wave reflects to the transducer and the display shows the distance and strength of the ultrasonic signal, from which discontinuities and anomalies can be detected and evaluated. Shear wave ultrasound testing is primarily used for weld inspections and is ideal for detecting non-laminar anomalies. Ultrasonic shear wave can also provide a high degree of accuracy of estimates in discontinuity size, shape and orientation.

3.6 Dye penetrant inspection (DP)

Liquid penetrant processes are non-destructive testing methods for detecting discontinuities that are open to surface. They may be effectively used in the inspection of both ferrous and non-ferrous metals and on non-porous, non-metallic materials, such as ceramics, plastics and glass. Surface discontinuities, such as cracks, seams, laps, cold shuts and laminations, are indicated by these methods.

3.7 Magnetic Particle Inspection

Magnetic particle inspection (often abbreviated MT or MPI) is a non-destructive inspection method that provides detection of linear flaws located at or near the surface of ferromagnetic materials. It is viewed primarily as a surface examination method.

Magnetic Particle Inspection (MPI) is a very effective method for location of surface breaking and slight sub-surface defects such as cracking, pores, cold lap, lack of sidewall fusion in welds etc in magnetic materials.

3.8 Hardness Measurements

NDT portable digital hardness tester equipment will be used for carrying out hardness testing on the coil, wherever feasible. The hardness tester follows the principle of rebound velocity from the metal surface to be tested. Hardness measurements are taken on polished tube surfaces so as to get the accurate hardness of the metallic tube excluding the external oxide scale. Hardness measurements will be taken at 10% of the total coil at random locations

3.9 In-situ Metallography

In-situ metallography will be performed on critical areas of the furnace coil. Spots are carefully picked so as to take spots with bluish patches, discolouration and other suspected surfaces where change in microstructures is suspected. After marking of spots, the spots are ground and polished to mirror finish. After etching, the spots are cleaned with solvent (acetone) and the replicas are taken. Subsequently the replicas are observed under optical microscope for metallographic investigation. In-situ metallography helps in identification of creep onset/creep damage.

3.10 Radiographic Testing (RT)

Radiographic Testing (RT) is a non-destructive testing (NDT) method which uses either x-rays or gamma rays to examine the internal structure of manufactured components identifying any flaws or defects.

In Radiography Testing the test-part is placed between the radiation source and film (or detector). The material density and thickness differences of the test-part will attenuate (i.e., reduce) the penetrating radiation through interaction processes involving scattering and/or absorption. The differences in absorption are then recorded on film(s) or through an electronic means. In industrial radiography there are several imaging methods available, techniques to display the final image, i.e., Film Radiography, Real Time Radiography (RTR), Computed Tomography (CT), Digital Radiography (DR), and Computed Radiography (CR).

The detailed inspection test procedure of each NDT are mentioned in document dossier of inspection test plan AEP/tkIS/CIL/AMMONIA TANK/ITP01 (R01).

4 Inspection Findings and Results

All the NDT results are summarized herewith. The reports results are taken from document dossier of inspection test plan AEP/tkIS/CIL/AMMONIA TANK/ITP01 (R01). The detailed inspection test procedure of each NDT is also enclosed in the document dossier.

4.1 Visual inspection

1. Outer tank manhole cutting carried out and grinding done – No defect Found
2. Inner tank manhole cutting carried out and grinding done. – No defect Found
3. Inner tank bottom surface mopping and cleaning done. – No defect Found
4. Tank shell plates and all attachments from inside up to 4th shell course, bottom plates in annular, anchors, pad plates, nozzles and all attachments, etc. up to anchor chair heights from outside of the tank visual inspection done – No defect Found

4.2 Vacuum Box Test

1. Vacuum Box Test was carried on Outer Tank Shell to Annular plate fillet weld
2. Result - No bubbles were observed during the vacuum box test the tank shell plate and annular plate weldment meet the acceptable criteria Of AP1 620.

4.3 Liquid Penetrant Test

1. Outer Tank Outside Cs11 to compression ring - No significant defect
2. Outer Tank inside C1 Full Circumference (Shell to Bottom Filet Weld) - No significant defect
3. Outer Tank Outside C1 Full Circumference (Shell to Bottom Fillet Weld) - No significant defect
4. Outer Tank inside C2 (Q1 to Q4) Full Circumference - No significant defect
5. Outer Tank inside C3 (Q1 to Q4) Full Circumference - No significant defect
6. Outer Tank inside C4 (Q1 to Q4) Full Circumference - No significant defect
7. Outer tank inside annular-to-annular butt weld - No significant defect
8. Outer Tank inside C1-L1 to C1-L12 Vertical Joints - No significant defect
9. Outer Tank inside C2-L1 to C2-L12 Vertical Joints - No significant defect
10. Outer Tank inside C3-L1 to C3-L12 Vertical Joints - No significant defect

4.4 Ultrasonic Test (Weld)

1. Outer tank shell course-1 (P1+P2) - No significant defect
2. Outer tank shell course-1 (P5+P6) - No significant defect
3. Outer tank shell course-1 (P11+P12) - No significant defect
4. Outer tank shell course -2 (P5+P6) - No significant defect
5. Outer tank shell course -2 (P9+P10) - No significant defect

6. Outer tank shell course -2 (P12+P13) - No significant defect
7. CS-02 Outer tank shell course (1-2) - No significant defect
8. Cs-03 Outer tank shell course (2-3) - No significant defect
9. CS-04 Outer tank shell course (3-4) - No significant defect

4.5 Fluorescent Magnetic Particle Inspection Test

1. Outer Tank shell course-1 Vertical joint - No significant defect
2. Outer Tank Shell to Annular plate fillet weld- No significant defect
3. Outer Tank Shell Plate Horizontal Butt weld- No significant defect
4. Outer Tank Shell course (3-4) Horizontal Butt Weld- No significant defect

4.6 Ultrasonic Thickness Gauge

Area	Nominal Thickness	Actual Thickness
Outer Tank Annular Plate	8.0	7.9
Outer Tank Shell Plate C1	17.0	16.4
Outer Tank Shell Plate C2	15.5	15.1
Outer Tank Shell Plate C3	14.5	14.1
Outer Tank Shell Plate C4	12.5	12.7

4.7 Vacuum Box

Vacuum Test has been carried on following weld areas:

1. Cup Tank Shell to Annular plate fillet weld
2. Cup Tank Bottom Sketch Plate Long Seam
3. Cup Tank Bottom Sketch Plate Short Seam
4. Cup Tank Annular Plate to Sketch Plate

Result - No bubbles were observed during the vacuum box test the tank shell plate and annular plate weldment meet the acceptable criteria of AP1 620.

4.8 Liquid Penetrant Test

1. Cup Tank Inside C1 Full Circumference (Shell to Bottom Fillet Weld) - No significant defect
2. Cup Tank Outside C1 Full Circumference (Shell to Bottom Fillet Weld) - No significant defect
3. Cup Tank Inside Annular-to-Annular Butt Weld - No significant defect
4. Cup Tank Inside C2 (Q1 to Q4) Full Circumference (Horizontal Weld) - No significant defect
5. Cup Tank Inside C3 (Q1 to Q4) Full Circumference (Horizontal Weld) - No significant defect
6. Cup Tank Inside C4 (Q1 to Q4) Full Circumference (Horizontal Weld) - No significant defect

7. Cup Tank Inside C5 (Q1 to Q4) Full Circumference - No significant defect
8. Cup Tank Inside C1-L1 to C1-L12 Vertical joints - No significant defect
9. Cup Tank Inside C2-L1 to C2-L12 Vertical joints - No significant defect
10. Cup Tank Inside C3-L1 to C3-L12 Vertical joints - No significant defect
11. Cup Tank Inside C4-L1 to C4-L12 Vertical joints - No significant defect

4.9 Ultrasonic Test (Weld)

1. Cup tank shell course-1 (Vertical) - No significant defect
2. Cup tank shell course-2 (Vertical) - No significant defect
3. CS-02 Cup tank shell course (1-2) - No significant defect
4. CS-03 Cup tank shell course (2-3) - No significant defect
5. CS-05 Cup tank shell course (4-5) - No significant defect

4.10 Fluorescent Magnetic Particle Inspection Test

1. Cup Tank Shell to Annular plate fillet weld- No significant defect
2. Cup tank annular to sketch plate lap weld- No significant defect
3. Cup Tank Sketch Plate T- weld- No significant defect
4. Cup Tank Shell Course (3-4) T-joint- No significant defect
5. Cup Tank Shell Course (4-5) T-joint- No significant defect
6. Cup Tank Shell Course (1-2) Horizontal welds- No significant defect
7. Cup Tank Shell Course (2-3) Horizontal welds- No significant defect
8. Cup Tank Shell Course (3-4) Horizontal welds- No significant defect

4.11 Ultrasonic Thickness Gauge

Area	Nominal Thickness	Actual Thickness
Cup Tank Shell Plate C1	17.0	17.1
Cup Tank Shell Plate C2	15.5	15.1
Cup Tank Shell Plate C3	14.0	14.0
Cup Tank Shell Plate C4	12.5	12.7
Cup Tank Shell Plate C5	11.0	11.0
Cup Tank Shell Plate C6	9.0	9.0
Cup Tank Shell Plate C7	7.5	7.4
Cup Tank Shell Plate C8	7.5	7.5
Cup Tank Shell Plate C9	6.5	6.5

Cup Tank Annular Plate	8.0	7.9
Cup Tank Sketch Plate	6.0	6.4

4.12 MFL Tank Floor Inspection

1. Except one plate all the tested plates are found in satisfactory condition.
2. 01 plate was observed surface minor depression

4.13 Hardness Report

1. CUP tank weld joint (Butt Weld) – Accepted
2. CUP tank weld joint (Lap Weld) – Accepted

4.14 Visual Report

1. Visual inspection and surface crack detection of fillet weld for anchor bracket which is welded to shell area – No defect Found

4.15 Non-Fluorescent Magnetic Particle Inspection Test

1. Cup Tank Anchor strip - No significant defect

4.16 Inspection Report for Ultrasonic Test (Weld)

1. Suspension Deck Hanger bolt ring-01 - No significant defect
2. Suspension Deck Hanger bolt ring-02 - No significant defect
3. Suspension Deck Hanger bolt ring-03 - No significant defect
4. Suspension Deck Hanger bolt ring-04 - No significant defect
5. Suspension Deck Hanger bolt ring-05 - No significant defect
6. Suspension Deck Hanger bolt ring-06 - No significant defect

4.17 Visual Report

1. Shell nozzles-(N2, N14, N15, N16, N18) and Roof nozzle-(N1, N3, N4, N5, N6, N7, N8, N9, N10, N11, N13, N19, N20, N21, N22, N23) Visual inspection, surface crack detection of all butt and fillet weld area. – No defect Found

4.18 Liquid Penetrant Test

1. Nozzle N6 - No significant defect
2. Nozzle N7 - No significant defect
3. Nozzle N5 - No significant defect
4. Nozzle N22- No significant defect
5. Nozzle N3 - No significant defect
6. Nozzle N1 - No significant defect

7. Nozzle N16 - No significant defect
8. Nozzle N4 - No significant defect
9. Nozzle N11 - No significant defect
10. Nozzle N23 - No significant defect
11. Nozzle N18 with RF pad - No significant defect
12. Nozzle N14 with RF pad - No significant defect
13. Nozzle N16 - No significant defect
14. Nozzle N2 with RF pad - No significant defect
15. Roof Plate Weld Joints (Long Seam) - No significant defect
16. Roof Plate top Horizontal weld joints - No significant defect
17. Roof Plate bottom Horizontal weld joints - No significant defect
18. Roof Plate weld joints (Full circumferential joints) - No significant defect

4.19 Ultrasonic Thickness Gauge

Area	Nominal Thickness	Actual Thickness
Roof Plate - P1	5.0	5.0
Roof Plate - P2	5.0	4.9
Roof Plate - P3	5.0	4.9
Roof Plate - P4	5.0	5.0
Roof Plate - P5	5.0	4.9
Roof Plate - P6	5.0	4.9
Roof Plate - P7	5.0	5.0
Roof Plate - P8	5.0	4.9
Roof Plate - P9	5.0	4.9
Roof Plate - P10	5.0	4.9
Roof Plate - P11	5.0	4.9
Roof Plate - P12	5.0	5.0
Roof Plate - P13	5.0	5.0
Roof Plate - P14	5.0	5.0
Roof Plate - P15	5.0	5.0
Roof Plate - P16	5.0	5.0
Roof Plate - P17	5.0	4.9
Roof Plate - P18	5.0	4.9
Roof Plate - P19	5.0	4.9
Roof Plate - P20	5.0	4.9
Roof Plate - P21	5.0	4.9
Roof Plate - P22	5.0	4.9

Roof Plate – P23	5.0	4.9
Roof Plate – P24	5.0	5.0
Roof Plate – P25	5.0	5.0
Roof Plate – P26	5.0	4.9
Roof Plate – P27	5.0	5.0
Roof Plate – P28	5.0	4.9
Roof Plate – P29	5.0	5.0
Roof Plate – P30	5.0	4.9
Roof Plate – P31	5.0	5.0
Roof Plate – P32	5.0	5.0
Roof Plate – P33	5.0	4.9
Roof Plate – P34	5.0	5.0
Roof Plate – P35	5.0	5.0
Roof Plate – P36	5.0	5.0
Roof Plate – P37	5.0	4.0
Roof Plate – P38	5.0	4.9
Roof Plate – P39	5.0	4.9
Roof Plate – P40	5.0	5.0
Roof Plate – P41	5.0	5.0
Roof Plate – P42	5.0	4.9
Roof Plate – P43	5.0	4.9
Roof Plate – P44	5.0	4.9
Roof Plate – P45	5.0	4.9
Roof Plate – P46	5.0	5.0
Roof Plate – P47	5.0	4.9

4.20 Visual Report

1. Visual Inspection of Suspended Deck Plates and hangers. – No defect found

4.21 Liquid Penetrant Test

1. Suspended Deck Ribs to Roof Compression ring - No significant defect
2. Suspended Deck Rafter to Roof fillet joints (up to 3 m accessible) - No significant defect
3. Suspended Deck Rafter stitch weld (up to 3 m accessible top) - No significant defect
4. Suspended Deck Rafter stitch weld (up to 3 m accessible bottom) - No significant defect
5. Suspended Deck Hanger weld joints Position -1 (Top side) - No significant defect
6. Suspended Deck Hanger weld joints Position -1 (Bottom side) - No significant defect
7. Suspended Deck Hanger weld joints Position -2 (Top side) - No significant defect
8. Suspended Deck Hanger weld joints Position -2 (Bottom side) - No significant defect

9. Suspended Deck Hanger weld joints Position -3 (Bottom side) - No significant defect
10. Suspended Deck Hanger weld joints Position -4 (Bottom side) - No significant defect
11. Suspended Deck Hanger weld joints Position -5 (Bottom side) - No significant defect
12. Suspended Deck Hanger weld joints Position -6 (Bottom side) - No significant defect
13. Suspended Deck Hanger weld joints Position -7 (Bottom side) - No significant defect
14. Suspended Deck Hanger weld joints Position -8 (Bottom side) - No significant defect
15. Suspended Deck Compression Bar to Compression Bar Butt Weld Joints - No significant defect
16. Suspended Deck Compression Ring to Compression Ring Weld Joints - No significant defect

4.22 Visual Report

1. Inner tank shell manhole (NIS) visual inspection, surface crack detection of all butt and fillet weld nozzle necks (pipes), and nozzle dished end. – No defect found
2. Outer area rafter to roof plate fillet stitch weld area. – No defect found

4.23 Ultrasonic Thickness Gauge

Area	Nominal Thickness	Actual Thickness
Suspension deck - C5	5.0	4.9
Suspension deck – C4	5.0	5.0
Suspension deck – C3	5.0	4.9
Suspension deck – C2	5.0	4.9
Suspension deck – C1	5.0	5.0
Suspended Deck Nozzle N1	SCH 40	10
Suspended Deck Nozzle N3	SCH 40	9.0
Suspended Deck Nozzle N4	SCH 40	7.6
Suspended Deck Nozzle N5	SCH 40	5.9
Suspended Deck Nozzle N6	SCH 40	9.8
Suspended Deck Nozzle N9	SCH 60	8.0
Suspended Deck Nozzle N10	SCH 60	7.9
Suspended Deck Nozzle N11	SCH 60	7.9
Suspended Deck Nozzle N22	SCH 60	5.9
Suspended Deck Nozzle N23	SCH 60	8.0

4.24 Water Filling test

1. Water filling test report of CUP tank – Satisfactory

4.25 Water filling and Foundation Settlement of Tank

1. Water filling and Foundation Settlement of Tank – Satisfactory
2. Observed Settlement readings within acceptable limit and found satisfactory

4.26 Tank Pneumatic Pressure Test

1. 61 Leakages were observed at different locations during 1000mmWC (g) pressure. As decided the same shall be rectified by patch welding and weld built up and RE-pneumatic test to be carried out.
2. 19 Leakages were observed at different locations during 1000mmWC (g) pressure. As decided the same shall be rectified by patch welding and weld built up and RE-pneumatic test to be carried out
3. 03 Leakages were observed at different locations during 1000mmWC (g) pressure. As decided the same shall be rectified by patch welding and weld built up and RE-pneumatic test to be carried out

5 Tank Assessment

5.1 Assessment Of General Metal Loss

During inspection Outer Tank Annular Plate, Outer Tank Shell Plate, Cup Tank Shell Plate, Cup Tank Annular Plate, Cup Tank Sketch Plate, Suspension deck, Roof Plate and Nozzle thickness multiple readings has been taken.

Also, MFL of bottom plate shows no sign of corrosion or metal loss. Please refer section 4 for more details.

All the readings shown no sign of corrosion or metal loss.

Average measured wall thickness of the all the component based on the point thickness readings (PTR) measured at the time of the inspection is equal to or greater than installed thickness or nominal thickness.

As per API 579 Table 4.6 – Acceptance Criteria For Level 1 and 2 Assessment for Atmospheric Storage Tanks:

$$\begin{aligned} &\text{Average Measured Thickness from Point Thickness Readings (PTR)} \\ &\geq \text{Minimum required wall thickness of the component} \end{aligned}$$

Hence As per API 579 Level 1 Assessment Acceptance Criteria, all the thickness readings of the component are accepted.

5.2 Assessment Of Crack-Like Flaws

Liquid Penetrant Testing, Fluorescent Magnetic Particle Inspection Test, Non-Fluorescent Magnetic Particle Inspection Test and Ultrasonic Test (Weld) has been carried out Multiple locations. Please refer section 4 for more details.

All the inspection records show no sign of any crack like defects.

Also, the Hardness report values are within acceptable range hence it can be concluded that the Stress corrosion Cracking mechanism is inactive.

6 CONCLUSION

The condition assessment has been performed as per scope of work in line with the applicable codes and standards, statutory and regulatory requirements, International Best Practices and Vysus Methodology.

The FFS assessment has been conducted in line with API 579-1. The following statement can be made regarding the Fitness for Service (FFS) of the Ammonia storage tank (T-1001) under scope.

- 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.
- To continue integrity of tank, schedule of recommended mitigation and remediation activities shall be followed

Assessment is based on the gathered NDT results and visual inspection findings. Refer section 5 for more details.

7 Recommendations

In conjunction to the existing inspection planning the following recommendations should be incorporated:

7.1 Operational Checks

Continuous monitoring of operating parameters.

1. Regular analyses of water and oxygen content in imported ammonia.
2. Regular site visits with visual checks of the equipment and facilities. These should include visits by the operating technicians and the responsible operating/engineering management personnel, on a less frequent basis.
3. Frequent (half yearly or yearly) tests of safety equipment (tank emergency shut-off valves, automatic valves, etc.).

7.2 Preventive maintenance

1. Ammonia detectors, if installed (half yearly visual inspection and calibration).
2. Electrical equipment, earth connection, lightning rods (yearly).
3. Instrument and control equipment e.g. level, pressure, temperature gauges (once in a year or once in two years).
4. Pumping and cooling facilities (yearly).
5. Safety valves (yearly).

7.3 Specific inspection controls

1. Annual visual inspection of the tank to identify any insulation damage on the tank or on connected piping. Any damage observed shall be restored at the earliest
2. Visual Inspection of connected pressure equipment and bund wall (yearly).
3. Inspection of foundation (if visual damage is observed) and level survey (once in 4 to 6 years).
4. Inspection of insulation. (once in 3 to 5 years).
5. Anchor bolts visual checks (once in 9 years).
6. Visual check of plates and roof on some places after removing the insulation (once in 5 years).
7. Inspection of pipes and supports (yearly).
8. After performing next inspection, an RBI analysis may be performed incorporating the inspection findings and have a new risk level and criticality rating for each component.

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A5

Ammonia Tank Major Jobs (Recent History):

1. Distributed Control System upgradation to the latest version with redundancy.
2. 35 No's of Safety Relief Valves are installed in the Ammonia Storage and Handling System including First Isolation valve of all ammonia system upgradation for reliable and safe isolation of ammonia system .
3. Total of 138 No's of Alarms are configured in the DCS from the old PLC system
4. Total of 51 Trips and Interlocks are configured in the DCS from the old PLC system
5. Two out of three logic interlock implemented for all critical trips and interlock for reliable trip mechanism .
6. Flare capacity upgradation from 1000 kg/hr to 3700 kg/hr
7. Totally, 19 nos of ammonia sensors installed for comprehensive ammonia level monitoring of entire ammonia storage facility .
8. Provided additional emergency staircase for Ammonia Storage Tank as additional safety during emergency .
9. FH pump capacity upgradation as an additional safety during emergencies .
10. Control room Safety measure improvement to ensure 100% gas proof system during emergencies to safely operate from control room .
11. Improved insulation of ammonia line near furnace oil storage facility to protect ammonia lines during fire hazard .



Coromandel International Limited, Ennore Unit Details

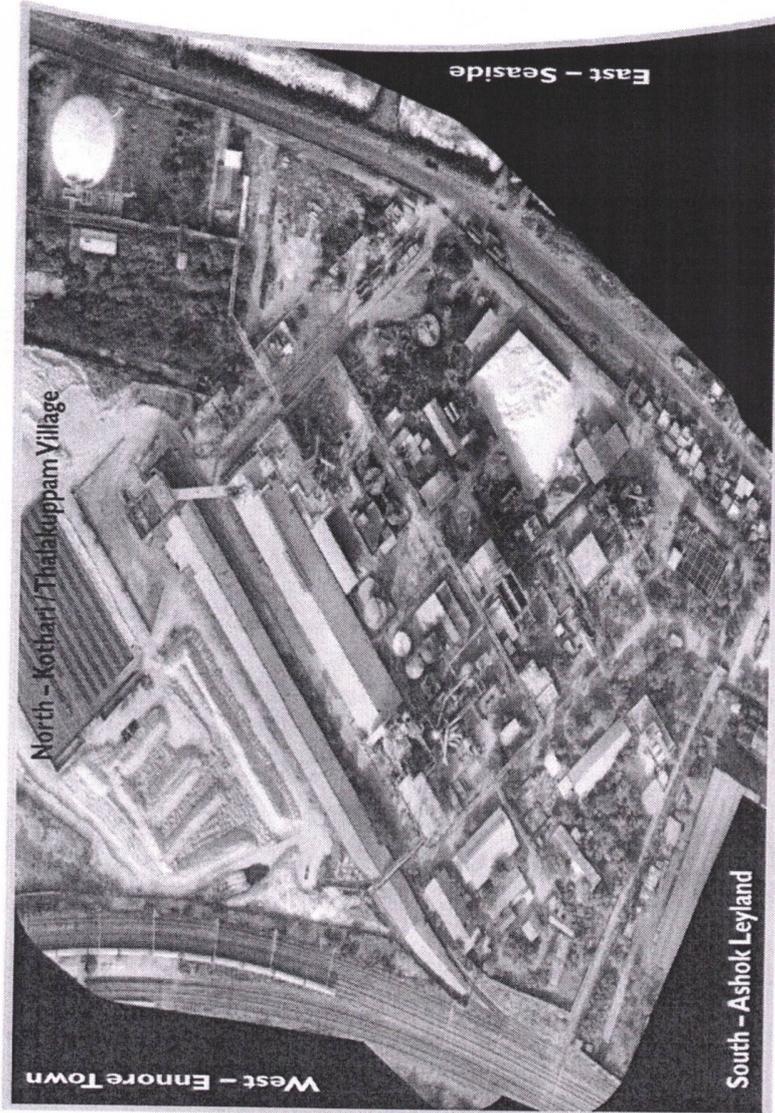


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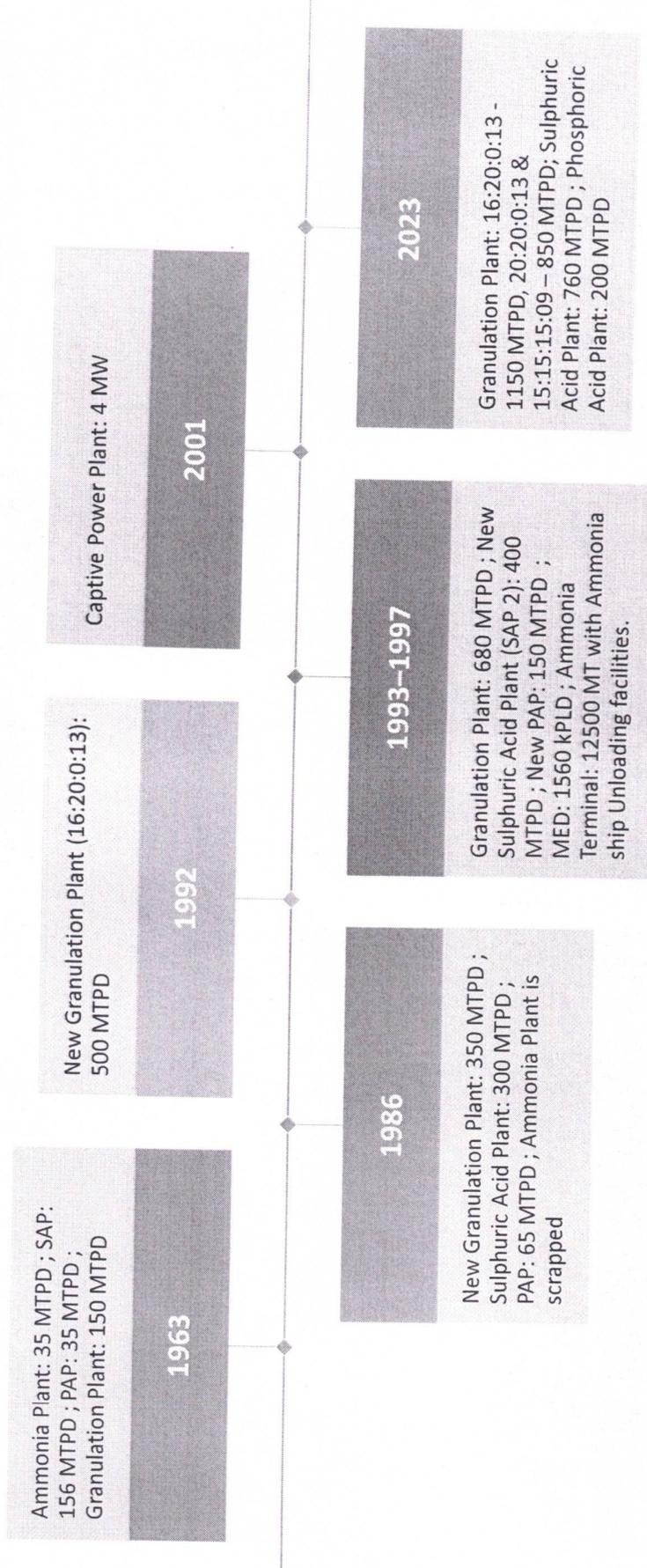
- **Ennore Unit**
 - Site Detail
 - Plant Capabilities at Various years.
 - Systems Implemented
- **Plant details**
 - SAP1
 - SAP2
 - PAP
 - APPS (Complex) Fertiliser
 - Ammonia Terminal

Site Detail



Plant	Capacity
Granulation Plant	4,00,000 TPA.
Phosphoric Acid Plant	66,000 TPA.
Sulphuric Acid Plant	2,58,000 TPA.
Captive Power Plant	4 MW Hr.
MED	1560 m ³
Phosphoric Storage Capacity: 4 Nos	760 MT
Sulphuric Storage: 4 Nos	7000 MT
Ammonia Storage Tank	12500 MT

Plant Capabilities at Various Year



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ISO 14001: 2015 – Environmental Management System

ISO 45001:2018 – OH&S Management System

ISO 50001:2018 – Energy Management System

PSMS – Process Safety Management System



Plant details



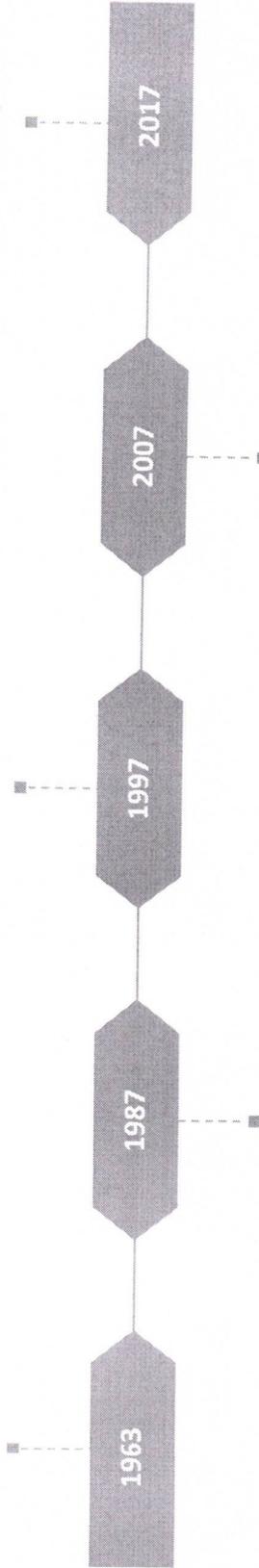
Sulphuric Acid Plant -1



Original installed capacity is 160 TPD with Single Contact Single Absorption Technology in the Year 1963

Revamping of plant in 1997 to 300 TPD with start up Scrubber.

In the Year 2017, Plant Capacity has been upgraded to 360 MT Per day



In the year 1987, Conversion process of Sulphuric Acid Converted from SCSA to Double Contact Double Absorption Process and Capacity also increased to 280TPD.

In the year 2007 September, Environmental Clearance obtained for Plant Capacity Increased.

Glimpses of SAP1



Sulphuric Acid Plant -2



Installed capacity is 400 TPD, designed for Double Contact Double Absorption Process in the year 1995.

Startup Scrubber installed in the year 2000 for effective Environmental Compliance.

SAP 2 Plant Steam Economy ratio (1.2 MT Steam/ MT of Acid) which is higher than SAP 1 (1 MT Steam/ MT of Acid)

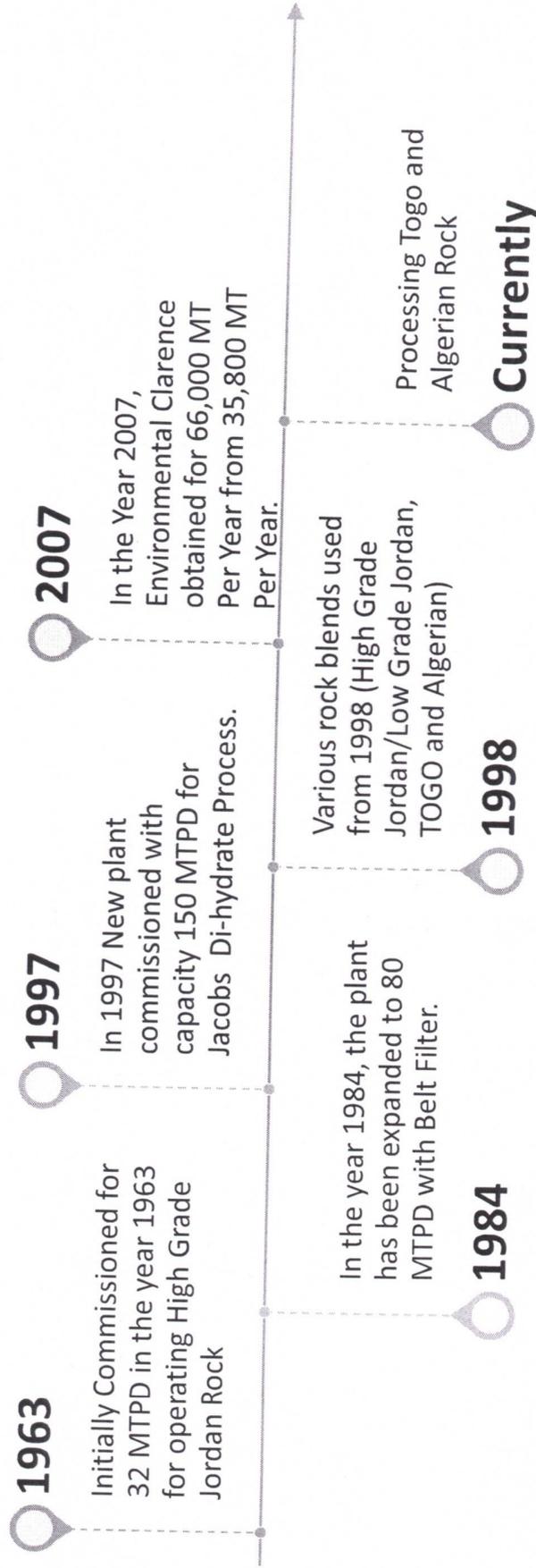
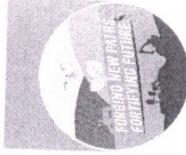
Designed to Produce 36 KSC to Operate Turbo Blower (Steam Operated Blower) & Exhaust Low Pressure Steam of Turbine being utilized in MED for Sea Water Desalination.



Glimpses of SAP2



Phosphoric Acid Plant



Glimpses of PAP



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Complex Fertilizer



In the Year 1963, Plant Installed with 160 MTPD with Saturator and Blunger technology designed by HDO.

Plant Capacity increased to 750 MTPD in the year 1995.

Pre-Neutralizer Reactor modified to Pipe Cross Reactor in the year 2006 to increase the throughput rate.

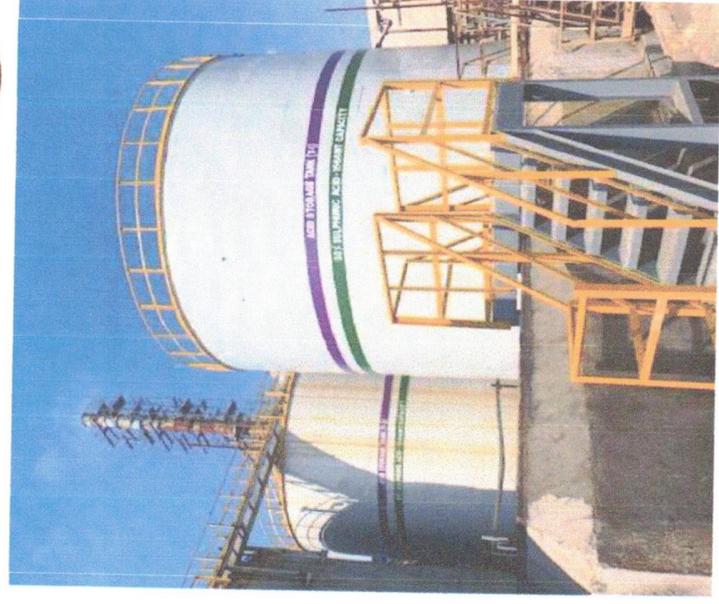
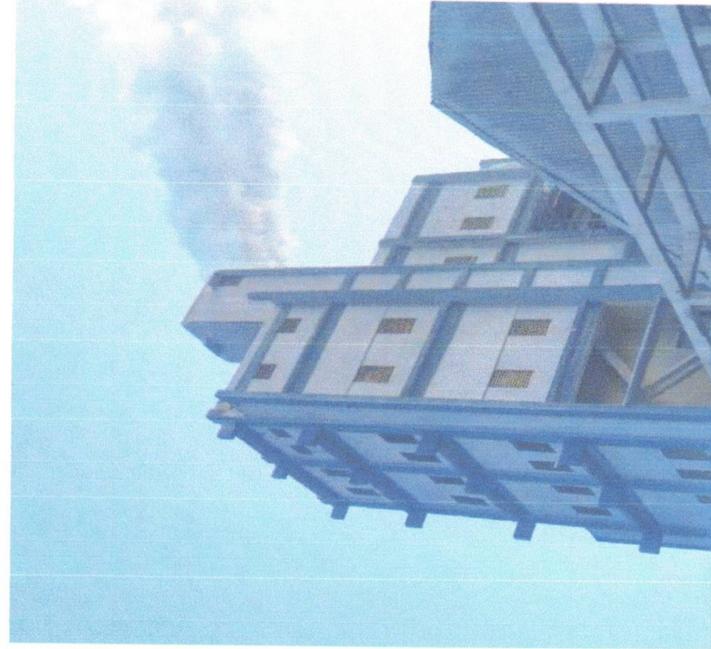
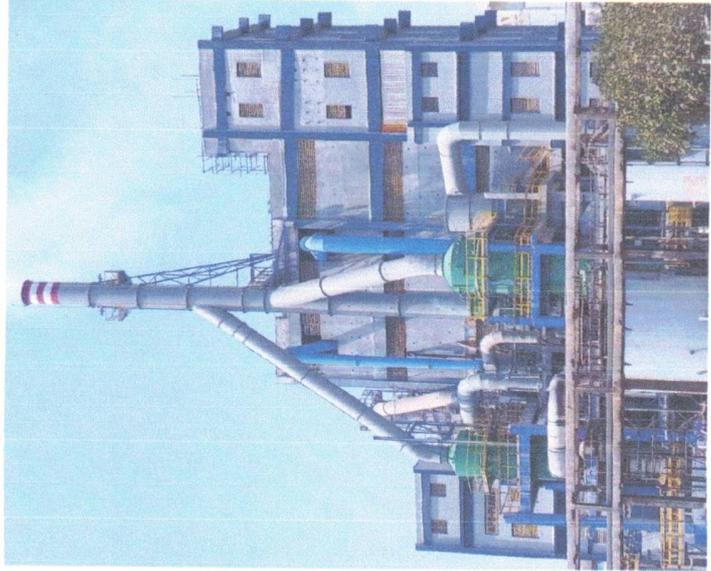
In the year 2007, Environmental Clearance obtained for Capacity of 3,30,000 MT per Year from 1,70,000 MT per Year.

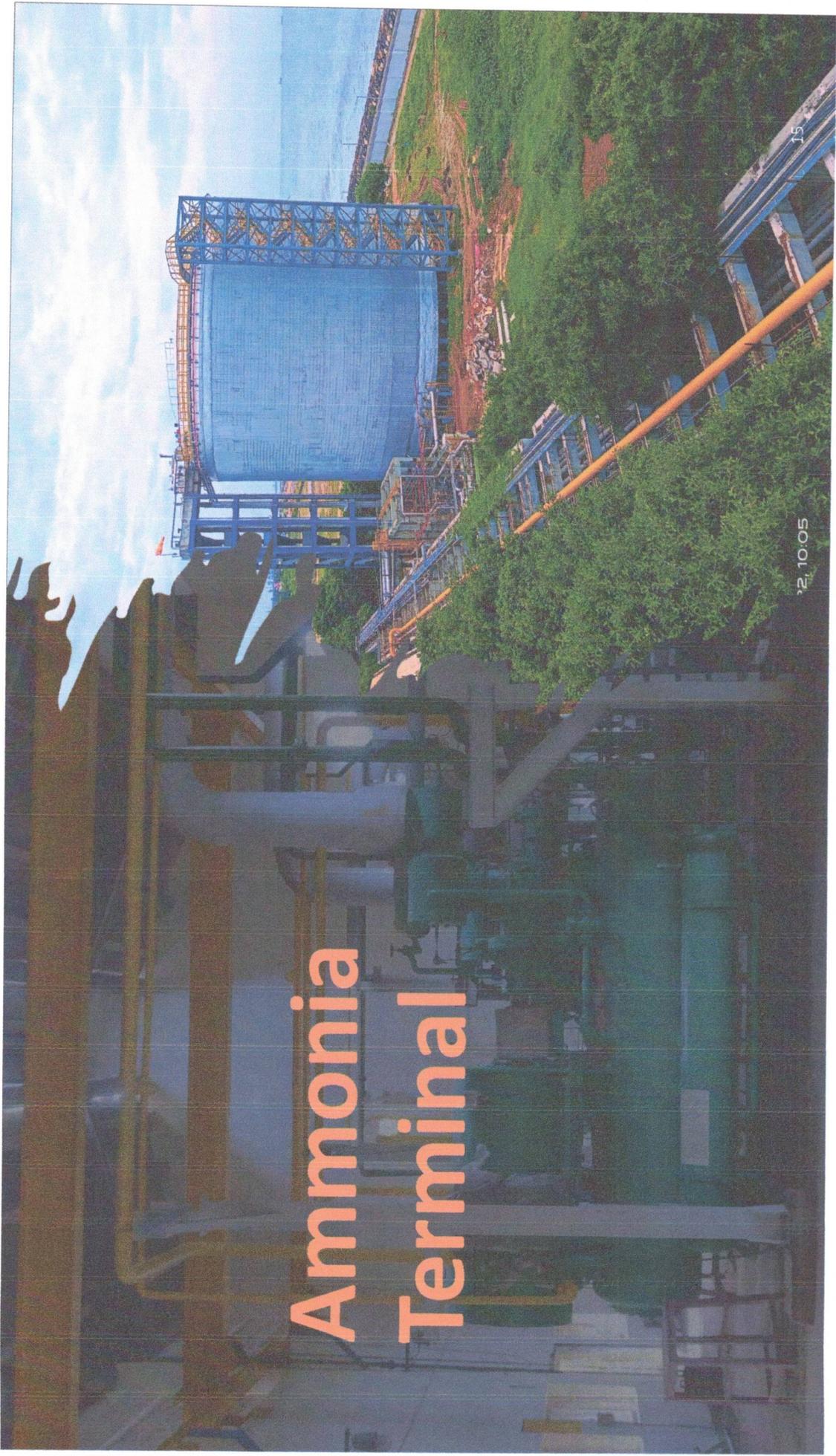
Plant producing 16:20:0:13 ; 20:20:0:13 & Triple 15

5 Stage Scrubber installed for effective environmental compliance



Glimpses of Complex Fertilizer





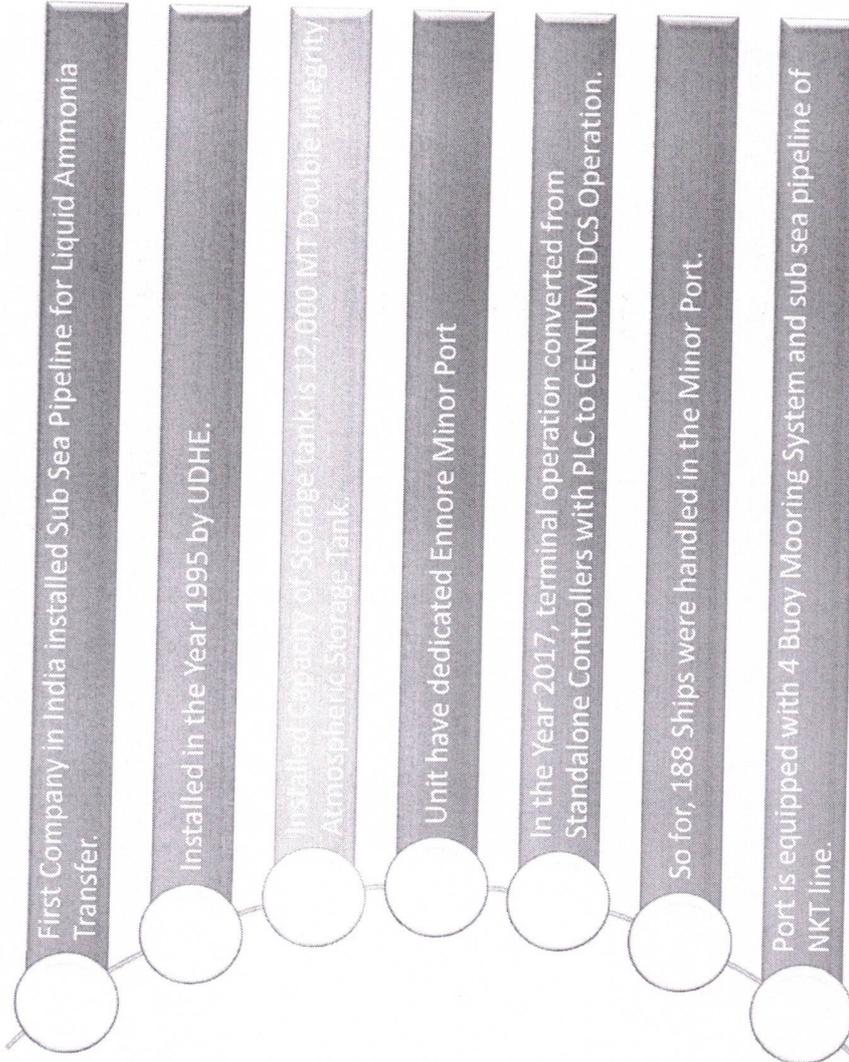
Ammonia Terminal

2012 10:05

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AMMONIA TERMINAL

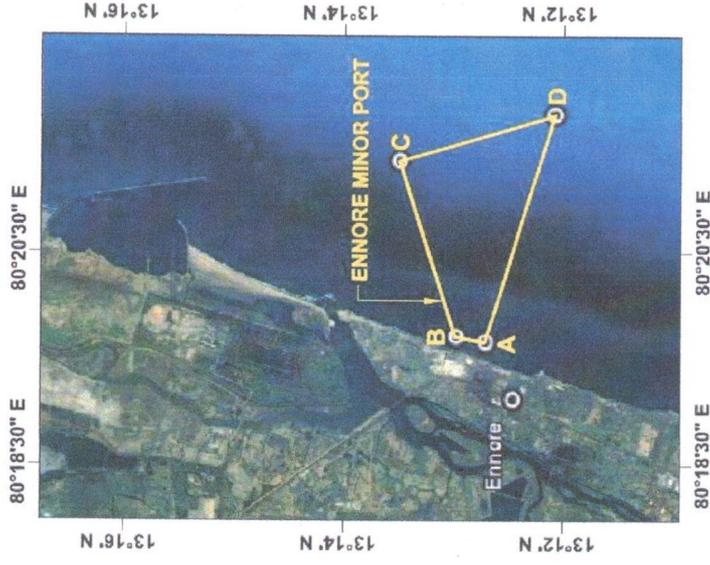


Ammonia Tank Details	
Capacity	12500 MT
Temperature	- 32.5 ° C to -33 ° C
Operating Pressure	350mmwc to 800mmwc
First Ship Name	EXCEL
Date of First Ship on	21.10.1996
Total Ships Handled	209 Ships so far
Total Qty Unloaded	10,91,632 MT
Last Ship Unloaded on	10.02.2021



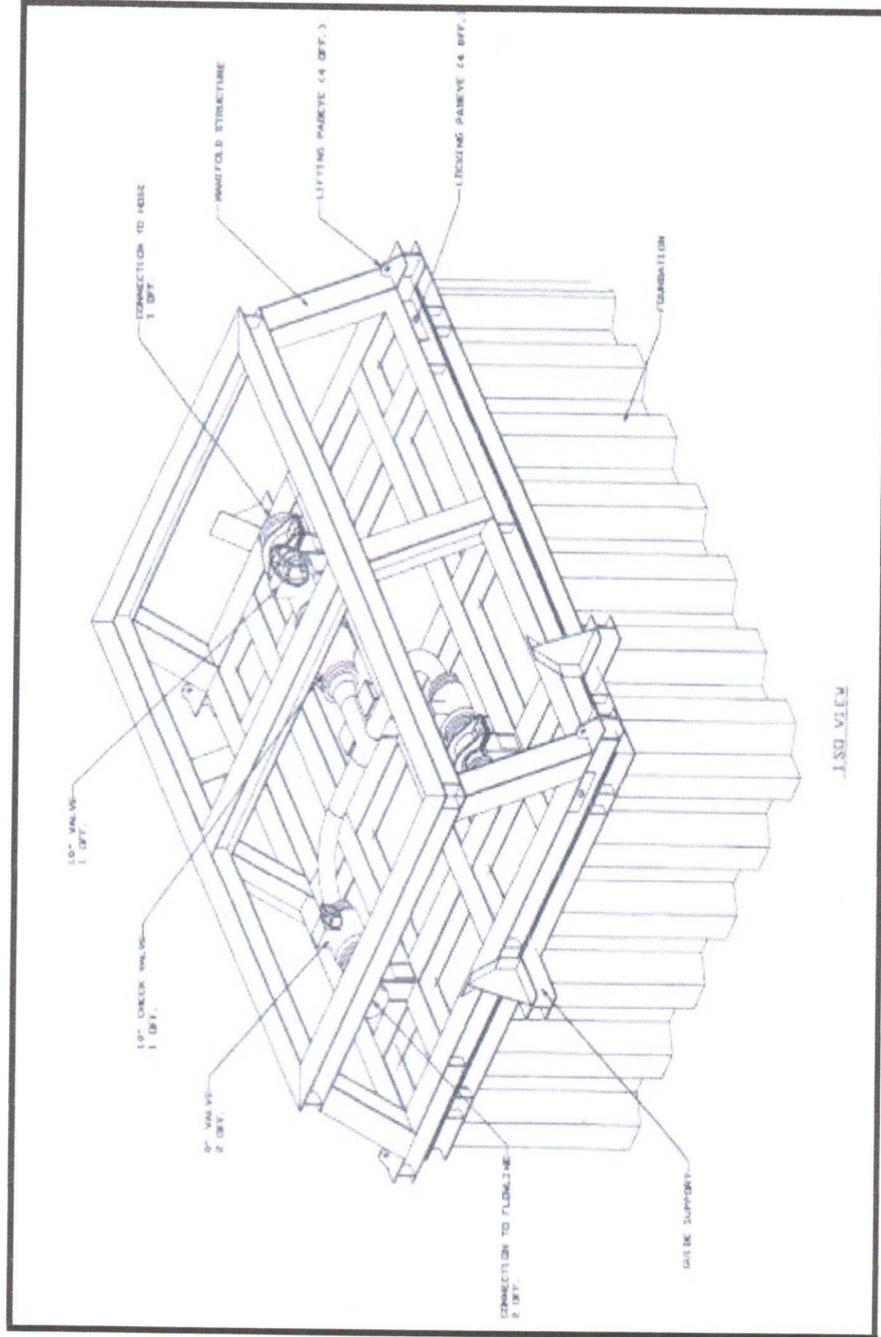
Ennore Minor Port

- Ennore Minor Port was constructed in the year 1996 to unload Liquid ammonia from ship.
- Awarded as an EPC Turnkey Contract & completely executed by M/s.NKT Engineering –Denmark (Currently acquired by M/s.NOV).
- The Minor port is under the control of the State Government.
- **Port Infrastructure:**
 1. Four Point Mooring System.
 2. Pipeline End Manifold (PLEM).
 3. Unloading Hoses
 4. Two HDPE Pipelines (named as NKT Pipeline)



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PLEM Assembly



PLEM Assembly

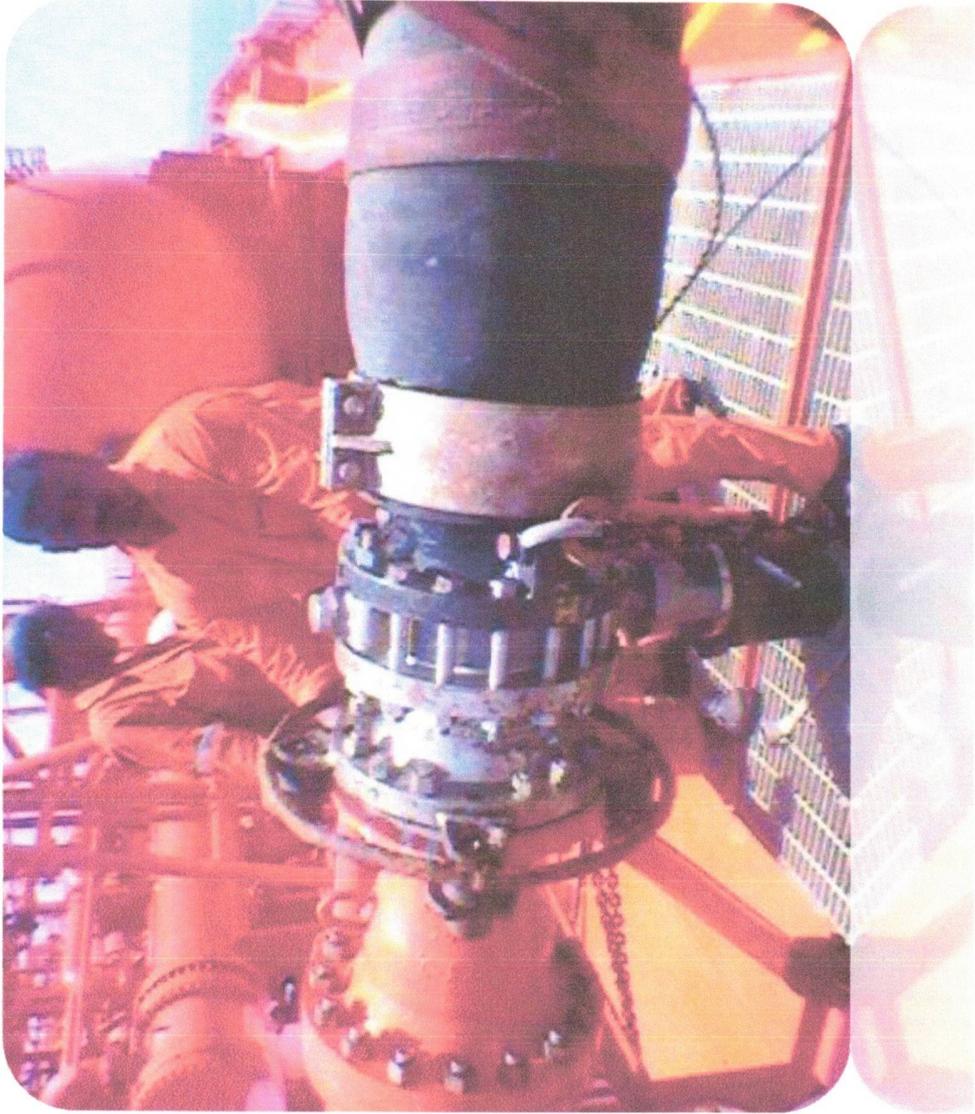


- ❖ Steel Foundation with Steel skirt – Gravity foundation
- ❖ Connected with NKT - Valves – 2 No. 8” Ball Valves
- ❖ Connected with Unloading Hose with 10” Butterfly Valve with NRV

SHIP UNLOADING HOSE LIFTING OPERATIONS



SHIP UNLOADING HOSE CONNECTION



NKT Subsea Pipeline

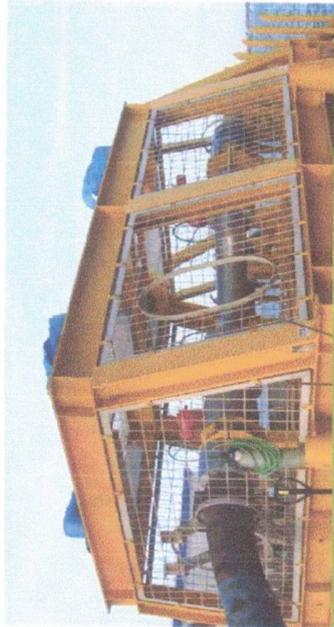
- The Pipeline was designed and commissioned by **M/s NKT Flexibles, Denmark.**
- The pipeline is made of **steel wire impregnated, multi layered (11 layers) polyurethane pipe.**
- At the time of installation, the coastal line profile at Ennore, was with **50 m of beach.** Pipeline laid in the coastal sand bed.
- The pipeline is designed for **25 kg/cm² against the operating pressure of 6 kg/cm².**
- The manufacturer has given **average life expectancy of the pipeline for 50 years.**
- The pipeline is designed for the worst case of **burst pressure of 131 kg/cm².**



AMMONIA SHIP UNLOADING SYSTEM



NKT Pipeline



PLUM Setup



Unloading Hose/ Dunlop Hose



Unloading Hose Connection in Ship Manifold



Mooring Buoy

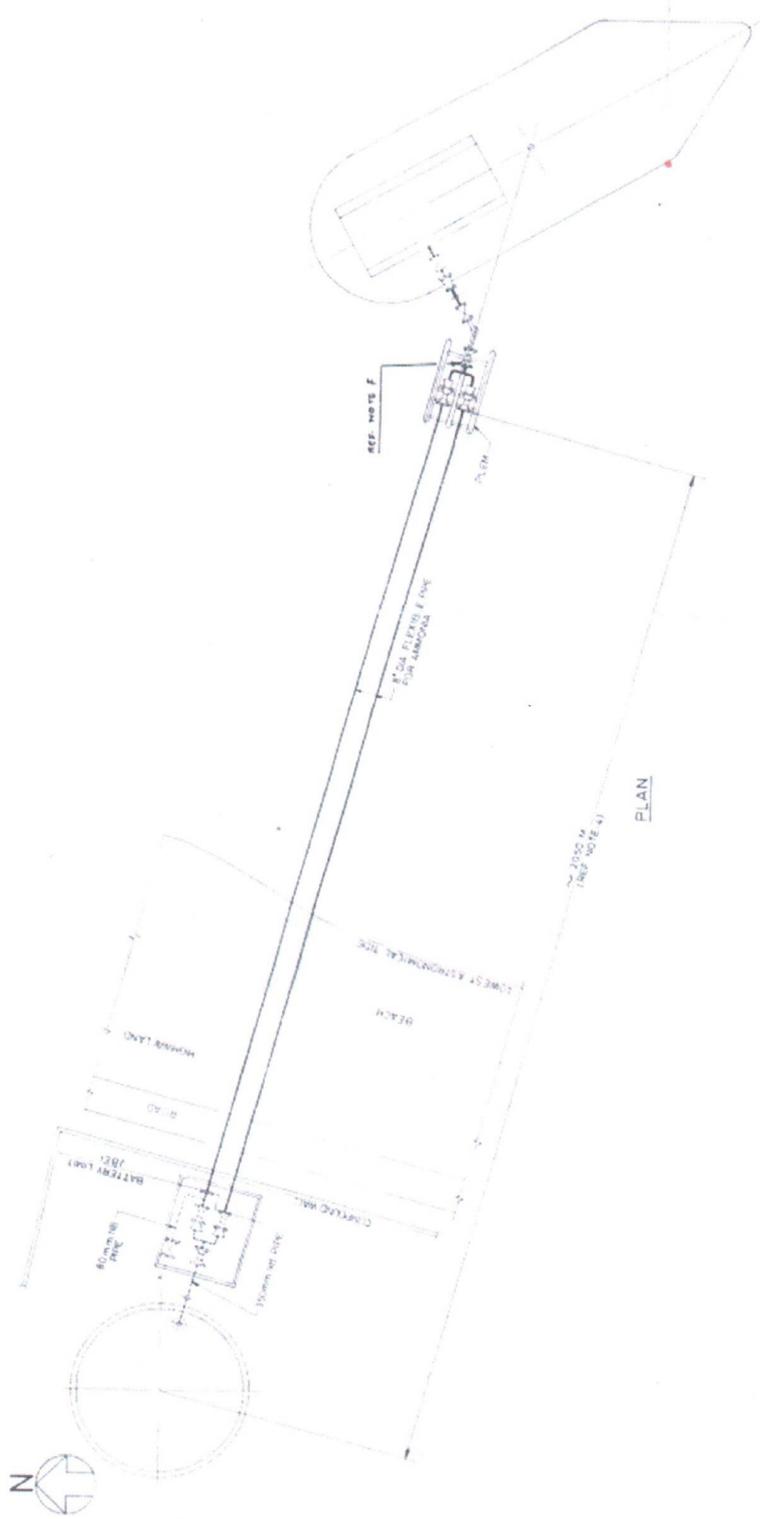


Recent Unloading Photo

Ammonia Unloading operation

- **Operation:**
- The vessel is piloted to the mooring buoys and after tying up, the hose is connected to the vessel and the cargo is pumped from the vessel directly to the shore storage tank.
- The first ammonia ship was unloaded in 1996.
- Till now totally **210 Ships** have been safely handled and **1208530 MT** of ammonia unloaded so far safely.
- On an average about 8 Shipments were handled per annum with average discharge quantity of 6000 MT per shipment.
- The average time for handling each shipment was around 56 hours of operation (Precooling 36 hrs and Ship unloading – 20 hrs).

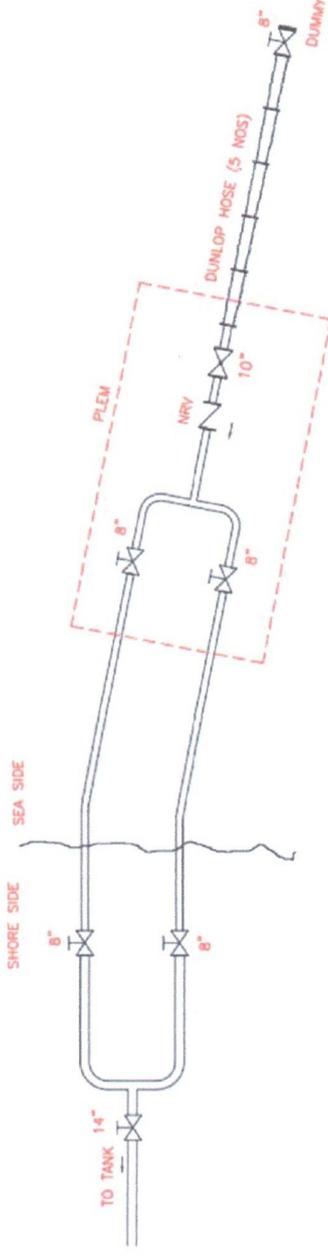
Ennore Minor Port - Operation



Ammonia Unloading Operation

Ammonia Ship Unloading Operation

- Since the ammonia is **cryogenic fluid**, it should be operated in **negative Temperature (-33 Deg.C)**
- it is mandatory to reduce the pipeline temperature near to -33 Deg.C to have a control on vaporisation rate.
- The process of reducing the pipeline temperature near to -33 Deg.C is called **Precooling Operation**.



Precooling Operation

- To reduce the pipeline temperature, liquid ammonia will be pumped slowly from the storage tank to one of the subsea pipelines and collected back to the tank through another subsea pipeline.
(i.e., Through Valve arrangement, two pipeline will make a U- loop so that liquid ammonia will be given in one end and collected back in another end).
- The ammonia return to the tank in vapour form and tank pressure will be maintained by running the compressors and flare operation.
- By circulating ammonia, pipeline temperature is slowly reduced to the range of **-12 to -16 Deg.C.**
- The time required to reach the mentioned temperature will be **typically 36 hrs of operation.**
- Hence, Precooling Operation will be carried out **two days prior to the ship unloading.**

Ship Unloading Operation

- Once the temperature has reduced in the subsea pipeline system, the ship unloading will be commenced by connecting unloading hose to ship manifold.
- The ammonia will be transferred to storage tank through two precooled subsea pipelines (through Valve arrangement).
- Based on the pipeline negative temperature, the ammonia will be transferred to the tank at **low rate initially** and the tank pressure will be controlled **by compressors and flare**.
- As the pipeline temperature keeps reducing, the flow rate will be increased gradually and attain **constant flow rate of 350 MTPH**.
- The unloading operation will be usually **1 – 2 days** based on the ship quantity.

NKT Subsea Pipeline - Layers



Cross Section View

S.No	Item	Material	Layer Thickness, mm	Outer Diameter, mm
1	Pipe Inner	HDPE	18.0	220.0
2	Bedding tape	Polyester	0.3	220.5
3	6" steel tapes	Fine grain	4.8	230.1
4	PVC - tape	PVC	0.6	231.3
5	PP - Yarn	PP	1.5	234.3
6	72 Steel wire 6.00	St 34	6.0	246.3
7	Asphalt	Asphalt	0.0	246.4
8	Bedding tape	Crepe tape	0.5	247.4
9	Bedding tape	Polyester	0.1	247.5
10	Outer Sheath	MDPE	7.0	261.5

NKT Subsea Pipeline - Properties

▪ Pipe Inner Diameter	184.0 mm
▪ Pipe overall diameter	261.5 mm
▪ Design Pressure	2.5 MPa
▪ Minimum Bending radius at service	2.6 m
▪ Minimum Bending radius at storage	2.2 m
▪ Stress in Pressure Armor at PD	68 N / mm ²
▪ Burst Pressure	13.1 MPa
▪ Stress in tensile Armor at PD	35 N / Sq. m

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 Coromandel <small>FUTURE POSITIVE</small>	COROMANDEL INTERNATIONAL LIMITED	Doc. No. : PSMS/SOP/AT03 Rev. No. : 00 Date : 01.04.2022 Page : 1 of 6	 murugappa
	PSM STANDARD OPERATING PROCEDURE		
Unit: ENNORE	PRE-COOLING AND SHIP UNLOADING PREPARATIONS		Plant: Ammonia Terminal

1.0 Purpose:

To prepare for pre-cooling and ship unloading operations.

2.0 Scope:

This procedure covers all steps to be taken prior to starting pre-cooling and ammonia ship unloading operation.

3.0 Abbreviations:

- TIC: Temperature Indication Control
- APS: Ammonium Phosphate Sulphate
- XV: On Off valve
- PCV: Pressure Control Valve
- VFD: Variable Frequency Drive
- ESD: Emergency Shutdown
- HIC: Hand Indication Control
- MCC: Main Control Center
- DCS: Distributed Control System
- ARC: Auto Recycle Control
- CT: Cooling Tower

4.0 Safety and Health considerations:

4.0.1 Properties and hazards of Ammonia.

Sl. No.	PROPERTY	PARAMETER
1	Normal boiling point	-33.4°C
2	Critical temperature	132.40°C
3	Critical pressure	112.8 bar
4	Freezing point	- 77.7°C.
5	Latent heat of vaporization at 1 atm and -33°C	1370.76 KJ/Kg.
6	Explosive limits	16 to 25% v/v.
7	Auto-Ignition temperature	651°C
8	Threshold limit value (TLV) - TWA (Time Weighted Average) for 8 hours.	25ppm
9	STEL (Short Term Exposure Limit, for 15 minutes).	35ppm

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4.0.2 Respiratory PPE to be used for Ammonia Handling:

Sl. No	Chemical	Health Hazard Data	Preventive Measures (PPE to be used)	First Aid
1.	Ammonia	Inhalation	1. Ammonia canister mask. 2. Self-contained breathing apparatus.	Remove the victim to fresh air area and provide artificial respiration or Oxygen, if necessary.
2.	Ammonia	Skin and Eyes	1. Ammonia canister mask. 2. Self-contained breathing apparatus	Wash the affected area for 15min. with plenty of water. Seek medical aid immediately.

4.0.3 Emergency Measures for Ammonia:

Sl. No	Condition	Emergency Measures
1	Fire	1. Stop flow of gas 2. Use water spray or fog
2	Spills	1. Contain the spillage on sand or earth, allow to evaporate. 2. Dilute the vapors with plenty of water.

4.0.4 Safety system and their functions for Ammonia

4.0.4.1 Relief valves are provided in the loop at upstream and downstream of control valves as per the below table:

Sl. No.	Tag. No.	LOCATION	SET PRESSURE Kg/cm ²	Basis for setting
1	SV-10112	Pre-cooling pump P1002A immediate discharge.	22.50	To avoid line pressurizing beyond design
2	SV-10113	Pre-cooling pump P1002B immediate discharge.	22.50	To avoid line pressurizing beyond design
3	SV-10114	Both pre-cooling pumps common discharge SRV	22.50	To avoid line pressurizing beyond design
4	SV-10106	NKT north line SRV	22.50	To avoid line pressurizing beyond design
5	SV-10116	NKT south line SRV	22.50	To avoid line pressurizing beyond design

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6	SV-10103	14" line horizontal line SRV	22.50	To avoid line pressurizing beyond design
7	SV-10104	14" vertical line SRV	22.50	To avoid line pressurizing beyond design

4.0.4.2 Operating Limits/ Parameters

S. No.	Tag No.	DISCRIPTION	Parameter
1.	PI-10141	NKT 14" line pressure	2 - 2.2 kg/cm ²
2.	PI-10143	NKT pre-cooling line pressure	^{2.0} - 5.0 kg/cm ²

4.0.4.3 Ammonia Sensors:

Ammonia sensor AI-10102 is provided at ammonia pumps area.

Ammonia sensors indications given on DCS as well as in field.

All the sensors are provided with High Alarm @ 5 ppm & High High Alarm @ 10 ppm.

4.0.4.4 Water sprinkling system:

FH water sprinkler system is provided in ammonia pumps area to contain any release of Ammonia. Sprinklers will be operated manually based on requirement.

5.0 Procedure:

5.0.1 Precooling operation preparation:

Step No.	Procedural Step	Responsibility	Signature
1.	START both the pre-cooling pumps through ARC for 15 min and ensure pump performance is good.	Panel Operator Field Operator	
2.	ENSURE AT Instrument air compressor availability	Panel Operator	
3.	ENSURE All Ammonia condenser tubes are cleaned.	Panel Operator Field Operator	
4.	ENSURE all Ammonia compressors lube oil coolers tubes are cleaned.	Panel Operator	
5.	ENSURE all ship unloading interlocks are working.	Panel Operator	
6.	ENSURE Healthiness of all motor starter and terminals	Panel Operator Electrical Operator	
7.	ENSURE Emergency vehicle availability for Ship unloading purpose	Plant in charge	
8.	ENSURE availability of LPG Cylinders (50 full cylinders).	Plant in charge	
9.	ENSURE availability of N2 Cylinders (4 full cylinders).	Plant in charge	

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Unit: ENNORE	PRE-COOLING AND SHIP UNLOADING PREPARATIONS		

Step No.	Procedural Step	Responsibility	Signature
10.	ENSURE availability of Diesel Drums (4 full drums).	Plant in charge	
11.	ENSURE availability of 750 KVA DG Set in Auto mode and rental DG operator availability	Plant in charge Panel Operator	
12.	ENSURE availability of Flare System and record the performance.	Panel Operator	
13.	ENSURE LPG regulator and hoses are in good condition	Field Operator	
14.	ENSURE Fire Hydrant System and Spray curtain	Panel Operator Field Operator	
15.	ENSURE all CT pumps suction filter are cleaned and record the performance (amps).	Panel Operator Field Operator	
16.	CLEAN FRP CT strainer.	Panel Operator Field Operator	
17.	ENSURE CT fans drive belts and maintain spare belts in control room.	Plant in charge Panel Operator	
18.	ENSURE healthiness of all ammonia sensors. Before inspection inform to safety department and plant manager	Plant in charge	
19.	CALIBRATE all temperature and Pressure gauges (Connecting with ship unloading).	Plant in charge	
20.	ENSURE tank SRV/VRV is in good condition.	Field Operator	
21.	ENSURE Availability of NH3 cartridge masks. (Total 10 No's).	Field Operator	
22.	ENSURE availability of SCBA (4 NO's) and Liquid Ammonia Full Suit 3 nos. Ensure Air cylinder pressure is not less than 200 bars.	Panel Operator	
23.	ENSURE water stock in the plant.	Plant In charge	
24.	ENSURE availability of EB Power (3.3KV) without interruption during precooling and ship unloading	Panel Operator	
25.	ENSURE availability of all utilities (Instrument air, Drinking water).	Panel Operator	
26.	ENSURE Walkie-talkies are in charged condition.	Panel Operator	
27.	CHECK the functioning of all safety showers and eye wash sprayers.	Field Operator	
28.	ENSURE the availability of all ship U/L compressors	Panel Operator	

5.0.2 EMERGENCY OPERATION/SHUTDOWN

1.IN CASE OF EXPORT LINE LEAK

Step No.	Procedural Step	Responsibility	Signature
1.0	STOP the Ammonia Transfer pump from DCS immediately in case of APS export line leak. (OR) CLOSE the tank outlet valve XV-10102 in DCS	Panel Operator Field Operator	

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Step No.	Procedural Step	Responsibility	Signature
	(OR) PUSH the ESD switch for XV-10102 (OR) PUSH the ESD switch for XV-10102 in local panel.		

6.0 Interlocks / Trips associated with this procedure

The following interlocks were provided to take care of ammonia pumps while running.

If any interlocks need to be bypassed as part of the startup, it should be mentioned in relevant step and also when should be brought back in line and who is authorized to do this (Shift in Charge or Plant Manager)

If there is any process safety consequence of not doing a step, then it must be written at appropriate step

No.	TAG No.	DESCRIPTION	SETTING	ACTION	BASIS FOR SETTING
1	LI-10101	Ammonia Tank Level (Enraf LT)	19.57 M	At high level tank inlet valve XV-10101 and HIC-10101 will close.	To avoid ammonia Overflow to annulus.
2	PIT-10101 PIT-10102 PIT-10103	Ammonia Tank Pressure	Any two pressure (P2oo3) reaches 860 mmWC	Tank inlet valve XV-10101 and HIC-10101 will close.	To avoid tank top SRV popup.
3	PIT-10101 PIT-10102 PIT-10103	Ammonia Tank Pressure	Any two pressure (P2oo3) reaches 100 mmWC	Tank outlet valve XV-10102 and running compressor will trip.	To avoid vacuum inside the tank.
4	750kva DG set	AT Diesel Generator set	Auto mode	Auto start of DG set whenever EB power failure.	To start LT compressor in order to maintain tank pressure.
5	XV-10211 XSOV-10211 PV-10211 PSOV-10211	Receiver pressure control valve	18.5 kg/cm ²	Receiver, Condenser vent control valve opens when the first compressor starts and closes when the last compressor stops.	To vent NCG accumulation in the receiver.

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7.0 Amendment / Records:

Rev No	Date of Amendment	Description of Amendment	Reason for Amendment
**	**	**	**

8.0 MSDS: PSMS/MSDS/001/Rev0.

9.0 Relief valves: PSMS/RS/003/Rev2.

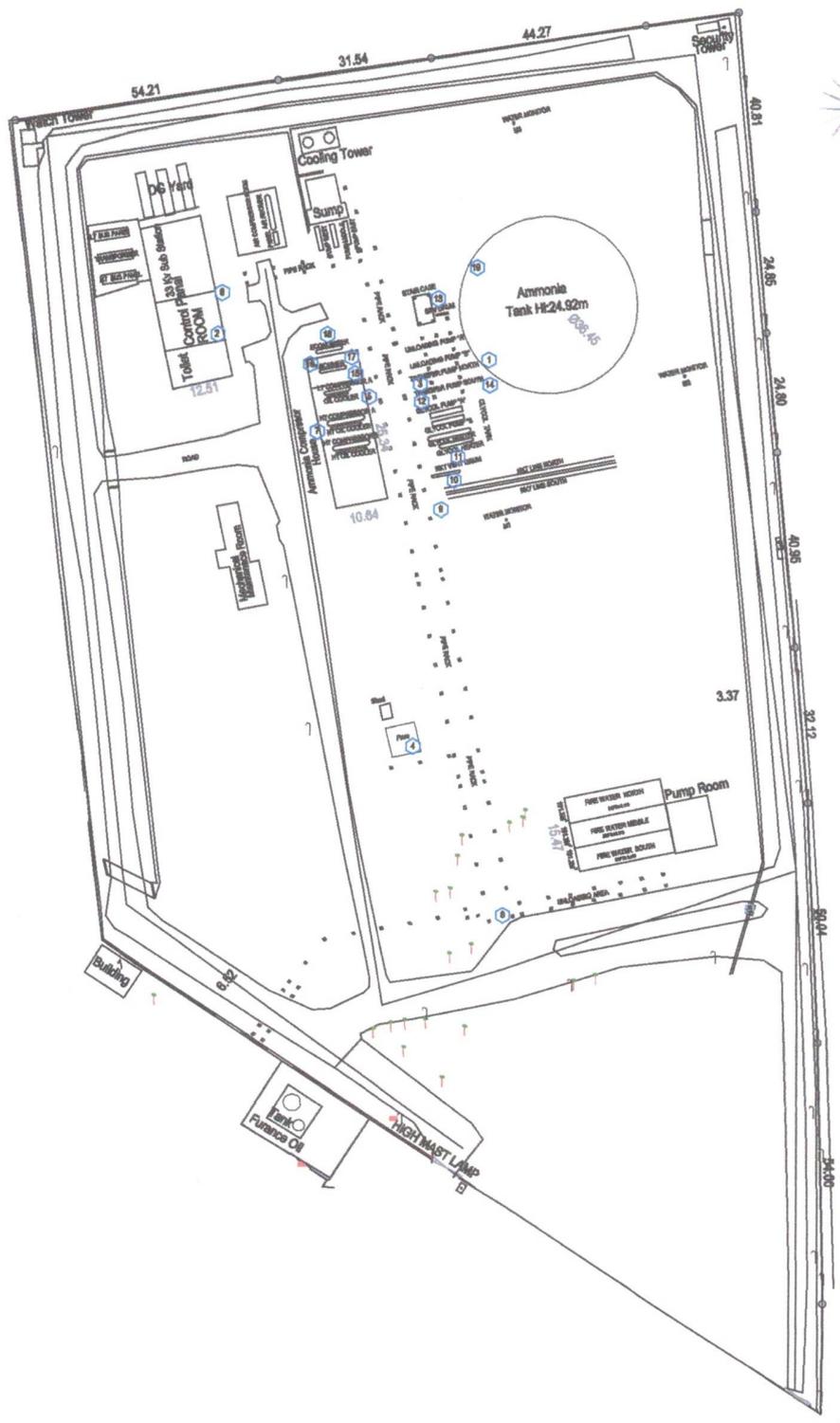
*****End of the Procedure*****

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RevNo	Revision note	Date	Signature	Checked
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COMMUNICATED TO ANY PERSON WITHOUT THE WRITTEN APPROVAL OF PROPERTIES

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DRN	V.SACHI	<p>Coromandel International Limited Supra Highway Road, Erode, Tamil - 626 017 Tamil Nadu, India. A Mahaganga Group Company</p>	
CHD	E.RAJIVABU		
APP	M.VETRIVEL		
DATE	22 / 08 / 2022	TITLE	
SCALE	NOT TO SCALE	AMMONIA TERMINAL - AMMONIA SENSOR LOCATION	
<p>THIRD ANGLE PROJECTION</p>	ALL DIMENSIONS ARE IN mm	DWG NUMBER	REV
		ENN / CORO / NH3 / MISC / 001	
SHEET 1 OF 1	IF IN DOUBT ASK	CHECK DRG WITH LATEST REVISION	

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	NKT CORRIDOR AREA INSPECTION POST CYCLONE	
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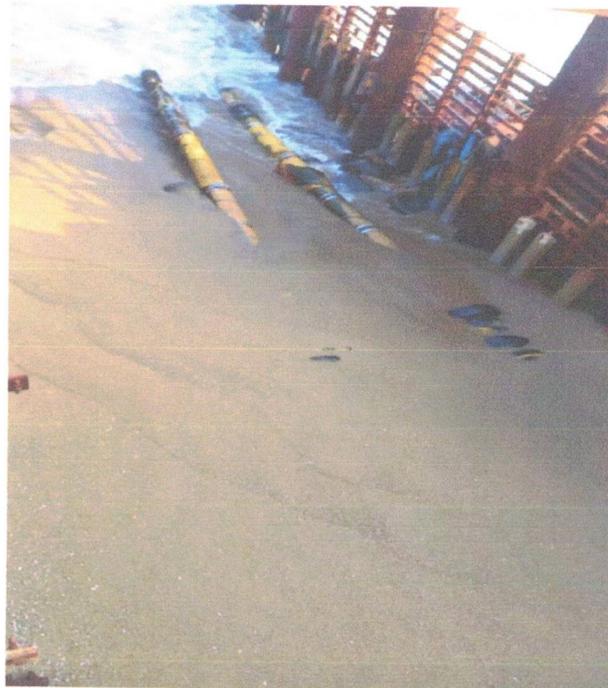
SCOPE OF WORK

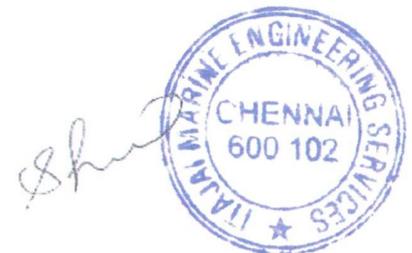
Coromandel International Ltd., Ennore has awarded the contract to Itajai Marine Engineering services for carrying out Boulder and debris clearing near the NKT corridor area, to secure the pipelines with rubber packings wherever there is a possibility of damage by boulder impact and post cyclone, the corridor area observations are to be recorded.

EXECUTION:

The post cyclone inspection of NKT corridor area was carried out on 13th December 2023. The observations have been listed below.

- i. The boulders & debris found near the NKT corridor area were cleared manually.
- ii. All anodes fixed on the beams observed before the cyclone were found intact.
- iii. No major beam or metal structure damages when compared to pre-cyclone inspection were observed.
- iv. The NKT pipeline was observed to be covered with sand till 6th Pile from the road.
- v. The distance between both NKT pipelines observed over the visible portion till splash zone remains the same.





01/01/2024

TO WHOMSOEVER IT MAY CONCERN

This is for your kind information that the following patients were admitted at our hospital on the respective dates and were treated and discharged on the dates as mentioned below.

At the time of their discharge, the patients were all clinically stable and advised review after 3 days

Totally 46 patients admitted on 27/12/2023

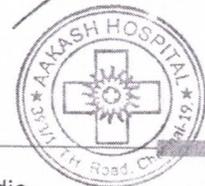
01 patient admitted on 28/12/2023

Note :

1. 38 patients discharged on 28/12/2023
2. 6 patients discharged on 29/12/2023
3. 2 patients discharged on 30/12/2023

Out of that one patient, a 70 years old female, a known case of Type 2 DM/CAD/SHTN/Old CVA is currently on treatment for cardiac management


Signature





AAKASH HOSPITAL



NABH Accredited
ISO 9001 : 2015 Certified

S.NO	PATIENT NAME	D.O.A	D.O.D	HOS.BILL	PHARMACY	CT SCAN
1	BABY.ATHIVIKA	27-12-2023	28-12-2023	10400.00	3044.00	
2	MRS.A.RAJAKUMARI	27-12-2023	28-12-2023	5750.00	1910.00	
3	MRS.P KARUPAYEE	27-12-2023	28-12-2023	6350.00	2569.00	
4	MRS.K.RADHA	27-12-2023	28-12-2023	6910.00	2200.00	4500
5	MRS.S.SHANKARDEVI	27-12-2002	28-12-2023	5810.00	1841.50	
6	MRS.A.ELAMATHI	27-12-2023	28-12-2023	6160.00	1292.00	
7	MR.R.SURIYA	27-12-2023	28-12-2023	6760.00	3488.50	
8	MR.D.MASILAMANI	27-12-2023	28-12-2023	5810.00	2217.50	4500
9	MR.G.SELVAMANI	27-12-2023	28-12-2023	7350.00	1611.50	
10	MRS.M.RATHANAKALA	27-12-2023	28-12-2023	6760.00	1749.50	
11	MR.K.GOVINDHAN	27-12-2023	28-12-2023	6600.00	1620.50	
12	MRS.S.VANITHA	27-12-2023	28-12-2023	6950.00	1885.00	
13	MRS.R.SELVI	27-12-2023	27-12-2023	6850.00	1664.50	
14	MRS.D.VENNILA	27-12-2023	28-12-2023	7200.00	1551.00	
15	MRS.G.NAYAGAM	27-12-2023	28-12-2023	6600.00	1622.50	
16	MRS.D.KASI	27-12-2023	27-12-2023	6660.00	1254.50	
17	MRS.S.VALLI	27-12-2023	28-12-2023	7260.00	2294.50	4500
18	MRS.K.SARASWATHI	27-12-2023	28-12-2023	6660.00	1491.00	
19	MRS.J.VIJAYA	27-12-2023	28-12-2023	8175.00	2000.00	
20	MR.P.MOORTHY	27-12-2023	28-12-2023	7100.00	2365.50	
21	MRS.K.KANAGAVALLI	27-12-2023	28-12-2023	11660.00	2784.00	
22	MRS.M.SALACHA	27-12-2023	28-12-2023	7510.00	2863.00	4500
23	MRS.R.VACHALA	27-12-2023	28-12-2023	6850.00	1945.00	
24	MRS.R VELLAYEE RAJAKANNU	27-12-2023	28-12-2023	8310.00	2791.00	
25	MRS.D.KALAISELVI	27-12-2023	28-12-2023	7510.00	1585.00	4500



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S.NO	PATIENT NAME	D.O.A	D.O.D	HOS.BILL	PHARMACY	CT SCAN
26	MRS.B.ANJALAKSHMI	27-12-2023	28-12-2023	12100.00	6800.50	4500
27	MRS.M.DESAM	27-12-2023	28-12-2023	12260.00	6978.50	4500
28	MISS C BHUVANESHWARI	27-12-2023	28-12-2023	11310.00	4101.00	
29	MRS.K.VANITHA	27-12-2023	28-12-2023	6350.00	2044.50	
30	MR.K.KUMAR	27-12-2023	28-12-2023	6000.00	2409.50	
31	MRS.S.PUNITHA	27-12-2023	28-12-2023	6000.00	1718.50	
32	MRS.N.NAGAMMAL	27-12-2023	28-12-2023	11990.00	4878.50	
33	MISS S SWETHA	27-12-2023	28-12-2023	11160.00	4071.50	
34	MR.C.CHANDRABABU	27-12-2023	28-12-2023	12005.00	4541.00	
35	MRS.V.KAVITHA	27-12-2023	28-12-2023	6500.00	2365.50	
36	MR.P.SANTHANAM	27-12-2023	28-12-2023	23625.00	3728.50	
37	MRS.R.SELVI	27-12-2023	28-12-2023	7260.00	3445.50	4500
38	MR.P.VIJAYAMOORTHY	27-12-2023	28-12-2023	5600.00	2187.50	
39	MRS.TAMILSELVI	27-12-2023	29-12-2023	28060.00	4932.50	
40	MRS.D.JAYAVALLI	27-12-2023	29-12-2023	16890.00	4904.50	3000
41	MRS.VALLI	27-12-2023	29-12-2023	14690.00	4391.00	
42	MRS.VANITHA PRAKASH	27-12-2023	29-12-2023	11990.00	4461.00	3000
43	MRS.D DESARANI	27-12-2023	29-12-2023	44550.00	7336.50	3000
44	MR.VADIVEL	27-12-2023	29-12-2023	14825.00	1768.50	
45	MRS.P.ELACHI	27-12-2023	30-12-2023	46490.00	5228.00	
46	MR.DESARAJ	28-12-2023	30-12-2023	9765.00	1230.50	
				499375.00	135163.50	45000
	TOTAL	679538.00				

We herewith confirm that we received a sum of Rs.6,24,921/- (Rupees Six laksh twenty four thousand nine hundred and twenty one only) from Coromandel international limited (UTR NO.HDFCR52024010167061289) on 01/1/2024

Signature

#393/1, Thiruvottiyur High Road, Chennai-600 019, Tamilnadu, India

Tel : 044 49304242 / 42034109 / 2573 0099

Web : www.aakashhospital.in / E-mail : aakashsrk_dr@yahoo.co.in / aakashsrkdr@gmail.com



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06/01/2024

TO WHOMSOEVER IT MAY CONCERN

This is for your kind information that the following patients were admitted at our hospital on the respective dates and were treated and discharged on the dates as mentioned below.

At the time of their discharge, the patients were all clinically stable and advised review after 3 days

S.NO	PATIENT NAME	D.O.A	D.O.D
1	MRS.N.SURIYAGANDHI	28-12-2023	04-01-2024
2	MRS.D.DESARANI	02-01-2024	04-01-2024

Signature



#393/1, Thiruvottiyur High Road, Chennai-600 019, Tamilnadu, India

Tel : 044 49304242 / 42034109 / 2573 0099

Web : www.aakashhospital.in / E-mail : aakashsrk_dr@yahoo.co.in / aakashsrkdr@gmail.com



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04-01-2024

S.NO	PATIENT NAME	D.O.A	D.O.D	HOS.BILL	PHARMACY	CT SCAN
1	MRS.N.SURIYAGANDHI	28-12-2023	04-01-2024	407980.00	30351.00	
2	MRS.D.DESARANI	02-01-2024	04-01-2024	55020.00	6372.00	
				463000.00	36723.00	
		TOTAL	499723.00			

We herewith confirm that we received a sum of Rs.4,53,423/- (Rupees Four laksh fifty three thousand four hundred and twenty three only) from Coromandel international limited (UTR NO.HDFCR52024010568369562) on 05/1/2024

Signature



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Online Pollution Monitoring Portal					
Site Name: M/s. COROMANDEL INTERNATIONAL LIMITED					
From Date: 2023/12/26 To Date: 2023/12/26					
Report Name: Custom Report					
Report Created by COILTD on 2023-12-28 12:55:33					
Sl No.	Time	Time_Office-SO2 - (ug/m3) Raw	Time_Office-NH3 - (ug/m3) Raw	Pump_Office-SO2 - (ug/m3) Raw	Pump_Office-NH3 - (ug/m3) Raw
1	2023-12-26 00:00	69.8	0	27.5	1.6
2	2023-12-26 00:15	69.6	0	27.7	1.7
3	2023-12-26 00:30	69.8	0	27.6	1.7
4	2023-12-26 00:45	70.1	0	27.8	1.9
5	2023-12-26 01:00	68.9	0	28.2	1.7
6	2023-12-26 01:15	69.1	0	27.3	1.5
7	2023-12-26 01:30	68.9	0	28	1.8
8	2023-12-26 01:45	68.4	0	28.4	1.6
9	2023-12-26 02:00	68.6	0	27.7	1.7
10	2023-12-26 02:15	68.6	0	27.5	1.7
11	2023-12-26 02:30	68.7	0	27.6	1.8
12	2023-12-26 02:45	68.5	0	27.1	1.9
13	2023-12-26 03:00	68.4	0	26.8	1.4
14	2023-12-26 03:15	68	0	26.6	1.8
15	2023-12-26 03:30	68.3	0	25.7	1.6
16	2023-12-26 03:45	68.4	0	26.4	1.7
17	2023-12-26 04:00	68.4	0	27.4	1.8
18	2023-12-26 04:15	68.6	0	27.1	1.5
19	2023-12-26 04:30	68.4	0	27.8	1.6
20	2023-12-26 04:45	68.6	0	28.1	1.6
21	2023-12-26 05:00	68.5	0	28.2	1.4
22	2023-12-26 05:15	68.7	0	28.2	1.6
23	2023-12-26 05:30	69	0	27.4	1.7
24	2023-12-26 05:45	68.2	0	27.4	1.7
25	2023-12-26 06:00	69.2	0	27.5	1.8
26	2023-12-26 06:15	68.6	0	27.7	1.6
27	2023-12-26 06:30	69.4	0	27.7	1.6
28	2023-12-26 06:45	69.5	0	27.9	1.7
29	2023-12-26 07:00	69.8	0	28.9	1.6
30	2023-12-26 07:15	69.4	0	28.9	1.6
31	2023-12-26 07:30	70	0	29.3	1.7
32	2023-12-26 07:45	71	0	29.5	1.6
33	2023-12-26 08:00	70.9	0	29.4	1.6
34	2023-12-26 08:15	72.4	0	27.7	1.6
35	2023-12-26 08:30	72.6	0	28.2	2
36	2023-12-26 08:45	72.1	0	28.1	1.6
37	2023-12-26 09:00	73	0	28	1.8

38	2023-12-26 09:15	73	0	27.8	1.7
39	2023-12-26 09:30	72	0	28.1	1.5
40	2023-12-26 09:45	72	0	27.4	1.9
41	2023-12-26 10:00	72.2	0	27	1.7
42	2023-12-26 10:15	70.8	0	27.3	1.6
43	2023-12-26 10:30	70.8	0	27.8	1.6
44	2023-12-26 10:45	70.4	0	27.8	1.7
45	2023-12-26 11:00	70.2	0	27.8	1.8
46	2023-12-26 11:15	69.7	0	27.1	1.7
47	2023-12-26 11:30	69.8	0	26.9	1.7
48	2023-12-26 11:45	69.2	0	26.7	1.4
49	2023-12-26 12:00	68.6	0	25.9	1.6
50	2023-12-26 12:15	68.8	0	25.5	1.8
51	2023-12-26 12:30	69.2	0	25.9	1.7
52	2023-12-26 12:45	68.9	0	25.3	1.6
53	2023-12-26 13:00	69.1	0	25.5	1.8
54	2023-12-26 13:15	68.8	0	25.2	1.9
55	2023-12-26 13:30	68.4	0	24.7	1.6
56	2023-12-26 13:45	69.2	0	24.8	1.6
57	2023-12-26 14:00	69.8	0	24.1	1.9
58	2023-12-26 14:15	68.7	0	25.7	2
59	2023-12-26 14:30	69	0	26.2	1.6
60	2023-12-26 14:45	69.1	0	24.5	1.6
61	2023-12-26 15:00	69	0	25.5	2
62	2023-12-26 15:15	69.4	0	24.6	1.7
63	2023-12-26 15:30	69.3	0	23.8	1.8
64	2023-12-26 15:45	69.1	0	24.5	1.9
65	2023-12-26 16:00	68.9	0	24.6	1.6
66	2023-12-26 16:15	69.1	0	24.7	1.9
67	2023-12-26 16:30	69.4	0	26	1.8
68	2023-12-26 16:45	69	0	26.2	1.9
69	2023-12-26 17:00	69.7	0	25.7	1.5
70	2023-12-26 17:15	69.6	0	25.7	1.6
71	2023-12-26 17:30	69.8	0	26.5	1.6
72	2023-12-26 17:45	69.4	0	26.8	1.8
73	2023-12-26 18:00	69.6	0	27.4	1.8
74	2023-12-26 18:15	69.6	0	28.3	1.6
75	2023-12-26 18:30	70.5	0	28.9	2
76	2023-12-26 18:45	69.8	0	28.6	2
77	2023-12-26 19:00	70	0	28.8	1.8
78	2023-12-26 19:15	70.1	0	29.4	1.8
79	2023-12-26 19:30	70.2	0	29.1	1.6
80	2023-12-26 19:45	70.1	0	29.7	1.9
81	2023-12-26 20:00	70.2	0	30.4	1.8
82	2023-12-26 20:15	69.7	0	29.7	1.8
83	2023-12-26 20:30	69.6	0	29.6	1.7
84	2023-12-26 20:45	70.1	0	30	2
85	2023-12-26 21:00	70.5	0	29	1.9
86	2023-12-26 21:15	70.5	0	29.7	1.5
87	2023-12-26 21:30	69.5	0	28.8	1.8

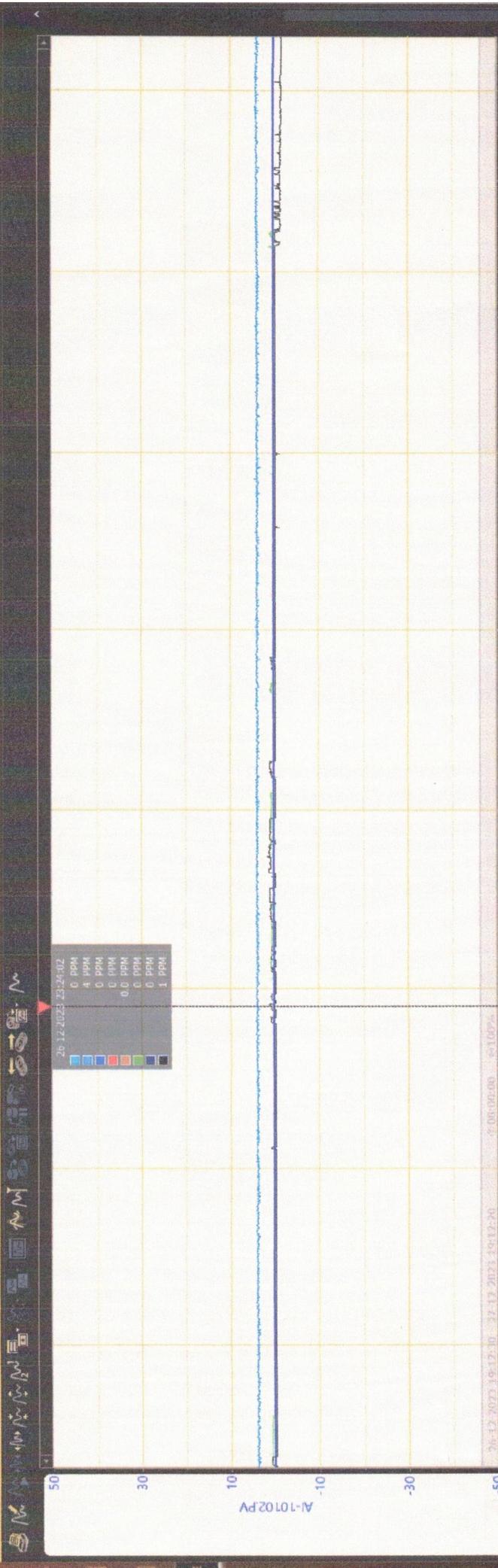
88	2023-12-26 21:45	69.8	0	27.9	1.9
89	2023-12-26 22:00	70.2	0	28.9	1.5
90	2023-12-26 22:15	70.8	0	29.2	1.8
91	2023-12-26 22:30	70.6	0	28.6	1.9
92	2023-12-26 22:45	71.1	0	28.3	1.7
93	2023-12-26 23:00	71.2	0	28.1	1.7
94	2023-12-26 23:15	71.1	0	28.1	1.8
95	2023-12-26 23:30	70.7	0	27.9	1.6
96	2023-12-26 23:45	NA	NA	NA	NA
97	Prescribed Standards	0 - 80	-	0 - 80	-
98	Maximum Value	73	0	30.4	2
99	Maximum Value At Time	2023-12-26 09:00	2023-12-26 00:00	2023-12-26 20:00	2023-12-26 08:30
100	Minimum Value	68	0	23.8	1.4
101	Minimum Value At Time	2023-12-26 03:15	2023-12-26 00:00	2023-12-26 15:30	2023-12-26 03:00
102	Geometric Mean	69.72	0	27.39	1.71
103	Median	69.6	0	27.7	1.7
104	Standard Deviation	1.13	0	1.5	0.15
105	Valid Data Points	95	95	95	95
106	Total Data Points	96	96	96	96
107	Data Availability %	98.96	98.96	98.96	98.96

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Online Pollution Monitoring Portal					
Site Name: M/s. COROMANDEL INTERNATIONAL LIMITED					
From Date: 2023/12/27 To Date: 2023/12/27					
Report Name: Custom Report					
Report Created by COILTD on 2023-12-28 12:57:20					
Sl No.	Time	Time_Office-SO2 - (ug/m3) Raw	Time_Office-NH3 - (ug/m3) Raw	Pump_Office-SO2 - (ug/m3) Raw	Pump_Office-NH3 - (ug/m3) Raw
1	2023-12-27 00:00	71.7	0	26.6	1.6
2	2023-12-27 00:15	72.5	0	26.5	1.8
3	2023-12-27 00:30	72.8	0	25.5	1.9
4	2023-12-27 00:45	73.5	0	25.8	1.8
5	2023-12-27 01:00	72.7	0	26.2	1.6
6	2023-12-27 01:15	72.3	0	26.4	1.7
7	2023-12-27 01:30	72	0	26.2	1.8
8	2023-12-27 01:45	72.1	0	26.3	1.5
9	2023-12-27 02:00	72.2	0	26.4	1.7
10	2023-12-27 02:15	72.4	0	26.2	1.6
11	2023-12-27 02:30	71	0	25.3	1.7
12	2023-12-27 02:45	70.7	0	25	1.6
13	2023-12-27 03:00	69.9	0	25.2	1.6
14	2023-12-27 03:15	69.9	0	25.2	1.6
15	2023-12-27 03:30	70.1	0	25.2	1.7
16	2023-12-27 03:45	70	0	25.3	1.9
17	2023-12-27 04:00	69.5	0	25.4	2
18	2023-12-27 04:15	69.5	0	26.1	1.6
19	2023-12-27 04:30	69.9	0	26.4	1.8
20	2023-12-27 04:45	69.3	0	26.7	1.9
21	2023-12-27 05:00	68.9	0	26.8	1.7
22	2023-12-27 05:15	69.5	0	27	1.5
23	2023-12-27 05:30	69.7	0	27	1.5
24	2023-12-27 05:45	69.3	0	27.9	1.5
25	2023-12-27 06:00	69.2	0	27.4	1.7
26	2023-12-27 06:15	69.4	0	26.3	1.8
27	2023-12-27 06:30	69.3	0	27.6	1.7
28	2023-12-27 06:45	69.4	0	27.6	1.5
29	2023-12-27 07:00	69.5	0	28.1	1.7
30	2023-12-27 07:15	69.1	0	27.6	1.6
31	2023-12-27 07:30	69.8	0	27.8	1.7
32	2023-12-27 07:45	69.6	0	27.7	1.6
33	2023-12-27 08:00	69.6	0	28.6	1.6
34	2023-12-27 08:15	69.3	0	27.8	1.8
35	2023-12-27 08:30	69.3	0	28.4	1.8
36	2023-12-27 08:45	69.3	0	28.3	1.9
37	2023-12-27 09:00	69.6	0	27.9	1.9
38	2023-12-27 09:15	69.5	0	28.1	1.7

39	2023-12-27 09:30	69.3	0	27.8	1.8
40	2023-12-27 09:45	70	0	27.3	1.9
41	2023-12-27 10:00	70	0	27.5	1.9
42	2023-12-27 10:15	69.4	0	27.4	1.6
43	2023-12-27 10:30	69.8	0	27.4	1.6
44	2023-12-27 10:45	69.8	0	27.5	1.8
45	2023-12-27 11:00	69.8	0	27.5	1.8
46	2023-12-27 11:15	70	0	26.7	1.8
47	2023-12-27 11:30	69.6	0	26.4	1.6
48	2023-12-27 11:45	69.4	0	25.8	1.7
49	2023-12-27 12:00	70.2	0	25.7	2.1
50	2023-12-27 12:15	70.1	0	24.9	1.6
51	2023-12-27 12:30	70.1	0	25	1.8
52	2023-12-27 12:45	69.8	0	24.9	1.8
53	2023-12-27 13:00	70.3	0	24.5	1.9
54	2023-12-27 13:15	70.5	0	25.1	1.8
55	2023-12-27 13:30	70.4	0	24.4	1.8
56	2023-12-27 13:45	70.4	0	24.3	1.8
57	2023-12-27 14:00	70.4	0	24.5	1.7
58	2023-12-27 14:15	70.1	0	23.7	1.7
59	2023-12-27 14:30	70.3	0	23.6	1.7
60	2023-12-27 14:45	70.1	0	24.4	1.8
61	2023-12-27 15:00	70.4	0	24.5	1.6
62	2023-12-27 15:15	70.1	0	24.3	1.7
63	2023-12-27 15:30	70.6	0	25.3	1.7
64	2023-12-27 15:45	70.3	0	25.1	1.6
65	2023-12-27 16:00	70	0	25.7	1.6
66	2023-12-27 16:15	69.8	0	26.1	1.8
67	2023-12-27 16:30	70.1	0	26.5	1.7
68	2023-12-27 16:45	70.2	0	26.3	1.7
69	2023-12-27 17:00	69.9	0	26.4	1.8
70	2023-12-27 17:15	69.7	0	26.3	1.7
71	2023-12-27 17:30	70.1	0	26.9	1.6
72	2023-12-27 17:45	70	0	26.5	1.7
73	2023-12-27 18:00	69.4	0	26.6	1.9
74	2023-12-27 18:15	69.7	0	27.9	1.8
75	2023-12-27 18:30	69.6	0	28.4	2
76	2023-12-27 18:45	69.9	0	27.8	2
77	2023-12-27 19:00	69.9	0	28.5	1.5
78	2023-12-27 19:15	70.1	0	27.9	1.8
79	2023-12-27 19:30	69.8	0	28.5	1.8
80	2023-12-27 19:45	70.2	0	28.6	2
81	2023-12-27 20:00	69.6	0	27	1.6
82	2023-12-27 20:15	70	0	27.2	1.7
83	2023-12-27 20:30	70.1	0	27.3	1.6
84	2023-12-27 20:45	69.7	0	26.8	1.6
85	2023-12-27 21:00	69.8	0	26.9	1.8
86	2023-12-27 21:15	70.2	0	27.5	1.8
87	2023-12-27 21:30	69.8	0	28.3	1.9
88	2023-12-27 21:45	70.1	0	27.3	1.5

89	2023-12-27 22:00	70.5	0	27.4	1.5
90	2023-12-27 22:15	71.2	0	27.3	1.7
91	2023-12-27 22:30	70.4	0	27.7	1.8
92	2023-12-27 22:45	70.5	0	28.4	1.9
93	2023-12-27 23:00	70.5	0	27	1.6
94	2023-12-27 23:15	70.1	0	27.2	1.9
95	2023-12-27 23:30	70.5	0	26.9	1.9
96	2023-12-27 23:45	NA	NA	NA	NA
97	Prescribed Standards	0 - 80	-	0 - 80	-
98	Maximum Value	73.5	0	28.6	2.1
99	Maximum Value At Time	2023-12-27 00:45	2023-12-27 00:00	2023-12-27 08:00	2023-12-27 12:00
100	Minimum Value	68.9	0	23.6	1.5
101	Minimum Value At Time	2023-12-27 05:00	2023-12-27 00:00	2023-12-27 14:30	2023-12-27 01:45
102	Geometric Mean	70.17	0	26.59	1.73
103	Median	70	0	26.7	1.7
104	Standard Deviation	0.89	0	1.25	0.14
105	Valid Data Points	95	95	95	95
106	Total Data Points	96	96	96	96
107	Data Availability %	98.96	98.96	98.96	98.96

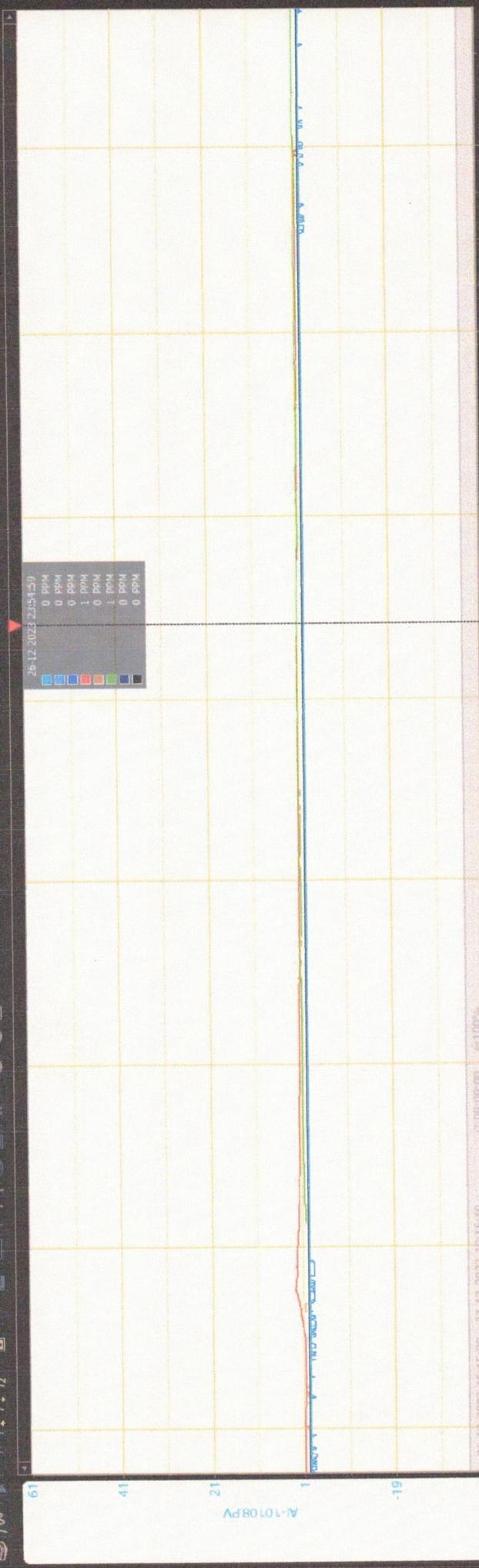


Tag Name	Tag Comment	Value	Unit	Lower	Upper
1 A-I-10102PV	NHS SENSOR TANK TOP-S	0	PPM	0	100
2 A-I-10101PV	NHS SENSOR CONTROL ROOM	4	PPM	0	100
3 A-I-10102PV	NHS SENSOR TRANSPIP-AN	0	PPM	0	100
4 A-I-10103PV	NHS SENSOR FLARE-FLOOR	0	PPM	0	100
5 A-I-10104PV	NHS SENSOR COMP ROOM-E	0.0	PPM	0.0	100.0
6 A-I-10105PV	NHS SENSOR CTRL ROOM ENT	0	PPM	0	100
7 A-I-10106PV	NHS SENSOR COMP ROOM-W	0	PPM	0	100
8 A-I-10107PV	NHS SENSOR-AT BAT LIMIT	1	PPM	0	100

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A16



TG0106 Block01 Group06



26-12-2023 23:54:59

0 PPM
0 PPM
0 PPM
1 PPM
0 PPM
1 PPM
0 PPM
0 PPM

02:30
27-12-2023

01:30

00:30

23:30
26-12-2023

22:30

21:30

20:30
26-12-2023

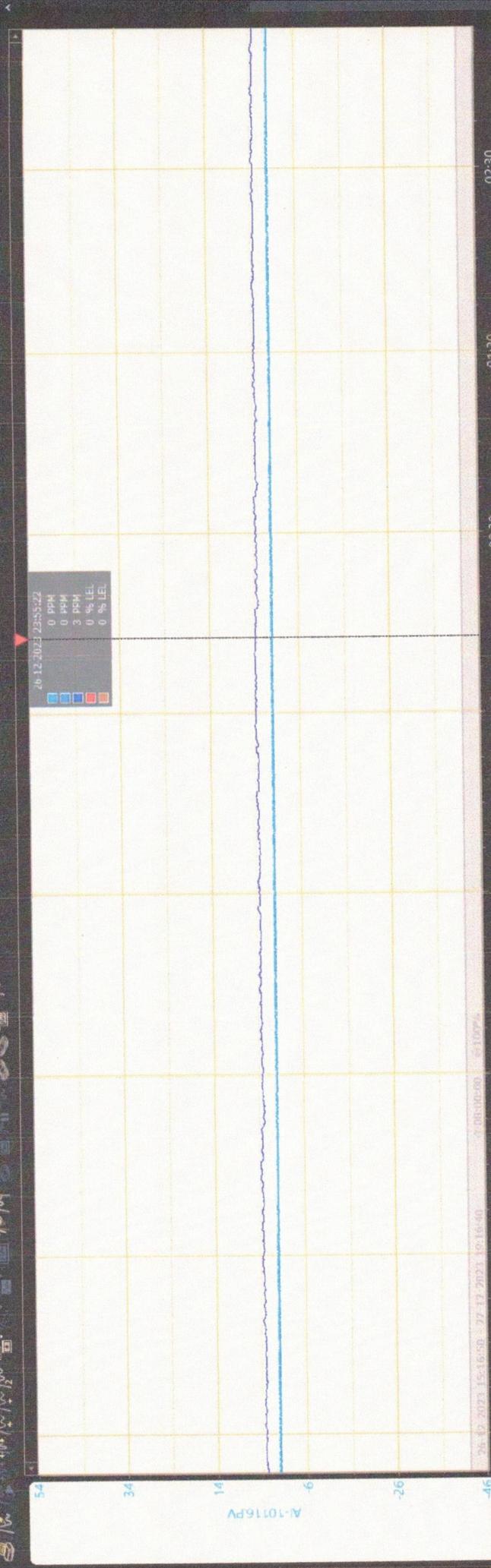
19:30

Tag Name	Tag Comment	Value	Unit	Lower	Upper
1 A-10106.PV	NH3 SENSOR - INKT SOUTH	0	PPM	0	100
2 A-10108.PV	NH3 SENSOR - INKT NORTH	0	PPM	0	100
3 A-10110.PV	NH3 SENSOR - PREHEATER ARE	0	PPM	0	100
4 A-10111.PV	NH3 SENSOR - TRANSP-BIS	1	PPM	0	100
5 A-10112.PV	NH3 SENSOR - DRUM POT AR	0	PPM	0	100
6 A-10113.PV	NH3 SENSOR - TANK OIL VLV	1	PPM	0	100
7 A-10114.PV	NH3 SENSOR - CONDENSOR IN	0	PPM	0	100
8 A-10115.PV	NH3 SENSOR - CONDENSOR-S	0	PPM	0	100

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TC0107 Block-01 Group07



19:30 20:30 21:30 22:30 23:30 00:30 01:30 02:30

26-12-2023 26-12-2023 27-12-2023

Tag Name	Tag Comment	Value	Unit	Lower	Upper
<input checked="" type="checkbox"/> 1. A-10116.FV	NH3 SENSOR, ECONOMIZER-N	0	PPM	0	100
<input checked="" type="checkbox"/> 2. A-10117.FV	NH3 SENSOR, RECEIVER-NOR	0	PPM	0	100
<input checked="" type="checkbox"/> 3. A-10118.FV	NH3 SENSOR, TANK-TOP-N	0	PPM	0	100
<input type="checkbox"/> 4. A-10119.FV	LPG SENSOR, FLARE AREA	0	% LEL	0	100
<input type="checkbox"/> 5. A-10120.FV	LPG SENSOR, LPG-SHED	0	% LEL	0	100



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A17



TAMIL NADU POLLUTION CONTROL BOARD



Proceedings No. T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated: 27.12.2023

Sub: TNPCB – Industries –1) M/s. Coromandel International Limited - Ammonia Storage Terminal Facility, S.F.No. 247, Kathivakkam Village, Thiruvottiyur Taluk, Chennai District and 2) M/s. Coromandel International Limited, located at S.F.No. 37/B2, 38/5A, 39/B1, 39/6A, 246/2,3,4,5,6,7 & 247/1A,2A,3C,3A, Ernavoor Village, Thiruvottiyur Taluk, Chennai District – Ammonia leak in the offshore pipeline from Port to Storage Tank - Directions under Section 33A of the Water (Prevention and Control of Pollution) Act, 1974 as amended and Section 31A of the Air (Prevention and Control of Pollution) Act, 1981 as amended – To suspend the operation of Ammonia offshore pipeline activity for precooling and ammonia transfer immediately - Issued - Regarding.

Ref: 1. Proc No. T1/TNPCB/F0101AMB/RL/AMB/W&A/2023 dated: 20/10/2023
2. Proc No. F0102 AMB/RL/JCEE–M/TNPCB/AMB/W&A/2023 dt. 12/05/2023
3. Lr.No. JCEE(M)/TNPCB/CHN.ZONE/AT/2023 Dated: 27.12.2023

Whereas, the unit of M/s Coromandel International Ltd., Ennore is a fertilizer manufacturing facility and involved in the manufacture of Ammonium Phosphate Potash Sulphate (APPS) -4 lakhs Tonnes /Annum. Ammonia is one of the raw materials for the manufacture of APPS. The unit has provided a double insulated ammonium storage tank of 12500 T capacity. The unit has obtained separate CTOs for APPS manufacturing and ammonia storage in the reference 1st and 2nd cited respectively subject to certain conditions.

Whereas, Ammonia is received via Ennore minor port through ships and transferred from there using 8" flexible HDPE pipeline of 2.5 km length laid underneath the seabed. The depth of pipeline from the sea surface varies from 1' near the shore to 18' at the mooring point at port. The unit receives and unloads ammonia of 3000 to 8000 T once a month. Ammonia is generally imported from Iran or Saudi Arabia. Ammonia is received in liquid form at -33°C and stored in the storage tank under the same condition. The pipelines are generally maintained at 2 Kg/cm² vapour pressure when no transfer of ammonia takes place. 36 hours prior to the transfer of ammonia from the ship, pre-cooling process of pipeline is carried out for pumping ammonia in liquid condition. The unit carries out the pre-cooling and ammonia transfer operation only after getting the permission from Tamil Nadu Maritime Board.

Whereas, a phone message was received from the unit at 12.45 am on 27.12.2023 regarding the ammonia gas leakage happened during the pre-cooling operation of the pipeline. Immediately the JCEE (M) Chennai along with DEE (Ambattur) and AEE (Manali) reached the site by 2.15 am and inspected the unit & the pipeline locations. The Joint Director, DISH who is the authority for the safety of the industrial operation was also present at the site.

Whereas, during inspection by the TNPCB officials, the unit has reported the following:

- The unit observed pressure drop in the pipeline at around 11.45 pm and simultaneously observed pungent odour around the storage terminal and near the material gate. The unit also immediately visited the pipeline location across the road and observed gas bubbles coming out of the pipeline at about 2 feet from the shore. The unit immediately started depressurising the pipeline by diverting the ammonia vapour to the flare and completed the operation within 20 minutes. The wind direction during the incident was observed to be West South West.
- The unit monitored the ammonia level in the ambient air near the material gate using hand held monitor and found that the ammonia level was 28 ppm during the incident.
- The unit also received information from the local Assistant Commissioner of Police regarding the complaints received from the public on ammonia odour from Periakuppam, Chinnakuppam and few other villages.
- Police and the District Administration along with the unit arranged ambulances and public transport for managing any emergency situation. Some people also received first aid due to eye irritation and breathing difficulties.

Whereas, during inspection by the TNPCB team, the following were observed.

- The ammonia level in the Ambient Air was monitored using handheld ammonia portable meter and found to be 3 ppm as against the standard of 0.57 ppm * 24 hrs average at 3.30 am near the Material gate. The ammonia level in the ambient air was also monitored in the following places.
 - a. Near Ammonia pipeline leak identified area : 3 ppm at 3.51 am
 - b. At Thalankuppam village: 0 ppm at 4.02 am
 - c. At Periakuppam village: 0 ppm 4.09am
 - d. At Chinnakuppam village: 0 ppm 4.12 am
 - e. At Ernavurkuppam village: 0 ppm 4.15 am
 - f. At Kathivakkam Railway bridge: 0 ppm 4.17 am
 - g. At Ennore near Gulf Oil Gate: 0 ppm, 4.20 am
 - h. At Ennore bus depot: 0 ppm at 4.24 am



TAMIL NADU POLLUTION CONTROL BOARD



- The sea water sample at the point of pipe line leakage was collected at 3.49 am and the ammonia level in the sea water was found to be 49 mg/L (Marine discharge standard of 5 mg/L). At 4.30 am, mild ammonia odour was observed near the site and the Chinnakuppam & Periyakuppam villages.
- The unit has stopped the operation of APPS Plant. The unit has reduced the production of Sulphuric Acid Plant and operating the same under low capacity.
- The unit has informed that they will identify the exact location and the extent of pipeline damage within a day and will rectify the same before commencing the ammonia transfer. The unit has been instructed to carry out the above activity at war footing and to put the pipeline in operation only with the concurrence of competent authority i.e., Tamil Nadu Maritime Board.

Whereas, the JCEE(M), Chennai has recommended for the issue of certain directions under Water (Prevention & Control of Pollution) Act, 1974 as amended in 1988 and Air (Prevention and Control of Pollution) Act, 1981 as amended

Whereas, the Board has decided to issue directions under the Water (Prevention & Control of Pollution) Act, 1974 as amended in 1988 and Air (Prevention and Control of Pollution) Act, 1981 as amended to comply with certain conditions.

Therefore, in exercise of powers conferred under section 33 A of the Water (Prevention and Control of Pollution) Act 1974, as amended and Section 31A of the Air (Prevention and Control of Pollution) Act, 1981 as amended, the Board issues the following directions to the units 1) **M/s. Coromandel International Limited - Ammonia Storage Terminal Facility, S.F.No. 247, Kathivakkam Village, Thiruvottiyur Taluk, Chennai District** and 2) **M/s. Coromandel International Limited, located at S.F.No. 37/B2, 38/5A, 39/B1, 39/6A, 246/2,3,4,5,6,7 & 247/1A,2A,3C,3A, Ernavoor Village, Thiruvottiyur Taluk, Chennai District** so as to comply with the following and the action taken in this regard shall be furnished to the Board within two days time.

1. The unit shall suspend the operation of Ammonia offshore pipeline activity for precooling and ammonia transfer immediately and shall resume the same only after obtaining the approval of Indian Register of Shipping (IRS) and the Tamil Nadu Maritime Board.
2. The unit shall precisely identify the location and the extent of damage that happened to the offshore pipeline and rectify the same early.
3. The unit shall ensure that no ammonia leak occurs during the pipeline rectification operation.

4. The unit shall restart the APPS plant and other allied units only after ensuring that all the ammonia pipeline inside the plant are intact and safe and shall obtain NOC from DISH before restarting the plant.

Failure to comply with the above said directions will attract action in accordance with the provisions of the Water (Prevention and Control of Pollution) Act, 1974 as amended and Air (Prevention and Control of Pollution) Act, 1981 as amended.

The receipt of this proceeding shall be acknowledged.

[Signature]
27/12/23
For Chairperson
[Signature]
28/12/2023

To

1. The Managing Director,
M/s. COROMANDEL INTERNATIONAL LIMITED
S.F No.37/B2,38/5A,39/B1,39/6A,246/2,3,4,5,6,7,247/(part)1A,2A,3C,3A,
Ernavoor Village, Thiruvottiyur Taluk,
Chennai District.
2. The Managing Director,
M/s. COROMANDEL INTERNATIONAL LIMITED - AMMONIA STORAGE
TERMINAL FACILITY,
S.F.No. 247, Kathivakkam Village,
Thiruvottiyur Taluk , Chennai District

Copy To

1. The Joint Chief Environmental Engineer (Monitoring),
Tamilnadu Pollution Control Board
Chennai Region.
2. The District Environmental Engineer
Tamilnadu Pollution Control Board
Ambattur - For follow up action and furnish report to
Board
3. File

Coromandel

FUTURE POSITIVE

CE/ EHS/ TNPCB / 12 2023

29th December 2023

To

The Chairperson
Tamil Nadu Pollution Control Board
76, Mount Road
Guindy
Chennai - 600032

Dear sir,

Sub:

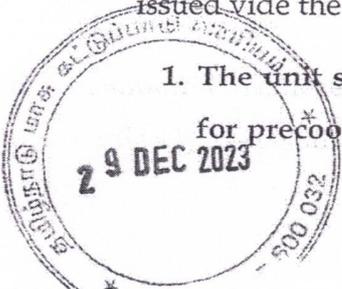
TNPCB - Industries -1) M/s. Coromandel International Limited - Ammonia Storage Terminal Facility, S.F. No. 247, Kathivakkam Village, Thiruvottiyur Taluk, Chennai District and 2) M/s. Coromandel International Limited, S. F. No. 37/B2, 38/5A, 39/BI, 39/6A, 246/2,3,4,5,6,7, 247/1A, 2A, 3C, 3A, Ernavoor village, Thiruvottiyur Taluk and Chennai District -Ammonia leak in the offshore pipeline from Port to Storage Tank - Directions under Section 33A of the Water (Prevention and Control of Pollution) act, 1974 as Amended and Section 31A of the Air (Prevention and Control of Pollution) act, 1981 as Amended - To suspend the operation of Ammonia offshore pipeline activity for precooling and ammonia transfer immediately Issued - Regarding.

Ref:

1. Proc No. T1/TNPCB/F0101AMB/RL/ AMB/W&A/2023 Dated: 20/10/2023.
2. Proc No. F. 0102 AMB/ RL/ JCEE-M/TNPCB/ AMB/W&A/2023 Dated 12/05/2023.
3. Lr. No. JCEE(M)/TNPCB/CHN.ZONE/AT/2023 Dated: 27.12.2023
4. Proceeding No. T1/TNPCB/F.0101 AMB/RL/W&A/2023dated: 27.12.2023.

We herewith submit the compliance status of the conditions based on directions issued vide the above reference:

1. The unit shall suspend the operation of Ammonia offshore pipeline activity for precooling and ammonia transfer immediately and shall resume the same



Registered Office : 'Coromandel House', 1-2-10
Sardar Patel Road, Secunderabad - 500 003
Telangana, India

1 page of 3
Tel: 91-40-66997300 / 6699 7500
Fax: 91-40-27844117
E-mail: mail@coromandel.murugappa.com


murugappa

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A18
Coromandel International Limited
Post Box No. 2, Ennore Express Highway Road,
Ennore, Chennai - 600 057, Tamil Nadu, India.
Tel: 91-44-2575 2300/10/20/30
Fax: 91-44-2575 2311
Website: www.coromandel.biz
CIN: L24120TG1961PLC000892

only after obtaining the approval of Indian Register of Shipping (IRS) and The Tamil Nadu Maritime Board.

We suspended the Ammonia precooling and unloading activity from ship to plant immediately and the ship was cancelled and the same was informed to the concern authorities. As directed by you, we are planning to assess the ammonia pipeline from Ennore Minor port to plant by engaging competent person and further inspection and maintenance procedure will be arrived. The same will be discussed with Concern Authorities (IRS and Tamil Nadu Maritime Board). After completing maintenance and inspection activity, we will submit the report and obtain approval from the above concern authorities. Once we get approval, the same will be informed to your good office.

- 2. The unit shall precisely identify the location and the extent of damage that happened to the offshore pipeline and rectify the same early.**

We are planning to identify the ammonia pipeline damage location and assessing by engaging competent person and further inspection and maintenance scope & procedure will be arrived at the earliest.

- 3. The unit shall ensure that no ammonia leak occurs during the pipeline rectification operation.**

We are planning the maintenance procedure with preventive and mitigative measures to avoid the ammonia leakage during the rectification operation by involving the expert team and ensure that no ammonia leak takes place.

- 4. The unit shall restart the APPS plant and other allied units only after ensuring that all the ammonia pipeline inside the plant are intact and safe and shall obtain NOC from DISH before restarting the plant.**

Based on your direction, all the plant operation was suspended in phased manner. We are planning for plant inspection for entire ammonia related process equipment and pipeline by competent person. Once inspection completed, the

Coromandel 

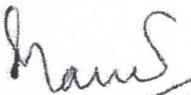
report will be submitted to DISH and requesting NOC for restarting the plant.
Once obtain the NOC, the same will be informed to your good office.

Hence, we request your good selves to take in consideration these submissions, the
above conditions will be complied at the earliest.

This is for kind information and perusal.

Yours faithfully

For Coromandel International Limited


S. Ramesh 29/12/23

Senior General Manager - Manufacturing.



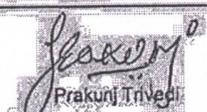
Cc to:

1. The Joint Chief Environmental Engineer,
Tamil Nadu Pollution Control Board,
First floor, 950/1, Poonamallee High Road
Arumbakkam
Chennai - 600106
2. The District Environmental Engineer,
Tamil Nadu Pollution Control Board,
77A, South Avenue Road,
Ambattur Industrial Estate,
Chennai - 600058

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Plant Ammonia Storage, Ennore	Client Coromandel	Contract Code CIL-ENNORE	Document ID 3099-PRC-00-DD -0001	Contract No. 66-3099
	PROCESS OBSERVATION REPORT FOR COROMANDEL-ENNORE INCIDENT			 FUTURE POSITIVE

<p>tkIS India / Vendor</p> <p>Category Codes (Distribution Project)</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1 For Approval <input type="checkbox"/> 2 For Review / Comments <input type="checkbox"/> 3 For Information <input type="checkbox"/> 4 For Engineering <input type="checkbox"/> 5 F / Enquiry <input type="checkbox"/> 6 For Order Placement <input type="checkbox"/> 7 Final & Approved <input type="checkbox"/> 8 Released for Construction <p>Acceptance Codes (Equipment Codes)</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1 Approved <input type="checkbox"/> 2 Approved for Manufacturing / Fabrication with Comments as marked <input type="checkbox"/> 3 Not Approved / Resubmit <input type="checkbox"/> 4 Released for Information / Records <input type="checkbox"/> 5 Reviewed <input type="checkbox"/> 6 Reviewed as Noted / Resubmit <p><small>Remarks for AC2 : This marked-up drawings is hereby approved for fabrication / manufacturing and shall be re-submitted after revision. This drawing should be revised only to the extent of tkIS India / Owner / Client comments. Any other changes made by you will not be considered unless clearly highlighted in covering letter asking for approval.</small></p> <p><small>This approval / review does not absolve the supplier from the full responsibility for design and fabrication.</small></p> <p>Date: / / Name: /</p>	<p>tkIS India / Owner / Client</p> <p>Category Codes (Distribution Project)</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1 For Approval <input type="checkbox"/> 2 For Review / Comments <input checked="" type="checkbox"/> 3 For Information <input type="checkbox"/> 4 For Engineering <input type="checkbox"/> 5 For Enquiry <input type="checkbox"/> 6 For Order Placement <input type="checkbox"/> 7 Final & Approved <input type="checkbox"/> 8 Released for Construction <p>Acceptance Codes (Equipment Codes)</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1 Approved <input type="checkbox"/> 2 Approved for Manufacturing / Fabrication with Comments as marked <input type="checkbox"/> 3 Not Approved / Resubmit <input type="checkbox"/> 4 Released for Information / Records <input type="checkbox"/> 5 Reviewed <input type="checkbox"/> 6 Reviewed as Noted / Resubmit <p>Date: / / Name: /</p>
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00	IFI	ISSUED FOR INFORMATION	30.01.24	 Vaibhav Mahajan / Gajanand Redekar Chief Manager-Process / Sr. Manger Instrumentation	30.01.24	 Prakunj Trivedi General Manger-Process	
Rev.	Status	Description	Date	Prepared	Date	Checked & Approved	AC
<p><small>© Copyright 2024: All rights reserved thyssenkrupp UHDE (India) Private Limited</small></p>							Category Code: -03

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Plant Ammonia Storage, Ennore	Client Coromandel	Contract Code CIL-ENNORE	Document ID 3099-PRC-00-DD -0001	Contract No. 66-3099
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5	OTHER OBSERVATION	5
6	PROCESS SCHEME FOR REMOVAL OF AMMONIACAL LIQUOR	6
7	OVERALL CONCLUSIONS.....	6

Annexure-1_Dilution Method

Annexure-2_Forced Circulation

Plant Ammonia Storage, Ennore	Client Coromandel	Contract Code CIL-ENNORE	Document ID 3099-PRC-00-DD -0001	Contract No. 66-3099
	PROCESS OBSERVATION REPORT FOR COROMANDEL-ENNORE INCIDENT			 FUTURE POSITIVE
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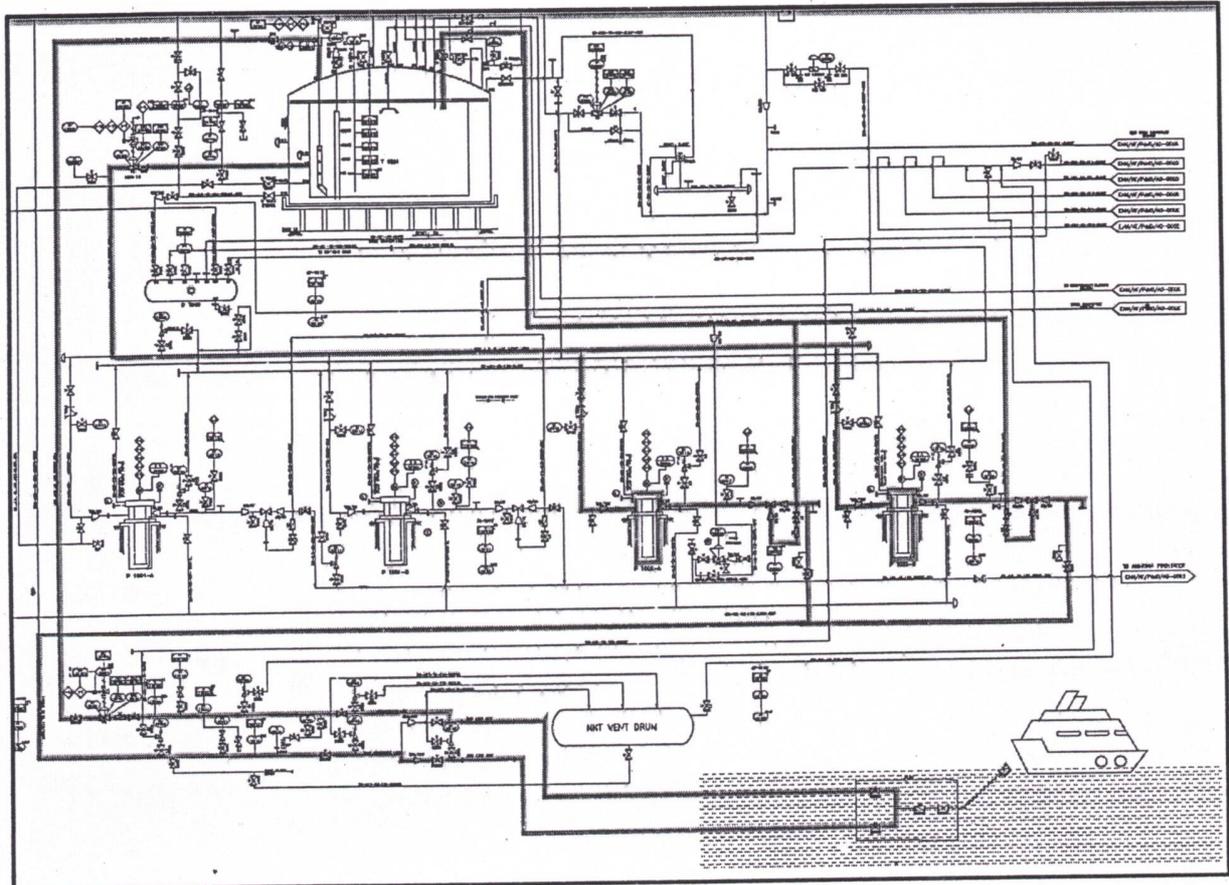
1 INTRODUCTION

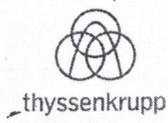
Based on recent ammonia leak incident at COROMANDEL-ENNORE unit, which is resulted in off-site emergency, it was decided by COROMANDEL-ENNORE unit to engage tk Uhde India Pvt. Ltd. (tkUIPL) to perform detail process audit of ammonia storage Pre-cooling & Ship Unloading Operation.

The following tkUIPL persons visited the COROMANDEL-ENNORE Ammonia Facilities for process audit.

- a) Mr. Prakunj Trivedi, Process Specialist
- b) Mr. Vaibhav Mahjan, Process Specialist
- c) Mr. Gajanand Redekar, Instrumentation Specialist

2 SCHEMATIC OF PRE-COOLING & SHIP UNLOADING LINES

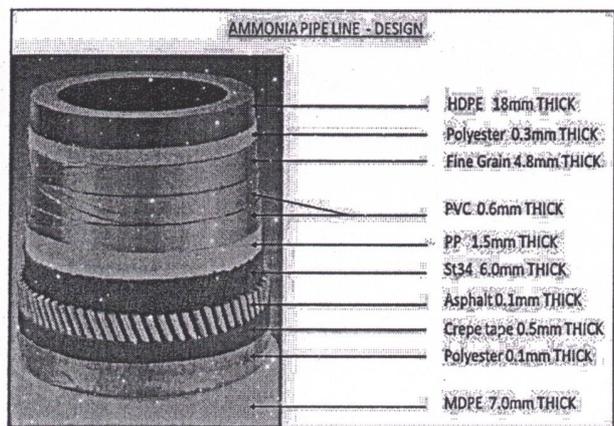


Plant Ammonia Storage, Ennore	Client Coromandel	Contract Code CIL-ENNORE	Document ID 3099-PRC-00-DD -0001	Contract No. 66-3099
	PROCESS OBSERVATION REPORT FOR COROMANDEL-ENNORE INCIDENT			 FUTURE POSITIVE

3 OBSERVATION WITH RESPECT TO DESIGN CONDITIONS

(BASED ON DATA PROVIDED BY COROMANDEL-ENNORE)

- a) Pre-Cooling Lines (3" & 4"): Design Pressure 22.5 kg/cm2g, MOC: LTCS
- b) Sub Sea Pipeline (8" x 2 Nos): Design Pressure 25 kg/cm2g, MOC: HDPE armoured with several layers of steel tapes and steel wires. Refer sketch below for cross section of subsea flexible hose.



- c) Pre-Cooling Pump Discharge Shut off Pressure: 6.76 kg/cm2g.
- d) Liquid Ammonia Temperature: -32.5°C supply side
- e) Subsea line pressure before start of pre-cooling: 2 kg/cm2g , corresponding liquid/vapor ammonia temperature is - 9°C.
- f) Even if subsea line temperature before start of pre-cooling is Ambient Temperature i.e. @35°C, corresponding vapor pressure of ammonia is 12.65 kg/cm2g which is below design pressure.
- g) **Conclusion: -**
 - a. All above parameters indicate that the chances of line pressurization beyond design pressure is not a credible scenario. Even considering the higher line temperature scenario, the likely increase in line pressure is well below the line design pressure value.

4 OBSERVATION WITH RESPECT TO PRE-COOLING OPERATION DATA

(BASED ON DATA PROVIDED BY COROMANDEL-ENNORE)

- a) Ensure NKT line pressure is about 2 kg/cm2g before start of pre-cooling.
- b) Between 8:00 PM to 11:00 PM, Run Pump-B & establish Pre-cooling circulation.
- c) All Process parameters & pump amperage are normal & line pressure is about 3.3 kg/cm2g.
- d) At 11:00 PM, Second Pump started to increase the circulation rate. Due to increase in circulation rate, line pressure was increased up to 3.8 kg/cm2g. Pump amperage is normal.
- e) At 11:23 PM, NKT supply line pressure drops to Zero & Pump A trips. Pump-B continue to run.
- f) Pump A restarted at 11:24 PM with discharge valve in full closed position.
- g) Both pumps stopped at 11:37 PM. NKT supply line pressure was 0.3 kg/cm2g & return line pressure was 3.1 kg/cm2g

Plant Ammonia Storage, Ennore	Client Coromandel	Contract Code CIL-ENNORE	Document ID 3099-PRC-00-DD -0001	Contract No. 66-3099
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h) NKT return line depressurized towards tank by running compressor & isolation valves (both) at NKT battery limit were closed.

i) Conclusion: -

- a. The pre-cooling operation & shutdown was performed as per established SOP.
- b. Running of two pumps is a normal & well established procedure. Hence no abnormalities observed.

5 OTHER OBSERVATION

- a) One to one discussion was performed with plant operation team members to find out the various action performed by them on incident day. It was observed that the plant operation team members are having proper knowledge of process parameters & various emergency actions required for handling any process emergency.
- b) Requested to removed SV 10116 (Pre-cooling Supply Line) & SV1016 (Pre-cooling Return Line).
 - i. Air breathing/movement observed in SV10116 tapping i.e. Air is coming out with sea waves coming towards shore & Air is going in with sea waves going away from shore. No Smell of ammonia observed in air. This infers there might be some opening in pre-cooling supply line. However, the same will be confirmed after visual inspection at site. Tapping is kept open to atmosphere for safeguard of Hose.
 - ii. Strong Vapor Ammonia smell observed in SV10106 tapping means line is still having ammonia or strong concentration of ammonical solution. Hose is connected at tapping point & dip in water bath to remove vapor ammonia from line.
- c) As per QAR study, there are 19 ammonia sensors are provided with ammonia storage tank area. All sensors are calibrated & kept in line, The high alarm value is kept at 5 ppm & high high alarm is kept at 10 ppm. TLV for ammonia is 25 ppm. On incident day, there was no alarm of any ammonia sensor which means there is no ammonia emission in plant area during ammonia pumping operation.

Plant Ammonia Storage, Ennore	Client Coromandel	Contract Code CIL-ENNORE	Document ID 3099-PRC-00-DD -0001	Contract No. 66-3099
	PROCESS OBSERVATION REPORT FOR COROMANDEL-ENNORE INCIDENT			 FUTURE POSITIVE
				Rev 00 Page 6 of 6

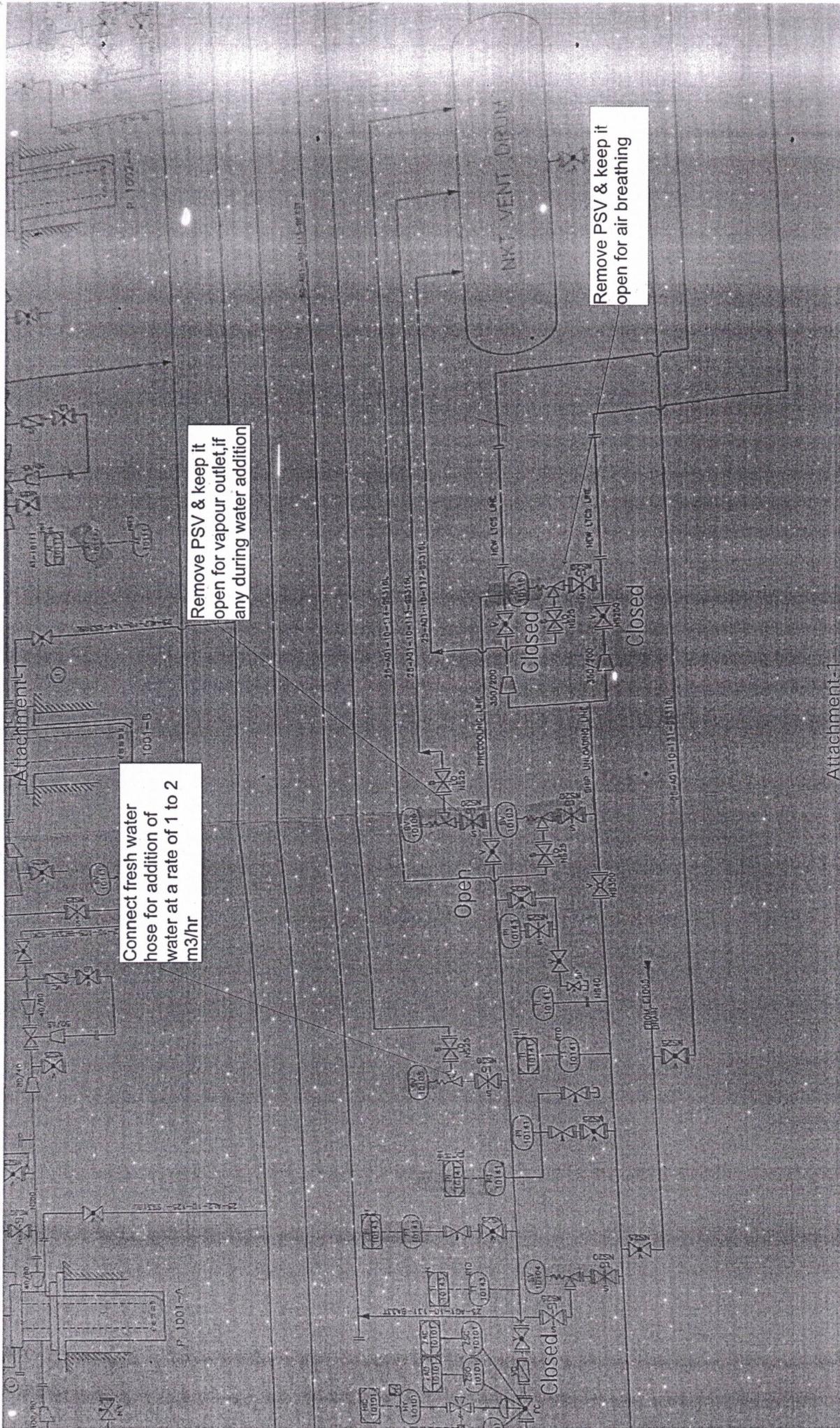
6 PROCESS SCHEME FOR REMOVAL OF AMMONIACAL LIQUOR

During site visit following schemes were discussed for removal of ammoniacal liquor from subsea pipelines.

- a) Water Dilution Method where addition of Fresh Water at control rate through pre-cooling return line safety valve tapping & dilute ammoniacal solution content in subsea return line. (Refer attached Annexure-1)
- b) Forced Circulation of Fresh Water from Pre-cooling Supply line & transferring ammoniacal solution to temporary tank via pre-cooling return line & temporary hose arrangement. Circulation rate will be between 20 to 50 m³/hr. All necessary safety precaution & water curtain arrangement at temporary tank area. (Refer attached Annexure-2).
- c) If Forced Circulation option fails to establish circulation through subsea pipelines than
 - i. Option-1: Get permission from local regulatory to do patch work at damage portion. Establish force circulation of fresh water to remove all ammoniacal water from lines & collect ammoniacal water in temporary tank at terminal end.
 - OR
 - ii. Option-2: Get permission from local regulatory to do once through circulation of sea water from PLEM side & collect ammoniacal water in temporary tank at terminal end.

7 OVERALL CONCLUSIONS

- a) The chances of line pressurization beyond design condition are not a credible scenario. Even if the line temperature before starting of precooling is ambient, the likely increase in line pressure is well below the line design pressure value.
- b) The pre-cooling operation & shutdown was performed as per established SOP.
- c) The process scheme has been developed for removal of aqua ammonia from subsea pipeline along with dilution of aqua ammonia with fresh water, which is the preliminary activity is to be carried out before attempting for maintenance.
- d) There is no ammonia emission in plant area during incident.
- e) Root cause of subsea failure will be verified and confirmed based on inspection report.



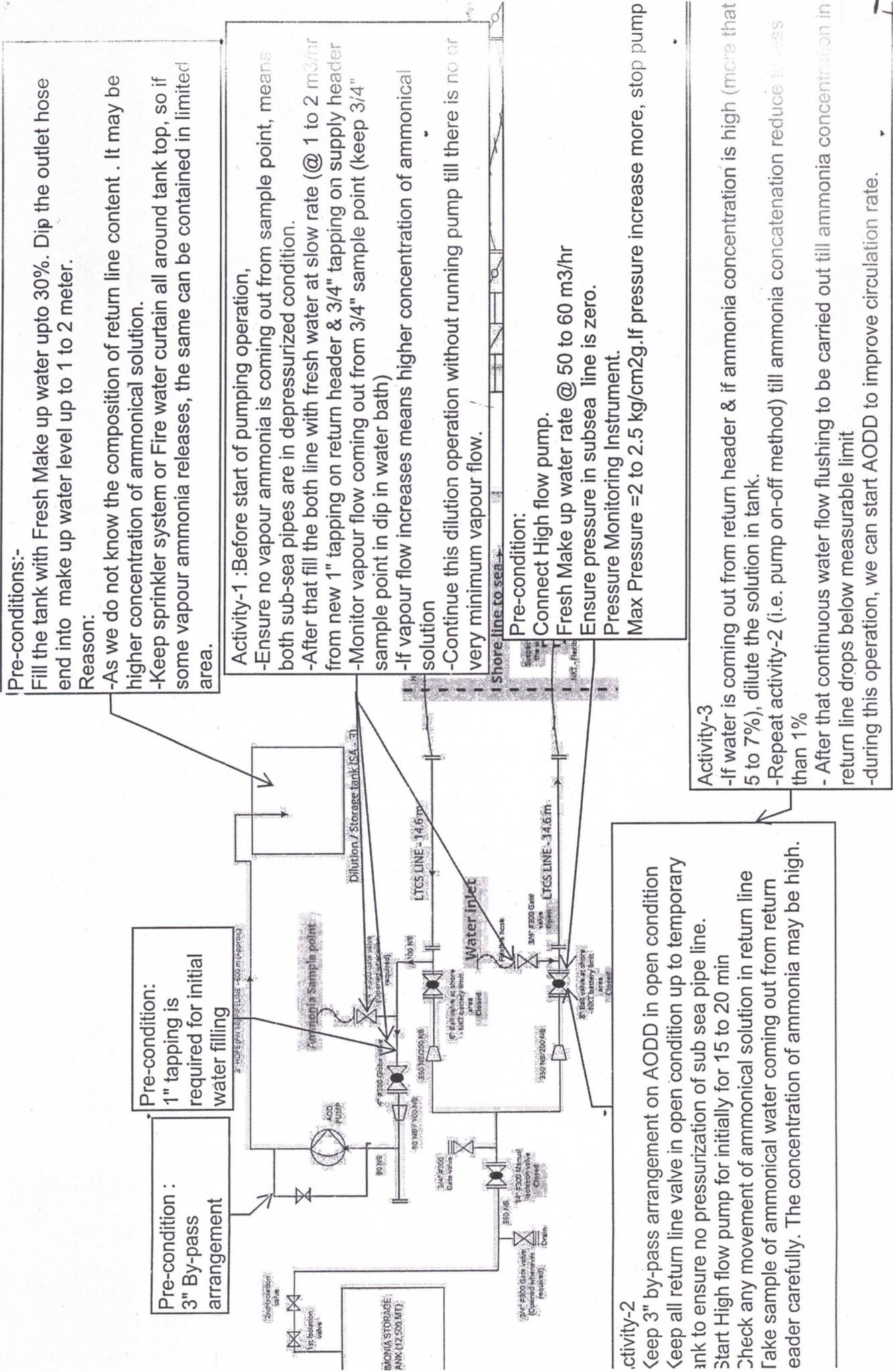
Connect fresh water hose for addition of water at a rate of 1 to 2 m3/hr

Remove PSV & keep it open for vapour outlet, if any during water addition

Remove PSV & keep it open for air breathing

Attachment-1

Attachment-2



Pre-conditions:-
 Fill the tank with Fresh Make up water upto 30%. Dip the outlet hose end into make up water level up to 1 to 2 meter.

Reason:
 -As we do not know the composition of return line content . It may be higher concentration of ammonical solution.
 -Keep sprinkler system or Fire water curtain all around tank top, so if some vapour ammonia releases, the same can be contained in limited area.

Activity-1 :Before start of pumping operation,
 -Ensure no vapour ammonia is coming out from sample point, means both sub-sea pipes are in depressurized condition.
 -After that fill the both line with fresh water at slow rate (@ 1 to 2 m³/hr
 -Monitor vapour flow coming out from 3/4" sample point (keep 3/4" sample point in dip in water bath)
 -If vapour flow increases means higher concentration of ammonical solution
 -Continue this dilution operation without running pump till there is no or very minimum vapour flow.

Pre-condition:
 Connect High flow pump.
 Fresh Make up water rate @ 50 to 60 m³/hr
 Ensure pressure in subsea line is zero.
 Pressure Monitoring Instrument.
 Max Pressure = 2 to 2.5 kg/cm². If pressure increase more, stop pump

Activity-3
 -If water is coming out from return header & if ammonia concentration is high (more than 5 to 7%), dilute the solution in tank.
 -Repeat activity-2 (i.e. pump on-off method) till ammonia concentration reduce to less than 1%
 - After that continuous water flow flushing to be carried out till ammonia concentration in return line drops below measurable limit
 -during this operation, we can start AODD to improve circulation rate.

Pre-condition:
 1" tapping is required for initial water filling

Pre-condition :
 3" By-pass arrangement

Activity-2
 Keep 3" by-pass arrangement on AODD in open condition
 Keep all return line valve in open condition up to temporary tank to ensure no pressurization of sub sea pipe line.
 Start High flow pump for initially for 15 to 20 min
 Check any movement of ammonical solution in return line
 Take sample of ammonical water coming out from return header carefully. The concentration of ammonia may be high.

January 8, 2024

The Station House Officer,
M5 – Ennore Police Station,
Ennore, Chennai.

Dear Sir,

Sub: Requesting Police protection for Subsea pipeline inspection.

Further to the request letter given on 30.12.2023, we are still unable to access the damaged subsea pipeline area to precisely identify the damage location and the extent of damage as advised by the Tamil Nadu Pollution Control Board vide proceedings no. T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated 27.12.2023 due to public protest despite inspection attempts from our side.

We request protection for our team from any public disturbance during the inspection activity.

Thanking you,

Yours faithfully,

For Coromandel International Limited,

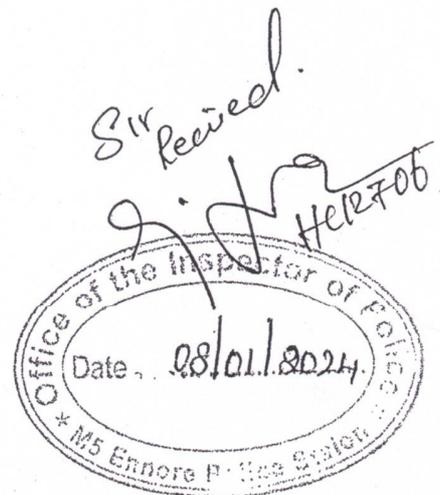
Ramesh S

Ramesh S

Sr. GM – Manufacturing & Unit Head

Copy to:

1. The Deputy Commissioner of Police, Madhavaram.
2. The Assistant Commissioner of Police, M5 Ennore.



January 23, 2024

The Chairperson,
Tamil Nadu Pollution Control Board,
76, Mount Salai, Guindy,
Chennai - 600032.

Dear Sir / Madam,

Ref: 1) Proceeding No. T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated: 27.12.2023.
2) Proceedings before National Green Tribunal, Southern Zone - Original Application
No.195/2023

With reference to the above matters, we are required to carry out subsea pipeline visual inspection to identify the leakage point (if any) in the ammonia pipeline. The inspection in the coastal region will be carried out by Coromandel team and request your support for carrying out the said inspection.

Till now we have not been able to access subsea pipeline area due to congregation of local community near the plant premises preventing us from carrying out uninterrupted and safe execution of pipeline inspection.

In this regard, we have requested support from Directorate of Industrial Safety & Health, Tamil Nadu Maritime Board and protection from Tamilnadu Police for the Ammonia Subsea pipeline inspection.

We sincerely request your support in guiding us through this inspection of Subsea pipeline which is also extremely critical for engaging overseas experts to suggest suitable measures in future.

Also, it is pertinent to note that we have shut down all other operating plants within the premises and longer closure period can potentially impact the asset integrity of these plants. Hence, we seek your support and direction for early resumption of Phos Acid and Sulphuric Acid plants, which are not connected with Ammonia subsea pipeline issue.

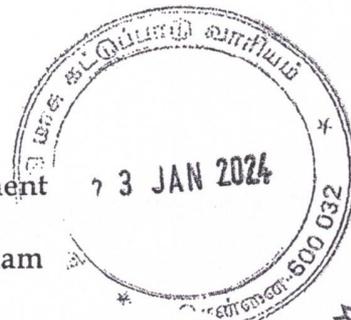
Thanking you,

Yours faithfully,
For Coromandel International Limited



Amir Alvi
President - Head of Manufacturing & Supply Chain Management

CC to. 1. The Joint Chief Environmental Engineer, Arumbakkam
2. The District Environmental Engineer, Ambattur.



January 24, 2024

Vice Chairman and Chief Executive Officer
Tamil Nadu Maritime Board,
No.171 South Kesavaperumalpuram,
Off Greenways Road, Raja Annamalaipuram,
Chennai - 600 028

Dear Sir / Madam,

Ref: 1) Proceeding No. T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated: 27.12.2023.
2) Proceedings before National Green Tribunal, Southern Zone - Original Application
No.195/2023

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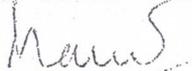
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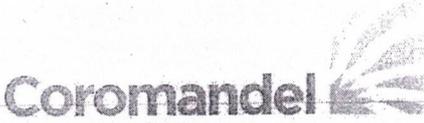
Yours faithfully,

For Coromandel International Limited



S. Ramesh

Sr. General Manager - Manufacturing & Unit Head



FUTURE POSITIVE

January 25, 2024

The Director of Industrial Safety & Health
T.S. No. 47/1 SIDCO Industrial Estate
Guindy, Chennai - 600032.

Coromandel International Limited
Post Box No. 2, Ennore Express Highway Road,
Ennore, Chennai - 600 057, Tamil Nadu, India.
Tel: 91-44-2575 2300/10/20/30
Fax: 91-44-2575 2311
Website: www.coromandel.biz
CIN: L24120TG1961PLC000892

Dear Sir / Madam,

- Ref: 1) Proceeding No. T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated: 27.12.2023.
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As per the direction No : 4 of the above proceeding, we have identified the reputed Classification society M/s. Llyods Register to carry out the pressure test to ensure the intactness of Ammonia pipeline inside the plant (from Ammonia terminal to APS plant Ammonia transfer line). In this regard, we request your permission to proceed the pressure test, or you may suggest the suitable competent agency to carry out the above activities.

Also, it is pertinent to note that we have shut down all other operating plants within the premises and longer closure period can potentially impact the asset integrity of these plants. Hence, we seek your support and direction for early resumption of APPS and allied units which are not connected with Ammonia Subsea pipeline issue.

Thanking you,
Yours faithfully,
For Coromandel International Limited

S. Ramesh
S. Ramesh
Sr. General Manager - Manufacturing & Unit Head

CC to: The Joint Director of Industrial Safety & Health, Thiruvottiyur.

சென்னை தொழில்துறை பாதுகாப்பு மற்றும்
சுற்றுச்சூழல் அமைச்சுக்கு உரிய
உள்ளூர் உதவிகளை எதிர்பார்த்துக் கொள்ளும்
பெற்றும் கொள்ளப்படுகிறது.

நாள் 29.01.24

[Signature]
[Name]



January 23, 2024

The Chairperson,
Tamil Nadu Pollution Control Board,
76, Mount Salai, Guindy,
Chennai - 600032.

Dear Sir / Madam,

- Ref: 1) Proceeding No. T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated: 27.12.2023.
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Thanking you,

Yours faithfully,
For Coromandel International Limited


Amir Alvi
President - Head of Manufacturing & Supply Chain Management



- CC to: 1. The Joint Chief Environmental Engineer, Arumbakkam
 2. The District Environmental Engineer, Ambattur.





TAMIL NADU POLLUTION CONTROL BOARD



Proceedings No. T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated: 27.12.2023

Sub: TNPCB – Industries –1) M/s. Coromandel International Limited - Ammonia Storage Terminal Facility, S.F.No. 247, Kathivakkam Village, Thiruvottiyur Taluk, Chennai District and 2) M/s. Coromandel International Limited, located at S.F.No. 37/B2, 38/5A, 39/B1, 39/6A, 246/2,3,4,5,6,7 & 247/1A,2A,3C,3A, Ernavoor Village, Thiruvottiyur Taluk, Chennai District – Ammonia leak in the offshore pipeline from Port to Storage Tank - Directions under Section 33A of the Water (Prevention and Control of Pollution) Act, 1974 as amended and Section 31A of the Air (Prevention and Control of Pollution) Act, 1981 as amended – To suspend the operation of Ammonia offshore pipeline activity for precooling and ammonia transfer immediately – Issued - Regarding.

- Ref:
1. Proc.No. T1/TNPCB/F0101AMB/RL/AMB/W&A/2023 dated: 20/10/2023
 2. Proc.No. F0102 AMB/RL/JCEE-M/TNPCB/AMB/W&A/2023 dt. 12/05/2023
 3. Lr.No. JCEE(M)/TNPCB/CHN.ZONE/AT/2023 Dated: 27.12.2023

Whereas, the unit of M/s Coromandel International Ltd., Ennore is a fertilizer manufacturing facility and involved in the manufacture of Ammonium Phosphate Potash Sulphate (APPS) -4 lakhs Tonnes /Annum. Ammonia is one of the raw materials for the manufacture of APPS. The unit has provided a double insulated ammonium storage tank of 12500 T capacity. The unit has obtained separate CTOs for APPS manufacturing and ammonia storage in the reference 1st and 2nd cited respectively subject to certain conditions.

Whereas, Ammonia is received via Ennore minor port through ships and transferred from there using 8" flexible HDPE pipeline of 2.5 km length laid underneath the seabed. The depth of pipeline from the sea surface varies from 1' near the shore to 18' at the mooring point at port. The unit receives and unloads ammonia of 3000 to 8000 T once a month. Ammonia is generally imported from Iran or Saudi Arabia. Ammonia is received in liquid form at -33°C and stored in the storage tank under the same condition. The pipelines are generally maintained at 2 Kg/cm² vapour pressure when no transfer of ammonia takes place. 36 hours prior to the transfer of ammonia from the ship, pre-cooling process of pipeline is carried out for pumping ammonia in liquid condition. The unit carries out the pre-cooling and ammonia transfer operation only after getting the permission from Tamil Nadu Maritime Board.

Whereas, a phone message was received from the unit at 12.45 am on 27.12.2023 regarding the ammonia gas leakage happened during the pre-cooling operation of the pipeline. Immediately the JCEE (M) Chennai along with DEE (Ambattur) and AEE (Manali) reached the site by 2.15 am and inspected the unit & the pipeline locations. The Joint Director, DISH who is the authority for the safety of the industrial operation was also present at the site.

Whereas, during inspection by the TNPCB officials, the unit has reported the following:

- The unit observed pressure drop in the pipeline at around 11.45 pm and simultaneously observed pungent odour around the storage terminal and near the material gate. The unit also immediately visited the pipeline location across the road and observed gas bubbles coming out of the pipeline at about 2 feet from the shore. The unit immediately started depressurising the pipeline by diverting the ammonia vapour to the flare and completed the operation within 20 minutes. The wind direction during the incident was observed to be West South West.
- The unit monitored the ammonia level in the ambient air near the material gate using hand held monitor and found that the ammonia level was 28 ppm during the incident.
- The unit also received information from the local Assistant Commissioner of Police regarding the complaints received from the public on ammonia odour from Periakuppam, Chinnakuppam and few other villages.
- Police and the District Administration along with the unit arranged ambulances and public transport for managing any emergency situation. Some people also received first aid due to eye irritation and breathing difficulties.

Whereas, during inspection by the TNPCB team, the following were observed.

- The ammonia level in the Ambient Air was monitored using handheld ammonia portable meter and found to be 3 ppm as against the standard of 0.57 ppm * 24 hrs average at 3.30 am near the Material gate. The ammonia level in the ambient air was also monitored in the following places.
 - a. Near Ammonia pipeline leak identified area: 3 ppm at 3.51 am
 - b. At Thalankuppam village: 0 ppm at 4.02 am
 - c. At Periakuppam village: 0 ppm 4.09am
 - d. At Chinnakuppam village: 0 ppm 4.12 am
 - e. At Ernavurkuppam Village: 0 ppm 4.15 am
 - f. At Kathivakkam Railway bridge: 0 ppm 4.17 am
 - g. At Ennore near Gulf Oil Gate: 0 ppm, 4.20 am
 - h. At Ennore bus depot: 0 ppm at 4.24 am



TAMIL NADU POLLUTION CONTROL BOARD



- The sea water sample at the point of pipe line leakage was collected at 3.49 am and the ammonia level in the sea water was found to be 49 mg/L (Marine discharge standard of 5 mg/L). At 4.30 am, mild ammonia odour was observed near the site and the Chinnakuppam & Periyakuppam villages.
- The unit has stopped the operation of APPS Plant. The unit has reduced the production of Sulphuric Acid Plant and operating the same under low capacity.
- The unit has informed that they will identify the exact location and the extent of pipeline damage within a day and will rectify the same before commencing the ammonia transfer. The unit has been instructed to carryout the above activity at war footing and to put the pipeline in operation only with the concurrence of competent authority i.e., Tamil Nadu Maritime Board.

Whereas, the JCEE(M), Chennai has recommended for the issue of certain directions under Water (Prevention & Control of Pollution) Act, 1974 as amended in 1988 and Air (Prevention and Control of Pollution) Act, 1981 as amended

Whereas, the Board has decided to issue directions under the Water (Prevention & Control of Pollution) Act, 1974 as amended in 1988 and Air (Prevention and Control of Pollution) Act, 1981 as amended to comply with certain conditions.

Therefore, in exercise of powers conferred under section 33 A of the Water (Prevention and Control of Pollution) Act 1974, as amended and Section 31A of the Air (Prevention and Control of Pollution) Act, 1981 as amended, the Board issues the following directions to the units: 1) M/s. Coromandel International Limited - Ammonia Storage Terminal Facility, S.F.No. 247, Kathivakkam Village, Thiruvottiyur Taluk, Chennai District and 2) M/s. Coromandel International Limited, located at S.F.No. 37/B2, 38/5A, 39/B1, 39/6A, 246/2,3,4,5,6,7 & 247/1A,2A,3C,3A, Ernavoor Village, Thiruvottiyur Taluk, Chennai District so as to comply with the following and the action taken in this regard shall be furnished to the Board within two days time.

1. The unit shall suspend the operation of Ammonia offshore pipeline activity for precooling and ammonia transfer immediately and shall resume the same only after obtaining the approval of Indian Register of Shipping (IRS) and the Tamil Nadu Maritime Board.
2. The unit shall precisely identify the location and the extent of damage that happened to the offshore pipeline and rectify the same early.
3. The unit shall ensure that no ammonia leak occurs during the pipeline rectification operation.

- 4. The unit shall restart the APPS plant and other allied units only after ensuring that all the ammonia pipeline inside the plant are intact and safe and shall obtain NOC from DISH before restarting the plant.

Failure to comply with the above said directions will attract action in accordance with the provisions of the Water (Prevention and Control of Pollution) Act, 1974 as amended and Air (Prevention and Control of Pollution) Act, 1981 as amended.

The receipt of this proceeding shall be acknowledged.

[Signature]
For Chairperson
[Date]

To

- 1. The Managing Director,
M/s. COROMANDEL INTERNATIONAL LIMITED
S.F.No.37/B2,38/5A,39/B1,39/6A,246/2,3,4,5,6,7,247/(part)1A,2A,3C,3A,
Ernavoor Village, Thiruvottiyur Taluk,
Chennai District.
- 2. The Managing Director,
M/s. COROMANDEL INTERNATIONAL LIMITED - AMMONIA STORAGE
TERMINAL FACILITY,
S.F.No. 247, Kathivakkam Village,
Thiruvottiyur Taluk, Chennai District.

Copy To

- 1. The Joint Chief Environmental Engineer (Monitoring),
Tamilnadu Pollution Control Board
Chennai Region.
- 2. The District Environmental Engineer
Tamilnadu Pollution Control Board
Ambattur
For follow up action and furnish report to
Board
- 3. File

January 25, 2024

The Director of Industrial Safety & Health
T.S. No. 47/1 SIDCO Industrial Estate
Guindy, Chennai - 600032.

Dear Sir / Madam,

Ref: 1) Proceeding No. T1/TNPCB/E.0101 AMB/RL/W&A/2023 dated: 27.12.2023.
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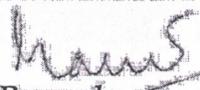
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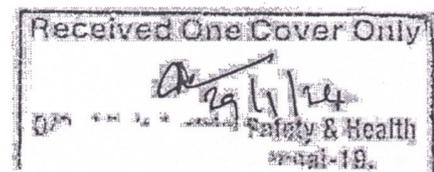
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For Coromandel International Limited


S. Ramesh

Sr. General Manager - Manufacturing & Unit Head

CC to: The Joint Director of Industrial Safety & Health, Thiruvottiyur.



January 23, 2024

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Amir Alvi

President - Head of Manufacturing & Supply Chain Management

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TAMIL NADU POLLUTION CONTROL BOARD



Proceedings No. T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated: 27.12.2023

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 - d. At Chinnakuppam village: 0 ppm 4.12 am
 - e. At Ennavurkuppam village: 0 ppm 4.15 am
 - f. At Kathivakkam Railway bridge: 0 ppm 4.17 am
 - g. At Ennore near Gulf Oil Gate: 0 ppm, 4.20 am
 - h. At Ennore bus depot: 0 ppm at 4.24 am



TAMIL NADU POLLUTION CONTROL BOARD



- The sea water sample at the point of pipe line leakage was collected at 3.49 am and the ammonia level in the sea water was found to be 49 mg/L (Marine discharge standard of 5 mg/L). At 4.30 am, mild ammonia odour was observed near the site and the Chinnakuppam & Periyakuppam villages.
- The unit has stopped the operation of APPS Plant. The unit has reduced the production of Sulphuric Acid Plant and operating the same under low capacity.
- The unit has informed that they will identify the exact location and the extent of pipeline damage within a day and will rectify the same before commencing the ammonia transfer. The unit has been instructed to carry out the above activity at war footing and to put the pipeline in operation only with the concurrence of competent authority i.e., Tamil Nadu Maritime Board.

Whereas, the JCEE(M), Chennai has recommended for the issue of certain directions under Water (Prevention & Control of Pollution) Act, 1974 as amended in 1988 and Air (Prevention and Control of Pollution) Act, 1981 as amended

Whereas, the Board has decided to issue directions under the Water (Prevention & Control of Pollution) Act, 1974 as amended in 1988 and Air (Prevention and Control of Pollution) Act, 1981 as amended to comply with certain conditions.

Therefore, in exercise of powers conferred under section 33 A of the Water (Prevention and Control of Pollution) Act 1974, as amended and Section 31A of the Air (Prevention and Control of Pollution) Act, 1981 as amended, the Board issues the following directions to the units: 1) M/s. Coromandel International Limited - Ammonia Storage Terminal Facility, S.F.No. 247, Kathivakkam Village, Thiruvottiyur Taluk, Chennai District and 2) M/s. Coromandel International Limited, located at S.F.No. 37/B2, 38/5A, 39/B1, 39/6A, 246/2,3,4,5,6,7 & 247/1A,2A,3C,3A, Ernavoor Village, Thiruvottiyur Taluk, Chennai District so as to comply with the following and the action taken in this regard shall be furnished to the Board within two days time.

1. The unit shall suspend the operation of Ammonia offshore pipeline activity for precooling and ammonia transfer immediately and shall resume the same only after obtaining the approval of Indian Register of Shipping (IRS) and the Tamil Nadu Maritime Board.
2. The unit shall precisely identify the location and the extent of damage that happened to the offshore pipeline and rectify the same early.
3. The unit shall ensure that no ammonia leak occurs during the pipeline rectification operation.

4. The unit shall restart the APPS plant and other allied units only after ensuring that all the ammonia pipeline inside the plant are intact and safe and shall obtain NOC from DISH before restarting the plant.

Failure to comply with the above said directions will attract action in accordance with the provisions of the Water (Prevention and Control of Pollution) Act, 1974 as amended and Air (Prevention and Control of Pollution) Act, 1981 as amended.

The receipt of this proceeding shall be acknowledged.

[Signature]
For Chairperson
[Date]

To

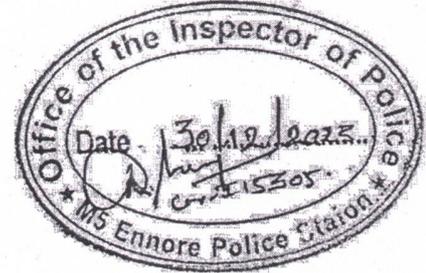
1. The Managing Director,
M/s. COROMANDEL INTERNATIONAL LIMITED
S.F No. 37/B2, 38/5A, 39/B1, 39/6A, 246/2, 3, 4, 5, 6, 7, 247/(part) 1A, 2A, 3C, 3A,
Ernavoor Village, Thiruvottiyur Taluk,
Chennai District.
2. The Managing Director,
M/s. COROMANDEL INTERNATIONAL LIMITED - AMMONIA STORAGE
TERMINAL FACILITY,
S.F.No. 247, Kathivakkam Village,
Thiruvottiyur Taluk, Chennai District

Copy To

1. The Joint Chief Environmental Engineer (Monitoring),
Tamilnadu Pollution Control Board
Chennai Region.
2. The District Environmental Engineer
Tamilnadu Pollution Control Board
Ambattur
For follow up action and furnish report to
Board
3. File

December 30, 2023

The Station House Officer,
M5, Ennore Police Station
Ennore, Chennai.



Dear Sir,

Further to the TNPCB proceedings no. T1/TNPCB/F.0101 AMB/RL/W&A/2023 dated 27.12.2023, we need access to inspect the leaked subsea Ammonia pipeline and to locate the damaged area. This is necessary to assess & finalize the scope of repair work to be carried out.

We request your kind co-operation and protection for our team from any public disturbance during this inspection activity. We assure that all related government orders and protocols will strictly be complied from our side.

Thanking you,

Yours faithfully,
For Coromandel International Limited,

Ramesh S
Unit Head & Sr. GM – Manufacturing

Copy to:

1. The Deputy Commissioner of Police, Madhavaram.
2. The Assistant Commissioner of Police, M5 Ennore.

**BEFORE THE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE BENCH AT CHENNAI**

APPLICATION No. 195 of 2023 (SZ)

Tribunal on its own motion- Suo Motu

..... Applicant

Versus

The Principal Secretary to
Government of Tamil Nadu and 10 others

.. Respondents

PAPERBOOK

*V. Prasad
Counsel For Respondent no 7*

M/S PRASAD VIJAYAKUMAR (Ms. No. 1254/1999)

VIGNESH SEKAR (Ms. No. 3281/2018)

PRANAV. R (Ms. No. 3700/2023)

No. 52 Law Chambers, High Court Buildings

Chennai- 600 104

9003271435

COUNSEL FOR RESPONDENT No. 7