



NATCO PHARMA LIMITED
Crop Health Sciences Division
Attivaram (Village), Ozili (Mandal)
SPSR Nellore (Dist.)
Andhra Pradesh, India

Safety Audit Report

Conducted on 9th July 2020



Prepared By

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4S-Safety Associates



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1. INTRODUCTION

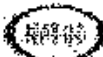
M/s. Natco Pharma was promoted by Shri. V C Nannapaneni in the year 1981 as a private company to be in the business of research, developing, manufacturing and marketing of pharmaceutical substances and finished dosage forms for Indian and International markets. The company began its operations in 1984 in Andhra Pradesh.

The company was ranked 82nd in sales among Indian pharmaceutical companies in 1994. M/s. Natco also has the credit of being one of the largest contract manufacturers in India.

Today the company, which began its operations as a single unit with 20 employees, has four manufacturing facilities and employs around 1500 people. It has an on-line data for analysis and decision making. Consistently ranked among the fastest growing pharmaceutical companies in the country, M/s. Natco is utilizing its collective experience to kick start its future plans as a global company.

■ Milestones

- Incorporated – 1981 for manufacture of pharmaceutical formulations.
- First full year in Operations – 1984 – sales Rs 0.5 million.
- Pioneered Timed Release, a delayed acting sustained release technology.
- Achieved a rare feat of introducing the largest array of timed release products based on zero order release concept of micro dialysis cell technology.
- Started Parenteral Manufacturing facility at Nagarjunasagar, India – 1986.
- Acquired Dr Karanth Pharma Chemical Labs, a small bulk drug manufacturer, now known as M/s. Natco Research Center.
- Established bulk drug and Intermediate facility at Mekaguda, India. This facility is TGA approved, and certified for its environmental management systems (ISO-14001).
- State-of-the-art manufacturing facilities – cGMP, ISO 9002 certified dosage facility.
- A wide distribution network, Indian and international.
- Merged three of the group companies with the parent, M/s. Natco Pharma Limited – 1995.
- Granted US patent for its manufacturing process of Omeprazole.



- Launched anti-cancer drug-Imatinib Mesylate 100 mg capsules under the brand name –VEENAT, Process developed in-house.
- 2010
M/s.Natco launches BENDIT (Bendamustine).
M/S. NATCO launches Anastrozole in the USA.
- 2011
M/S. NATCO and Levomed LLC, USA formed a Joint Venture company, NATCOFARMA DO BRASIL for sales and distribution in Brazil.
NATCO's new chemical entity (NCE) receives 'Orphan' designation from US FDA
- 2012.
Golden Peacock Award for Corporate Social Responsibility – 2012
M/S. NATCO Pharma receives approval for Lansoprazole capsules.

Natco Belief

Natco Trust strongly believes that a true society can be built by strong minds and committed hearts

Values of Natco

Natco strongly believe in giving back to the communities in which they function. The desire to serve under-privileged children and poor people in society is an integral part of Natco DNA.

Vision statement by Natco

To facilitate self-sustained development among the communities being served.

Natco Mission

To provide such support and service to the society which would have long standing impact on improving the lives of the individuals benefitting thereof.

Heritage timeline:

M/s. Natco Pharma Limited was incorporated in Hyderabad in the year 1981 with an initial investment of INR 3.3 million. With a modest beginning of operations as a single unit with 20 employees, M/s. Natco today has five manufacturing facilities spread across India with dedicated modern research laboratories, capabilities in New Drug Development, etc. M/s. Natco family currently consists of more than 3,200 employees, are consistently

ranked among fastest growing pharmaceutical companies in India. M/s. Natco is well recognized for its innovation in Pharmaceutical R&D.

■ The highlights of NATCO's EHS policy are:

- ▶ Comply with applicable legislations, regulations and other applicable requirements.
- ▶ Incorporating suitable techniques such as waste management, recovery of raw materials, isolating by-products and distillations of solvents to prevent pollution.
- ▶ Conserving raw materials, natural resources such as water, coal & electricity.
- ▶ Reduce the risks by identifying, assessing and controlling the hazards to prevent ill-health and injury.
- ▶ Continually improve EHS performance by setting time bound objectives and targets.
- ▶ Promote awareness of EHS requirements among the employee, contractors and visitors.
- ▶ Continually improve our environmental, health and safety performance.
- ▶ Communicated to all persons in the organization and made aware of their individual Occupational Health and Safety obligations.

Care for the Environment is one of our core corporate values and, as a part of this commitment, we enunciated our Environment, Health & Safety (EHS) Policy. Our EHS policy provides for the creation of a safe and healthy workplace and a clean environment for employees and the community. It aims for the highest international standards in plant design, equipment selection, maintenance and operations. The policy is a commitment that we will manufacture products safely and in an environmentally responsible manner. The implementation of the EHS Policy is ensured by institutionalizing a robust EHS Management System, adequately supported by a well-defined organizational structure.

■ Natco Accreditations and Awards:

- Winner of "Golden Peacock Environment Management Award" for the Year 2016.
- Winner of Marketing Excellence Award from AWACS for Hepcinat as a "New Introduction of the Year - 2016 in Acute segment.
- Winner of Marketing Excellence Award from AWACS for Gefinat as "Best Specialty Brand - 2016.



- * Best Specialty Brand-SILVER AWARD* for marketing excellence in India during 2014-15 fiscal year.
- * Winner of "Golden Peacock Innovation Management Award" for the year 2015.
- * Shreshtha Suraksha Puraskar* National Award from National Safety Council of India
- * Golden Peacock Awards - 2014 for Occupational Health and Safety.
- * Appreciation Awards for implementation of OHSAS-18001 from Director of Factories - Andhra Pradesh Chapter.
- * Appreciation for Occupational Health and Safety from "NATIONAL SAFETY COUNCIL" Awards.
- * Golden Peacock Award for Corporate Social Responsibility.
- * Best Cleaner Production Award from Andhra Pradesh Pollution Control Board (APPCB) in the year 2012, etc.

With the endeavor to improve the overall safety situation in the plant, the management of M/s. Natco Pharma Limited crop health science division has decided to conduct a Safety Audit of their upcoming plant in commissioning stage and entrusted the work to M/s 4S-Safety Associates, Hyderabad to conduct a thorough inspection and audit.

The Safety Audit has been conducted on 09.07.2020 and the relevant observations are recorded for the benefit of the organization. The critical and non-critical areas are studied. Those works which doesn't require any investment can be taken up immediately as the observations are very important and critical. The plant is under commissioning stage.

The following Officials of M/s. Natco Pharma Limited, Attivaram have been present during the Audit.

S.No	Name	Department
1	P.Sudhakar	Production
2	D.Trinadh	EHS
3	A. Amerendranath	Maintenance
4	Ch.V. Ramprasad Rao	Electrical

2. SCOPE:

The broad areas covered in the safety audit are as under.

- 2.1. Health and Safety (H&S) Management system.
- 2.2. Physical Hazards and control measures.
- 2.3. Safety in storage and handling of chemicals.
- 2.4. Fire Prevention and protection
- 2.5. Electrical safety.

3. SCHEDULE OF VISIT & STUDY:

- 3.1. Site visit made on 09.07.2020 and discussions/documents given by M/s. Natco Pharma Limited Crop health science division.
- 3.2. During field visit, different working areas are visited and sample study of safety in the proposed operations are observed.
- 3.3. During the visit, safety measures in place are discussed with Heads of the sections and Supervisory personnel.
- 3.4. Safety Management System related details are gathered.

4. SAFETY AUDIT PROTOCOL:

- 4.1. BIS 14489 protocol is relied upon in conducting and reporting safety audit.

5. OBJECTIVES:

- 5.1. Identify design deficiencies and weaknesses.
- 5.2. Examine the proposed operating/maintenance and other work practices, safety systems, fire protection facilities and control measures which might have degraded over the time.
- 5.3. Identify potential Health & Safety (H&S) hazards not covered by the existing control procedures.
- 5.4. Recommend improvements for better effectiveness of the existing procedures, systems and control measures for H&S Hazards.

- 5.6. Recommend Procedures, systems and control measures for the hazards identified.
- 5.6. Study compliance with critical statutory provisions and relevant codes of practice and recommend actions to be taken wherever there is non-compliance.

5. AUDIT TEAM COMPOSITION:

The Safety Audit was carried out by a 2 member team comprising the following members.

- a. Mr. T. Gandhi Reddy
- b. Mr. M. Chandra Sekhar

5.1. Site Inspections

During the field visit, the safety Audit team held discussions with various levels of employees. The Officers accompanied the safety audit during the field visit. The Field inspection was carried out with a view to focus on key areas of safety.

7. AUDIT METHODOLOGY

For the safety audit the following methodology is adopted:

- 6.1. Study and analyze preliminary information provided by the Management.
- 6.2. Opening Meeting with concerned head of the Site.
- 6.3. Carry out site rounds of the site.
- 6.4. Discuss with key personnel individually to know their views, suggestions or to verify the proposed systems/ procedures.
- 6.5. Study important documents and records.
- 6.6. Closing meeting with the senior personnel of plant to present important observations and recommendations.
- 6.7. Submission of the draft report to the management to correct factual errors/ discrepancies in observations. If any.
- 6.8. Submission of the final Safety Audit report to the management.

The entire audit will be focusing on understanding and assessing infrastructure, Systems and people functioning or behavior to meet the overall compliance requirements and set goals and objectives of the Site with respect to Environment, Health and safety.

The audit was carried out covering the following regulations and Standards:

- ▶ Factories Rules
- ▶ E P Act and Rules
- ▶ MSHC Rules
- ▶ Gas Cylinders Rules
- ▶ Petroleum Rules
- ▶ Hazardous Substances /Chemical Management
- ▶ Batteries Rules
- ▶ Bio-medical Rules
- ▶ Chemical management Best Practices
- ▶ Electrical Safety (IE Rules)
- ▶ Best practices in machine guarding
- ▶ IS Code of Practice 14489

This study report is based on field observations and the information provided by Management, regarding the safety in manufacturing process, process conditions and built in safety measures.

**5. SITING:**

The Plant is located with reference to surrounding area as under

Direction	Surrounding properties
East	M/S Alegro speciality chemicals Pvt Ltd.
West	Kanur Village Road
North	Forest Land
South	APIIC Road

6. METEOROLOGICAL INFORMATION:

Company is located at Latitude N 17° 4' 55.1061", Longitude E 78° 16' 55.3248"

Maximum temperature	:	42 °C
Minimum Temperature	:	15 °C
Average Rainfall	:	264 mm
Maximum Relative Humidity	:	74%
Minimum Relative Humidity	:	9%
Wind Speed	:	2-4 (Beaufort)
Floods	:	Nil

10. WORK PLACE CATALOGS:

Minimum Number of Persons Working in the site Category Wise

Shift	Staff		Contract		Total	
	M	F	M	F	M	F
A	5		7		12	
B	5		5		11	
C	5		5		11	
G	8		10		16	
Total	21		27		50	

Working hours:

- A - Shift : 06.00Hrs to 14.00Hrs
- B - Shift : 14.00Hrs to 22.00Hrs
- C - Shift : 22.00Hrs to 06.00Hrs
- General Shift : 09.00Hrs to 17.30Hrs

11. AUDIT CONDUCTED FOR THE MAJOR SECTIONS, DEPARTMENTS AND FACILITIES:

Audit conducted for the major sections, departments and facilities of the site as under:

The Plant has the following facilities viz

11.1. Security

11.2. HVD

11.3. Engineering Utility

11.4. Production Block

11.5. QA&QC

11.6. HR

11.7. ZLD Plant

11.8. Fire Hydrant System

11.9. DG Area

11.10. HT Yard

11.11. Solvent Tanks area

11.12. Warehouse

11.13. Services : Boiler, Diesel generators, Transformer yard, FHP Pump, OHC, Chilling plants, Water Plants, MCC/PCC rooms, HT Yard, Security Office.

Being a chemical process industry, the plant works round the clock. About 50 employees will be employed.

The products in the scope (2 products) are proposed to manufactured in production blocks. Steam Tray Dryers, Vacuum Dryer are used for this process

12. LIST OF PRODUCTS MAJORLY MANUFACTURED IN THIS SITE ARE:

12.1. Chloran Tranilliprole (CTP)

12.2. Thiamethoxam

Solvent storage details in the site:

S. No	Storage Tank code	Solvent	Capacity	Location	Fire protection system & Containment Dyke
1	DT A01	Acetonitrile	6 KL	Above Ground	Breather Valve & dyke wall
2	DT A02	Acetonitrile	6 KL	Above Ground	Breather Valve & dyke wall
3	ST A01	CS Lye	25 KL	Above Ground	Flame Arrestor & dyke wall
4	ST A02	Acetonitrile	25 KL	Above Ground	Flame Arrestor & dyke wall

**13. LIST OF MAJOR PRODUCTION EQUIPMENTS USED AT NATCO PHARMA:**

S. No	Equipment Name
1.	Stainless steel reactors
2.	Glass lined Reactors
3.	SS Centrifuge
4.	Tray driers
5.	Vacuum Tray drier
6.	Leaf Filter
7.	Sifter
8.	Multi mill
9.	Blender
10.	Boiler
11.	Hoist
12.	Filter press
13.	Pulveriser
14.	Air jet mill
15.	Rubber lined Centrifuge
16.	Harar lined centrifuge
17.	Chillers
18.	Single Fluid Heat Transfer System

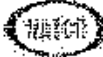
14. EXECUTIVE SUMMARY:

The Management at Natco Pharma Limited is focused on the Safety management systems and is desirous of making them the robust. The stress on fire safety is quite evident from the gate with highly visible posters and various infrastructure present the note of maturity the site has developed over the time. The security team members and other ERT members are well versed with the process of emergency preparedness and have undergone the fire prevention programs which are carried out on the Site at a regular interval. One of the major advantages of the Site is the strong EHS team lead by Mr. Srinivas Rao at corporate level and Mr. Trinadh at plant level. for the team is energetic and open minded to learn and fix the issues, when escalated to them. The house keeping of the site is creditable with majority of areas found without any spills or strong odours may in commissioning stage. Facility located at Ativaram (V), Ozili Mandal, SPSR Nellore Dist, Andhra Pradesh.

- ✦ World class manufacturing facility and having over 20% of their premises under Green Belt as a part of commitment to Environment, Health and Safety which is one of their core corporate values.
- ✦ The facility has individual block for production, ware house, utility, DG set, power house, boiler house, etc..
- ✦ While the Site EHS team has a few programs encompassing emergency preparedness, new employees trainings. It is recommended to implement programs involving employees in various safety activities like taking lead in carrying out PPE compliance audits in the laboratories, labelling and storage compliance on the Site by some of the lab managers or heads, electrical safety in solvent usage areas, integrity check validation for the reactors and pipelines, training effectiveness validation through on-job verification before commence operations. While the Safety has significance visibility, it should not be limited to emergency services but need to become part of the culture for the Site.
- ✦ Earthing continuity provision with alarm system to be provided to ensure equipment continuity all the time.

- ⊕ Ensure that the all tanks / reactors are provided with blow leg/sprout arrangement, or else material falls under free fall directly into the tanks and poses a potential risk of fire hazard due to static electricity. It is suggested to provide blow leg / sprout arrangement. Sprout arrangement should have marking on the top in ensuring proper installation for easy identification.
- ⊕ Recommended to maintain safe distance between solvent storage day tanks and scrap yard.
- ⊕ Material charging sequence to be reviewed in production block in closed system. Ensure the continuity of the same.
- ⊕ It is also recommended to carry out awareness sessions on critical aspects of EHS, like regulatory requirements, chemical safety, fire fighting, job hazard analysis overview, unsafe conditions and acts, accident reporting and investigation, industrial hygiene, contractor health and safety. Site requires looking in to the compliance for petroforum rules for storing solvents before commencing operations.
- ⊕ Safety basic induction training to be strengthen to the new entrant on how to work safely, including arrangements for first aid, fire and evacuation Safety induction training format to be devolved with required topics.
- ⊕ A PPE assessment matrix for the activities needs to be developed and posted for every area to indicate right PPE for an activity. PPE compliance to be enforced across the site for promoting safety culture.
- ⊕ It is highly recommended to install fire suppression system (preferably modular fire extinguishers) and smoke/heat detection system in all electrical control panel room areas.
- ⊕ Ensure the installation of flame arrestors on vents to prevent ignition sources travel through the vents into the vessel exploding the same.

- ✦ Dyke wall to be provided around the solvent storage tanks.
- ✦ Ensure all GLRs in use have Tantalum Plug arrangement to prevent accumulation of static charge.
- ✦ Fire retardant suits to be provided in all production blocks to wear during charging of raw materials in to the reactors.
- ✦ Low RPM motors with bronze impeller are to be provided in centrifugal pumps to transfer the flammable solvents from storage tanks to day tanks.
- ✦ High level and Low level temperature alarm system to be provided on for reactor where the critical reactions are processed with Single Fluid Heat Transfer System venting should be taken to safe area.
- ✦ It is recommended to provide safety relief valve and Rupture disks for reactors on all reactors and rupture disk vent should be connected with dump tank.
- ✦ Ensure that all doors installed in production blocks and RM stores are fire rated. If not replace the same with fire rated doors.
- ✦ Colour coding work in progress for solvent transfer lines. Colour coding to be given for solvent transfer lines as per the colour coding chart which displayed in production block.
- ✦ The use of plastic containers for solvent is NOT a recommended practice. Presently plastic containers are used in production blocks for handling solvents.
- ✦ Ensure that dual safety protection provided on the reactors (Safety pressure relief valve and Rupture disk) is provided on all reactors and those are calibrated time to time. If not provided, to be provided the same (during the site visit some reactors does not have SRV and Rupture disk).
- ✦ High temperature alarm to be provided for hot oil system (SFHTSH-907). During the site visit nuisance smell persists in this area, venting should be taken to safe area.



- ⊕ It is recommended to ensure implement the PTW system.
- ⊕ Earth continuity to be ensured where flammable solvents are pumped. Jumpers are missing between the flanges and flanges of the flow glass. It is recommended to conduct a review on this and provide the same. This applies to all flow glasses in the plant area that contain solvent.
- ⊕ Ensure that all receivers and condensers are earthed. It is extremely important to prevent charge build up in these vessels by providing the earthings Leaf filters stand on plastic wheels which need to be body earthed.
- ⊕ Pool proof design to be made, to avoid accidental closing of fire hydrant system isolation valves on water supply line.
- ⊕ Over fill protection for solvent and acid day tanks to be ensured.
- ⊕ Safety audit to be conducted after the commencement of operations.

This report consists of completed IS 14489:1998 checklist (annexure-1), detailed report with various focus areas (Chemical Management, Training, Contractor Health and Safety, Emergency Preparedness, Electrical Safety, New Process Introduction, R&D and few others) which require improvement and site visit observations with recommendations which could have helped the overall audit process.

15. SAFETY MANAGEMENT SYSTEM:

15.1. SHE Policy

- ▶ SHE Policy is declared and is issued under the signature of Chairman.
- ▶ SHE policy is displayed at various locations in English and local language.
- ▶ There is a procedure for review of SHE Policy on need based.

15.2. Safety Organization

- ▶ Head EHS is the Head of Safety Organisation.
- ▶ Roles and Responsibilities of SHE Personnel are defined in EHSMS manual.
- ▶ It is recommended to compare the responsibilities given under Factories Act and Rules and any gaps need to be augmented.

15.3. Employee Placement and Selection

- ▶ It is recommended to consider safety as one of key parameters in employee Evaluation.

15.4. Safety motivation and Promotion

- ▶ Audit score based encouragement to be initiated to build up safety culture.
- ▶ Violation Token system can be adopted as a deterrent.
- ▶ Safety motivational programmes to be initiated.
- ▶ Safety Related KRAs (Key Result Areas) are to be set and implemented.

15.5. Work Place Monitoring

- ▶ Noise Levels, Illumination levels are to be monitored in production block and other vulnerable places before commencing operations.

15.6. Work Permit

- ▶ Work permit system is in place for hot work, confined space, work at height and excavation works. However these needs to be reviewed.
- ▶ Work permit system to be implemented for Tanker loading and unloading permit to be strengthened (Check list containing the details of vehicle, driver and integrity

of the tank etc. to be prepared and implemented to check the tankers at security gate i.e., before allowing inside the factory).

- ▶ Ensure that the Earth interlock is connected with pump, so that pump will be automatically shut down if earthing fails.

15.7. Machine Guarding

- ▶ In general, machine guarding compliance is satisfactory.
- ▶ Either Indian Standard or Relevant ISO are to be followed in respect of colour code for machine guards.
- ▶ Replacement of guard after maintenance is to be made mandatory in the internal procedures.
- ▶ It is recommended to provide a guarding check list for all equipments.

15.8. Material Handling

- ▶ Material lift found in the ware house and production block. It is to be ensured that such CPBs are inspected / tested in all aspects (sling, hook etc) are only used. To this effect, procedural arrangement is to be made.
- ▶ Hoists are identified in the site. It is to be ensured that testing and inspection certificates are available in addition to procedural support.
- ▶ Warning signs and SWL (safe working load) to be posted on hoist and Fork lift.
- ▶ Chemical Pipeline flanges are to be provided with flange guards

15.9. Static Electricity Control

- ▶ Ensure that the all tanks / reactors are provided with blow leg/sprout arrangement, or else material falls under free fall directly into the tanks and poses a potential risk of fire hazard due to static electricity. It is suggested to provide blow leg / sprout arrangement. Sprout arrangement should have marking on the top in ensuring proper installation for easy identification. During the site visit observed that some of the tanks / reactors do not have dip legs in them.
- ▶ Awareness of Hazards is given to employees and need to improve
- ▶ On the field, plastic buckets, mugs etc are to be avoided by special review.



- ▶ Where required, in case of powders, static charge relaxation time is to be considered and implemented (for example, after filtration or separation, drying, milling etc).
- ▶ Ensure earth continuity with jumpers at flanges of the flow glass. This applies to all flow glasses in the plant area that contain solvent.
- ▶ It is recommended to ensure all receivers and condensers are earthed. It is extremely important to prevent charge build up in these vessels by providing the earthlings. Leaf filters stand on plastic wheels which need to be body earthed.

15.10. Hazard Communication

- ▶ Hazard communication is essential part of safety awareness and acts as foundation. Material Safety Data Sheet (MSDS) is the key aspect of this. The plant has no systematic collection and training of personnel based on MSDS. The Plant Personnel lack appreciation about hazardous property of the chemicals used. Therefore it is essential to conduct periodical training (classes) for the supervisors and operators in local language.
- ▶ Another aspect of hazard communication is proper labeling. During inspection it was found several barrels with no labels or wrong labels attached to them. This shortcoming should be rectified. Such failures can result in wrong usage and dispatch of material. This can lead to major accident.
- ▶ Compatibility chart is to be prepared and displayed in ware house and production area. However need to establish a chemical compatibility for the chemicals which is stored and processed in the plant and ware house areas.

15.11. Electrical Safety

- ▶ Ensure that the all Employees operating electrical installation are qualified and experienced.
- ▶ High voltage gloves are available. However, shelf life of gloves is to be ensured.
- ▶ Arc Flash Protection is to be provided
- ▶ Earth Pit inspection and testing, lightning protection system inspection are carried out and records are maintained and displayed. Resistance value and due inspection details on the earth pit itself.
- ▶ Integrity could be reviewed near electrical joints.

- It is highly recommended to install fire suppression system (preferably modular fire extinguishers) in all electrical control panel rooms.

15.12. Hazardous Area Classification

- Hazardous Area Classification is followed but it needs to be recorded on a plant layout and record is maintained.
- Whenever changes in the classification are made, such changes are to be incorporated.
- However, few locations, where the management is not compatible and recommendations related to such situations are covered and included in field visit related recommendations and are to be complied.

15.13. Medical Examination

- Ensure all employees, pre employment medical examination is carried out.
- Further, every year, periodical medical examination is carried out.
- Ensure availability of ambulance services all the time.
- Ensure, Antidotes for critical chemicals are maintained and readily available in OHC all the time recommended to maintain anti-snake venom in the site.

16. PROCESS SAFETY MANAGEMENT ELEMENTS

15.1. Duties of workers

- 15.1.1. The following important duties of workers and be brought to their knowledge through display and information:
- 15.1.2. Worker are not permitted to make safety device or appliance or any guarding or fencing arrangement, inoperative or defective and is obligatory to report the defective condition of the aforesaid arrangements as soon as he is aware of any such defect. Workers are to report any mal-function or defect immediately to the supervisor or any responsible person of the management.
- 15.1.3. All workers to co-operate in all respects with the management while carrying out any work or any emergency duty assigned to them towards the safety of the workers and plant facilities.



15.1.4. The workers will not refuse undergoing medical examination as statutorily required.

15.2. Job Safety Analysis

- ▶ For New activities, Job Safety Analysis is to be carried out.
- ▶ It is recommended to identify existing critical activities and take up job safety analysis.

15.3. Training – Identification, implementation, effectiveness evaluation

- ▶ The Site needs a specific chemical safety training program which needs to be implemented after commencement of operations.
- ▶ The training program needs a method of evaluating the effectiveness of trainings carried out which needs to be implemented.
- ▶ The training modules are stand-alone and there is a need to make sure the incidents on the Site find a place in the training modules when the modules are reviewed after a periodicity.
- ▶ Site has ensure refresher program for firefighting techniques and emergency handling. Some of the programs like chemical safety require periodic refresher courses to ensure relevant and updated information is given to employees.
- ▶ Site needs to establish a focused PPE& First Aid training program for the employees.

15.4. Hazard Assessment of New Equipment

- ▶ New Equipment Safety Assessment is to be carried out and recorded by a team of User Department, Maintenance Department and Safety Department.

15.5. Plant safety Inspection / Safety Audit

- ▶ Plant is yet to prepared safety audit checklist depending upon the plant equipment, hazards, operations and operating parameters, checklist is to be provided and used. Ensure before commencement of operations.
- ▶ Equipment-wise safety checklist (Reactor, Dryer, centrifuge, Dryer systems, etc), inertisation checklist, static charge control checklist, fire safety checklist, work place environment control, standby power etc are to be checked.



- * Similarly, warehouse safety checklist is to be prepared covering storing procedures, sampling procedures, spill controls, fire protection arrangements including detection and foam etc are to be checked.
- * Nitrogen as inertisation medium, quality is to be checked in addition to calibration of such measuring instruments.

15.6. Plant Condition Monitoring

- * Plant, equipment and machinery used in process is to be periodically tested before taking up process operations depending upon the criticality but not later than 2 years. For this, it is recommended to layout a schedule for each equipment or plant and follow the same. Safe Test Procedures are to be laid out. Records of testing and examination are to be maintained.

16.7. Fire Protection System

- * Fire hydrant system available with following capacities

Pumping Capacities				
Pump specifications	Pumping Capacity	HP	Head	Suction.
Jockey Pump.	15 m ³ /hr	10	70 m	Positive
Main Fire Pump (Electric driven)	171 m ³ /hr	75.75	70 m	Positive
Stand by Fire Pump (Diesel Engine Drive Pump)	171 m ³ /hr	69.1 kw	80 m	Positive

Water storage Capacity	:	400 KL
Fire Hydrant points	:	28 Nos
Fire Hose Box	:	5 Nos
Water & Foam monitors	:	4Nos (yet to install)
Fire Brigade Inlet	:	02 nos
AFFF Foam Quantity	:	400 lit
Foam guns	:	04 Nos
Hose Reel Drums	:	04 Nos

- ▶ Ensure all Solvent storage area including diesel storage covered with sprinkler system.
- ▶ Do not use water on pyrophoric chemicals near hazardous material storage area, special fire precautions to be taken near pyrophoric materials storage area in ware house.
- ▶ Fire hydrant System checks are conducting on daily basis.
- ▶ Around 60 number of fire extinguishers (different classes) are available in the site.

15.8. Emergency Preparedness and Response

- ▶ Emergency Response Plan is under preparation.
- ▶ Emergency Siren for communication is provided.
- ▶ Fire alarm system provided with MCP provisions around the plant and public addressing system is in good working condition at the time of audit.
- ▶ Mock drill schedule is yet to be conducted. It is recommended to prepare a action plan for the observation noted during Mock drill.

15.9. Safety committee

- ▶ Safety committee is consisted of contract, employees and management representative;

Ensure the following functions and duties are fulfilled by the safety committee once in 3 months:

- a) Assisting and co-operating with the management in achieving the aims and objectives outlined in the 'Health and Safety Policy' of the occupier.
- b) Dealing with all matters concerning health, safety and environment and to arrive at practicable solutions to problems encountered.
- c) Creating safety awareness amongst all workers.
- d) Undertaking educational, training and promotional activities;
- e) discussing reports on safety, environmental and occupational health surveys, safety audits, risk assessment, emergency and disaster management plans and implementation of the recommendations made in the reports.
- f) Carrying out health and safety surveys and identify causes of accidents;
- g) Looking into any complaint made on the likelihood of an imminent danger to the safety and health of the workers and suggest corrective measures; and
- h) Reviewing the implementation of the recommendations made by it.

17. CHEMICAL MANAGEMENT PROGRAM:

Finding	Closure required	Prioritization
The Site has to ensure clear chemical list that can at a glance give the quantification of hazardous chemicals being used on the Site.	The Site needs to ensure such a list which is approved by Plant Manager and is available at the gate for usage in case of emergencies.	Medium
Site has to focus on chemical safety training program before and after commencement of operations	The Site needs to implement a focused chemical safety training to make employees aware of the hazards. This is to make sure all users of chemicals are provided with adequate awareness on the kind of chemicals being used and the related hazards, understanding of MSDS and handling safety.	High
In the warehouse storage, observed liquids stored along with solid raw materials.	A risk review needs to be carried out for the compatibility, storage requirement compliance, current capacity to handle fire and adequacy of suppression systems	High
Site has not carried out PPE assessment for the activities before commencement of operations.	Develop a PPE assessment based on various activities and the same needs to be enforced. Many places, chemicals were being handled without adequate hand protection	High

Some of the Best Practices for Material Storage and Handling

- * Stacking of materials must never be against the wall and should be well with in 3 meters height. At least 1.5 meters around the stacking must be kept clear for movement and inspection on regular basis.
- * Yellow line discipline to be adhered where ever applicable.
- * Ensure adequate firefighting equipment is available in the area.
- * Adequate Firefighting equipment's and water Hydrant system with Monitor to be installed.

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- ▶ Yellow line discipline to be adhered where ever applicable.
- ▶ Ensure adequate firefighting equipment is available in the area.
- ▶ Adequate Firefighting equipment's and water Hydrant system with Monitor to be installed.
- ▶ To maintain clean environment in the storage area and to avoid Oil/Liquid spillage.
- ▶ Authorized Operator only to handle Fork Lift trucks, to follow instructions as per Equipment manual
- ▶ No one is permitted to sit on the forklift truck other than the truck operator. To drive at safe speed with caution.
- ▶ Do not leave the Fork Lift Truck with engine on and do not load such that visibility is restricted.
- ▶ Ensure proper Anchoring of the Load on Vehicles.
- ▶ Avoid using Fork Lift truck wherever trolley can be used.
- ▶ Use proper lifting tackles and associated tools and equipment such as Hoist, Chain Pulley blocks, Jacks etc., for handling heavy loads.
- ▶ Avoid swinging of Hoist chain with or without load and movement of personnel below the overhead load being carried.

DON'TS

- ▶ Do not carry load without properly balancing it.
- ▶ Don't carry load over persons and machines.
- ▶ Don't allow load to remain suspended.
- ▶ Don't overload the equipment beyond its capacity.
- ▶ Don't allow more than one person to give signals.
- ▶ Don't use the equipment for pulling the load.
- ▶ Don't create jerk while transferring the load.
- ▶ Don't ride on the load.

18. ACCIDENT REPORTING AND INVESTIGATION:

Finding	Closure required	Prioritization
The Site has to ensure formal record of accidents and incident trend analysis.	Site needs to maintain the record of complete accidents and incidents and prepare a trend analysis based on which the training programs need to be rolled out.	High
The Site has to established mechanism to capture work related accidents / incidents/ illnesses.	Site needs to explore the options to communication for effective capturing of incidents.	Medium
Site has to carried out any exposure studies for people working with chemicals after the commencement of operations	Site needs to carry out a preliminary assessment of exposure studies to understand the effectiveness of engineering, administrative and PPE controls in the areas of chemical usage for establishing a base record.	High

19. ELECTRICAL SAFETY PROGRAM:

- ❖ The Site needs to develop a robust electrical safety program for ensuring safety with all electrical installations and for promoting safe work culture in electrical areas.
- ❖ Tapping through bus-bar is a dangerous operation and need to be discouraged.
- ❖ Continuity through bonding to be checked on a continuous basis.
- ❖ A diagram indicating all earth pits need to be prepared and the same to be maintained in healthy conditions. The earth pits need to be labeled and a sticker to be posted on the date of last inspection.
- ❖ Transformers and other such critical equipment to be covered with a scheduled maintenance charts to ensure healthiness.
- ❖ Site Management need to ensure compliance to IE rules with regard to people working in DG area as they require licenses to work on the electrical installations.

DO'S

- ▶ Only qualified & experienced persons should be allowed to undertake electrical works.
- ▶ Treat all circuits as live unless ensured dead by testing.
- ▶ Ensure extension cords are free from cuts, damaged insulations, kinks or joints.
- ▶ Ensure that pins of the socket/plug are not loose.
- ▶ Ensure easy access to put off the power supply.
- ▶ While using any portable electrical equipment, ensure that it is properly earthed, no leakage of current through the body of the equipment.
- ▶ Report all electrical hazards to the competent person.
- ▶ In case of short-circuit or fire, put off main switches immediately.
- ▶ CO₂ / DCP are the extinguishing mediums in case of fire.
- ▶ Place rubber mats in front of the distribution boards.
- ▶ Use protection such as rubber gloves, shoes and insulated tools while working with electricity.
- ▶ Remove the fuse cutouts and keep them in self-custody while undertaking repairs.
- ▶ Label the feeders.
- ▶ Use switches which clearly indicate "ON"/ "OFF" and are of appropriate amperage.
- ▶ Use work permit in areas of flammable atmosphere.
- ▶ Know First-Aid procedures.

- ▶ Remember, AC is more dangerous than DC.
- ▶ Do not meddle with the Interlocks with regular inspection of cords and related tools.
- ▶ Avoid temporary connections. Use Standard Materials for complete protection. Ensure safety by personal observation and not by other persons report.
- ▶ Cable ducts and trenches to be covered with proper covers and regularly leantred.
- ▶ All switches on phase wire and not on neutral wire.

Don'ts

- ▶ Don't tamper with settings of Earth Leakage Circuit Breakers.
- ▶ Don't have any unsafe temporary connections, naked joints/wirings.
- ▶ Don't work wet, on electrical equipment
- ▶ Don't just operate any switch unless you know the repercussions.
- ▶ Don't overload an electrical point.
- ▶ Don't use water for extinguishing electrical fire. Use dry sand, CO2, or DCP extinguishers.
- ▶ Don't take short-cuts in tapping electric current.
- ▶ Don't store any material near the electrical mains/switch-boards.
- ▶ Don't work on live circuits, even when the job is very small.

20. FIELD VISIT OBSERVATIONS AND RECOMMENDATIONS FOR ENHANCING SAFETY:**20.1. Field Visit, Observations and Recommendations for Enhancing Safety-fire hydrant pump house and safety room:**

- 20.1.1. Modular fire extinguishers to be installed in Fire hydrant electrical panel room.
- 20.1.2. Housekeeping need to be improved rear side of the electrical panel.
- 20.1.3. Hand railing is provided, potable water storage tank to prevent accidental fall.
- 20.1.4. Float valve to be arranged to measure water level in storage tank for easy monitoring.
- 20.1.5. Water level in the fire hydrant water sump and diesel level to be measured and recorded in fire hydrant log book.
- 20.1.6. Smoke detection system to be provided in safety office above and below after completing false ceiling work.
- 20.1.7. The electrical panels rooms needs attention as the panels are placed closely and back-side of the panels is used to dump material. The rubber mats placed are also worn out and not adequate need replacement with sufficient quantity.
- 20.1.8. Metal braided hose to be used for handling of LPG for gas cutting to prevent accidental cuts from sharp edges and protection from hot slag.

20.2. Field Visit, Observations and Recommendations for Enhancing Safety-Power House.

1010 KVA X 1 No of DG sets installed in ground floor of this area.

- 20.2.1. Ensure Earthing and bonding are adequately provided for all diesel day tanks.
- 20.2.2. Fire suppression system (preferably modular fire extinguishers) to be provided in all electrical panel room.
- 20.2.3. Identification markings to be given rear side of the electrical panel as given in front side to avoid human errors during maintenance operations.
- 20.2.4. Safety signage's like "Entry restricted" "Authorized persons only" to be displayed at all electrical panel areas.
- 20.2.5. Ensure that the all Employees operating electrical installation are qualified, experienced and certified holders.

- 20.2.5. Non conductive shoes must be worn by the employees who are working near electrical panels.
- 20.2.7. Emergency lights to be identified and to be marked
- 20.2.8. Sand buckets provided with sufficient quantity of sand.
- 20.2.9. Rubber mats to be provided rear side of all electrical panels.
- 20.2.10. Emergency lights to be identified and to be marked
- 20.2.11. Organization may use the checklist to maintain the panel boards in good and safe working condition attached at annexure-2.

20.3. Field Visit, Observations and Recommendations: MEE

Its under commissioning stage

- 20.3.1. Fire suppression system (preferably modular fire extinguishers) to be provided in MEE electrical panel room.
- 20.3.2. Identification markings to be given rear side of the electrical panel as given in front side to avoid human errors during maintenance operations.

20.4. Field visit observations and recommendations: Tank Farm area & Ware House .

Tank farm area: (2 Tanks)

- 20.4.1. Dispensing procedure is in place.
- 20.4.2. Explosive license details along with validity date displayed at the entrance.
- 20.4.3. Suitable anchoring point needs to be provided on the top of the road-solvent tanker unloading bay for anchoring safety harness during sampling time.
- 20.4.4. Ensure that, all the transfer pumps are provided with catch trays for collection of leaks through glands.
- 20.4.5. Plastic bucket and mug should not be used for transferring of solvents. Site has to take policy on it.
- 20.4.6. NFPA Labeling to be adopted for easy identification of the nature of the hazardous materials. These color codes help emergency responders know about potential health, fire, and chemical instability issues.
- 20.4.7. Flame proof electrical fixtures integrity needs to be tested as observed during the visit some of them have missing screws which defeats the purpose of having flame proof electrical fittings.

- 20.4.8. Security checks need to be incorporated in the tanker unloading procedure.
- 20.4.9. RM-store does not have smoke detection system. It is recommended to provide suitable smoke detection system (reflected beam photoelectric detectors may be considered)
- 20.4.10. Emergency lighting arrangements to be done in cold room.
- 20.4.11. General chemical compatibility chart displayed in the RM stores needs to be displayed for the chemicals stored.
- 20.4.12. PPE Matrix to be prepared and displayed in RM stores and The PPE enforcement to be strictly done.
- 20.4.13. Manual handling instructions to be posted in prominent places as ready reference and to avoid ergonomical hazards.
- 20.4.14. Ensure no obstruction to reach emergency exit and emergency exit should be open to outside.
- 20.4.15. Fire retardant suit to be provided at material dispensing area.

Engineering stores:

- 20.4.16. Storage cabinet loading to be distributed from bottom to top in descending weight order (Maximum load at bottom and Minimum load at top) to prevent fall of the cabinet. This safety norm applies for all such storage cabinets.
- 20.4.17. Manual handling and ergonomic hazards to be posted.

20.5. Field Visit, Observations and Recommendations in OHC Center & canteen

OHC:

- 20.5.1. Occupational center available near security facility with adequate equipments.
- 20.5.2. Need to be equipped with Ambulance.
- 20.5.3. Ensure that, antidote kits are readily available with OHC center all the time.
- 20.5.4. Tracking mechanism to be adopted in OHC center to find out occupation related problems.

Canteen:

- 20.5.5. Exhaust fans mesh guard to be cleaned.

20.6. Field Visit, Observations and Recommendations: Production Block

- 20.6.1. Bund walls to be constructed for all storage tanks and receivers adjacent to the Production block.
- 20.6.2. Fume/Dust extraction system is provided, where ever open charging is taking place.
- 20.6.3. Inertisation procedure to be prepared, validated and displayed in the plant to make aware of and as ready reference.
- 20.6.4. The Site needs to implement a focused chemical safety training to make employees aware of the hazards this is to make sure all users of chemicals are provided with adequate awareness on the kind of chemicals being used and the related hazards, understanding of MSDS and handling safety, operation of fire extinguishers, etc.
- 20.6.5. For all reactors, ensure Nitrogen is fed through flow meter arrangement.
- 20.6.6. All chemical containers (plastic containers, barrels etc) should have labeling which shows the name of the contents and NFPA rating. Observed some of the carboys does not have any label.
- 20.6.7. Material charging sequence to be reviewed as the existing system of solvent charging and then charging of solid raw materials in solvent containing reactor through manhole having potential fire hazard of flash fire. Charging sequence to be changed to solid first and then solvent to overcome. It has to be reviewed. It can be done most of the cases by providing flush bottom valves to the reactors.
- 20.6.8. Variable Frequency Drive (VFD) to be provided to all the centrifuges and ensure that Lid and motor interlocking system is in good working condition.
- 20.6.9. Ensure that the all tanks / reactors are provided with dip legs, or else material falls under free fall directly into the tanks. This poses a risk of hazard due to static electricity. It is suggested to provide a marking to ensure that the blow leg is properly installed after maintenance activity.
- 20.6.10. Earthing continuity provision with alarm system to be provided to ensure equipment continuity all the time.

- 20.6.11. Flange to flange bonding missed at some of the equipments and reactor bottom valves. Continuity through bonding to be checked on a continuous basis.
- 20.6.12. Ensure that all reactors equipped with Rupture disk and SRVs, it is recommended to provided rupture disk as a secondary safety measure to prevent explosion due to pressure build up.
- 20.6.13. Colour coding to be given for the solvent transfer lines as per the organization designed colour codes.
- 20.6.14. Wall clocks in the plant are non-flame proof at the present moment. They should be changed to flame proof as they are potential sources of ignition.
- 20.6.15. Emergency lights to be identified and marked. If no emergency lighting, need to be provided.
- 20.6.16. Ensure that all solvent lines are having blow leg. Ensure that the all tanks / reactors are provided with blow leg/sprout arrangement, or else material falls under free fall directly into the tanks and poses a potential risk of fire hazard due to static electricity. It is suggested to provide blow leg / sprout arrangement. Sprout arrangement should have marking on the top in ensuring proper installation for easy identification.
- 20.6.17. Person working on hoist without follow the LOTO, PTW system to be strictly implemented to prevent accidents.
- 20.6.18. Thionyl chloride is used in the plant. Scrubbing system in place and keep scrubbing system in operation after commencement of operations.
- 20.6.19. Reactor condenser vents are presently located inside the building. Vents should be strictly located outside the building.

21. USEFUL INFORMATION TO THE ORGANISATION:

21.1. Following check points needs to be ensured before storing in bulk storage tanks.

1. General cleanliness: Housekeeping in the storage premises
2. Condition of roof & shell plates: deterioration of paint, presence of rusty spots
3. Condition of Hand railings, platforms and treads of the staircase, weathering of paint, rusting and leakages.
4. Condition of foundation: damage, cracks developed, vegetation growth etc.
5. Leakage or seepage: from circumferential joint of the tank bottom, with shell plates, roof shell plate etc
6. P&V valves, free vents condition.
7. Leakage from valve glands, expansion joints, pipelines, pumps etc.
8. Signs of external corrosion on inlet/outlet pipes.
9. Condition of insulation of the insulated tanks.
10. Condition of tank nozzles and pipe connections
11. Tank earthing and bonding
12. Condition of level indicator, pressure gauge, safety valve, breather vents, flame arrestor, if any.
13. Alarms, trips, if any
14. Condition of cooling/ sprinkler system, if any
15. Testing and inspection of tank and pipelines: hydraulic test, thickness test, safety valve test, if any
16. Static discharge continuity tests and earth pit resistance
17. Provision of flange guards, bonding to flange joints, coupling guards, if any.
18. Condition of dyke wall, drain pits, drain valves, etc.
19. Display of signboards: License board indicating License No., License Capacity & validity at main entrance of premises. Labels on tank indicating chemical name and capacity of tank, boards furnishing the information of date of pressure test and next due date, test pressure, design pressure, working pressure.
20. General condition of fire fighting appliances.

21.2. Some of the following safety recommendations can be strictly followed during plant operations

21.2.1. Chemical Storage

1. Ensure all the containers have been identified properly.
2. Remove leaking and bulged containers from the storage.
3. Ensure the availability of spill control material in sufficient quantity nearby.
4. Do not store Organic acids with Inorganic ones.
5. Ensure water reactive materials are stored away from water, moisture and chemicals having water as ingredient.
6. Use siphon pumps while dispensing liquids.
7. Do not store different chemicals on the same pallet.
8. Keep ready necessary protective gear nearby.
9. Do not obstruct the electrical switches by storing chemicals right below it.
10. Do not store containers one above the other.
11. All highly reactive chemicals should be stored on the bottom most rack of the storage.

21.2.2. Solvent Yard

1. Ensure all the tanks are indicated properly with respect to content, quantity and tank code.
2. Ensure all the electrical fittings are of Flame proof type and are in good condition.
3. Ensure all the tanks are provided with flame arrestors at the vents.
4. Ensure area is free of vegetation.
5. Ensure the "No smoking" board has been displayed at the gate.
6. All the lines carrying solvents should be ensured for continuity by installing jumpers at the flanges.
7. All the manholes of the tanks should be secured tightly before closing the stores.
8. While taking the dips do not release the dip rod freely to hit the bottom.

9. No caution / under maintenance/ lockout tags shall be removed by persons other than the signed.
10. Ordinary torches, lights are not permitted in chemical/ Solvents storages and chemical plants. Use only flame proof type.
11. While unloading the tankers follow strictly the checklist in the Tankers loading and unloading permit.
12. All the transfer pumps should be provided with catch trays for collection of leaks through glands.
13. Ensure fencing is in good condition.

21.2.3. Unloading solvent tanker into over ground tank:

- After getting approved analytical report from the QCD, TANKER SHALL BE WEIGHED
- Note the gross weight of the tanker and take the solvent tanker near to the storage tank.
- Check as per solvent unloading check list.
- Connect the solvent tanker to the solvent lifting pump through a conductive hose.
- Connect the earthing clip to the metal portion of the tanker.
- Measures the solvent present in the over ground tank.
- Opens the valve of solvent tanker.
- Switch on the pump. Observe for any leaks. If observed arrest it
- Ensures that the unloading is complete.
- Stop the pump and removes the dedicated hose pipe connected to the solvent tanker and solvent lifting pump.
- Remove the earthing clip from the metal portion of the tanker.
- Measures the volume of the solvent in the over ground tank.
- Take the empty tanker r weight and note down the empty weight.

SAFETY PRECAUTIONS:

- Ensure proper earthing to road tanker/storage tank and storage tank/drums.
- Transfer pump must be earthed.



- Specific Personnel Protective equipment like shoes, goggles/face shield, gloves and apron must be used.

Instruction to drivers

- Ensure vehicle speed should not exceed 16 KMPH
- If anything DEVIATION occurs in route should inform over phone to the management without any delay.
- As soon as he reaches the Supplier's Place he should call the Management over Phone.
- He should watches very carefully while the Tanker gets loaded and unloaded.

21.3. UNIT OPERATIONS

21.3.1. Handling of reactor

1. Ensure Earthing to the body of all equipments and earth continuity to be ensured.
2. Ensure usage of Non sparking tools where solvents are handled.
3. Ensure the function of Alarm system provided to alert when ever temperature and pressure parameters cross the limits.
4. Ensure dip-pipe provision for charging of solvents to avoid generation of static charge. Check the condition of the dip pipe before every use.
5. Ensure flame arrester provision in the vent line.
6. Ensure wall thickness and pressure testing should be conducted, as per statutory requirement by the competent authority.
7. Ensure Exhaust system in place in the rooms of process to avoid spreading of vapours/fumes.
8. Ensure provision of day tanks to measure solvents before charging in to the reactors.
9. Ensure safety valves provision on all the reactors.
10. Preventive maintenance schedules should be followed to avoid untoward incidents.
11. Ensure Herm city test done to prevent leakages.
12. Ensure display of SOPs near the work place.

13. Ensure the mechanical seals kept always cool
 14. Prevent manual feeding to the reactors and plan to charge mechanically or gravity charging is ideal.
 15. Slowly heat the contents by using steam.
 16. Ensure Slow cooling the heating of batches.
 17. Ensure Charging of raw materials should be slow, so that temperature pressure and vapours during reaction should not raise.
 18. Ensure vigilance on parameters and note in the batch sheet
 19. Ensure the following safety appliances in the work place where hazardous chemicals area handled.
 - Eye washes cum drench shower.
 - Air line mask
 - Goggles
 - Rubber gloves
 - Apron
 - Overalls
 - Shoes
 - Face shields
- Ensure the availability of the following type of fire fighting equipments
- Water point
 - Foam
 - Co2
 - Dry chemical powder
20. Ensure no wobbling of the anchor of the reactor.
 21. Ensure no loose electrical wiring around the reactor.
 22. Ensure maintaining of Good Housekeeping all around the shop floors.
 23. Ensure no stock storage of raw materials around the reactors
 24. Washing of the reactor at every stage should be ensured and sample to be taken for any residue. In certain instances there are possibilities of accidents, if residue is left. Please avoid such situations.
 25. Ensure PRV on steam line function. If found any deviation immediately take appropriate steps to rectify.

26. Ensure Scrubber function is good while in process.
27. Ensure Rupture disk with dump tank at isolate place should be provided, if there is a runaway reaction.
28. There is a danger, if stirrer gets stopped, RT, chilled water and brine system fails to the reactor. In such cases, DG set should be started within few seconds to avoid any eventually.
29. Ensure function of Emergency lights in case of power failure.
30. Ensure no Raw materials should stacked around the reactor to avoid hindrance during emergency
31. Watch the gland cooling
32. Ensure all operators are trained; Trained operating personnel only should operate the reactor.
33. Ensure Painting done to avoid corrosion
34. Ensure Insulation done to avoid heat dispersion
35. Ensure / Design gap between two reactors should be more to avoid congestion.
36. Ensure Service lines placed at appropriate heights so as head may not hit the lines.

21.3.2. FILTRATIONS

21.3.2.1. Centrifuge:

1. Ensure both break and lid interlocks are functioning.
2. Do not attempt feeding from top/ cleaning by keeping basket in motion
3. Check earthing continuity, belt guards and fastening bolts before starting feed.
4. Ensure nitrogen blanketing for all solvent based filtrations.
5. Do not attempt stopping the basket motion by hand.
6. Ensure earthing and bonding for feed line and MLs line for all solvent based filtrations.
7. In case of vibrations stop the centrifuge level the load, and continue.
8. Ensure the exhaust of the centrifuge leads out of the dept.
9. While unloading the product ensure the push buttons are locked.

10. In case of operations in side the cubicle, ensure evacuation of solvent vapours through a powerful exhaust and special attention should be given to the flameproof ness of the electrical connections in side the cubicle.
11. Do not throttle the out let of the centrifuge.
12. MLs collection tub should be out side the cubicle or sufficiently away from the nearest electrical point in an enclosed container.
13. Ensure that none of the implements used for unloading like scoops, scrapers are left in the centrifuge.

21.3.2.2. Leaf filter:

1. Do not set up the equipment blocking the access to the exits emergency equipment, movement of the persons etc.
2. Ensure the good condition of wheels, valves, nozzles, jackets, gauges, and fastening bolts before starting the operations.
3. Ensure the hoses do not have cracks, soft portions, and shredings.
4. Connect hoses firmly and securely using good clamps and use double clamping if necessary.
5. Ensure bonding/earthing while transferring solvents/solvent based MLs.
6. Ensure flameproofness of the pump used for the purpose.
7. Ensure availability of the safety relief valve on the lid with proper setting. Arrange the discharge of the safety valve in such a way that the discharge is let out safely without affecting personnel.
8. Ensure the pump has catch tray to collect leakage from the gland if applicable.
9. Use only nitrogen pressure to remove residual solvent from the bed.
10. Ensure the pressure is discharged completely before opening the manhole.
11. Collect the residues separately in a bag and duly label.

21.3.2.3. Nutsch Filter

1. Set up the equipment in such a way that access to exits- emergency equipment and movement of the personnel is not blocked.
2. Ensure the receiver is empty.
3. Feed the product in controlled feed rate.



4. Do not resort to continuous vacuum sucking. Apply vacuum only after filling the top.
5. Ensure earthing and bonding while feeding and draining solvents and MLs.
6. Ensure that MLs is not sucked to the vacuum pump. Vacuum could be applied through receiver of suitable size.

21.3.3. Drying Operations

21.3.3.1. Tray Drier

1. Do not charge slurry material to the drier.
2. Ensure flameproof integrity of the electrical connections.
3. Do not allow seating in front of the drier.
4. Ensure good condition of gauges, door locks and exhaust.
5. Do not charge lumpy material to the drier.
6. Do not over heat or prolong the drying.
7. Ensure drier vent is open.

21.3.4. DISTILLATIONS:

21.3.4.1. Simple Atmospheric Distillations:

1. Refer to the MSDS of the liquid to be distilled.
2. Check the suitability of the reactor/system.
3. Leave sufficient space for evaporation.
4. Check coolant inlet & outlet for proper functioning.
5. Start circulation of the coolant the Condenser before starting the heating.
6. Ensure vent opening before starting heating.
7. Use hot water for distilling low boiling liquids (up to 70 deg. C)
8. When using steam heat gradually & avoid bumping.
9. Ensure condensate is cool.
10. Do not over heat MLs for it may contain dangerous residues.
11. Ensure solvent uncondensed vapours not discharged through vent
12. Ensure earthing / bonding while charging and collecting.
13. Stop distillation at 5 deg. More than boiling range.
14. Ensure gauges on the reactor system are duly calibrated.
15. When carrying out distillation of corrosive liquids, liquids containing trapped gases use suitable scrubber.



16. Use trap/series of traps to avoid back suction of scrubber liquor.
17. Apply nitrogen when cooling the reactor after completion of the work.

21.3.4.2. Vacuum Distillation

1. Ensure vacuum pump is flame proof when distillation flammable solvents/liquids.
2. Release vacuum through nitrogen only
3. Do not over heat the residues.
4. Ensure the entire system is leak proof
5. Follow instructions mentioned in the simple atmospheric distillation except venting.
6. Release vacuum by feeding nitrogen.



**22. DISCLAIMER :**

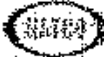
This report and any recommendations in it are based on certain observations made by us and/or from information supplied to us from sources which 4S Safety Associates believes it is entitled to assume are reliable.

Conditions may have changed since our survey and/or the preparation of this report, and the reader must take this into account when acting in reliance on it.

It is not, and is not intended to be, exhaustive or conclusive, covering every hazard or risk potential, nor to guarantee compliance with any statute or regulation, nor does its preparation

Date: 29th July 2020
Hyderabad

T.Gandhi Reddy DIS, M.Tech
4S - Safety Associates

**ANNEXURE - I**

The Completed Safety Audit Check List as per IS 14489:1998

S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
OCCUPATIONAL HEALTH & SAFETY POLICY		
1.	Does the organization have a health and safety policy? (If yes, please attach one copy)	They have developed Health and safety policy and communicated to all. The same is also displayed at various places.
2.	Do you have any corporate safety policy? (If yes, please attach one copy)	Yes
3.	Who has signed the health safety policy? (Indicate his position)	Chairman
4.	Whether it is prepared as per guidelines of the Statutory Provisions?	Yes the Policy is as per guidelines
5.	When was the safety policy declared and adopted?	2007
6.	How many times it has been updated till now?	4 times
7.	Whether the policy is made known to all?	The policy is displayed in some of the places within the Site.
8.	Whether the safety policy was scrutinized by outside expert agency?	Yes, policy reviewed by OHSAS agency
9.	What was the last date of updation?	23.11.2016
10.	Does it find a place in the annual report?	Planning to update
SAFETY AND HEALTH ORGANIZATION SETUP		
11.	Does the factory have a safety department?	Yes



SNO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
12.	<p>If yes, furnish the following information:</p> <p>i) Head of the Safety Department:</p> <p>a. Name</p> <p>b. Designation</p> <p>c. Qualification</p> <p>d. Experience</p> <p>e. Status</p> <p>ii) Strength of the safety department including safety officers and staff.</p>	<p>Mr. Trinadh</p> <p>Head - Environment, Health and Safety Officer-EHS</p> <p>Msc Environment</p> <p>10 Years</p> <p>1</p>
13.	Does the head of safety department /safety officer report to the chief executive?	Yes
14.	How often are the safety officers retained in the latest techniques of total safety management? What is the frequency of retaining?	To review the training History of safety officers and make this judgment
15.	What additional duties the safety officer is required to do?	Nothing except the responsibilities as defined under Factories Rules.
16.	What is the power of safety officer vis-a-vis unsafe condition or unsafe act?	Empowered to stop any unauthorized and unsafe activities
SAFETY COMMITTEES		
17.	Does the Factory has Safety Committee? Their types, structure and terms of reference	Yes
18.	Is the tenure of the SC as per statute?	Yes
19.	Selection of SC elected or nominated	Nominated
20.	Frequency of SC meet	Once in a period of 6 months

S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
21.	What are the subjects / or the problem discussed in the meeting.	Agenda is in place
22.	How are recommendations of the committee(s) implemented?	Taken as objective and prepare action plan for each point raised in safety committee.
23.	Are the minutes of the safety committee(s) implemented?	Yes
24.	Are the minutes forwarded to the trade union(s) and chief executive and occupier?	Yes
25.	How the management and trade union are play their active roles in supporting and accepting the committee(s) recommendations(s)?	Implement the recommendations as per the target dates
26.	How are the safety committee(s) members apprised of the latest developments in safety health and environment?	Discussed in next safety committee
SAFETY BUDGET		
27.	What is the annual safety budget?	No separate budget, however any safety critical issues are funded
28.	How much percentage is this budget of the total turnover of the Company?	No limitation as far safety is concerned
29.	How much budget has utilized till date?	NA
30.	Is the safety budget adequate?	Yes
31.	How is the safety budget arrived at?	No limitations on safety
32.	What is the pattern of expenditure for the last five years?	NA



S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
33.	What are approved sanctions for the expenditure in this budget?	NA
34.	Does this budget get reflected in the annual report of the company?	Yes
ACCIDENT REPORTING, INVESTIGATION AND ANALYSIS		
35.	Whether accident data for the last three years for reportable and non-reportable accident available?	Yes
36.	Is there any system of classifying and analyzing the near-miss incidents and accidents? Give the details.	Procedure is in place
37.	Are all near-miss incidents and accidents reported and investigated?	Yes.
38.	For how many years are the investigation report retained?	Life time
39.	By whom the accident statistics and data are maintained?	Head-EHS
40.	How is the management apprised of these data?	During Management review meetings.
41.	Is the accident statistics effectively utilized?	Yes
42.	What nature of injuries occurred during last three years?	One minor fire incident took place in the month of april-2017. Incident investigation report has been prepared and corrective actions have been taken.
43.	How do you ensure implementation of the recommendations to avoid the recurrence of the incidents and	Action plan prepared for the recommendations mentioned in the investigation report.

S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	accidents?	
SAFETY INSPECTIONS		
44.	What type of safety inspections are carried out and what are their ?	Daily inspections
45.	Is there any system of internal inspection?	Yes
46.	Who does the inspections?	Safety officer along with plant in-charges
47.	Are the check-list prepared for these inspections? (Specify item-wise, eg. House keeping, fire protection, etc).	Yes for few systems
48.	To whom the recommendations are submitted?	Plant Head
SAFETY EDUCATION AND TRAINING (A) TRAINING		
49.	Is there any training department?	HR dept, handles all employee trainings with the co-ordination of EHS team.
50.	Is there any program of induction training?	Yes
51.	Mention the duration of induction training for each category of employees	2 Hrs for all the category of employees
52.	Whether the assessment of the trainee worker is done?	Yes, safety officer does carry out assessment of the training carried out. However, it needs to be strengthened
53.	What infrastructure facilities with audio-visual support are available for training?	Yes
54.	Do the program cover the plant safety rules, hazard, communication and any other special safety rules or	Fire fighting awareness and training carried out regularly. However need to improve.

S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	safety and health.	
65.	What is the training plan for next two years? Give details?	Yearly training calendar is in place
66.	What documentation system has been established regarding safety and health training?	Training attendance sheets available
(C) SAFETY COMMUNICATION / MOTIVATION/ PROMOTION		
67.	Does the factory have safety suggestion schemes?	Yes
68.	Does your factory participate in National Awards / Suggestion schemes?	No
69.	Has your factory been awarded during last five years?	No
70.	Are safety contest organized in the factory?	Yes
71.	What are the publications of your organization? Do they include information on safety and health subjects?	Closely working with National Safety council, Andhra chapter and established safety calendars and other safety publications.
72.	Is the literature on safety and health made available to the employees?	Safety data sheets are available in the site
73.	How is the safety and health publicized in your factory? i) Bulletin boards ii) Post serious accidents iii) News letter iv) Others. specify	Safety notice board available at security and canteen
74.	Does the organization celebrate	Yes



S/NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	procedures unique to the plant or specific departments?	
55.	Whether the training programs are conducted in the local language?	Yes
58.	Whether visits to safety institutions / organizations are arranged?	Yes
B) PERIODIC TRAINING / RETRAINING		
57.	Are all the employees trained and what is the frequency of such training?	Employees are found trained in basic fire safety and chemical handling etc.
58.	Do training program cover safety and health aspects and if so how many sessions?	Yes generally covered
59.	Do the trained supervisors train their own employees in safety and health aspects?	No records found to indicate the same
60.	Is the retraining performed whenever new hazard / process changes are followed / introduced?	Yes
61.	How are the senior management personnel trained in safety and health?	No specific program
62.	How many employees have been trained in safety and health in the last five years? Give break up?	Not available.
63.	How many man-days / hours are used in training the employees?	Not available
64.	How do you ensure that the training is put to use by the employees trained in	The effectiveness of the trainings not captured.





SNO	SAFETY/AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	safety day / week or organize safety exhibition?	
75.	When was the last safety day / week celebrated?	4 th March 2020
FIRST AID		
76.	Are adequate numbers of first aid boxes provided? Give locations details?	First aid boxes provided at production, security and administration areas.
77.	Is there any first aid / ambulance room?	Yes
78.	Are qualified / trained first aiders available in each shift?	Yes
79.	How many qualified / trained first aiders are available?	1 members in each shift and qualified medical practitioner available in the premises round the clock.
80.	How many persons are trained / given refresher training in first aid in a year?	5 members in each shift and qualified medical practitioner available in the premises round the clock.
OCCUPATIONAL HEALTH CENTRE		
81.	Whether occupational safety and health center is provided or not?	Provided
82.	Does it conform to the provisions of the existing legislation	Yes
83.	Are the Medical Attendants / Doctors available in each shift?	Yes
84.	Is ambulance van available in each shift?	No.
85.	Any liaison with the nearest hospital (s)? Give details.	Yes they have identified nearby clinics and Hospitals, list is available in the site.

S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
GENERAL WORKING CONDITION		
(A) House keeping		
86.	Are all the passages, floors and the stairways in good condition?	Yes
87.	Do you have the system to deal with spillage?	Spill control kits and Sand buckets arranged in prominent areas.
88.	Do you have sufficient disposable bins clearly marked and Whether these are suitably located?	Yes
89.	Are drip trays positioned wherever necessary?	Yes
90.	Do you have adequate localized extraction and scrubbing facilities for dust, fumes and gases? Please specify.	Yes. Some areas need to improved.
91.	Whether walkways are clearly marked and free from obstruction?	Yes
92.	Do you have any inter-departmental competition for good house-keeping?	No, they are planning to establish
93.	Has your organization elaborated good house-keeping practices and standards and made them known to the employees?	General housekeeping of the area is good though there is no formal procedure.
94.	Are there any working conditions which make the floors slippery? If so, what measures are taken to make safe?	No.
95.	Does the company have adequate measures to suppress polluting dust	Yes



S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	generating noise? Specify?	
97.	Was any noise study conducted?	Yes
98.	Which are the areas having high-level noise?	Chilling plant
99.	Have engineering and administrative controls been implemented to reduce noise exposure below the permissible limits?	Yes, acoustic enclosures provided for DG set and ear plugs and ear muffs are supplied to the operator. Safety signage posted.
100.	Is there a system of subjecting all those employees to periodic audiometric test who work in high level noise areas?	Yes
101.	Whether the workers are made aware of the ill effects of high noise?	Yes
102.	Whether any personal protective equipment along with ear muffs / plugs are provided and used?	Yes, employees are using ear muffs.
(C) VENTILATION		
103.	Whether natural ventilation is adequate or not?	No
104.	Whether dust / fumes / hot air is generated in the process?	Yes, production areas and solvent transfer areas.
105.	Is there any exhaust dilution, ventilation system in any section(s) to check the record?	Yes Local exhaust ventilation system is provided in some of the areas.
106.	Whether any ventilation study has been carried out in the section(s) to check the record?	No such ventilation study is conducted.

S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
106.	Whether any ventilation study has been carried out in the section(s) to check the record?	No such ventilation study is conducted.
107.	Are periodic / preventive maintenance of ventilation system carried out and record is maintained.	preventive maintenance is carrying out and procedure is in place.
108.	Does any ventilation system recirculation the exhausted air in work areas?	No
109.	Is the work environment assessed and monitored?	Yes
110.	Whether personal protective equipment are given to workers exposed to dust / fumes and gases? Give details.	PPE usage enforced. Need a hazard matrix and PPE compliance according to the matrix. (Contractor employee PPE compliance needs to be enforced and monitored)
(D) ILLUMINATION		
111	Was any study carried out for the assessment of illumination level?	Yes
112.	Is there any system of periodical cleaning and replacing the lighting fittings / lamps in order to ensure that they give the intended illumination levels?	The general maintenance schedule is followed
113.	Are the workers subject to periodic optometry test and records maintained?	Yes
HAZARD IDENTIFICATION AND CONTROL		
114.	Are all the hazardous areas	On-site Emergency Preparedness plan

S NO.	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	Identified?	preparation under progress
115.	What are the types of hazards (physical-noise, heat, etc. and chemical-fire, explosion, toxic release etc)?	Fire, toxic gas leakage and explosion
116.	What steps have been taken to prevent these hazards?	Fire extinguishers, modulars, fire hydrant and deluge valve system and other emergency equipment provided
117.	Are there any safety inter-locks, alarms and trip systems? Give details	Yes, centrifuges, hoist and RCVD having inter-lock arrangements
118.	Are these tested periodically? How often? Please specify.	Yes, once in every month
119.	Are there any ambient monitoring devices with alarm for leakage of hazardous materials?	Yes, LEL meters provided at prominent areas.
120.	Are there audit or HAZOP or any other studies carried out and the recommendations implemented?	Yes
121.	What has been the major modification done in plant / process and has the approval of the competent authority concerned?	Yes
122.	What decision and monitoring equipment are available and used for checking the environmental conditions in and around the plant?	Yes
TECHNICAL ASPECT		
SAFE OPERATING PROCEDURES (SOP)		
123.	Are written safe operating procedures	Yes

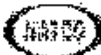
S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	available for all operations?	
124.	Whether the SOP is prepared jointly by the plant and safety departments?	Yes.
125.	What system is used to ensure that the existing SOP is updated?	Change control procedure
126.	Have the workers been informed of the consequences of failure to observe the SOP?	Yes
127.	Are contractor workers educated & trained to observe safety at workplace?	Yes
128.	Whether contractor's workers are permitted on process / operations?	Yes
WORK PERMIT SYSTEM		
129.	What necessary type of work permits exists in your factory?	Hot work, confined space, work at height, Excavation and tanker loading and unloading permits are in place.
130.	What are the hazardous chemicals handled?	List of chemicals available
131.	Are the keys kept for individual locks which are used for electrical lock outs with the supervisor concerned?	LOTO system is in place however need to be strengthen
WASTE DISPOSAL SYSTEM		
132.	Is identification done for various types of wastes? Give details.	Yes
133.	Are these quantities less than those specified by the Hazardous wastes. (Management & Handling) Rules, 1989.	Yes.

S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
134.	What are their disposal modes?	Member ship with TSDF
135.	What is the system / measures adopted for controlling air / waste / land pollution?	Stored in closed containers
136.	What is the system of effluent treatment plant and whether it is approved by the competent authority?	ZLD is in place
137.	How are the treated effluent used?	Used for cooling tower makeup.
PERSONAL PROTECTIVE EQUIPMENT (PPE)		
138.	Has a list of required PPE for each area / operation been developed and the required PPE is made available to the workers?	PPEs are in place, however need to establish work wise PPE matrix.
139.	Are the safety department & the workers consulted in the selection of PPE?	Yes
140.	Have the workers been trained in proper use of PPE?	Yes
141.	What is the system of replacement / issue / of PPE?	Replacement of PPE when ever required
142.	What are the arrangements for safe custody and storage of PPE provided to the workers?	PPE boxes provided in all blocks
143.	Are the contractor's workers provided with the required PPE? Who is responsible? Give details.	Contract workers are provided the required PPE and it is the responsibility of line Manager.
144.	Are the PPE conforming to any Standard?	Yes, IS & EU
145.	Give the details of PPE and also	It is the responsibility of self and line

S NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	specify the responsibility for their inspection and maintenance?	manager
FIRE PROTECTION		
146.	Indication on a plant layout the location, number (quantity) and type of portable fire extinguishers available?	Yes, list available
147.	Are the fire fighting system and equipment approved, tested and maintained as per relevant standard?	Yes
148.	What is the inspection & maintenance schedule of the above extinguishers? Who performs these functions?	Fire extinguishers servicing is carried out once in a period of 3 months.
149.	Which areas of the plant are covered by the fire hydrants? Indicate the locations of hydrant points and how the required pressure maintained in the system and ensured.	Production block Utility area
150.	What is the capacity of water reservoir for supply to the hydrants? What is the source of water?	400 M ³
151.	i) How is the power supply to the hydrant pump ensured? ii) What is the alternate source of supply in case of power failure?	Dedicated DG set available
152.	Are all personnel conversant with the fire prevention and protection measures?	Yes, however needs practical demonstration on operation of fire extinguishers and fire hydrant system.

S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
153.	What percentage of plant personnel & staff and officers, have been trained in the use of portable fire extinguishers?	40.%
154.	Do you have fixed or automatic fire fighting installation(s) in any section of your plant?	Yes, however need to provided in some other areas too.
155.	Are the fire alarms adequate and free from obstruction?	Yes
156.	Do you have fire dept? If yes, give details.	Trained persons available in the site.
157.	What is the system for conducting mock drills?	Once in six months
158.	Do you have any mutual aid scheme with any of your neighboring industry or any local organizations(s)?	Yes, written agreement to be taken.
159.	Give details of the existing fire resistant walls and doors.	Masonry walls in all areas.
160.	Do you have any system of colour coding for all the pipelines for hazardous chemical? Give details including marking of flow direction.	Yes
161.	Are there any safe containers for the movement of small quantities of hazardous chemicals? Give details.	Yes, bottle carriers available in stores to carry small quantity of chemicals.
162.	Are all self-closing fire doors in good condition and free from obstructions?	Fire rated doors provided
163.	How many major and minor incidents / fires were there in the factory during last five years? Give department /	No incident occurs so far

S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	plant wise:	
164.	Have all the fires / incidents been investigated and corrective actions taken?	Yes
EMERGENCY PREPAREDNESS		
165.	Is there an on-site emergency plan for your factory?	Site has an on-site emergency preparedness plan and also carries out a fire drill.
166.	What is the frequency of conducting mock drills of on-site emergency plan?	Once in every six months
167.	What are the number & location of emergency control center, assembly points?	Four assembly points available in the site
168.	Whether emergency team or the key personnel identified?	Yes
169.	Are suitable & adequate protective & rescue equipment available? How is the emergency rescue team trained to use this equipment?	Yes, however team needs effective training on emergency equipments.
170.	How is the emergency communications with local bodies & other organizations ensured?	List of Emergency telephone numbers displayed in the plant.
171.	Is any alternate power source identified?	DG set available with sufficient capacities
172.	What is the medical emergency response system?	Maintained hospital details with emergency telephone numbers.
173.	Are you a member of any MUTUAL - AID - SCHEME of your area?	Yes



S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
174.	How many emergency alarm system(s) is/are available?	15 MCPs provided in the premises.
PLANT LAYOUT & AREA CLASSIFICATION:		
175.	What is the system of classification of hazardous zones in the plant for electrical installations?	Flame proof electrical arrangements provided in most of the areas and some of the areas does not provided, however electrical area classification programme needs to be conducted for the entire site.
176.	Whether a qualified person does periodic inspection and preventive maintenance of electrical installations & record is maintained?	Yes
177.	Whether plant layout with area classification has been displayed at appropriate place(s)?	Plant lay-out displayed in the site. Plant layout well planned and adequate space is maintained, did not see any space congestion, it meets statutory requirements of space.
STATIC ELECTRICITY:		
178.	Whether the process(s) & equipment generate & accumulate static charge has been identified? Give details.	Control measures has been taken for dissipation of static charge by arranging static earth rods and structural earthing. In few areas, particularly in solvent transfer, the implementation of static prevention needs to assessed and improved / tightened.
179.	Whether all such equipments are properly bonded & earthed?	Yes, however need to ensure in all the areas.
180.	How is electrical resistance for	Earth pits are maintained by putting salt



S.NO.	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	earthing circuits maintained?	charcoal and water in periodical intervals.
181.	Are periodic inspections done and recorded.	Yes
182.	Are adequate arrangements made at the terminal points where hazardous chemicals are handled through pipes?	Yes, however needs to ensure periodically
183.	Are anti static charged devices fitted wherever necessary?	Yes
184.	Whether these devices are periodically checked & maintained by a qualified person?	Yes
185.	Have all the fires / incidents been investigated and corrective actions taken?	Yes
PRESSURE VESSELS (FIRED & UNFIRED)		
186.	Give details of the plants, piping & vessels / pressure greater than the atmospheric pressure?	List of equipment and operating pressure and design pressure details list to be maintained.
187.	How is it ensured that the working pressure inside the pressure vessels / pressure for which it is designed.	Adequately designed Pressure gauges, safety relief valves, rupture discs to be provided and tag to be displayed for identification of pressure reliefs.
188.	What means of isolating the pressure vessels or means to prevent rise in pressure are installed?	Production blocks are isolated and Adequately designed suitable Rupture discs and pressure relief valves to be installed.
189.	What standards / codes of practice are adopted for design, fabrication, operation & maintenance of the	IS, ASTM



S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	pressure vessels & records maintained?	
190.	How are the pressure vessels tested?	By Competent person periodically.
191.	Is there any competent person for testing these pressure vessels?	Yes
192.	Give details of safety devices available for these pressure vessels?	Rupture discs, pressure relief valves and dump tank to be provided for all reactors and safety relief valves and rupture disks out line to be connected to dump tank
193.	Whether log book for pressure vessels & pressure plant has been maintained?	Yes
NEW EQUIPMENT REVIEW		
194.	What is the system for effecting any change in the existing plant equipment or process? Whether it is approved by the appropriate competent authority?	Change control procedure is in place
195.	Whether Piping & Instrumentation diagrams & other related documents are updated accordingly?	Yes
LIFTING MACHINES & TACKLES		
196.	Whether all the lifting machines are marked with SWL ?	Yes
197.	Are all the examinations & tests documented in the prescribed form?	Yes
198.	Are all the examinations & tests carried out & certified by competent person? Give details.	Yes.





S.NO.	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
199.	Are adequate lifting tackles provided at all places where it is required? Give details.	Yes, hoist provided in production and ware house for material movement.
200.	Are the trained operators engaged for operating the equipment? Give details.	Yes.
201.	What is the system of training such operators?	EHS team will give the safety training.
202.	Are all the lifting machines & tackles are maintained in good condition & record maintained?	Yes, organization needs to be ensured.
MOBILE EQUIPMENT & VEHICULAR TRAFFIC		
203.	Are all the mobile equipments are in good condition?	Yes.
204.	Are trained drivers engaged for fork lift trucks?	Yes.
205.	What is the system for identifying these drivers from other drivers?	Yes.
206.	What system do you adopt to assess their standard driving as poor/ fair / satisfactory / good?	Good.
207.	Are there adequate number of signs & signals?	Yes.
208.	Are the hazards associated with transportation within the plant identified & safety measures taken? Give details.	Yes.
ACCESS		
209.	Is adequate safe access provided to	Yes.



S. NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	all places where workers need to work?	
210.	Are all such access in good condition?	Yes
211.	Are portable access platforms necessary? If yes:	Yes
212.	i) Are these sufficient?	Yes
213.	ii) Are these regularly inspected?	Yes
214.	iii) Are these provided with toe-boards and railings?	Yes
215.	Are all drain covers in good condition & fitting flush?	Yes
MATERIAL HANDLING		
216.	Are these adequate storage facilities available?	Yes
217.	Are these areas clearly defined?	Yes
218.	Are all racks & steel ages in good condition?	Yes
219.	Have you adequate equipment for handling materials?	Yes
220.	Do the workers know the hazards associated with manual material handling?	Yes, however need to conduct periodical training programs on manual handling and ergonomic problems.
221.	Where manual handling is necessary, are the workers been trained?	Yes, however need to conduct periodical training programs on manual handling and ergonomic problems.
222.	Do they practice this?	Yes
223.	Do workers follow safe procedures for storage of materials?	Yes, however compatibility chart to be prepared for the chemicals which are being used in the site and to be stored as

S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
		per the compatibility and conduct periodical training programmes on storage and material handling
224.	Whether contractor workers are trained in safety?	Yes
225.	What is the system for handing over plant to the maintenance department & receiving back?	Pre-start up and shut down procedures are in place.
226.	Is the system consistently applied?	Yes
227.	What is the system for the preventive & predictive maintenance & how do you ensure its effectiveness? Give details.	Preventive maintenance schedule is in place.
TANK STORAGE VESSEL AREA		
228.	Whether it is pressure vessel or not?	No
229.	Give storage vessels designation (exceeding threshold quantities specified in MSIRC, Rules 1989)	
230.	Give the names of storage materials in each of them.	
231.	What are the vessel sizes (capacity of tones)?	
232.	What is the material of construction for each vessel & what standards followed in designing fabricating the vessel?	
233.	What are the operating pressure & temperature?	Atmospheric pressure and ambient temperature
234.	What are the vessels location?	

S.NO.	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	(Please indicate on-site plan or plot plan).	
235.	Indicate whether vessels are above ground / underground?	Above ground
236.	If any of the tanks storing flammable material, whether electrical installations are flameproof or not?	Yes
237.	Are these storage vessels bunded / dyked?	Yes, most of the storage tanks provided with bund walls, however suitable bund walls need to be provided for some of the storage tanks and receivers.
238.	If yes, What is the capacity of the bunds / dykes?	Need to be provided with 10% additional space of the tank volume.
239.	Are the vessels isolated in the event of a mishap?	Yes
240.	How are the vessels isolated in the event of a mishap?	Located away from the production blocks
241.	Are the vessels fitted with remotely controlled isolation valves?	Work is under process
242.	Are vessels provided with emergency vent relief valve, bursting disc, level indicator, and pressure gauge overflow line?	Yes
243.	Where do such vents discharge?	Atmosphere, need to connect with dump tank
244.	Are the vessels provided with alarms for high level, high temperature & high pressure?	No
245.	Are stand by empty tanks provided for	Yes



S.NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	empty in case of emergencies?	
246.	What are the provisions made for firefighting / tackling emergency situations around the storage vessels?	Yes, provided
247	Has any consequence analysis been carried out for these vessels? (If yes give details).	No
248.	What periodical testing is carried out on the vessels to find out the integrity of the vessels?	Yes, however needs document evidence for testing carried out.
249.	Whether these tests are certified by the approved competent persons?	Yes
250.	Whether log sheets are filled up on daily basis for recording the parameters of these vessels?	Need to maintain log sheet on daily basis
ON-SITE GAS CYLINDERS STORAGE AREA		
251.	What are the various gas cylinders used in the plant? Give details.	No
252.	What are the storage facilities?	
253.	What are the measures taken for combating any emergency in the cylinders storage area?	
254.	Are valid licenses available for storing all these cylinders?	
255.	Whether integrity test certificates is obtained from the suppliers for cylinders	
COMMUNICATION SYSTEM ADOPTED IN PLANT		



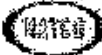
S.NO.	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
256.	Is public address system available in all plant areas?	Yes
257.	Are public address system provided with uninterrupted power supply?	Ensure it should be connected with UPS power
258.	Whether public address system is checked periodically for its proper functioning?	Yes
259.	Is there any hot line provided to fire station?	No
260.	What is the means of communicating emergency in the plants?	By blowing emergency siren as per organization design code.
TRANSPORTATION		
261.	What potentially hazardous materials are transported to or from the site (including wastes)?	Solvents and acids
262.	What modes of transport are used: i) Road ii) Rail iii) Pipelines	Road
ROAD		
263.	Does the company employ licensed vehicle of its own / outside sources?	Out sourced
264.	Are loading / unloading procedures, on-site & safety precautions displayed?	Yes
265.	Are loaded tankers or trucks parked in a specific area, on-site?	Yes
266.	Do all trucks & tanker drivers carry TREM card or instruction booklet?	Yes
267.	Do all truck & tanker drivers get	Yes



S NO	SAFETY AUDIT ELEMENTS	SUMMARY OF OBSERVATIONS
	training in handling emergencies during transport?	
RAIL		
268.	What hazardous materials are transported by rail?	NA
269.	Does the company have a direct siding on site?	NA
270.	Are tankers or others wagons used in transportation?	NA
PIPELINES		
271.	What materials are transported to & from the site by pipeline?	Solvents
272.	Are the pipelines underground or over ground?	Over ground
273.	Are corrosion protection measures employed to the pipelines?	Yes
274.	Whether intermediate booster pumps are used?	Yes
275.	What the maximum, minimum & average transfer rates?	10 M ³ per hour
276.	Are the pipelines extended in the public domain?	No
277.	Are the pipelines dedicated for each type of chemicals?	Yes
278.	Are the pipelines fitted with safety equipments such as leak detectors, automatic shut off walls etc.	No
279.	What is the frequency & method of testing pipelines?	Preventive maintenance is in place.
280.	Is there written procedures for tackling leakages in pipelines?	Yes.

ANNEXURE-II

ELECTRICAL SAFETY RISK ASSESSMENT FOR PANEL BOARDS	
1	Is degree of protection of panel designed as per hazardous area classification?
2	Is ventilation required for the Panel? If yes, is ventilation provided ?
3	Are bus bars colour coded with PVC sleeving ?
4	Are panel doors earthing provided?
5	Are metering (Volt / Ammeter / KWH) provided ?
6	Is panel fully compartmentalized and feeders with separate enclosures ?
7	Is panel designed with bottom / Top cable entry?
8	Any observations given by regulatory in writing?
9	Have the observations given by regulatory been complied?
10	Are separate earth pits (min two nos) with interconnection to each other and connection provided to the panel ?
11	Is earthing connected to panel of adequate rating / capacity?
12	Are all the doors of the panel board in closed condition?
13	Are all the doors of the panel board be opened with special tools only ?
14	Are all feeders of the panel board, clearly labeled?
15	Is the panel board free from access to dangerous parts from all directions?
16	Are switchgear provided in panel suitable for finger proof?
17	Are all feeders with on / off / trip and with LED indication?
18	Are all feeders provided with LOTO facility?
19	Is incomer provided with LOTO facility?
20	Is the panel board having double earthing facility?
21	Is the panel board displayed with voltage capacity with danger signage at various places both front & back side of the panel?
22	Is shock treatment chart provided near panel board?
23	Are rubber mats provided in front of panel boards are with sufficient thickness, with ISI mark and in proper condition?
24	Are there any temporary connections given from the panel board?



ELECTRICAL SAFETY RISK ASSESSMENT FOR PANEL BOARDS	
25	Are power cables used in the panel suitable for double insulated with armoured as per IS 1554 and are FRLS as per IEC 332 - 1/3?
26	Are control cables used in the panel suitable for double insulated?
27	Is there proper illumination around panel board area?
28	Is smoke detector provided above the panel board?
29	Is Earth Leakage Circuit Breakers (ELCB) or Residual Circuit Devices (RCD) installed and tested at regular intervals?
30	Is the panel boards located away from combustibles, water, steam lines, dust etc?
31	Is the circuit diagram of the panel board with feeders displayed?
32	Is emergency light available near panel board?
33	Are carbon dioxide fire extinguishers located near panel boards?
34	Is there a clear space of not less than 1 metre in width provided in front of the panel board?
35	Are the incoming and outgoing cables are properly dressed and laid on a cable tray as per IE rules?
36	Are cable trays earthed and continuation of earthing maintained?
37	Is the panel updated in CAMMS for preventive maintenance?
38	Is double earthing provided to each capacitor with adequate size of earth strip / conductor?
39	Measure the Voltage across Neutral to Earth & record the same
40	Are all the feeders accessible to the operator?

