

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL**WESTERN ZONE BENCH, PUNE****ORIGINAL APPLICATION NO. 121 OF 2024(WZ)****AND****ORIGINAL APPLICATION NO. 136 OF 2024(WZ)**

SUO-MOTO COGNIZANCE----- COMPLAINANT

V/S

1. MAHARASHTRA POLLUTION CONTROL BOARD

Through Member Secretary

Having address at: Kalpataru Point, 3rd & 4th floor, Opp. PVR Cinema,
Sion Circle, Mumbai-400002

2. MAHARASHTRA INDUSTRIAL DEVELOPMENT CORPORATION

Through Chief Executive Officer

Having address at: "Udyog Sarathi", Marol Indl. Area, Mahakali Caves
Road, Andheri (East), Mumbai - 400 093

3. DISTRICT COLLECTOR - THANE

Having address at: Court Naka, Ad Prabhakar Hegde Rd, Kharkar Alley,
Thane (West), Maharashtra - 400 601

4. CENTRAL POLLUTION CONTROL BOARD

Through Regional Directorate Having address at: Survey No. 110,
Dhankude Multipurpose Hall, Baner Road, Baner, Pune 411 045

5. DIRECTORATE OF INDUSTRIAL SAFETY AND HEALTH Having

address at: Kamgar Bhawan, 5th Floor, C-20, E Block, Opp. R.B.I,
Bandra Kurla Complex, Mumbai - 400 051

6. AMUDAN CHEMICALS PVT. LTD.

Having address at: W-229, Phase - 2, MIDC, Dombivli, Thane,
Maharashtra - 421 203

AFFIDAVIT IN REPLY ON BEHALF OF RESPONDENT NO. 5

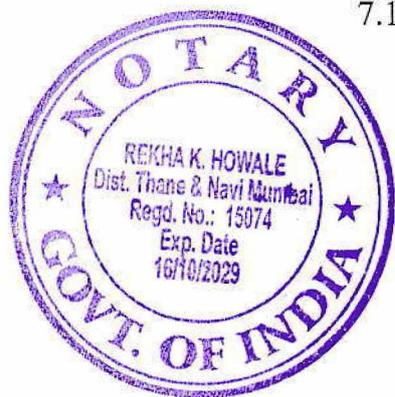
1. I, Sachin Ganpat Bhele, age 42 years, working as the Deputy Director, Industrial Safety and Health, Kalyan, District: Thane, and duly authorized by Respondent No. 5, solemnly affirm and state on behalf of Respondent No. 5 (Director. Industrial Safety and Health, Mumbai) as follows:
2. I say that I have read the order issued by Hon'ble National Green Tribunal, Western Zone Bench, Pune in the O.A. No. 121/2024 and perused the relevant record maintained by our department with reference to the subject matter of the present O.A. and based on the said record, I am filing this affidavit.
3. I say that the Directorate of Industrial Safety and Health (DISH) working under the Labour Department, Government of Maharashtra, is enforcing The Factories Act, 1948 and Rules made thereunder. This Directorate conducts inspections of factories and enquiries about accidents, fires, explosions, or any dangerous occurrences occurring in the factory. In case of violation of any of the provisions of the Act and Rules, the Directorate is empowered to initiate legal action against the occupier and manager of the factory.
4. I say that as per directions of the Hon'ble NGT, DISH was part of the constituted committee and visited the site and submitted the report on behalf of DISH to the Joint committee as per 'Terms of Reference'. A copy of the interim report of the Joint committee is attached as annexure 1.

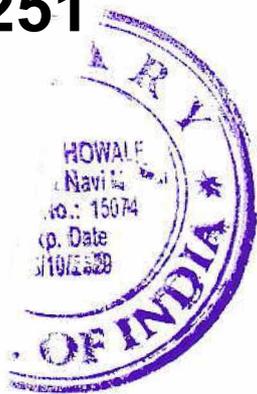




5. M/s. Amudan Chemicals Pvt. Ltd.. Plot No. W-229, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Tal – Kalyan & Dist-Thane 421204 is registered under Section 85 of the Factories Act, 1948 and holds a factory license bearing no. 10018373, renewed till the year 2025. Mr. Malay Pradeep Mehta and Mrs Sneha Malay Mehta are the occupiers as per Section 2 (n)(ii) of the Factories Act, 1948
6. On receipt of the telephonic message from the MARG member from Dombivali, Dy. Director, Industrial Safety And Health, Kalyan visited the factory on 23.05.2024 @ 2:00 PM to enquire into the explosion that took place in the factory @ 1:35 PM on 23.05.2024, which resulted in fire and an offsite emergency. Kalyan Dombivli Municipal Corporation, Navi Mumbai Municipal Corporation, Ulhasnagar Municipal Corporation, Ambarnath Municipal Council and NDRF Battalion No. 5 and TDRF had conducted rescue operations. On 25.05.2024 at 3.42 pm the said rescue operation was stopped. A total of 13 workers died, and 67 persons were injured in this incident.
7. Directorate of Industrial Safety & Health (DISH), Govt of Maharashtra conducted a detailed investigation of the industrial accident. A copy of the report is enclosed in Annexure-2. The following is mentioned about the 'Occurrence of explosion and fire in the factory' in the said investigation report

7.1 The said unit was engaged in the manufacturing of various organic peroxides such as Methyl Ethyl Ketone Peroxide (MEKP), Di Tertiary Butyl Peroxide (DTBP), and Tertiary Butyl Hydro Peroxide (TBHP). Tertiary Butyl hydrogen peroxide (TBHP) manufacturing is a highly exothermic reaction.





7.2 On 23/05/2024, the synthesis of Tertiary Butyl hydroperoxide (TBHP) was carried out in the Glass Line reactor (GLR) (3 KL), and the settling of Tert- Butyl Peroxybenzoate (TBPB) was carried out in the SS reactor (3 KL).

7.3 On 22/05/2024, at night in GLR (3KL), H₂O₂ (1200 kg) is charged and the temperature of the reactor was brought to around 17° C. Also, in the SS reactor (3 KL) there was making of TBPB and at night, there was the activity of the stirring of TBPB in SS reactor (3 KL).

7.4 On 23/05/2024 at 9:00 am, operator had cooled the reactor around 17° C and charging of H₂SO₄ of around 180 Kg was charged from the H₂SO₄ can with help of vacuum pump. The charging of 1 can (63 Kg) of H₂SO₄ takes around 15 minutes. Total 180 Kg was charged from the 3 cans taking around 40 to 45 minutes. Then, when the vacuum was released there was an increase in temperature and the temperature was maintained below 25°C and the stirring was carried out for around 2 to 2 & 1/2 hours.

7.5 Thus, the charging of the remaining 210 Kg H₂SO₄ from the 3 & 1/2 cans was carried out at 11:15 am, and the charging was finished at 12:30 pm.

7.6 At 12:30 PM, there was a lunch break till 1:00 PM. After lunch break, TBA of around 100-150 Kg was charged into the reactor. Soon after the charging was over, by releasing the vacuum, the temperature increased rapidly, leading to an exothermic reaction at 60 to 70°C. The cooling arrangement was insufficient to



control the runaway reaction. As the temperature increased inside the reactor, pressure increased beyond the bursting pressure of 95 Kg/cm², leading to the bursting of GLR (3KL).

7.7 Due to the explosion of the reactor, the shock waves and tremendous heat, the adjacent SS reactor (3KL) containing TBPB also exploded due to the decomposition reaction of TBPB exceeding the SADT temperature by more than 60° C.

7.8 Also, the MS tank containing DMP was exploded which led to the rupture of the tank due to forming explosive mixtures with air on intense heating and the MEK tank was thrown away at a distance of 7 meters from the original position.

7.9 Due to the presence of combustible liquid and flammable liquids in the premises, the fire started in the factory and spread rapidly to the adjacent factories. After the explosion followed by fire, the workers of the adjacent factory informed the Fire brigade about the incident. The Fire brigade from Dombivili MIDC reached the spot at 1:50 PM and started extinguishing the fire. After some time, another Fire brigade from Kalyan Dombivli Municipal Corporation arrived. Navi Mumbai Municipal Corporation, Ulhasnagar Municipal Corporation, Ambarnath Municipal Council and NDRF Battalion No. 5 and TDRF had conducted rescue operations and on 25.05.2024 at 3.42 pm, the said rescue operations were stopped.

8. In the enquiry, following contravention of provisions of the Factories Act, 1948 and Maharashtra Factories, rules 1963 were detected: -





8.1 The occupier had failed to maintain the factory in safe working order as well as the system without risking the workers' health by not providing no facility for control addition of sulphuric acid and not providing alarm and interlock such as Utility failure alarm, agitator failure alarm, High temperature alarm, Alarm for High rate of addition of limiting reactant which is added at controlled rate, and FCV and/or On-Off valve interlocked with the reaction mass temperature and agitator tripping. Hence Provisions of section 7 A- (2) (a) of the Factories Act 1948 was contravened.

8.2 It is reported that Mr Malay Pradeep Mehta and Mrs Sneha Malay Mehta are the Directors of the M/s. Amudan Chemicals Pvt. Ltd... The Occupier has not sent a written notice in form no. 1 containing the name and address of the Occupier after he begins to occupy the premises as factory. Hence, the provision of Section 7 (1) (b) of the Factories Act, 1948 was contravened.



8.3 The occupier had not drawn an on-site emergency plan and detailed disaster control measures for the factory. Hence the provisions of Section 41-B (4) of the Factories Act, 1948 was contravened.

8.4 The occupier of a factory had not appointed persons who possess qualifications & experience in handling hazardous substances and are competent for such handling. Hence the the provisions of Section 41-C (b) of the Factories Act, 1948 was contravened..

8.5 The machinery layout was not in conformity with the earlier approved plans. Hence the Provisions of Rule 4(2) of Maharashtra Factories Rules 1963 was contravened.

8.6 Thus, there is change in manufacturing process of TBHP, But the occupier was using the premises as factory without getting plan

approval from Jt. Director DISH, Kalyan regarding changes total or partial in manufacturing process. Hence, the the Provisions of Rule 4(1) (d) of Maharashtra Factories Rules 1963 was contravened.

8.7 It is found that the workers working on manufacturing process of synthesis of TBHP, TBBP, MEKP were not provided with information in relation to handling of hazardous materials like Hydrogen peroxide TBA, Sulphuric Acid, hence the provisions of the Rule 73-N(1) of Maharashtra Factories Rules,1963 was contravened.

8.8 Occupier had not arranged to carry out a Safety Audit externally once in two years by safety auditor Hence, the Provisions of Rule 3 (b) of Maharashtra Factories (Safety Audit) Rules, 2014 was contravened.

8.9 Thus the Manager had not submitted written report in form No. 24 within the prescribed time limit 12 hours, the provisions of Rule 115 (2) of Maharashtra Factories Rules, 1963 was contravened.

Deputy Director I.S.H. Kalyan carried out the enquiry and contraventions were found against the Occupier and Show Cause letter dated 14/06/2024 regarding why legal action for the contraventions (mentioned at Sr 7.1 to 7.9) may not be considered against the occupier of the factory was issued to the occupier of the factory and the Criminal cases are filed in the court of Hon'ble Chief Judicial Magistrate, Thane

8.11 Also, the Factory license of Amudan Chemicals Pvt. Ltd. Plot No. W-229, Phase-2, Dombivli, renewed till the year 2025, has been revoked on 15/06/2024 under Rule 9 (A) of the Maharashtra Factories Rules, 1963.



9. To avoid the reoccurrence of such incidents in future, the following remedial measures are suggested by DISH

9.1 The facility for control addition of sulphuric acid through an additional vessel/glass flask shall be made.

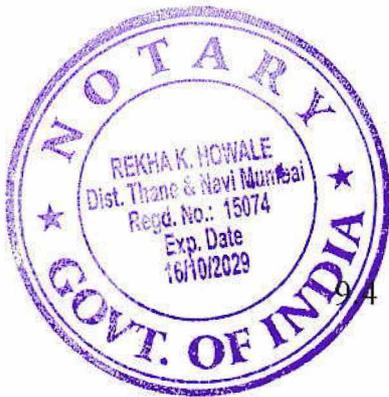
9.2 On the reactor system, an alarm and interlock such as utility failure alarm, agitator failure alarm, and high temperature alarm for high rate of addition of limiting reactant, which is added at a controlled rate, shall be provided.

9.3 Flow control valve and / or On-Off valve for raw material shall be installed such that raw material (limiting reactant) addition rate should be controlled by flow control loop. The controlling parameter is reactor temperature. And FCV and/or On-Off valve should be interlocked with the reaction mass temperature and agitator tripping.

9.4 A HAZOP study for the entire process shall be carried out by specialized expert and recommendations thereof shall be complied with.

9.5 Workers and the operator shall be trained well-designated Training Programme for operation and working staff regarding handling of hazardous chemical and hazardous associated with it. and the same shall be periodically refreshed with the latest information available within the scope

10. I say that the Occupier of the factory has provided the following aid to the legal heirs of the deceased.



10.1 In this incidence, 13 workers died, and 67 persons were injured. Out of a total of 13 workers, 12 workers are insured under ESIC. The Occupier of the factory has submitted compensation claims towards pension to legal heirs to Employee's State Insurance Corporation (ESIC) authorities. Also, this office had requested ESIC regarding getting compensation through ESIC to the heirs of the said deceased workers. As the salary of one deceased worker, Mr. Dhaval Vadhani is more than the standard salary limit under the ESIC scheme, it has been informed through a letter to the Hon. Compensation Commissioner cum Hon. Labour Court regarding compensation to the heirs of Mr. Dhaval Vadhani.

10.2 The Government of Maharashtra allotted a total of Rs. 65,00,000/- (Rupees sixty-five lakhs only) from the Chief Minister's Relief Fund to disburse Rs. 5,00,000/- each (Rupees five lakhs only) to the legal heirs of the deceased workers. A total of Rs. 60,00,000/- from the Chief Minister's Relief Fund, amounting to Rs. 5,00,000/- each, is being distributed by the office of the Tahsildar in Kalyan to the legal heirs of the 12 deceased workers. For the remaining one deceased worker, a payment of Rs. 5,00,000/- from the Chief Minister's Relief Fund will be made upon receipt of the necessary documents from the legal heirs. Additionally, seriously injured persons received free treatment at private hospitals.

11. Currently, officers from the DISH Department can visit factories under the centralized inspection scheme. However, a special drive was initiated following the incident to identify hazardous factories in the Dombivli



MIDC area, and safety inspections were conducted. So far, 110 factories have been inspected, Show Cause Notices have been issued, and 34 Criminal cases have been filed in the court of Hon'ble Chief Judicial Magistrate, Thane. Also, 6 prohibitory orders under Section 40(2) of the Factories Act, 1948, were issued to the factories.

12. That, in light of the above submissions, it is respectfully prayed that this Answering, Respondent No. 5, i.e. DISH, shall abide by any order or directions passed by this Hon'ble Tribunal.

DEPONENT

SACHIN GANPAT BHELE

Deputy Director
Industrial Safety and Health, Kalyan

Place : Thane

Date:- 26th March, 2025



VERIFICATION

Verified at Thane on this 26th day of March, 2025 that the contents of the above affidavit are true and correct to the best of my knowledge and belief and nothing has been concealed therein.


DEPONENT

SACHIN GANPAT BHELE

Deputy Director

Industrial Safety and Health, Kalyan

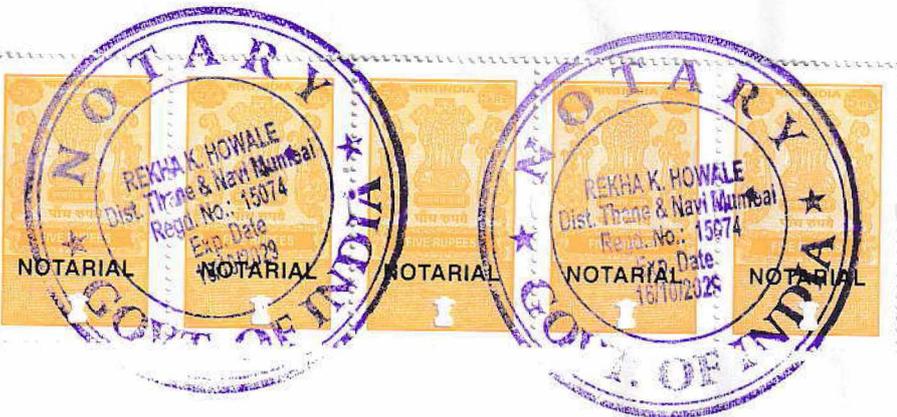
Place : Thane

Date:- 26th March, 2025



BEFORE ME
Howale
26/3/25
REKHA KISHOR HOWALE
ADVOCATE & NOTARY
GOVT. OF INDIA
Serial No. 2698/2025
Page No. 036

26 MAR 2025



Joint Committee Interim Report

Hon'ble NGT matter- OA No. 121/2024 (WZ) related to incident at
M/s.Amudan Chemicals Pvt. Ltd. Dombivli, Dist Thane, Maharashtra

1. The Hon'ble NGT (WZ) has constituted a committee in the matter of OA 121/2024 (WZ) vide order dated 24.05.2024 which is registered *suo moto* on the basis of News item titled "Amudan Chemicals Pvt. Ltd. in Dombivli East- 8 killed, 60 injured in boiler blast at Thane Chemical Unit" appearing in The Indian Express dated 24.05.2024.
2. Hon'ble NGT vide aforesaid order directed to the joint committee to visit the site and submit report. The 'Terms of Reference' for the Joint Committee is also provided in the aforesaid order. The Copy of the aforesaid order is given as **Annexure-I**.

The Joint committee comprising following members nominated by the concerned department have carried out the site visit on 31/05/2024, the copy of visit report is enclosed as **Annexure-II**.

- Shri Rajesh Mule, Deputy Engineer, MIDC Dombivali
- Shri Sachin Bhele, Deputy Director, DISH, Kalyan
- Shri Satyajit Chavan, Residential Nayab Tahsildar
- Shri Rajendra D. Patil, Scientist 'E', CPCB RD Pune
- Dr. Rajendra Rajput, Regional Officer, MPCB, Kalyan – Nodal Officer

The pointwise details as per ToR in Hon'ble NGT order are given as below-

3. ACCIDENT INVESTIGATION REPORT ALONG WITH CORRECTIVE ACTION PLAN;

- 3.1. Directorate of Industrial Safety & Health (DISH), Govt of Maharashtra carried out detail investigation of the said industrial accident. DISH has submitted its report to the Govt of Maharashtra. A copy of the report is also provided to the committee for the reference, same is enclosed at **Annexure-III**.
- 3.2. Following is mentioned about the 'Occurrence of explosion and fire in the factory' in the said investigation report
- 3.2.1. The said unit was engaged in manufacturing of various organic peroxides such as Methyl Ethyl Ketone Peroxide (MEKP), Di Tertiary Butyl Peroxide (DTBP), Tertiary Butyl Hydro Peroxide (TBHP). The manufacturing process of Tertiary Butyl hydrogen peroxide (TBHP) is a highly exothermic reaction.
- 3.2.2. On 23/05/2024, the synthesis of Tertiary Butyl hydro peroxide (TBHP) was carried out in Glass Line reactor (GLR) (3 KL), and the settling of Tert- Butyl Peroxybenzoate (TBPB) was carried out in the SS reactor (3 KL).
- 3.2.3. On 22/05/2024, at night in GLR (3KL), H_2O_2 (1200 kg) is charged and the temperature of the reactor was brought to around $17^{\circ}C$. Also, in the SS reactor (3 KL) there was making of TBPB and at night, there was the activity of the stirring of TBPB in SS reactor (3 KL).

- 3.2.4. On 23/05/2024 at 09 am, operator had cooled the reactor around 17^o C and charging of H₂SO₄ of around 180 Kg was charged from the H₂SO₄ can with help of vacuum pump. The charging of 1 can (63 Kg) of H₂SO₄ takes around 15 minutes. Total 180 Kg was charged from the 3 cans taking around 40 to 45 minutes. Then, when the vacuum was released there was an increase in temperature and the temperature was maintained below 25^oC and the stirring was carried out for around 2 to 2 ½ hours.
- 3.2.5. Thus, the charging of the remaining 210 Kg H₂SO₄ from the 3 & ½ cans was carried out at 11:15 am and the charging was finished at 12:30 pm.
- 3.2.6. At 12:30 PM there was a lunch break till 1:00 PM. After lunch break TBA of around 100-150 Kg was charged into the reactor, soon after the charging was over by releasing vacuum, the temperature was increased rapidly leading to exothermic reaction at 60 to 70^oC and to control runaway reaction cooling arrangement was insufficient. As the temperature increased inside the reactor pressure increased beyond bursting pressure of 95 Kg/cm² leads to bursting of GLR (3KL).
- 3.2.7. Due to the explosion of the reactor, the shock waves and tremendous heat, the adjacent SS reactor (3KL) containing TBPB was also exploded due to the decomposition reaction of TBPB exceeding the SADT temperature more than 60^o C.

3.2.8. Also, the MS tank containing DMP was exploded which leads to the rupture of the tank due to forming explosive mixtures with air on intense heating and the MEK tank was thrown away at a distance of 7 meters from the original position.

3.2.9. Due to the presence of combustible liquid and flammable liquids in the premises, the fire started in the factory and spread rapidly to the adjacent factories. After the explosion followed by fire the workers of the adjacent factory informed the Fire brigade about the incident. The Fire brigade from Dombivili MIDC reached the spot at 1:50 PM and started extinguishing the fire. After some time other Fire brigade from Kalyan Dombivli Municipal Corporation, Navi Mumbai Municipal Corporation, Ulhasnagar Municipal Corporation, Ambarnath Municipal Council and NDRF Battalion No. 5 and TDRF had conducted rescue operations and on 25.05.2024 at 3.42 pm the said rescue operations was stopped.

3.3. The said report also quoted the possible responsible reasons.

3.3.1. The workers had neither formal education in the chemistry of reactions and handling of hazardous substances nor had qualifications and experience in handling hazardous substances. They were not competent to supervise such handling within the factory.

3.3.2. On the day of incidence, there was no facility for control addition of sulphuric acid through an addition vessel / glass

flask. Sulphuric acid was directly charged into the reactor from the sulphuric acid carboys through vacuum charging.

3.3.3. A safety relief valve was provided on the SS reactor (3 KL) but the rupture disc was not provided. In the Case of GLR (3 KL) neither a safety relief valve nor a rupture disc was provided on it.

3.3.4. On the reactor system, there was no provision for an alarm and interlock such as a utility failure alarm, agitator failure alarm, High-temperature alarm or Alarm for a High rate of addition of limiting reactant which is added at a controlled rate. Also, there was no control system installed in which the raw material (limiting reactant) addition rate is controlled by the flow control loop. The controlling parameter is reactor temperature.

3.3.5. The flow control valve or on-off valve (interlocked with the reaction mass temperature and agitator tripping) was not installed on the reactor.

4. DETAILS OF DECEASED PERSONS – EMPLOYEE/CONTRACT WORKER/OTHER, AGE, LAST DRAWN SALARY, COMPENSATION PAID;

4.1. As per the details provided by the District Administration, total 13 persons were deceased on the spot.

4.2. Compensations of Rs. 5.00 lakh each paid to 2 persons and District Administration is in process to pay the compensation to the remaining deceased persons.

4.3. Details of last salary drawn of permanent and contractual employee/worker submitted by the industry to MPCB on 02/07/2024 and same is enclosed herewith as Annexure-IV.

5. DETAILS OF INJURED PERSONS - EMPLOYEE/CONTRACT WORKER/OTHER, AGE, LAST DRAWN SALARY, NATURE OF INJURY, PERMANENT DISABLEMENT, IF ANY, DATE OF ADMISSION IN HOSPITAL, DATE OF DISCHARGE, COMPENSATION PAID;

5.1. A total of 68 people were injured and taken to different hospitals for treatment. Free treatment has been provided by the Government of Maharashtra.

5.2. Out of these 68 injured individuals, two casualties were reported later in addition to the 13 people who died on the spot during the incident.

5.3. The details provided by the District Administration are attached in the Annexure-V.

5.4. Details related to the compensation paid are awaited.

6. DAMAGE TO NEARBY STRUCTURES, IF ANY;

6.1. After explosion, the raw material finished product being combustible and flammable caught fire. This fire spread into the adjacent factories

as well. Due to the high intensity, many houses and industrial establishments in the surrounding area have been damaged.

6.2. In addition to the unit in question, collapse of the structures was observed in the adjacent units M/s. Mehta Paint and M/s. Saptvarna Colourant having common boundary wall with the unit in question.

6.3. The committee also observed that the structures and manufacturing equipment of other surrounding units has been damaged.

6.4. The committee also noted that some minor structures within an approximately one-kilometre aerial distance were also damaged. According to the information from the Tahsildar Office, a detailed survey was conducted and minor and major damages have been reported upto an approximate distance of 1.5 km.

6.5. As per the report of the Revenue Department, Kalyan Dombivli Municipal Corporation (KDMC) and Revenue Department has jointly conducted a panchnama of the incident site and total 980 residential properties and commercial properties in the surrounding area. Out of 980 properties, 643 residential properties were minorly affected and 337 commercial properties were also affected (298 commercial properties were minorly affected and 39 commercial properties were fully affected).

7. ACTIONS TAKEN BY DISH AND MPCB AFTER THE ACCIDENT;

7.1. MPCB has issued Closure Directions vide No. MPCB/ROK/750/24, Dated 23/05/2024 to the said unit M/s. Amudan Chemicals Pvt Ltd and also issued voluntary Closure Directions to the adjacent 8 units.

The copies of the these directions are enclosed herewith as Annexures-VI.

7.2. MPCB has carried out survey of Chemical units located in MIDC area Dombivali during 25/05/2024 to 28/05/2024 and issued Closure Directions issued to 36 defaulter units. The list of total 45 units is attached at Annexure-VII.

7.3. The DISH carried out detailed investigation and submitted report categorially mentioning about the occurrence of the accidents, possible responsible factors and remedial measures to be taken to consider such accidents in future.

8. ENVIRONMENTAL DAMAGE IN TERMS OF AIR/WATER/LAND POLLUTION AND MITIGATION MEASURES;

8.1. During the incident, due to explosion followed by fire, hazardous chemicals/ material burned which resulted into air pollution.

8.2. MPCB informed that around 214.2 MT of contaminated waste has been shifted to CHWTSDF for safe disposal.

8.3. According to CHWTSDF estimation, another 100 to 150 MT of contaminated waste remains at the site and they are in the process of removing it. They have also collected seven residue samples for analysis to confirm the appropriate method of treatment and disposal.

8.4. MPCB conducted Ambient Air Quality Monitoring for 24 hours from 4:00 PM on 23/05/2024. As per monitoring reports the lower and higher concentrations of PM10 level during 24 hours are $187 \mu\text{g}/\text{m}^3$ and $314 \mu\text{g}/\text{m}^3$ respectively. (Standard of PM10 for 24 hours in

industrial and residential area is 100 $\mu\text{g}/\text{m}^3$). The AAQM Results is attached at Annexure-VIII.

8.5. The committee observed some liquid spillages at the site however, no significant quantities were noticed.

8.6. The committee was of the opinion that technical services from the reputed institute/organization should be hired to estimate the environmental damage in terms of air, water, and land pollution. The committee opined to engage the services of the suitable technical institute for damage assessment of environment due to said incidence.

9. RECORD OF REGULATORY COMPLIANCE BY THE UNIT IN TERMS OF EPA 1986, WATER (PREVENTION AND CONTROL OF POLLUTION) ACT 1974, AIR (PREVENTION AND CONTROL OF POLLUTION) ACT 1981, HAZARDOUS WASTE (MANAGEMENT AND HANDLING) RULES 2016;

9.1. As per the information with MPCB, the unit had provided the following infrastructure to control the environmental pollution,

9.1.1. Effluent Treatment Plant (ETP) of 1.5 CMD capacity comprising primary treatment. Treated effluent was sent to Common Effluent Treatment Plant (CETP) for further treatment.

9.1.2. Stack was provided to LDO fired Thermopack.

9.1.3. Scrubber was provided to process reactor.

- 9.2. The unit was having Consent to Operate having validity 31/12/2028 under Water Act, Air Act and HW Rule. The Consent copy is attached at Annexure-IX.
- 9.3. Industry has submitted online HW returns for the 2022-23. Industry has disposed HW 3 Kg in 21.09.2023, 21.12.2023, 18.04.2024 and 16.05.2024.
- 9.4. The unit was also submitted Pollution Audit Report under provision of Environment (Protection) Act, 1986. The report is attached at Annexure-X.
10. **UNAUTHORIZED CONSTRUCTION/ EXPANSION/INSTALLATION CARRIED OUT BY THE UNIT, IF ANY;**
- 10.1. MIDC informed that area of the plot is 700 sq. mtr. and MIDC has permitted built up area 240 sq. mtr.
- 10.2. As per the records with MIDC, no unauthorized construction/ expansion/installation has been reported.
11. **Record of Regulatory Compliance by the Unit in terms of Manufacture, Storage and Import of Hazardous Chemicals Rules 1989 specifically in the terms of HAZOP Study/ies, Safety Audit/s carried out in past 3 years before the accident;**
- 11.1. HAZOP study of the unit was carried out in Dec 2020 by DISH certified Safety Auditor Mr Dhananjay Jadhav (Register No.MS/DISH/SA/J-006/2019) M/s. Dtech Engineering.

11.2. In the HAZOP study report the manufacturing activity details, raw material details, process flow and production process of organic peroxide was studied. Also, the studies of activities like mixing of chemical, charging of chemicals, the possible hazards generation of static charged / splash fire, explosion / chemical / vapor explosion are mentioned in the said report. The HAZOP Report is attached at Annexure-XI.

12. HAZOP STUDY/IES, SAFETY AUDIT/S CONDUCTED AFTER THE ACCIDENT ALONG WITH STATUS OF IMPLEMENTATION OF AUDIT RECOMMENDATIONS AND ALSO IMPLEMENTATION OF RECOMMENDATIONS OF MPCB AND DISH; AND

12.1. DISH have carried out detailed investigation and submitted report categorially mentioning about the occurrence of the accidents, possible responsible factors and remedial measures to be taken to consider such accidents in future. DISH has carried out study after the accident and submitted recommendations.

12.2. To avoid reoccurrence of such incidence in future following remedial measures are suggested by DISH :-

12.2.1. The facility for control addition of sulphuric acid through an additional vessel / glass flask shall be made.

12.2.2. On the reactor system provision of alarm and interlock such as utility failure alarm, agitator failure alarm, High temperature alarm for High rate of addition of limiting reactant which is added at controlled rate shall be provided.

- 12.2.3. Flow control valve and / or On-Off valve for raw material shall be installed such that raw material (limiting reactant) addition rate should be controlled by flow control loop. The controlling parameter is reactor temperature. And FCV and/or On-Off valve should be interlocked with the reaction mass temperature and agitator tripping.
- 12.2.4. A HAZOP study for the entire process shall be carried out by specialized expert and recommendations thereof shall be complied with.
- 12.2.5. Workers and the operator shall be trained well-designated Training Programme for operation and working staff regarding handling of hazardous chemical and hazardous associated with it, and the same shall be periodically refreshed with the latest information available within the scope.

13. PROFIT AND LOSS STATEMENT FOR THE UNIT FOR PAST 3 YEARS PRIOR TO THE ACCIDENT.

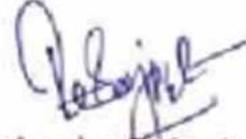
- 13.1. The profit and loss statements of year 2021-2022 and 2022-2023 are submitted by industry to the MPCB on 01/07/2024 and same are enclosed herewith as Annexure-XII.

14. The photographs taken during the visit of the committee are attached herewith as Annexure-XIII.

15. The committee humbly submits before Hon'ble NGT to consider this report as interim report and allow time to submit the final report including environmental damage assessment with help of the reputed technical institute/organisation.

Date : 02/07/2024

Place : Kalyan



Dr. Rajendra Rajput,
Regional Officer, MPCB, Kalyan –
Nodal Officer

(Pune Bench)

**BEFORE THE NATIONAL GREEN TRIBUNAL
WESTERN ZONE BENCH, PUNE**

THROUGH PHYSICAL HEARING (WITH HYBRID OPTION)

Original Application No.121/2024(WZ)

News item titled "Amudan Chemicals Pvt. Ltd. in Dombivli East-8 killed, 60 injured in boiler blast at Thane Chemical Unit" appearing in The Indian Express dated 24.05.2024.

Date of hearing: 24.05.2024

**CORAM: HON'BLE MR. JUSTICE DINESH KUMAR SINGH, JUDICIAL MEMBER
HON'BLE DR. VIJAY KULKARNI, EXPERT MEMBER**

Respondent : Ms. Manasi Joshi, Advocate for MPCB

ORDER

1. We have perused the report of the learned Registrar of this Tribunal dated 24.05.2024 in respect of news item published in The Time of India dated 24.05.2024 titled "8 die, 62 hurt in chemical unit blast in dense Dombivli MIDC".
2. This Original Application is registered *suo-moto* on the basis of above-mentioned report of learned Registrar as well as news item published in The Indian Express dated 24.05.2024 titled "Amudan Chemicals Pvt. Ltd. in Dombivli East 8 killed, 60 injured in boiler blast at Thane chemical unit".
3. As per the newspaper reports, a boiler explosion took place in a chemical industry in Dombivli (East) of Thane District in Maharashtra on Thursday afternoon. The name of the Chemical Industry is recorded as Amudan Chemicals Pvt. Ltd., wherein it is reported by the Officials of Kalyan Dombivli Municipal Corporation (KDMC) that the boiler explosion happened in Phase- 2 of the Dombivli MIDC area around 1.40 pm, affecting adjacent factories and houses. The explosion was heard in a

radius of two kilometers and the window panes of nearby houses in the buildings in 500 mtrs. radius were shattered due to the impact. A smoke cloud could be seen billowing from the factory. A photograph of the same is also given in the newspaper.

4. It is further reported in the newspaper that a fire brigade official said that the Amudan Company, owned by Malay Mehta, is dealing into hardener (chemical) manufacturing, where two-three blasts followed the main blast. The impact was such that four companies nearby were gutted. People working in and around Amudan were thrown off. Due to the presence of chemicals within the premises, there were two more explosions. Metal objects were flung around in a radius of about 500 mtrs.

5. It is further reported in the newspaper that the KDMC had pressed nearly 12 fire engines, 16 water tankers and 50 foam drums for rescue operations. In this occurrence, 8 lives were lost and 60 were injured. As per the preliminary information, those killed were working in neighbouring factories. The cause of the explosion is still not known. In the year, 2016, a similar explosion took place at a company in Dombivli MIDC in which 12 people were killed.

6. It is further reported in the newspaper that the boiler in the factory was not registered under the Indian Boiler Regulations, 1950. Large number of people are feared trapped in the factories around the chemical factory and efforts are made to rescue those people. All most-hazardous industrial units falling under the red category are directed to have been closed down immediately, which would be given option to shift to another location or change the usage (category).

7. Looking to the seriousness of the occurrence, we are inclined to take cognizance of this occurrence *suo moto* and direct the Registry to

implead following parties as respondents in the present Original Application:-

- (i). **Maharashtra Pollution Control Board**
through Member Secretary
Kalpataru Point, 2nd floor, Opp. PVR Theatre, Sion (E),
Mumbai-400022, Maharashtra
Email - ms@mpcb.gov.in
- (ii). **Maharashtra Industrial Development Corporation**
through Chief Executive Officer
"Udyog Sarathi", Marol Indl. Area,
Mahakali Caves Road, Andheri (East),
Mumbai - 400 093.
Tel: 022-47488312/47484699/47484679
Email - ceo@midcindia.org
- (iii). **District Collector -Thane**
Collector Office, Court Naka,
Thane (West), Pin 400601
Telephone : +91- 22 - 25347444
E-mail: collector.thane@maharashtra.gov.in
- (iv). **Central Pollution Control Board**
through Regional Directorate
Survey No. 110, Dhankude Multi Purpose Hall,
Baner Road, Baner, Pune - 411045
Tel: 020-2991 2772 & 020-2991 2773
E-mail - pratik.cpcb@gov.in
- (v). **Directorate of Industrial Safety and Health**
Kamgar Bhawan, 5th Floor, C-20, E-Block, Opp R.B.I.,
Bandra-Kurla Complex, Bandra (E), Mumbai-400 051.
Tel.-+91 22 26572504 / 09 / 22 / 58
E-mail- dirdish.mum-mh@gov.in
- (vi). **AMUDAN CHEMICALS PRIVATE LIMITED**
through Directors- Malay Mehta and Sneha Malay Mehta
W-229, MIDC Phase II, Manpada Road,
Dombivli (East), Thane 421203.
E-mail:- amudanchemicals@gmail.com

8. We also deem it appropriate to constitute a Joint Committee comprising one Member each of:-

- (i). Maharashtra Pollution Control Board;
- (ii). Maharashtra Industrial Development Corporation;
- (iii). District Collector -Thane;

- (iv). Central Pollution Control Board; and
- (v). Directorate of Industrial Safety and Health.

9. The Maharashtra Pollution Control Board (MPCB) shall be the nodal agency for coordination and logistic support.

10. The Committee is directed to visit the site in question within two days positively. Following shall be the Terms of Reference for the Joint Committee along which the report is required to be submitted by the Committee:-

1. Accident Investigation Report along with corrective action plan;
2. Details of deceased persons - employee/contract worker/other, age, last drawn salary, compensation paid;
3. Details of injured persons - employee/contract worker/other, age, last drawn salary, nature of injury, permanent disablement, if any, date of admission in hospital, date of discharge, compensation paid;
4. Damage to nearby structures, if any;
5. Actions taken by DISH and MPCB after the accident;
6. Environmental damage in terms of air/water/land pollution and mitigation measures;
7. Record of Regulatory Compliance by the Unit in terms of EPA 1986, Water (Prevention and Control of Pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981, Hazardous Waste (Management and Handling) Rules 2016;
8. Unauthorized construction/expansion/installation carried out by the unit, if any;
9. Record of Regulatory Compliance by the Unit in terms of Manufacture, Storage and Import of Hazardous Chemicals Rules 1989 specifically in the terms of HAZOP Study/ies, Safety Audit/s carried out in past 3 years before the accident;

10. HAZOP Study/ies, Safety Audit/s conducted after the accident along with status of implementation of Audit recommendations and also implementation of recommendations of MPCB and DISH; and
 11. Profit and Loss statement for the unit for past 3 years prior to the accident.
11. The Committee shall submit its report within one month.
 12. We further direct that the Member Secretary, MPCB shall ensure that an Officer not below the rank of Regional Officer shall be personally responsible in carrying out the investigation and the said Officer shall appear before this Tribunal on the date fixed by us with action taken report.
 13. The report in the matter be submitted by MPCB through e-filing by using portal of NGT in the form of searchable PDF/OCR Support PDF and not in the form of Image PDF.
 14. A copy of this order be communicated to the above-mentioned Committee and respondent No.6 forth-with for compliance.

Put up this matter for further consideration on 03.07.2024

Dinesh Kumar Singh, JM

Dr. Vijay Kulkarni, EM

May 24, 2024
Original Application No.121/2024(WZ)
P.Kf

Visit of the joint committee with reference to Hon'ble NGT Order OA 121/2024 (WZ) related to incident at Amudan Chemicals Pvt. Ltd. Dombivli

The Hon'ble NGT (WZ) has constituted a committee in the matter of OA 121/2024 (WZ) vide order dated 24.05.2024 which is registered suo moto on the basis of News item titled "Amudan Chemicals Pvt. Ltd. in Dombivli East- 8 killed, 60 injured in boiler blast at Thane Chemical Unit" appearing in The Indian Express dated 24.05.2024.

Hon'ble NGT item titled "Amudan Chemical (P) Ltd., Dombivli (E) 8 killed, 60 injured in boiler blast at Thane Chemical unit" appearing in the Indian Express dated 24/05/2024) and directed to the joint committee to visit the site and submit report. The 'Terms of Reference' for the Joint Committee is also provided in the aforesaid order.

The following members, nominated by the concerned department, carried out the site visit on 31/05/2024.

- Rajesh Mule, Deputy Engineer, MIDC Dombivli
- Sachin Bhele, Deputy Director, DISH, Kalyan
- Satyajit Chavan, Residential Nayab Tahsildar
- Rajendra D. Patil, Scientist 'E', CPCB RD Pune Dr. Rajendra
- Dr. Rajendra Rajput, Regional Officer, MPC Board, Kalyan -Nodal Officer

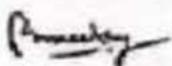
Following is some of the key observations made during visit.

- 1) It was reported that the explosion began between 1:30 and 2:00 PM on 23/05/2024 and that the fire continued until late at night.

- 2) The committee observed that the structures of the unit have collapsed at the site and that the debris are spread across the unit area.
- 3) In addition to the unit in question, collapses of the structures were observed in the adjacent units, M/s. Mehta Paint and M/s. Saptvarna Colourant, which shared their boundary walls with the unit in question.
- 4) The committee also observed that the structures and manufacturing equipment of other surrounding units have been damaged.
- 5) According to the information provided by Residential Nayab Tahsildar, total of 15 units sustained damage to their civil/building structures.
- 6) MPCB officials informed that MPCB issued voluntary closure orders to the 8 adjacent units, immediately after the blast & fire incident.
- 7) MPCB also informed that 214.2 MT of contaminated waste have been shifted to CHWTSDF for safe disposal and about 100 to 150 MT of contaminated waste remains at the site. CHWTSDF is in the process of removing the waste. Seven residue samples of the waste have collected for analysis to confirm the appropriate method of treatment and disposal.
- 8) MPCB conducted Ambient Air Quality Monitoring for 24 hours starting from 4:00 PM on 23/05/2024..
- 9) The committee observed traces of liquid spillages at the site; however, no significant quantities were noticed.
- 10) The committee also noted that minor structures within an approximately one-kilometre aerial distance were damaged. According to the information provided Residential Nayab Tahsildar, a

detailed survey was carried out, and minor and major damages have been reported up to an approximate distance of 1.5 km.

- 11) The committee has requested representatives from the concerned department to provide relevant information as per the Terms of Reference mentioned in the 'para 10' of the aforesaid order within 10 days.
- 12) The committee is also of the opinion that technical services from the national level reputed institute/organization should be hired for the assessment of environmental damage in terms of air, water, and land pollution. The committee requested MPCB to expedite the process as soon as possible.

Name of the officer	Signature
Rajesh Mule, Deputy Engineer, MIDC Dombivali	
Sachin Bhele, Deputy Director, DISH, Kalyan	
Satyajit Chavan, Residential Nayab Tahsildar	
Rajendra D. Patil, Scientist 'E', CPCB RD Pune	
Dr. Rajendra Rajput, Regional Officer, MPC Board, Kalyan	
Date of visit	May 31, 2024



Government of Maharashtra
Directorate of Industrial Safety & Health
Office of Joint Director,

Industrial Safety & Health, 3rd Floor, Gandhi Tower, Near Joker Cinema, Bail Bazar, Kalyan
(W). Ph.no:- 0251-2207042, E-mail ID: jdishkalyan@gmail.com

By RPAD

No.JDISH/Visit/SGB/3335

Date - 4 JUN 2024

Forwarded the visit remarks dtd. 23/05/2024 to Occupier/Manager of M/s. Amudan
Chemicals Pvt Ltd., Plot No. W-229, M.L.D.C. Phase II, Manpada Road, Dombivali (East)
Kalyan, Tal - Kalyan & Dist-Thane 421204 pasting in Inspection Book & early compliance.

(S.G. Bhele)
Deputy Director,
Industrial Safety & Health, Kalyan

M/s. Amudan Chemicals Pvt Ltd.,
Plot No. W-229, M.L.D.C. Phase II, Manpada Road,
Dombivali (East) Kalyan
Tal – Kalyan & Dist-Thane 421204.

1. On receipt of the telephonic message from the MARG member from Dombivali, I, visited the factory on 23.05.2024 @ 2:00 PM to enquire into the explosion that took place in the factory @ 1:35 PM on the same day which resulted into fire and an offsite emergency.
2. Shri. D.B. Gore, Director, Directorate of Industrial Safety & Health, Maharashtra, Shri. S.S. Joshi, Jt. Director, Kalyan, Shri. L.K. Gorane, Dy. Director, DISH were also present at the accident spot.
3. A total of 13 workers died, and 67 persons were injured in this incident. The injured workers were immediately taken to AIMS Hospital, ICON Hospital, and Shastri Hospital KDMC and other hospitals in Dombivli east in after a rescue operation was launched. A total of 36 nearby industrial establishments have been verified by the Police department in connection with the blast incident, and the following industrial establishment workers were found missing. later, the dead bodies were identified by relatives /DNA sampling. Below is the list of deceased workers due to accident.

Sr. No	Name of deceased workers	Age	Sex	Name of the factory where the deceased worker was employed	Whether Factory Worker / Contract Worker	Whether Registered under ESIC/WC
1.	Mrs. Rohini Kadam	26	Female	Amudan Chemicals Pvt. Ltd.,	Staff	Registered under ESIC. INS.NO – 3417421857
2.	Mrs. Riddhi Khandwilkar	38	Female	Amudan Chemicals Pvt. Ltd.,	Staff	Registered under ESIC. INS.NO. – 3417421616
3.	Mr. Dhaval Vaghani	29	Male	Amudan Chemicals Pvt. Ltd.,	Staff	Not registered under ESIC.
4.	Mr. Ravi Rajbhar	45	Male	Amudan Chemicals Pvt. Ltd.,	Factory Worker	Registered under ESIC. INS.NO -

						3517457747
5.	Mr. Satyanarayan Rajbhar	48	Male	Amudan Chemicals Pvt. Ltd.,	Factory Worker	Registered under ESIC. INS. NO – 3517457791
6.	Mr. Manoj Jondhale	54	Male	Amudan Chemicals Pvt. Ltd.,	Contract worker of Disha Enterprises	Registered under ESIC. INS. NO – 3417344667
7.	Mr. Sirajuddin Ahmed	24	Male	Amudan Chemicals Pvt. Ltd.,	Contract worker of Kishore Prabhakar Gulhane	Registered under ESIC. INS. NO – 3416976471
8.	Mr. Bharat Jaiswar	43	Male	Amudan Chemicals Pvt. Ltd.,	Contract worker of Kishore Prabhakar Gulhane	Registered under ESIC. INS. NO – 3416091051
9.	Mr. Manoj Chavan	35	Male	Amudan Chemicals Pvt. Ltd.,	Contract worker of Poonam Enterprises	Registered under ESIC. INS. NO – 3415848558
10.	Mr. Manish Kumar Das	22	Male	Amudan Chemicals Pvt. Ltd.,	Contract worker of Poonam Enterprises	Registered under ESIC. INS. NO – 3416802910
11.	Mr. Rakesh Rajput	49	Male	Saptavarna Colors Pvt. Ltd., W - 230, MIDC, Phase - 2, Dombivli,	Contract worker of Colourmax Dyestuff Pvt. Ltd.	Registered under ESIC. INS NO- 5609503478
12.	Mr. Vishal Poundwall	42	Male	Cosmos Company	Factory worker	Registered under ESIC. INS NO- 3417424412
13.	Mr. Jai Sarkar	26	Male	Cosmos Company	Factory worker	Registered under ESIC. INS NO- 3417428289

4. Kalyan Dombivli Municipal Corporation, Navi Mumbai Municipal Corporation, Ulhasnagar Municipal Corporation, Ambarnath Municipal Council and NDRF Battalion No. 5 and TDRF had conducted rescue operations. On 25.05.2024 at 3.42 pm the said rescue operation was stopped.

List of Industrial establishments affected by the explosion & fire at M/s. Amudan Chemicals Pvt. Ltd.,

Sr. No.	Company Name and Address
1.	Wagjhai Enterprises Plot no. W-233, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Kalyan Tal - Kalyan & Dist-Thane 421204
2.	Neo orgo Chem LLP ,Plot No. W-222, Phase II,Dombivali PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
3.	Omega Fine Chemicals, Plot No. w-130,Phase II,Dombivali Dist. Thane
4.	Omega Fine Chemicals, Plot No. A-88,Phase II,Dombivali Dist. Thane
5.	Mehta corporation Plot no. W-228, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Kalyan Tal - Kalyan & Dist-Thane 421204
6.	Auto Car Color & Coating Pvt Ltd, Plot No.734, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Kalyan Tal - Kalyan & Dist-Thane 421204
7.	S.D.A. Industries Limited Plot no. W-227, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Kalyan Tal - Kalyan & Dist-Thane 421204
8.	Brisk Chemical,Plot No. W-221, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
9.	Modern Industrial Gases, W-170/1, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
10.	Mr. Vighnagar Chemicals, Plot no. W-225, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
11.	Vinayak Tech Plasticchem Pvt. Ltd., Plot no. W- 226, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
12.	Deccan Colors & Chemicals Pvt. Ltd. Plot no. W-232, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Kalyan
13.	Saptavarna Colorants Pvt. Ltd. Plot no. W-130, Sonarpada, manpada Road, MIDC phase 2, Dombivali,
14.	Cosmos Engineering, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
15.	Kaushal Chemical, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
16.	Metro godown, Mhatre compound, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane

5. Due to the high intensity of the said chemical accident, many houses and industrial establishments in the surrounding area have been damaged and lives have been lost. As per the report of the Revenue department, Kalyan Dombivli Municipal Corporation and Revenue Department had jointly conducted a panchnama of the incident site and a total of 980 properties of residents and commercial properties in the surrounding area. Out of 980 properties, 643 residential properties were minorly affected, and 337 commercial properties were also affected (298 commercial properties were minorly affected, 39 commercial properties were fully affected).
6. **Observations at the affected M/s. Amudan Chemicals Pvt. Ltd., :**
After the incidence following situation was found during the enquiry;
- i. The factory shed, the compound wall, factory building structure having 1 floor with MS platform was completely collapsed due to explosion.
 - ii. A crater size of around 15 feet diameter & about 7 feet deep is formed due to explosion in the factory.
 - iii. Due to explosion shock waves, the adjacent factories building, structures, roofs etc. collapsed, Glass window panels & door panels/shutters, etc, of the residential and commercial buildings in the surrounding area got damaged.
 - iv. The GLR (3 KL) was totally shattered into pieces and the SS reactor (3KL) too was shattered into pieces. The MS platform along with the structure was thrown away from the actual location.
 - v. The Di Methyl Phalate (DMP) tank exploded and was found ruptured. The MEK tank was thrown away at a distance of 12.8 meters from the actual location.
 - vi. The SS reactor, which was not in use, located at a distance of 7 meters from the GLR, was thrown away at a distance of 70 meters, and the SS blender was thrown away at a distance of 100 meters from the actual location.
 - vii. After explosion, the raw material finished product being combustibile and flammable caught fire. This fire spread into the adjacent factories,
 - a) Saptavarna Colorants Pvt. Ltd.
Plot no. W-130, Sonarpada, manpada Road, MIDC phase 2, Dombivali,
 - b) Cosmos Engineering, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
 - c) Kaushal Chemical, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
 - d) K.G Chemicals, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane

e) Metro Company Godown, PHASE - MIDC, SONARPADA, DOMBIVALI, Kalyan Page 27



A still Pics of M/s. Amudhan Chemicals, Before explosion



The devastated factory after explosion and fire



A crater formed due to the explosion of the reactor at the original position of the reactor



Rupture of 20 KL DMP tank



The dislocation MEK Tank from the original position

7. Visited the factory again on 25/05/2024 and 29/05/2024 to carry out further enquiry of incidence. The following activities were carried out during the visit.
 - i. I obtained the sketch of the actual layout, and machine layout showing the position of the storage tanks, SS reactor, glass line reactor, blender, chilling plant, office on the first floor, storage of raw material, and finished goods. (Annexure-1)
 - ii. I have collected information about the latest plan approved by my office, which shows that the Plans were revised vide letter no. DISH/PLN/DBD/147/2009/137 dtd. 22/05/2007. The approved plan shows that mixing vessels, reactor vessel, mutch filter, receiver, condenser, flask, baby boiler, oil expansion tank, vacuum pump etc. were installed in the premises. (Annexure- 2)
 - iii. I have obtained a report of examination of pressure vessel – SS reactor of 3 KL (Eq no. SSR-02 ID NO. PVO2,MOC-SS, installed in 2023), GLR reactor no. 3 KL (Eq no. GLR-01 ID NO. PV03,MOC-MS/GLR installed in 2023), Blending vessel 1.5 KL (Eq no. BV-

01 ID NO. PV04, MOC-SS, installed in 2005), SS reactor KL (Eq no. SSR-01 ID NO. PV01, MOC-SS), in form no-13 obtained from competent person Mr. Dhananjay Jadhav on dated 23/09/2023. The hydraulic examination, ultrasonic test was carried out on 23/09/2023, and it was observed that ultrasonic tests revealed that

Sr. no		Shell thickness	Dish thickness
1	SS reactor no. 2	4.2 mm 4.11 mm	4.22 mm, 4.30 mm
2	GLR reactor	16.02 mm 16.13 mm	18.22 mm, 18.30 mm

- iv. Risk Assessment & job safety analysis, HAZOP study, Safety Audit was carried out in Dec 2020 by Mr. Dhananjay Jadhav of M/s. Dtech Engineering.
- v. I have recorded the statement of Mr. Ganesh Ashok Musale, Supervisor of M/s. Amudan Chemicals Pvt Ltd., Dombivli.

8. From the above enquiries and the recorded statement it is revealed as follows:-

- a) The factory manufactures various organic peroxides such as Methyl Ethyl Ketone Peroxide (MEKP), Di Tertiary Butyl Peroxide (DTBP), Tertiary Butyl Hydro Peroxide (TBHP).
- b) On 23/05/2024, in the factory there was the following raw materials and finished goods were stored in the factory.

Sr. No.	Name of Chemicals	Mode of storage	Total quantity stored	remarks
1.	Methyl Ethyl Ketone (MEK)	SS tank of 20 KL capacity	10 MT	Raw Material
2.	Di Methyl Phalate (DMP)	SS tank of 20 KL capacity	20 MT	Raw Material
3.	Hydrogen Per Oxide (H ₂ O ₂)	40 Drums	7 to 8 MT	Raw Material
4.	DEG	40 Drums	9.5 MT	Raw Material
5.	TBA	40 Drums	6.6. MT	Raw Material
6.	Benzoyl Chloride	8 Drums	2 MT	Raw Material
7.	Sulphuric Acid	14 cans (63 kg each),	882 Kg	Raw Material
8.	Methanol	6 Drums	930 Kg	Raw Material
9.	Di Tertiary Butyl Peroxide (DTBP)	Plastic Cans	700 Kg	Finished Goods

10.	TBPB-	Plastic Cans	approx. 30 Kg	Finished Goods
11.	MEKP FG 50	Plastic Cans	3 MT	Finished Goods
12.	MEKP FG 40-	Plastic Cans	1.5 MT	Finished Goods
13.	MEKP LG- 1.5	Plastic Cans	1.5 MT	Finished Goods
14.	Cobalt		around 1.5 MT	Finished Goods

- c) The following equipment were installed and used in manufacturing activity on the ground floor in the shed.

Sr. No.	Name of equipment	Equipment ID	Installed on
1.	SS reactor of 3 KL	Eq no. SSR-02 ID NO. PVO2,MOC-SS	2023
2.	GLR reactor no. 3 KL	Eq no. GLR-01 ID NO. PV03,MOC-MS/GLR	2023
3.	Blending vessel 1.5 KL	Eq no. BV-01 ID NO. PV04,MOC-SS,	2005
4.	SS reactor 1 KL	Eq no. SSR-01 ID NO. PV01,MOC-SS	2005
5.	Vacuum pump and ejector (7HP & 5 HP)	-	
6.	Chilling Plant	42 TR	2023
7.	Cooling tower	--	--

Also, in front of the main gate inside the factory, there was an office on the first floor; next to the office was a store.

- d) The Factory is registered under Section 85 of the Factories Act, 1948 The factory is engaged in manufacturing activity in relation to Chemical Industries – Electrochemicals (Peroxides) industries listed under Sr. 17 of the First Schedule of the Factories Act, 1948.Hence the factory is carrying out Hazardous process as defined under section 2(cb) of the Factories Act, 1948.
- e) The factory license bearing no. 10018373 is found renewed till the year 2025. As per the application for renewal of licence in form No: - 01, it is revealed that Mr. Kirti Gokuldas Mehta, Director is the Occupier of the factory. But, as per letter dtd. 29/05/2024 by Mr Kirti Mehta it was reported that, he had resigned from the position of Director of M/s.

Amudan Chemicals Pvt. Ltd., and the same was accepted by Mr. Malay Mehta. Also, as per the Register of Companies, Mumbai, it is revealed that Mr Malay Pradeep Mehta and Mrs Sneha Malay Mehta are the Directors of the M/s. Amudan Chemicals Pvt. Ltd. Hence, Mr. Malay Pradeep Mehta and Mrs. Sneha Malay Mehta are the occupiers as per Section 2 (n)(ii) of the Factories Act, 1948

- f) It is found from the office records that the occupier had not drawn an on-site emergency plan and detailed disaster control measures for his factory.
- g) On the day of incident 23/05/2024, at 1:30 PM, there was the manufacturing of TBHP in Glass Line reactor (3 KL) and the manufacturing of TBPB in the SS reactor (3 KL)
- h) On the day of the incident, 23/05/2024, the following workers were working in the factory incidental to the TBHP manufacturing process.

Sr. No.	Name Of Worker	Nature of work
1)	Mr. Ravi Rajbhar	Operator
2)	Mr. Satyanarayan Rajbhar	Operator
3)	Mr. Sirajuddin Ahmed	Helper
4)	Mr. Bharat Jaiswar	Helper
5)	Mr. Manoj Chavan	Helper
6)	Mr. Manish Kumar Das	Helper

- i) The manufacturing process of Tertiary Butyl hydrogen peroxide (TBHP) is a highly exothermic reaction. Exothermic reaction means the release of Heat during the reaction
- j) It was revealed from the recorded statement of Mr. Ganesh Musale, that workers were not fully aware of the risks involved in H₂O₂ and its reaction with sulphuric acid and TBA. Also, the workers, as stated above, had no formal education in the chemistry of reactions and handling of hazardous substances nor had qualifications and experience in handling hazardous substances and were not competent to supervise such handling within the factory.
- k) On the day of incidence there was no facility for control addition of sulphuric acid through an addition vessel /glass flask. sulphuric acid was directly charged into the reactor from the sulphuric acid carboys through vacuum charging.
- l) A safety relief valve was provided on the SS reactor (3 KL), but the rupture disc was not provided. In the Case of GLR (3 KL), neither a safety relief valve nor a rupture disc was provided on it.

- m) On the reactor system, there was no provision for an alarm and interlock such as a utility failure alarm, agitator failure alarm, High-temperature alarm, or Alarm for a High rate of addition of limiting reactant, which is added at a controlled rate. Also, there was no control system installed in which the Raw material (limiting reactant) addition rate is controlled by the flow control loop. The controlling parameter is reactor temperature. Also, the flow control valve or on-off valve (interlocked with the reaction mass temperature and agitator tripping) was not installed on the reactor.
- n) As per the manufacturing process and process flow submitted vide renewal application form no. 100030712015 dtd. 11/09/2020 it was revealed that, the manufacturing process flow is as follows:
 Take sulphuric acid in the glass vessel cool it upto 6-10 °C, start addition of TBA over stir for 15-20 deg. Celsius. Start addition of Hydrogen peroxide, and maintain temperature 15 to 30 °C, Stir for 8 hrs. Stop stirring and separate out TBHP as per batch taken.
 But on 23/05/2024, it was revealed that, the manufacturing process flow is as follows:
 Take Hydrogen peroxide in the reactor cool it upto 17-18 °C, Start addition of sulphuric acid, and maintain temperature 25 to 30 °C, then add TBA into the reactor maintaining the temperature below 25° C Stir for 8-12 hrs. Stop stirring and separate out TBHP as per batch taken.
- o) Hydrogen peroxide is a strong oxidant with explosive risk. An increase in the temperature promotes the decomposition as well as a higher pH Value, for optimum stability, the pH range of hydrogen peroxide below 4.5. Above pH 5.0 decomposition increases sharply, for the commercial solution generally pH adjusts under 5.0. The Decomposition will produce a vast amount of gas which increase the pressure of the system, release very high heat. The impurities trigger the decomposition of hydrogen peroxide at low temperatures.
- p) Hydrogen peroxide with sulfuric acid to produce peroxy mono sulfuric acid (Piranha solution), Even small amounts of organics could make the piranha solution unstable
- q) S, Tert- Butyl Hydro peroxide bearing CAS no75-91-2 is having Flash point 43 °C , flammability limit 5%-100%, Auto Ignition 238°C, Boiling point 96° C, SADT > 60° C.
- r) As per MSDS, Tert- Butyl Peroxybenzoate (TBPB) is a organic peroxide bearing CAS no. 614-45-9 is having Flash point > 93 °C , SADT > 60° C. The TBPB batch was in SS reactor (3 KL) adjacent to the GLR reactor.
- s) As per MSDS, Solvent MEK is highly flammable liquid, having boiling point 78° C, flash point is -7 °C.

- t) As per MSDS, Dimethyl phthalate (DMP) is combustible liquid, having boiling point 282°C , flash point is 146°C , auto ignition temperature is 470°C . It forms explosive mixtures with air on intense heating. A range from approx. 15 Kelvin below flash point is rated as critical.
- u) As per MSDS, Tert- Butanol bearing CAS no. 75-65-0 is having flash point 11°C , auto ignition temperature is 490°C , Boiling point is 83°C . It is flammable, containers may explode when heated, vapours may form explosive mixtures with air.
- v) One chilling plant and one cooling tower were installed in the factory. Temperature was controlled via jacket cooling.

7) Details of the TBHP Manufacturing Process-

- a. TBHP reaction was carried out in GLR reactor 3 KL (Eq no. GLR-01 ID NO. PV03, MOC-MS/GLR installed in 2023).
- b. The brief of reactants added in GLR is H_2O_2 (1200 kg) + H_2SO_4 (300 Kg) + TBA (1260 Kg).
- c. First, H_2O_2 is added in GLR and chilled up to 17 to 18°C . This addition was done on previous night i.e. on 22/05/2024.
- d. On the 23/05/2024, Mr. Ravi Rajbhar, Operator, Mr. Satyanarayan Rajbhar, Operator, Mr. Sirajuddin Ahmed, Helper, Mr. Bharat Jaiswar, Helper, Mr. Manoj Chavan, Helper, Mr. Manish Kumar Das, Helper were present.
- e. H_2SO_4 is added GLR maintaining the temperature below 25 to 30°C . @ 9 am on 23/05/2024, the addition of 180 Kg of H_2SO_4 is completed. After 2-2^{1/2} hours, another addition of the remaining 210 Kg of H_2SO_4 was made into the GLR (charging of 1 can of 63 Kg takes around 8-10 mins.) maintaining the temperature below 25 to 30°C . After that TBA addition is started in the reactor maintaining the temperature below 25°C (approximately 100 kg to 150 kg per addition)
- f. After completion of the addition of TBA, the reactor is maintained in stirring condition for 10 to 12 hrs.
- g. After that it is transferred to the mixing process in the blender and neutralise with Magnesium Carbonate and adjust PH.
- h. After Active Oxygen testing, add methanol as per requirement.
- i. It is note that, at one batch around 1500 Kg of TBHP is obtained.

The manufacturing process flow chart of TBHP is shown in Figure below

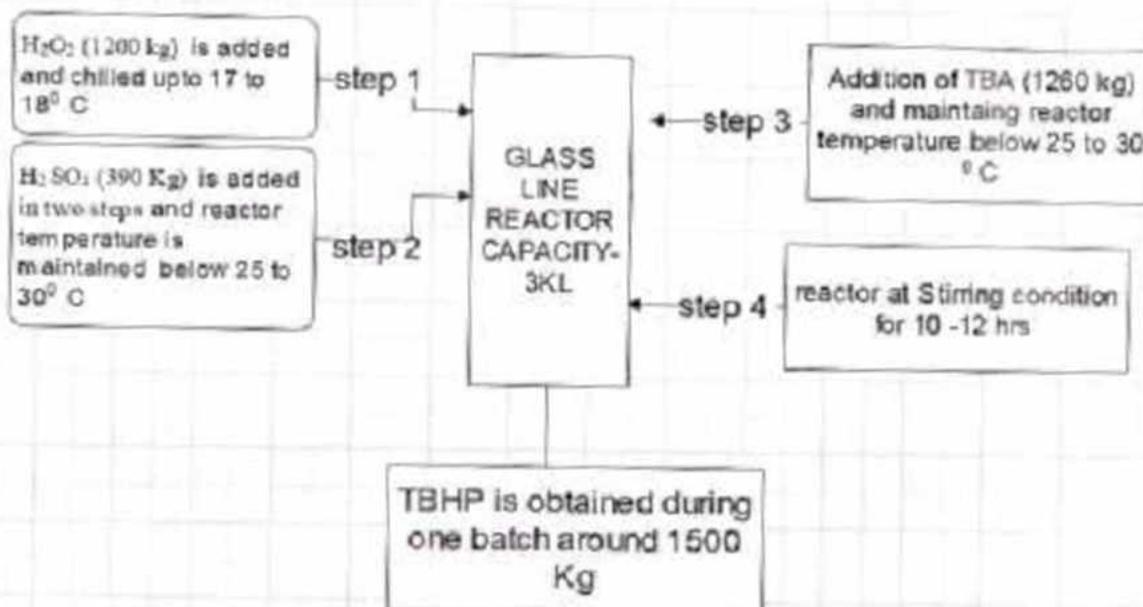


Figure - Manufacturing Process Flow Chart for TBHP

8) Details of the TBPB Manufacturing Process-

- TBPB reaction was carried out in SS reactor 3 KL. (Eq no. SSR-02 ID NO. PVO2,MOC-SS, installed in 2023),
- The brief of reactants added in SSR is TBHP - N (450 kg) + Caustic Soda Solution + Benzoyl Chloride.
- Caustic Soda Solution (approx. 200 Kg) as per testing of TBHP -N added in SS reactor and maintain temperature below 20° C.
- Addition of Benzoyl Chloride. Stir, maintaining the temperature 20-25° C.
- The reactor is maintained in stirring condition for 9-12 hours. After completion of the reaction separate water from the product by layer separation.
- Material is transferred in the blender and then add magnesium sulphate for removing water content, After removing the water collect the filtrate via filter in 30 Kg Nutch filter

9) Occurrence of explosion and fire in the factory:

On 23/05/2024, The synthesis of Tertiary Butyl hydro peroxide (TBHP) was carried out in GLR (3 KL), and in the SS reactor (3 KL), the settling of TBPB was carried out.

- i. On 22/05/2024, at night in GLR (3KL), H_2O_2 (1200 kg) is charged and the temperature of the reactor was brought to around $17^{\circ}C$. Also, in the SS reactor(3 KL) there was making of TBPB, and at night, there was the activity of the stirring of TBPB in SS reactor (3 KL).
- ii. On 23/05/2024 @ 09 am Mr. Ravi Rajbhar, operator, had cooled the reactor around $17^{\circ}C$ and charging of H_2SO_4 of around 180 KG was charged from the H_2SO_4 can with help of vacuum pump. The charging of 1 can (63 Kg) of H_2SO_4 takes around 15 minutes. Total 180 KG was charged from the 3 H_2SO_4 Cans taking around 40 to 45 minutes. Then, when the vacuum was released, there was an increase in temperature, and the temperature was maintained below $25^{\circ}C$, and the stirring was carried out for around 2 to 2 1/2 hours.
- iii. Thus, the charging of the remaining 210 KG H_2SO_4 from the H_2SO_4 cans (3 & 1/2 cans) was carried out at 11:15 am, and the charging was finished @ 12:30 pm.
- iv. At 12:30 PM there was a lunch break till 1:00 PM. After lunch break TBA of around 100-150 Kg was charged into the reactor, soon after the charging was over by releasing vacuum, the temperature was increased rapidly leading to exothermic reaction @ 60 to $70^{\circ}C$ and to control runaway reaction cooling arrangement was insufficient. As the temperature increased, also inside the reactor pressure increased beyond bursting pressure of 95 Kg/cm^2 leading to the bursting of GLR (3KL).
- v. Due to the explosion of the reactor and the shock waves and tremendous heat, the adjacent SS reactor (3KL) containing TBPB also exploded due to the decomposition reaction of TBPB exceeding the SADT temperature of more than $60^{\circ}C$.
- vi. Also, the MS tank containing DMP also exploded, leading to the rupture of the tank due to forming explosive mixtures with air on intense heating and the MEK tank was thrown away at a distance of 7 meters from the original position.
- vii. Due to the presence of combustible liquid, and flammable liquids at the premises, the fire started in the factory and spread rapidly to the adjacent factories. After the explosion followed by fire the workers of the adjacent factory informed the Fire brigade about the incident. The Fire brigade from Dombivili MIDC @ 1:50 PM reached the spot and started extinguishing the fire. Also, after some time other Fire brigade from Kalyan Dombivili Municipal Corporation, Navi Mumbai Municipal Corporation, Ulhasnagar Municipal Corporation, Ambarnath Municipal Council and NDRF Battalion No. 5 and TDRF had conducted rescue operations. On 25.05.2024 at 3.42 pm the said rescue operation was stopped.
- viii. The injured workers were immediately taken to AIMS Hospital, ICON Hospital, and Shastri Hospital KDMC and other hospitals in Dombivili east in after a rescue operation was launched. Out of 68 workers. One worker Mr. Jay Sarkar of M/s. Cosmos Engineering

succumbed to the burn injury on 29/05/2024 while treatment at the National Burn Centre, Airoli. A total of 13 workers died, and 67 persons were injured in this incident.

10) Observation of samplings Raw materials, finished goods of TBA, Hydrogen peroxide and hydrogen peroxide for simulation of accident scenario.

1. On 28/10/2022, I have collected samples from the thrown away reactor and the crater formed at the site. Also as per reactions carried out in GLR on the date of incidence, reaction mass of containing same raw materials and finished product was sent to the laboratory for examination to M/S GVS Cibatech, Bhandup for DSC analysis on 03/06/24. the result of the same was received at my office on 15/06/2024 (Annexure -3).
2. As per thumb rule calculation and ASME, the burst pressure of the reactor is calculated as below:

$$\begin{aligned}
 \text{Burst pressure} &= 2 eSt/D-0.8t \\
 &= 2 \times 0.85 \times 75000 \times 0.75 / 70.86 - 0.8 \times 0.75 \\
 &= 1361 \text{ PSI} \\
 &= 95 \text{ Kg/cm}^2 \\
 e &= \text{welding efficiency} \\
 S &= \text{Tensile Strength} \\
 t &= \text{thickness of vessel} \\
 D &= \text{outside diameter of vessel}
 \end{aligned}$$

Even though we are getting, Burst pressure 95 Kg/cm². Considering vessel condition like life, welding joints, nozzle joints, dish end etc the vessel will burst at pressure exceeding 70 Kg/ cm²..

Conclusions from the results of collected samples, chemical analysis :

From the result of DSC test report from M/S. GVS Sebatech, Bhandup it is concluded that, there is violent / exothermic / runaway reaction of the carried out GLR up to temperature of 70 deg. cel. Thus, violent/runway/ exothermic reaction at this temperature occurred, leading to an increase in pressure inside the reactor beyond 80 Kg/cm². Heat generation rate and cooling capacity in the reactor are needed to assess the possibility of a runaway. Also, the additional cooling system was not in place to remove the heat generated during the runaway reaction. There was no controlled addition of sulphuric acid, and the sulphuric acid was charged into the reactor directly from the carboy through vacuum charging.

On the reactor system there was no alarm and interlock such as Utility failure alarm, agitator failure alarm, High temperature alarm, Alarm for High rate of addition of

limiting reactant which is added at controlled rate, Raw material (limiting Page 39 addition rate should be controlled by flow control loop and FCV and/or On-Off valve interlocked with the reaction mass temperature and agitator tripping system was not available or installed on the reactor. Hence this accident has occurred

11) Contraventions:-

1) The contraventions of Provisions of Section 7 A- (2) (a) of the Factories Act 1948:-

On 23/05/2024, The synthesis of Tertiary Butyl hydrogen peroxide (TBHP) was carried out in GLR (3 KL), and in the SS reactor (3 KL), the settling of TBPB was carried out. On 22/05/2024, at night in GLR (3KL), H₂O₂ (1200 kg) is charged and the temperature of the reactor was brought to around 17^o C. Also, in the SS reactor(3 KL) there was making of TBPB, and at night, there was the activity of the stirring of TBPB in SS reactor (3 KL). On 23/05/2024 @ 09 am Mr. Ravi Rajbhar, operator, had cooled the reactor around 17^o C and charging of H₂SO₄ of around 180 KG was charged from the H₂SO₄ can with help of vacuum pump. The charging of 1 can (63 Kg) of H₂SO₄ takes around 15 minutes. Total 180 KG was charged from the 3 H₂SO₄ Cans taking around 40 to 45 minutes. Then, when the vacuum was released, there was an increase in temperature, and the temperature was maintained below 25^o C, and the stirring was carried out for around 2 to 2 1/2 hours. Thus, the charging of the remaining 210 KG H₂SO₄ from the H₂SO₄ cans (3& 1/2 cans) was carried out at 11:15 am, and the charging was finished @ 12:30 pm. At 12:30 PM there was a lunch break till 1:00 PM. After lunch break TBA of around 100-150 Kg was charged into the reactor, soon after the charging was over by releasing vacuum, the temperature was increased rapidly leading to exothermic reaction @ 60 to 70^o C and to control runaway reaction cooling arrangement was insufficient. As the temperature increased, also inside the reactor pressure increased beyond 80 Kg/cm². The inside pressure due to the reaction would have increased beyond 80 Kg/cm² leading to the bursting of GLR (3KL).

On the 23/05/2024, safety relief valve was provided on the SS reactor (3 KL), but the rupture disc was not provided. In the Case of GLR (3 KL), neither a safety relief valve nor a rupture disc was provided on it. Also, on the reactor system there was no provision of alarm and interlock such as Utility failure alarm, agitator failure alarm, High temperature alarm, Alarm for High rate of addition of limiting reactant which is added at controlled rate, Raw material (limiting reactant) addition rate should be controlled by flow control loop. The controlling parameter is reactor temperature. And FCV and/or On-Off valve should be interlocked with the reaction mass temperature and agitator tripping.

The aforementioned causes contributed to this incident, so it was essential to maintain the following work system to ensure worker safety and the absence of any health risks. However, in this instance, the occupier failed to ensure safety of the workers and there was risk to their health while they were at work:

- a. There was no facility for control addition of sulphuric acid through an addition vessel /glass flask. sulphuric acid was directly charged into the reactor from the sulphuric acid carboys through vacuum charging.
- b. By providing alarm and interlock such as Utility failure alarm, agitator failure alarm, High temperature alarm, Alarm for High rate of addition of limiting reactant which is added at controlled rate, Raw material (limiting reactant) addition rate should be controlled by flow control loop.
- c. The controlling parameter being the reactor temperature. And FCV and/or On-Off valve should be interlocked with the reaction mass temperature and agitator tripping.

Thus, the occupier had failed to maintain the in safe working order as well as the system without risking the workers' health.

Hence Occupier of the factory have been contravened Provisions of section 7 A- (2) (a) of the Factories Act 1948 on the day of incidence.

II) The contraventions of Provisions of Section 7 (1) (b) of the Factories Act, 1948 It is reported that Mr Malay Pradeep Mehta and Mrs Sneha Malay Mehta are the Directors of the M/s. Amudan Chemicals Pvt. Ltd.. As per Section 7 (1) of the Factories Act, 1948, Whenever Occupier begins to occupy any premises as factory, he shall send a written notice in form no. 1 as stated in Rule 14 of the Maharashtra Factories Rules 1963 at least 15 days before begins to occupy any premises as factory. The Occupier has not sent a written notice in form no. 1 containing the name and address of the Occupier; hence, the provision of Section 7 (1) (b) of the Factories Act, 1948 is contravened.

III) The contraventions of Provisions of Section 41-B (4) of the Factories Act, 1948

The factory is engaged in manufacturing activity in relation to Chemical Industries – Electrochemicals (Peroxides) industries listed under Sr. 17 of the First Schedule of the Factories Act, 1948. Hence the factory is carrying out Hazardous process as defined under section 2(cb) of the Factories Act, 1948.

It is revealed from the office records that the occupier had not drawn an on-site emergency plan and detailed disaster control measures for his factory. Thus, the occupier had not drawn an on-site emergency plan and detailed disaster control measures for the factory. **Hence the**

Occupier had contravened the provisions of Section 41-B (4) of the Factories Act, 1948.

IV) The contraventions of Provisions of Section 41-C (b) of the Factories Act, 1948

The factory is engaged in manufacturing activity in relation to Chemical Industries – Electrochemicals (Peroxides) industries listed under Sr. 17 of the First Schedule of the Factories Act, 1948. Hence the factory is carrying out Hazardous process as defined under section 2(cb) of the Factories Act, 1948.

It was revealed that workers were not fully aware of the risks involved in H₂O₂ and its reaction with sulphuric acid and TBA. Also, the workers, as stated above, had no formal education in the chemistry of reactions and handling of hazardous substances nor had qualifications and experience in handling hazardous substances and were not competent to supervise such handling within the factory. Thus, the occupier of a factory involving Hazardous process as stated above, had not appointed persons who possess qualification & experience in handling hazardous substances and are competent for such handling. Hence the Occupier had contravened the provisions of Section 41-C (b) of the Factories Act, 1948.

V) The contraventions of Provisions of Rule 4(2) of Maharashtra Factories Rules 1963

At the time of my visit it is found that, the plans of the were revised vide letter no. DISH/PLN/DBD/147/2009/137 dtd. 22/05/2007. The approved plan shows that mixing vessels, reactor vessel, nutch filter, receiver, condenser, flask, baby boiler, oil expansion tank, vacuum pump etc. were installed in the premises., The present factory machinery layout are not in conformity with the approved plans, it is seen that, On the ground floor, SS reactor of 3 KL (Eq no. SSR-02 ID NO. PVO₂,MOC-SS, installed in 2023), GLR reactor no. 3 KL (Eq no. GLR-01 ID NO. PV03,MOC-MS/GLR installed in 2023) and SS tank of 20 KL capacity used for the storage of Methyl Ethyl Ketone (MEK), SS tank of 20 KL capacity used for the storage of Di Methyl Phalate (DMP) was installed in factory. Thus machinery layout are not in conformity with the earlier approved plans. Therefore the Occupier has contravened the Provisions of Rule 4(2) of Maharashtra Factories Rules 1963,

VI) The contraventions of Provisions of Rule 4(1) (d) of Maharashtra Factories Rules

1963 As per the manufacturing process and process flow submitted vide renewal application form no. 100030712015 dtd. 11/09/2020 it was revealed that, the manufacturing process flow is as follows:

Take sulphuric acid in the glass vessel cool it upto 6-10 0 C, start addition of TBA for 15-20 deg. Celsius. Start addition of Hydrogen peroxide, and maintain temperature 15 to 30 0 C, Stir for 8 hrs. Stop stirring and separate out TBHP as per batch taken. But on 23/05/2024, it was revealed that, the manufacturing process flow is as follows:

Take Hydrogen peroxide in the reactor cool it upto 17-18 0 C, Start addition of sulphuric acid, and maintain temperature 25 to 30 0 C, then add TBA into the reactor maintaining the temperature below 250 C Stir for 8-12 hrs. Stop stirring and separate out TBHP as per batch taken.

Thus, there is change in manufacturing process of TBHP, But the occupier was using the premises as factory without getting plan approval from Jt. Director DISH, Kalyan regarding changes total or partial in manufacturing process. **Therefore, the Occupier has contravened the Provisions of Rule 4(I) (d) of Maharashtra Factories Rules 1963**

VII) The contraventions of Provisions of 73-N(1) of Maharashtra Factories Rules ,1963

The factory is engaged in manufacturing activity in relation to Chemical Industries – Electrochemicals (Peroxides) industries listed under Sr. 17 of the First Schedule of the Factories Act, 1948. Hence the factory is carrying out Hazardous process as defined under section 2(cb) of the Factories Act, 1948.

As per rule 73-N(1) of Maharashtra Factories Rules ,1963 , The occupier of a factory carrying on a 'Hazardous process' ought to be compiled and made known to workers individually through supply of booklets or leaflets the following information in relation to handlings of hazardous materials like methanol, IPA etc. Or any hazardous substances in the manufacture, transportation, storage and other processes of making TBHP, TBBP, MEKP:

- a) Information of Hazardous processes carried on in the factory.
- b) Location and availability of all materials Safety Data Sheets as per Rule 73-M.
- c) Material safety data sheets of raw materials and finished products and intermediates handled in manufacturing process at plant.
- d) Physical and health hazards arising out of the exposure to or handling of substance.
- e) Measures to be taken by the workers to ensure safe handling, storage and transportation of hazardous substance.
- f) Personnel protective equipments required to be used by workers employed in hazardous process or dangerous operation.

g) Sign and symptoms likely to be manifested on exposure to hazardous substances and to whom to report.

h) Measures to be taken by the workers in case of any spillage or leakage of hazardous substance.

But during enquiry it is found that the workers working on manufacturing process of synthesis of TBHP, TBBP, MEKP were not provided with information in relation to handling of hazardous materials like Hydrogen peroxide TBA, Sulphuric Acid, thus occupier of has contravened the provisions of the Rule 73-N(1) of Maharashtra Factories Rules, 1963.

VIII) The contraventions of Provisions of Rule 3 (b) of Maharashtra Factories (Safety Audit) Rules, 2014

The factory is engaged in manufacturing activity in relation to Chemical Industries – Electrochemicals (Peroxides) industries listed under Sr. 17 of the First Schedule of the Factories Act, 1948. Hence the factory is carrying out Hazardous process as defined under section 2(cb) of the Factories Act, 1948.

A safety Audit was carried out in Dec 2020 by Safety Auditor Mr Dhananjay Jadhav. In Dec 2022, Safety Audit was not carried out by the occupier of the factory. As per Rule 3 (b) of Maharashtra Factories (Safety Audit) Rules, 2014, The occupier of the factory shall arrange to carry out the safety audit externally, once in two years by the Safety Auditor as a measure for securing the safety of persons employed . But the Occupier had not arranged to carry out a Safety Audit externally once in two years by safety auditor **Therefore, the Occupier has the Provisions of Rule 3 (b) of Maharashtra Factories (Safety Audit) Rules, 2014**

IX) The contraventions of Provisions of Rule 115 (2) of Maharashtra Factories Rules, 1963

There was an explosion and fire on 23/05/2024 at 1:30 pm in the factory leading to the accident of 10 workers. I came to know about accident through telephonic message from the MARG member from Dombivali, @ 2:00 PM The notice of an accident should have been confirmed by the manager by sending a written report in form No. 24 within 12 hours of taking place of this accident as per provision of Rule 115 (2) of Maharashtra Factories Rules 1963. However, the written report in form No. 24 has not been submitted till date.

Thus the Manager had not submitted written report in form No. 24 within the prescribed time limit 12 hours, the provisions of Rule 115 (2) of Maharashtra Factories Rules, 1963 have been contravened by the Manager of the factory.

12) Remedial Measures:

To avoid the reoccurrence of such incidence in future following remedial measures are suggested:-

- i. The facility for control addition of sulphuric acid through an addition vessel /glass flask. Shall be made
- ii. On the reactor system provision of alarm and interlock such as Utility failure alarm, agitator failure alarm, High temperature alarm, Alarm for High rate of addition of limiting reactant which is added at controlled rate shall be provided.
- iii. Flow Control Valve and/or On-Off valve for raw material shall be installed such that raw material (limiting reactant) addition rate should be controlled by flow control loop. The controlling parameter is reactor temperature. And FCV and/or On-Off valve should be interlocked with the reaction mass temperature and agitator tripping.
- iv. A HAZOP study for the entire process shall be carried out by specialized expert and recommendations thereof shall be complied with.
- v. Workers and the operator shall be trained well-designed Training Program for operators & working staff regarding handling of hazardous chemicals & hazards associated with it, and the same shall be periodically refreshed with the latest information available within the scope.

13) Payment of Compensation and Ex-gratia:

The occupier is directed to -

1. Pay legal due compensation to heirs of diseased under intimation to this office.
2. Pay substantial sum of rupees as ex-gratia payment to heirs of diseased under intimation to this office.
3. Adequate Medical treatment shall be extended to the injured. Health progress of injured shall be reported periodically to this Directorate. Injured worker shall be paid their wages during medical leave.

14) Show Cause Notice :

The occupier may explain & show causes if any within 7 days that why legal action shall not be considered against him for the above said contraventions.


(S. G. Bhele.)
Deputy Director,
Industrial Safety and Health,
Kalyan

DETAILS OF DECEASED PERSONS PERMANENT STAFF AND WORKERS OF
AMUDAN CHEMICALS PVT LTD

Sr No	NAME	AGE	SALARY/MONTH	ESIC COVERED INS NO.
1	SATYANARAYAN RAJBHAR	48	14820	3517457791
2	RAVI RAJBHAR	45	14820	3517457747
3	DHAVAL WAGHANI	38	55000	NOT REGISTERED
4	RIDDHI A KHANVILKAR	38	16000	3417421616
5	ROHINI C KADAM	26	18000	3417421857

DETAILS OF DECEASED PERSONS ON CONTRACT BASIS THROUGH
CONTRACTOR OF AMUDAN CHEMICALS PVT LTD

Sr No	NAME	AGE	CONTRACTOR NAME	ESIC COVERED INS NO.
1	MANOJ JONDHALE	54	DISHA ENTERPRISES	3417344667
2	SIRAJUDDIN AHMED	24	SAHARA MULTI SERVICES	3416976471
3	BHARAT JAISWAR	43	SAHARA MULTI SERVICES	3416091051
4	MANOJ CHAVAN	35	POONAM ENTERPRISES	3416848558
5	MANISH KUMAR DAS	22	POONAM ENTERPRISES	3416802910



उपविभागीय अधिकारी तथा उपविभागीय दंडाधिकारी
कल्याण उपविभाग कल्याण यांचे कार्यालय



क्र.केडी/टे-३/ने.आ./अमुदान कंपनी/७८५/२०२४

दि.१९/०६/२०२४

प्रति,
प्रारंभिक अधिकारी,
महाराष्ट्र प्रदुषण नियंत्रण मंडळ,
सिध्दीविनायक संकुल, तिसरा भाडा
स्टेशन रोड, कल्याण(प)-४२१३०९,
ता.कल्याण, जि.ठाणे

महाराष्ट्र कायद्यालय
म.प्र.वि. मंडळ, कल्याण.
आवक क्र. २३६०
दिवांक २५/०६/२४

विषय : मौजे सोनारपाडा येथील अमुदान केमिकल कंपनी मध्ये झालेल्या स्फोटाबाबत...

संदर्भ : १) NGT Western Zone bench, Pune order dated 24.05.2024

२) Minutes Of Joint Committee Visit to Amudan Chemicals
Pvt.Ltd.Dombivali

३) तहसिलदार कल्याण यांचेकडील पत्र क्र. जा.क्र./महसूल/ने.आ/टे-४/कावि-
३६/२०२४, दि. १४/०६/२०२४

उपरोक्त संदर्भिय विषयाचे अनुषंगाने सादर करणेत येते की, कल्याण तालुक्यातील मौजे सोनारपाडा, डोंबिवली पूर्व, M.I.D.C, Phase II मधील प्लॉट नं.W २२९, अमुदान केमिकल्स प्रा.लिमिटेड या कंपनीत दि. २३/०५/२०२४ रोजी दुपारी १.४० वाजता रिजॅक्टर केमिकल स्फोट झाल्याने कंपनीमधील अनेक कर्मचारी मयत / जखमी झाले आहेत.

सादरह घटनेत एकूण ६८ लोक जखमी झाले आहेत. त्यांचा तपशिल खालीलप्रमाणे आहे.

Sr. No.	Patient Name	Age	Gender	Hospital Name	No. of Patients	Ward Name	Company Name
1.	Ankush Kumbhar	52	Male	AIMS HOSPITAL		P93	Omega
2.	Janki Nair	47	Female	AIMS HOSPITAL		P93	Shrinivas Chemical
3.	Ravindra Kumar Ram	32	Male	AIMS HOSPITAL		P93	Cosmos Company
4.	Akhilesh Mehta	36	Male	AIMS HOSPITAL		P93	Cosmos Company
5.	Sonu Kumar	21	Male	AIMS HOSPITAL		P93	Cosmos Company

SROK

6.	Shirish Talele	62	Male	AIMS HOSPITAL	31	P93	Cosmos Company
7.	Shivram Thavale	43	Male	AIMS HOSPITAL		P93	Dexan Company
8.	Shivam Tiwari	20	Male	AIMS HOSPITAL		P93	-
9.	Manoj Kumar	-	Male	AIMS HOSPITAL		ICU 1	-
10.	Indrapal Bhardvaj	34	Male	AIMS HOSPITAL		ICU 1	-
11.	Reena Kanojia	27	Female	AIMS HOSPITAL		ICU 1	-
12.	Rahul Pote	33	Male	AIMS HOSPITAL		ICU 2	-
13.	Sudarshan Mehta	35	Male	AIMS HOSPITAL		ICU 2	-
14.	Manisha Pokharkar	46	Female	AIMS HOSPITAL		ICU 2	-
15.	Prince Gupta	27	Male	AIMS HOSPITAL		Ward	-
16.	Sanjay Kumar Mahto	24	Male	AIMS HOSPITAL		Ward	Peemco Company
17.	Sagar Dohale	28	Male	AIMS HOSPITAL		Ward	Chaware Industry
18.	Kishor Sawant	51	Male	AIMS HOSPITAL		Ward	Mahal Printing Press
19.	Ravi Kumar	21	Male	AIMS HOSPITAL		Ward	Shakti Enterprises
20.	Tejal Gavit	23	Female	AIMS HOSPITAL		Ward	Model Industry
21.	Vikas Mehta	35	Male	AIMS HOSPITAL		Ward	Shakti Enterprises
22.	Sujata Kanojia	34	Male	AIMS HOSPITAL		Ward	Deccan Color
23.	Sagar Das	30	Male	AIMS HOSPITAL		Ward	Cosmos Company
24.	Ram Chauhan	70	Male	AIMS HOSPITAL		Ward	Raj Sons Industry
25.	Vasudev Yadav	48	Male	AIMS HOSPITAL		ICU 3	-
26.	Kamlesh Mehta	-	Male	AIMS HOSPITAL		Casualty	Techo Fiber

27.	Prachi Ghadi	44	Female	AIMS HOSPITAL		Casualty	-
28.	Rajan Gothankar	56	Male	AIMS HOSPITAL		-	-
29.	Rajendra Mishra	55	Male	AIMS HOSPITAL		-	-
30.	Geema Bharti	42	Female	AIMS HOSPITAL		-	-
31.	Vasudev Yadav	48	Male	AIMS HOSPITAL		-	-
32.	Ravindra Chormare	-	Male	Mamta Hospital	7	-	-
33.	Prakash Kambli	-	Male	Mamta Hospital		-	-
34.	Mansi patil		Male	Mamta Hospital		-	-
35.	Ujwal Mankar		Male	Mamta Hospital		-	-
36.	Yellappa		Male	Mamta Hospital		-	-
37.	Anil Bind		Male	Mamta Hospital		-	-
38.	Ramesh Kumar		Male	Mamta Hospital		-	-
39.	Pratik Waghmare		Male	Neptune Hospital	9	ICU	
40.	Rajan Ghotankar	56	Male	Neptune Hospital		-	-
41.	Rudyansh Dalvi	5	Male	Neptune Hospital		-	-
42.	Pravin Chavan	41	Male	Neptune Hospital		-	-
43.	Madhura Kulkarni	37	Female	Neptune Hospital		-	-
44.	Hemangi Chouk	56	Female	Neptune Hospital		-	-
45.	Kishor Vichapure	54	Male	Neptune Hospital		ICU	-
46.	Akshat Patil	24	Male	Neptune Hospital			
47.	Baban Devkar	45	Male	Neptune Hospital			
48.	Rajendra Mishra	57	Male	Aurindam	5	-	-

				Hospital			
49.	Smita Dharve		Female	Aurindam Hospital		-	-
50.	Prasad Dhawale		Male	Aurindam Hospital		-	-
51.	Bhumi Yadav	25	Female	Aurindam Hospital		-	-
52.	Lalita Mehta	36	Female	Aurindam Hospital		-	-
53.	Reema Vijay Bharti	38	Female	Gajanan Hospital	3	-	-
54.	Ashwini umesh Bhalerao	29	Female	Gajanan Hospital		-	-
55.	Vinodkumar Ananral Das	63	Male	Gajanan Hospital		-	-
56.	Deepak Singh	22	Male	Shastri Nagar	3	-	-
57.	Rahul Gaikwad	36	Male	Shastri Nagar		-	-
58.	Ehsan Khan	34	Male	Shastri Nagar		-	-
59.	Pratik Waghmare	35	Male	Icon Hospital	4	-	-
60.	Ramesh Shukla	45	Male	Icon Hospital		-	-
61.	RamsuratPaswani	52	Male	Icon Hospital		-	-
62.	Dinesh Vishwakarma	30	Male	Icon Hospital		-	-
63.	Suresh kothari	47	Male	Shivam Hospital	5	ICU	-
64.	Jay Sarkar	27	Male	Shivam Hospital		ICU	-
65.	Shailesh Prajapati	34	Male	Shivam Hospital		OPD	-
66.	Ranvijay Mishra	40	Male	Shivam Hospital		Ward	-
67.	Raghunath Shigwan	37	Male	Shivam Hospital		OPD	-
68.	Uttara Nikulse	-	Female	Ashirwad Hospital	1	-	-
Total					68		

तसेच मे.अमुदान केमिकल्स मध्ये झालेल्या स्फोट घटनेच्या अनुषंगाने पोलीस विभागामार्फत जवळच्या एकूण ३६ औद्योगिक आस्थापनांची पडताळणी करण्यात आली असून खालील आस्थापनांमधील कामगार बेपर्सा आहेत.

१. अमुदान केमिकल्स - १०

वरीलपैकी १० मूतदेहांची ओळख घटविययात आलेली आहे.

२. सदापर्ण कौमकल्स - १

सरर मूतदेहाची ओळख घटविययात आली आहे.

३. फॉसबॉस कौमकल्स - २

वरीलपैकी २ मूतदेहाची ओळख घटविययात आली आहे.

पर नमुद केलेंप्रमाणें १३ कामगारांचा ओळख घटविययात आली आहे.

वॉरिष्ट पोलोस निरिधक, गुन्हे शाखा, घटक ४, उल्लासनगर यांनी दिनांक १०.०६.२०२४ रोजी या कार्यरतपास अहवाल सादर केलेनुसार, ओळख घटलेल्या मघत व्यक्तींचा तपशील खालीलप्रमाणे

१. शोचिणी चंद्रकांत करम - २६ वर्षे, रा.रुम नं.२०९, पाटुरंग अथा, मातोश्री शाळा, आनंदेगाव, डोंबिवली(पूर्व)
२. रिष्दी अमिता खानीबलकर - ३८ वर्षे, रा.रु.नं.९, नव मालती सोसायटी, रामचंद्र नगर, डोंबिवली(पूर्व)
३. परतलाल गोरखनाथ जयसवाल - ४० वर्षे, रु.नं.२, निर्मलनगर, संदीप पाटील फौमलेसा, दावडी, डोंबिवली (पूर्व)

४. मनिष कुमार हिलीप दास - २२ वर्षे, रा.रु.नं.१०३, समर्थ हिल्डींग, नमस्कार टावा, आडिवली बोकळी, कल्याण(पूर्व)

५. राकेश वसुधिरि रजपूत - ४५ वर्षे, रा.शैलप्री कृपा चाळ, रु.नं.५, सोनारपाडा, डोंबिवली(पूर्व)

६. विद्याल सुनिल चौडवाल - ३९ वर्षे, रा.नारायण पॅलेस, रु.नं.१०२, राजल चाळ जवळ, गींज रोड, वरलापूर(प.)

७. जय सरकार - कौसर्मांस कंपनीमधील कामगार

८. रवी आंबेकाप्रसाद रामभार - २७ वर्षे, रा.रमेश व्हाट्रे चाळ, शंकरनगर, सोनारपाडा, डोंबिवली(पूर्व)

९. मनोज आंबेकाप्रसाद जॉर्डे - ४५ वर्षे, रा.विठ्ठल कृपासोसायटी, १०१, शंकरनगर, सोनारपाडा, डोंबिवली(पूर्व)

१०. मनोजसोती चौहान - ३५ वर्षे, रा.ओमश्री गुरुलिला, रु.नं.३०२, सोनारपाडा, डोंबिवली (पूर्व)

११. सत्यनारायण विन्धनाथ राजभर - ४० वर्षे, रा.जार्डवाई चाळ, मुकेरा पाटील यांचे बंगल्याचे मागे, सोनारपाडा, डोंबिवली

१२. सिराजउद्दीन याहीद अहमद सत्यमानी - २२ वर्षे, वासनाव, तहसिल मेलनगर, पोलोस टाणे तर्मा, नि.आनामगाड, उत्तरधर्श

१३. धवल जगादीश बायानी - ३८ वर्षे, रा.२००४, जाल्कन हिल्डींग, एस.एडिव्याना सोसायटी, कासारवाडवली, टाणे

सररच्या तसदीनक अपघाताचा तीव्रता जास्त असल्याने आसपासच्या परिसरातील अनेक घरांचे तसेच औद्योगिक आस्थापनांचे नुकसान झालेले असून निवृत्त व विलाहीनी झालेले आहे. त्याअनुषंगाने महसूल विभाग व कल्याण डोंबिवली महानगरपालिका यांनी संयुक्तरित्या घटनासगळ्यांचे तसेच त्याबाबुच्या परिसरातील रहिवासी व बाणिज्य एकूण ९८३ मालमत्तांचे पंचनामे करण्यात आलेले आहेत. त्यांचा तपशील खालीलप्रमाणे आहे.

अ.क्र.	मालमत्तेचा प्रकार	एकूण मालमत्तेचे नुकसान	मालमत्तेचे नुकसान अंशतः	मालमत्तेचे नुकसान पूर्णतः	रक्कम
१.	रहिवासी मालमत्ता	६४३	६४३	०	१६६३०१००/-
२.	व्याणिज्य मालमत्ता	३३७	२९८	३९	१२२४४३३१८/-
एकूण		९८०	९४१	३९	१३९०७३४१८/-

तसेच मे.अमुदान केमीकल्स प्रा.लि त्गतच्या एकूण १५ औद्योगिक आस्थापनांचे प्रत्यक्ष जागेवर पंचनामे करण्यात आलेले आहेत. त्यांचा तपशिल खालिलप्रमाणे आहे.

अ.क्र.	कंपनीचे नाव	नुकसान रक्कम
१.	श्री ४८ वाघाजाई इंटरप्राइजेस व बिजकेम इंटरप्राइजेस	१३३०००००/-
२.	NEOORGA CHEM LLP	३६००००/-
३.	ओमेगा फाईनकेमीकल्स प्रा.लि. W १३०	३२५०००००/-
४.	ओमेगा फाईनकेमीकल्स प्रा.लि. A ८८	४१००००००/-
५.	महताकॉपोरेशन	१५५०००००/-
६.	ऑटोकारकलर अँडकॉटिंग्स प्रा.लि.	५००००००/-
७.	पल्लवी इंटरप्राइजेस प्रा.लि	१५२०००००/-
८.	SDA INDUSTRIES W २२७	१८२५०००/-
९.	BRISK CHEMICAL INDUSTRIES	३०५०००००/-
१०.	MODERN INDUSTRIAL GASS PVT LTD	१४००००००/-
११.	विघ्नहर्ता केमीकल्स प्रा.लि.	१७००००००/-
१२.	VINYLTEK PLASTICHEM PVT LTD	१४००००००/-
१३.	सप्तवर्ण कलर प्रा.लि.	१०३००००००/-
१४.	फॉसमॉस इंजिनियरिंगकंपनी	२१८८७००००/-
१५.	डेक्कन कलर केमीकल प्रा.लि.	४४८०००००/-
एकूण		२२१८२२०००/-

प्रस्तुत प्रकरणी दिनांक २३/०५/२०२४ रोजीच्या रिअॅक्टर केमीकल स्फोटच्या घटनेत मोठ्या प्रमाणावर जीवित व वित्तहानी झालेली असल्याने, सदरचा महकल आपले मार्फत भा. राष्ट्रीय हरित न्यायाधिकरण यांचेकडे पाठविणेत यावा.



(विश्वास गुजर)
उपविभागीय अधिकारी कल्याण
उपविभाग कल्याण

MAHARASHTRA POLLUTION CONTROL BOARD Page 52**REGIONAL OFFICE-KALYAN**

Tel. No. (0251) 2310167/2310212

Fax No. (0251) 2310192

Visit us on: <http://mpcb.gov.in>E-mail: rokalyan@mpcb.gov.in

"Your Service is our Duty"

Siddhivinayak Sankul,
3rd Floor, Near Oak Baug,
Station Road,
Kalyan (West) – 421 301.

No.: MPCB/ROK/ 750/24

Date:- 23 / 05 /2024

To,
M/s. Amudaan Chemicals Pvt Ltd
Plot No. W-229, MIDC Phase-II,
Dombivli, Dist. Thane**Sub:-** Closure Directions u/s 33A of the Water (P&CP) Act, 1974 and u/s 31 A of the Air (P&CP) Act, 1981.**Ref: -** 1) Consent granted by MPC Board
2) Fire Incidence taken place in your unit on dtd 23.05.2024.
3) Visit of Board Official on 23/05/2024.
4) Legal action proposal received from SRO Kalyan-1.

WHEREAS, you are operating the industry in the pollution prevention area declared under the Provisions of the Water (P&CP) Act, 1974 and the Air (P&CP) Act, 1981 and the Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016.

AND WHEREAS, it is obligatory on your part to obtain Conditional Combined Consent and Authorization to operate your industrial plant to discharge sewage and trade effluent in water pollution prevention area subject to certain terms and conditions more precisely under the provisions of 25/26 of the Water (P&CP) Act, 1974 and section 21 of the Air (P&CP) Act, 1981 and the Ha Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016. **AND WHEREAS,** it was also obligatory on your part to provide adequate and efficient pollution control devices and take adequate measures to control air & water pollution from all sources so as to achieve the standards prescribed in the Environment (Protection) Act, 1986.

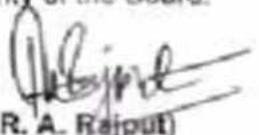
AND WHEREAS, fire incidence taken place in your Plot No. W-229 at 1.30 pm on dtd.23/05/2024 due to reactor explosion it has been has noticed that near by area is affected as well as caused pollution and about 6-7 fatalities reported.

AND WHEREAS, as per consent condition no. 15 you have not reported to MPC Board about this incidence.

AND WHEREAS, the burnt raw material and finished products, spilled contaminated soil, sand, debris found lying in company premises and also drums containing chemicals shall be safely disposed off to CHWTSDF as per the provision of environmental enactment.

NOW THEREFORE, in exercise of powers conferred upon me by the Board u/s. 33A of the Water (P&CP) Act, 1974 and u/s 31A of the Air (P&CP) Act, 1981. I, The Regional Officer, Kalyan hereby directed you to not to start your manufacturing activity till further order from MPC Board and NOC from DISH Authority.

This is issued with the post facto approval from competent authority of the Board.


(R. A. Rajput)
Regional Officer, Kalyan

Copy submitted for information to:

1. Member Secretary, M.P.C. Board, Mumbai.
2. Joint Director (WPC), M.P.C. Board, Mumbai.
3. Law Officer M.P.C. Board, Mumbai.

Copy to:

Sub-Regional Officer, M.P.C. Board, Kalyan-I- It is directed to serve the directions to above industry and submit compliance time to time.

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MAHARASHTRA POLLUTION CONTROL BOARD
REGIONAL OFFICE-KALYAN

Tel. No. (0251) 2310167/2310212
Fax No. (0251) 2310192
Visit us on: <http://mpcb.gov.in>
E-mail: rokalyan@mpcb.gov.in



Siddhivinayak Sankul,
3rd Floor, Near Oak Baug,
Station Road,
Kalyan (West) – 421 301.

No.: MPCB/ROK/ 757/24

Date:- 23 / 05 /2024

To,
M/s. Deccan Colour and Chemical Pvt. Ltd.
Plot No. W- 232, MIDC Phase-II,
Dombivalli, Dist. Thane

Sub:- Closure Directions u/s 33A of the Water (P&CP) Act, 1974 and u/s 31 A of the Air (P&CP) Act, 1981.

Ref: - 1) Consent granted by MPC Board
2) Fire Incidence occurred in M/s Amudan Chemicals Pvt Ltd on dtd.23.5.2024.
3) Visit of Board Official on 23/05/2024.
4) Legal action proposal received from SRO Kalyan-1.

WHEREAS, you are operating the industry in the pollution prevention area declared under the Provisions of the Water (P&CP) Act, 1974 and the Air (P&CP) Act, 1981 and the Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016.

AND WHEREAS, it is obligatory on your part to obtain Conditional Combined Consent and Authorization to operate your industrial plant to discharge sewage and trade effluent in water pollution prevention area subject to certain terms and conditions more precisely under the provisions of 25/26 of the Water (P&CP) Act, 1974 and section 21 of the Air (P&CP) Act, 1981 and the Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016. **AND WHEREAS,** it was also obligatory on your part to provide adequate and efficient pollution control devices and take adequate measures to control air & water pollution from all sources so as to achieve the standards prescribed in the Environment (Protection) Act, 1986.

AND WHEREAS, fire incidence taken place in M/s Amudaan Chemicals Pvt Ltd. Plot No. W-229 at 1.30 pm on dtd.23/05/2024 the industry located near to your unit and due to which the machineries and the building structure of your unit is found damaged.

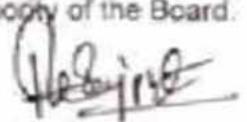
AND WHEREAS, the burnt raw material and finished products, spilled contaminated soil, sand, debris noticed in your company premises and drums containing chemicals shall be safely disposed off to CHWTSDF as per the provision of environmental enactment.

: 2 :

NOW THEREFORE, in exercise of powers conferred upon me by the Board u/s. 33A of the Water (P&CP) Act, 1974 and u/s 31A of the Air (P&CP) Act, 1981. I The Regional Officer, Kalyan hereby directed you to voluntary safely closed down your manufacturing activity as precautionary measures and safety purpose in order avoid further mishap.

AND WHEREAS, you shall not start manufacturing activity till further order from MPC Board and NOC from DISH Authority.

This is issued with the post facto approval from competent authority of the Board.



(R. A. Rajput)
Regional Officer, Kalyan

Copy submitted for information to:

1. Member Secretary, M.P.C. Board, Mumbai.
2. Joint Director (WPC), M.P.C. Board, Mumbai.
3. Law Officer M.P.C. Board, Mumbai.

Copy to:

Sub-Regional Officer, M.P.C. Board, Kalyan-I- It is directed to serve the directions to above industry and submit compliance time to time.

MAHARASHTRA POLLUTION CONTROL BOARD
REGIONAL OFFICE-KALYAN

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3rd Floor, Near Oak Baug,
Station Road,
Kalyan (West) – 421 301.

No.: MPCB/ROK/ 756 / 24

Date:- 23 / 05 / 2024

To,
M/s. MEHTA PAINTS INDUSTRIES
Plot No. W- 227, MIDC Phase-II,
Dombivalli, Dist. Thane

Sub:- Closure Directions u/s 33A of the Water (P&CP) Act, 1974 and u/s 31 A of the Air (P&CP) Act, 1981.

Ref: - 1) Consent granted by MPC Board
2) Fire Incidence occurred in M/s Amudan Chemicals Pvt Ltd on dtd 23.5.2024
3) Visit of Board Official on 23/05/2024.
4) Legal action proposal received from SRO Kalyan-1.

WHEREAS, you are operating the industry in the pollution prevention area declared under the Provisions of the Water (P&CP) Act, 1974 and the Air (P&CP) Act, 1981 and the Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016.

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AND WHEREAS, fire incidence taken place in M/s Amudaan Chemicals Pvt Ltd. Plot No. W- 229 at 1.30 pm on dtd.23/05/2024 the industry located near to your unit and due to which the machineries and the building structure of your unit is found damaged.

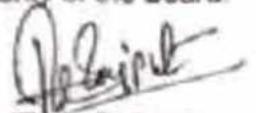
AND WHEREAS, the burnt raw material and finished products, spilled contaminated soil, sand, debris noticed in your company premises and drums containing chemicals shall be safely disposed off to CHWTSDF as per the provision of environmental enactment.

: 2 :

NOW THEREFORE, in exercise of powers conferred upon me by the Board u/s. 33A of Water (P&CP) Act, 1974 and u/s 31A of the Air (P&CP) Act, 1981. I The Regional Officer, Kalyan hereby directed you to voluntarily safely closed down your manufacturing activity as precaution measures and safety purpose in order avoid further mishap.

AND WHEREAS, you shall not start manufacturing activity till further order from M.P.C. Board and NOC from DISH Authority.

This is issued with the post facto approval from competent authority of the Board.



(R. A. Rajput)
Regional Officer, Kalyan

Copy submitted for information to:

1. Member Secretary, M.P.C. Board, Mumbai.
2. Joint Director (WPC), M.P.C. Board, Mumbai.
3. Law Officer M.P.C. Board, Mumbai.

Copy to:

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MAHARASHTRA POLLUTION CONTROL BOARD
REGIONAL OFFICE-KALYAN

Tel. No. (0251) 2310167/2310212
Fax No. (0251) 2310192
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"Your Service is our Duty"

Siddhivinayak Sankul,
3rd Floor, Near Oak Baug,
Station Road,
Kalyan (West) – 421 301.

No.: MPCB/ROK/ 749/24

Date:- 23 / 05 / 2024

To,
M/s. OMEGA FINE CHEMICALS
Plot No. W-231/D,, MIDC Phase-II,
Dombivall, Dist. Thane

Sub:- Closure Directions u/s 33A of the Water (P&CP) Act, 1974 and u/s 31 A of the Air (P&CP) Act, 1981.

Ref: - 1) Consent granted by MPC Board
2) Fire Incidence occurred in M/s Amudan Chemicals Pvt Ltd on dtd.23.5.2024
3) Visit of Board Official on 23/05/2024.
4) Legal action proposal received from SRO Kalyan-1.

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AND WHEREAS, fire incidence taken place in M/s Amudaan Chemicals Pvt Ltd. Plot No. W-228 at 1.30 pm on dtd.23/05/2024 the industry located near to your unit and due to which the machineries and the building structure of your unit is found damaged.

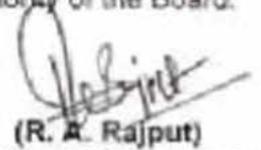
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Page 60

MAHARASHTRA POLLUTION CONTROL BOARD
REGIONAL OFFICE-KALYAN

Tel. No. (0251) 2310167/2310212
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Siddhivinayak Sankul,
3rd Floor, Near Oak Baug,
Station Road,
Kalyan (West) – 421 301.

No.: MPCB/ROK/ 751/24

Date:- 23 / 05 / 2024

To,
M/s. OMEGA FINE CHEMICALS
Plot No. W-130., MIDC Phase-II,
Dombivall, Dist. Thane

Sub:- Closure Directions u/s 33A of the Water (P&CP) Act, 1974 and u/s 31 A of the Air (P&CP) Act, 1981.

Ref: - 1) Consent granted by MPC Board
2) Fire Incidence occurred in M/s Amudan Chemicals Pvt Ltd on dtd.23.5.2024
3) Visit of Board Official on 23/05/2024.
4) Legal action proposal received from SRO Kalyan-1.

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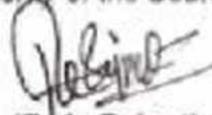
AND WHEREAS, fire incidence taken place in M/s Amudan Chemicals Pvt Ltd. Plot No. W-229 at 1.30 pm on dtd.23/05/2024 the industry located near to your unit and due to which the machineries and the building structure of your unit is found damaged.

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MAHARASHTRA POLLUTION CONTROL BOARD Page 62
REGIONAL OFFICE-KALYAN

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 3rd Floor, Near Oak Baug,
 Station Road,
 Kalyan (West) – 421 301.

No.: MPCB/ROK/ 753/24

Date:- 23 / 05 / 2024

To,
 M/s. Saptavarna Colourants Private Limited
 Plot No. W-230 MIDC Phase-II,
 Dombivalli, Dist. Thane

Sub:- Closure Directions u/s 33A of the Water (P&CP) Act, 1974 and u/s 31 A of the Air (P&CP) Act, 1981.

Ref:- 1) Consent granted by MPC Board
 2) Fire Incidence occurred in M/s Amudan Chemicals Pvt Ltd on dtd.23.5.2024
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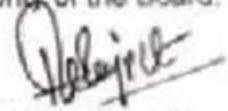
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MAHARASHTRA POLLUTION CONTROL BOARD
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3rd Floor, Near Oak Baug,
Station Road,
Kalyan (West) – 421 301.

No.: MPCB/ROKJ 754/24

Date:- 23 / 05 / 2024

To,
M/s. SEAGULL CHEMICALS PVT LTD
Plot No. W-127 MIDC Phase-II,
Dombivli, Dist. Thane

Sub:- Closure Directions u/s 33A of the Water (P&CP) Act, 1974 and u/s 31 A of the Air (P&CP) Act, 1981.

Ref:- 1) Consent granted by MPC Board
2) Fire Incidence occurred in M/s Amudan Chemicals Pvt Ltd on dtd.23.5.2024
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4) Legal action proposal received from SRO Kalyan-1.

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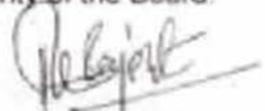
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MAHARASHTRA POLLUTION CONTROL BOARD
REGIONAL OFFICE-KALYAN

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Siddhivinayak Sankul,
3rd Floor, Near Oak Baug,
Station Road,
Kalyan (West) – 421 301.

No.: MPCB/ROK/ 752/24

Date:- 23 / 05 /2024

To,
M/s. SOHAN DYECHEM PVT LTD
Plot No. W-124, W-131 , W-124 MIDC Phase-II,
Dombivli, Dist. Thane

Sub:- Closure Directions u/s 33A of the Water (P&CP) Act, 1974 and u/s 31 A of the Air (P&CP) Act, 1981.

Ref: - 1) Consent granted by MPC Board
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4) Legal action proposal received from SRO Kalyan-1.

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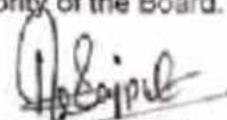
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 3rd Floor, Near Oak Baug,
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 Kalyan (West) – 421 301.

No.: MPCB/ROKI 755/24

Date:- 23 / 05 / 2024

To,
 M/s. Supra Chemicals.
 Plot No. W-129, MIDC Phase-II,
 Dombivall, Dist. Thane

Sub:- Closure Directions u/s 33A of the Water (P&CP) Act, 1974 and u/s 31 A of the Air (P&CP) Act, 1981.

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Regional Office, Kalyan

Sr. No.	Name and Address of the industry	Closure Direction Issued on
1	M/s Amudan Chemicals Pvt. Ltd. Plot No. W-229, MANPADA RD, PH - II, MIDC Dombivli, Dist. Thane	23.5.2024
2	Peroxy chem (INDIA) PRERANA BUNGLOW, V P ROAD, Dombivli, Thane, Tal. Kalyan, Dist. Thane	28.5.2024
3	Astec LifeSciences Limited F-39, MIDC, Phase-II, Sonarpada, Dombivli (East), Tal. KALYAN, Dist. Thane	28.5.2024
4	SURFCHEM ORGANICS PVT LTD W-148, M.I.D.C. Phase II, Dombivli (E.), Tal. KALYAN, Dist. Thane	28.5.2024
5	Altra Pharma Chem p.Ltd. W-31, Sonarpada, MIDC, Phase-II, Dombivli	28.5.2024
6	Sunbeam Monochem Pvt. Ltd. A-72, MIDC, Phase-I, Dombivli, Kalyan, Dist- Thane.	29.5.2024
7	Pilogrip Resins and Chemicals Pvt. Ltd. W-78 MIDC Phase-II, Dombivli	29.5.2024
8	Hindustan Monomers (Unit No.II) Pvt. Ltd. Plot no. D-7/4, MIDC Phase-I, Dombivli.	29.5.2024
9	Western Chemical Industries B-31, MIDC Phase-I, Dombivli	29.5.2024
10	Aarti Industries Limited Plot No D-55, 56,57, 59 & 60, MIDC, Phase-II Dombivli	29.5.2024
11	MOORE DYE-CHEM PVT.LTD., W-165, , M.I.D.C., PH-II,DOMBIVLI - 421 204.	30.5.2024
12	AKSHAY CHEMICALS D-33, MIDC, PHASE II, SAGAON, DOMBIVLI EAST- 421203, Tal. KALYAN, Dist. Thane	30.5.2024
13	CHEMORG, W 122, PHASE II DOMBIVLI	30.5.2024
14	Neelam Ayurchem India Pvt. Ltd. Plot No. A-43, MIDC Phase-I, Dombivli	30.5.2024
15	DREAMLAND DYES PVT LTD Plot No. W-133, MIDC Phase-II, Dombivli (E)	30.5.2024
16	S.A.I. Products. W-54, Phase II, MIDC Area, Dombivli(E), Tal. Kalyan, Dist. Thane	03-06-2024
17	Jaishil Sulphur and Chemical Industries. Plot No.B-11/2, M.I.D.C., Phase-I, Dombivli (East), Dist- Thane	03-06-2024
18	ZEN CHEMICALS PVT LTD PLOT NO. D-5, M.I.D.C., PHASE - II, OPP PIMPALESHWAR MANDIR, DOMBIVLI (E), Tal. KALYAN, Dist. Thane	03-06-2024
19	Furia Chemicals, Plot No. A/35, MIDC, Ph-II, Dombivli (E)	03-06-2024
20	Chemstar, TS-5, Sagoan, MIDC, Dombivli(E), Tal. KALYAN, Dist. Thane	03-06-2024
21	SAMUH CHEMICALS W-101, PHASE-II, MIDC, DOMBIVALI	03-06-2024
22	Nirmal Chemicals A-73, PHASE I, MIDC, DOMBIVLI, 421203, Tal. DOMBIVLI, Dist. Thane	03-06-2024
23	M/s. Neoloba Specialty Pvt. Ltd. Plot No.A-19,A-19(Part) & C-10/1, MIDC,Phase-I, Dombivli (East),Dist.Thane	03-06-2024

24	VCM Polyurethanes Pvt. Ltd. W- 134 , MIDC, Phase - II, Dombivali, Thane, Tal. Kalyan, Dist. Thane	03-06-2024
25	M/S SUYOJIT CHEMICALS WORKS PVT LTD, A-25, MIDC, Phase-1, Dombivli-E, Tal. Kalyan, Dist. Thane	03-06-2024
26	B R Sons Sagaon, MIDC Phase II	03-06-2024
27	M/s. Ambrosia Chemicals (Formerly Known as Amber Chemicals) W-84, PHASE II, MIDC, DOMBIVLI, 421203, Tal. DOMBIVLI, Dist. Thane	04-06-2024
28	Mr. H.R. Badodkar Plot No. : W-32, M.I.D.C., Phase-II, Sagaon, Dombivli (E), Tal. KALYAN, Dist. Thane	04-06-2024
29	Durvesh Rasayan Pvt Ltd W-60, Phase II, MIDC, Dombivli (E)	04-06-2024
30	Dhanwantary Laboratories Pvt. Ltd. Plot No. W-140, MIDC Dombivali, Tal. Kalyan, Dist. Kalyan.	04-06-2024
31	M/S. Indian Dyestuff & Chemicals Mfg.Co Plot No W-25, MIDC Phase II, Dombivali, Tal: Kalyan, Dist : Thane	04-06-2024
32	HYPOPHOSPHITES AND CO. PLOT NO. A-78, MIDC, PH -I , DOMBIVALI WEST, Tal. KALYAN, Dist. Thane	04-06-2024
33	AUCHEL PRODUCTS LTD PLOT NO A/85-86 AND C-22 MIDC PHASE I DOMBIVLI (E) DIST THANE	11-06-2024
34	Alu Fin, W-153 , MIDC, Phase II	13-06-2024
35	CRYSTAL INDIA W-114, MIDC, PHASE II, DOMBIVLI(E)	13-06-2024
36	Crystal India W-111 & W-112, MIDC Phase II Manpada Dombivali	13-06-2024
Sr. No.	Name and Address of the industry	Voluntary Closure Direction issued on
37	M/s. OMEGA FINE CHEMICALS, Plot No. W-231/D, MIDC, Phase -II, Sonarpada Village, Dombivali (E), Dist. Thane	23.5.2024
38	M/s. SOHAN DYECHEM PVT LTD Plot No. W-124, W-131 , W-124, MIDC, Phase-II Dombivali	23.5.2024
39	M/s. OMEGA FINE CHEMICALS, UNIT NO 2, PLOT NO W-130, PHASE II, DOMBIVALI (EAST) , DIST. THANE	23.5.2024
40	M/s. Deccan Colour and Chemical Pvt. Ltd. Plot No. W-232, MIDC Phase II, Dombivali, Dist Thane	23.5.2024
41	M/s. Saptavarna Colourants Private Limited Plot No. W-230, Phase-II, MIDC, Dombivali, Dist. Thane	23.5.2024
42	M/s. MEHTA PAINTS INDUSTRIES, Plot No. W-227, MIDC Phase-II, Dombivli East, Dist.-Thane	23.5.2024
43	M/s. SEAGULL CHEMICALS PVT LTD Plot No. W-127, MIDC PHASE-II, DOMBIVLI, Dist Thane.	23.5.2024
44	M/s. Supra Chemicals. Plot No. W-129, MIDC, PH-II, Dombivali, Dist. Thane	23.5.2024
45	M/s. UNILAB CHEMICALS & PHARMACEUTICALS PVT. LTD Plot No. : W-32, M.I.D.C., Phase-II, Sagaon, Dombivli (E), Tal. KALYAN, Dist. Thane	03-06-2024

MAHARASHTRA POLLUTION CONTROL BOARD

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Phone : 022-67195031 Email : icclab@mpcb.gov.in Website : http://mpcb.gov.in	 "Your Service is our Duty"	Central Laboratory Central Laboratory, Maharashtra Pollution Control Board, P-3, "Nirmal Bhavan", MIDC Industrial Area, Mahape, Navi Mumbai- 400 710
------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Report Outward No.: MPCB/CLab/Ambient/24-25/06/34
 Date: 25/06/2024 06:01 PM

Analysis Report-Air (Ambient)

Client/Industry/location Name & Address
amudan chemicals pvt ltd R25 Basic chemicals and electro chemicals and its derivatives including manufacturing of acid

Sample Details	
Field Sample ID :	BR-0073178
Laboratory Sample Code :	MPCB/CLab/AMB/24-25/142
Sample Details (Water/Air/HW) :	Air
Sample Volume Received :	
Sample Collected By :	SRO-Kalyan I (Shri. Upendra Kulkarni) (SRO-Kalyan I)
Seal No. :	128
Type of Industry / Location details :	Red
Sample Collected On :	May 23 2024 04:00:00:000PM

Sr.No	Parameter	Starting Time	Closing Time	Result	Unit	Method of analysis
1	PM10	23-05-2024 16:00	24-05-2024 00:00	314	µg/m ³	
2	PM10	24-05-2024 00:00	24-05-2024 08:00	237	µg/m ³	
3	PM10	24-05-2024 08:00	24-05-2024 16:00	187	µg/m ³	
4	SO2	23-05-2024 16:00	23-05-2024 20:00	5	µg/m ³	
5	SO2	23-05-2024 20:00	24-05-2024 00:00	5	µg/m ³	
6	SO2	24-05-2024 00:00	24-05-2024 04:00	4	µg/m ³	
7	SO2	24-05-2024 04:00	24-05-2024 08:00	5	µg/m ³	
8	SO2	24-05-2024 08:00	24-05-2024 12:00	6	µg/m ³	
9	SO2	24-05-2024 12:00	24-05-2024 16:00	4	µg/m ³	
10	NOx	23-05-2024 16:00	23-05-2024 20:00	15	µg/m ³	
11	NOx	23-05-2024 20:00	24-05-2024 00:00	14	µg/m ³	
12	NOx	24-05-2024 00:00	24-05-2024 04:00	13	µg/m ³	
13	NOx	24-05-2024 04:00	24-05-2024 08:00	14	µg/m ³	
14	NOx	24-05-2024 08:00	24-05-2024 12:00	13	µg/m ³	
15	NOx	24-05-2024 12:00	24-05-2024 16:00	14	µg/m ³	

Report Type: final

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Report generated on: 25/06/2024 06:00 PM

Compiled by: Archana Lendait

Approved by: Dr P D Khadkikar

Reviewed on Date: 25/06/2024 06:01 PM

Reviewed by: Dr P D Khadkikar

Dr P D Khadkikar
Senior Scientific Officer,
I/c Central Laboratory,
MPCB, Navi Mumbai.

* Electronic report does not require signature

Note :

1. The results refer to the samples and parameters requested for analysis.
2. Abbreviations: - BDL=Below Detectable limit, N.D.=Not Detected, N.A.= Not Analyzed
3. The Contents of this Report shall not be reproduced in part or in full without written approval of laboratory.

*** End of the Report ***

MAHARASHTRA POLLUTION CONTROL BOARD

Tel: 0251-2310212
0251-2310167
Fax: 0251-2310192
Website: <http://mpcb.gov.in>
Email: rokalyan@mpcb.gov.in



Maharashtra Pollution
Control Board,
Sidhivinayak Sankul, 3rd
and 4th Floor, Station
Road, Kalyan (West)

RED/S.S.I ()
No:- Format 1.0/RO/UAN
No.0000173336/CR/2312002013

Date: 20/12/2023

To,
M/s. Amudan Chemicals Pvt. Ltd.
Plot No. W-229, MIDC PHASE -II, Manpada Road,
Dombivli (East), Dist -Thane



Sub: Consent to Operate

Ref: Board has granted Consent to Operate vide Consent No:
MPCB/19/464/1908001014 dtd. 31.08.2019.

Your application No.MPCB-CONSENT-0000173336 Dated 10.06.2023

For: grant of Consent to Operate under Section 26 of the Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981 and Authorization under Rule 6 and Rule 18(7) of the Hazardous & Other Wastes (Management & Transboundary Movement) Rules 2016 is considered and the consent is hereby granted subject to the following terms and conditions and as detailed in the schedule I, II, III & IV annexed to this order:

1. The consent to renewal is granted for a period up to 31/12/2028
2. The capital investment of the project is Rs.0.3757 Crs. (As per C.A Certificate submitted by industry)
3. Consent is valid for the manufacture of:

Sr No	Product	Maximum Quantity	UOM
Products			
1	Tertiary Butyl Pivolate	1	MT/M
2	Cummene Hydro Peroxide	1	MT/M
3	Benzoyl Peroxide	1	MT/M
4	Tertiary Butyl Octate	1	MT/M
5	Aluminum Isopropoxide	1	Ton/M
6	DI tertiary Butyl Peroxide	2	Ton/M
7	Tertiary Butyl Per Benzoate	2	Ton/M
8	Di Methyl phthalate	2	Ton/M
9	Tertiary Butyl Hydro Peroxide	1	Ton/M
10	Methyl Ethyl Ketone Peroxide	20	Ton/M

4. **Conditions under Water (P&CP), 1974 Act for discharge of effluent:**

Sr No	Description	Permitted (in CMD)	Standards to	Disposal Path
1.	Trade effluent	1.2	As per Schedule-I	CETP
2.	Domestic effluent	0.4	As per Schedule-I	Soaked in soak pit

5. **Conditions under Air (P& CP) Act, 1981 for air emissions:**

Sr No.	Stack No.	Description of stack / source	Number of Stack	Standards to be achieved
1	S-1	Thermopack	0	As per Schedule -II

6. **Non-Hazardous Wastes:**

Sr No	Type of Waste	Quantity	UoM	Treatment	Disposal
1	N. A.	0	--NA--	N. A.	N. A.

7. **Conditions under Hazardous & Other Wastes (M & T M) Rules 2016 for Collection, Segregation, Storage, Transportation, Treatment and Disposal of hazardous waste:**

Sr No	Category No./ Type	Quantity	UoM	Treatment	Disposal
1	35.3 Chemical sludge from waste water treatment	50	Kg/M	Landfill	CHWTSDF

8. The Board reserves the right to review, amend, suspend, revoke this consent and the same shall be binding on the industry.
9. This consent should not be construed as exemption from obtaining necessary NOC/ permission from any other Government authorities.
10. The industry shall not carry expansion / additional investment / modernization / upgradation / additional construction without prior permission of the Board.
11. Industry shall obtain necessary permission from the Directorate of Industrial Safety & Health (DISH) & Fire Department NOC time to time.
12. The Public Liability Insurance (PLI) Act 1991 referred to PLI Act 1981 provides a mandatory Public Liability Insurance for an owner, industry or Installation handling its liability arising out of accident involving Hazardous Chemicals.
13. Applicant shall obtain permission from Central Ground Water Authority (CGWA) for use of bore-well water for industrial purpose.
14. Applicant shall not carry any activities which require prior environmental clearance as per EIA notification 2006 & as amended thereafter.

15. If CETP does not work for achieving standards and problem of pollution occurs, industry shall voluntarily stop the production or total effluent shall be reused.



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Signed by: R. A. Rajput
Regional Officer
For and on behalf of
Maharashtra Pollution Control Board
rkalyan@mpcb.gov.in
2023-12-20 10:25:04 IST

Received Consent fee of -

Sr.No	Amount(Rs.)	Transaction/DR.No.	Date	Transaction Type
1	7500.00	TXN2309001982	12/09/2023	Online Payment
2	1500.00	TXN2311003906	28/11/2023	Online Payment
3	10869.86	TXN2311003907	28/11/2023	Online Payment

Copy to:

1. Sub-Regional Officer, MPCB, Kalyan I
- They are directed to ensure the compliance of the consent conditions.
2. Chief Accounts Officer, MPCB, Sion, Mumbai



SCHEDULE-I

Terms & conditions for compliance of Water Pollution Control:

1. A) As per your application, you have provided Effluent Treatment Plant (ETP) of designed capacity of 1.50 CMD consisting of Primary (Collection tank, Neutralization tank), Tertiary (Pressure sand filter), Sludge treatment (Sludge drying bed) for the treatment of 1.2 CMD of trade effluent.
- B) The Applicant shall operate the effluent treatment plant (ETP) to treat the trade effluent so as to achieve the following standards prescribed by the Board or under EP Act, 1986 and Rules made there under from time to time, whichever is stringent:

Sr.No	Parameters	Limiting concentration not to exceed in mg/l, except for pH
(1)	pH	6.0 -8.5
(2)	BOD (3 days 27°C)	30
(3)	COD	250
(4)	TSS	100
(5)	Oil & Grease	10
(6)	***Benzene	0.1
(7)	Sulphides as S	2
(8)	Phenolic Compounds	1
(9)	Sulphate	1000
(10)	Chloride	600

- C) The Industry shall ensure connectivity online monitoring system to the MPCB server including separate energy meter for pollution control system.
 - D) The treated effluent shall be sent to CETP for further treatment. In no case, effluent shall find its way for gardening / outside factory premises.
2. A) As per your application, you have provided Septic Tank followed by Soak pit for the treatment of 0.4 CMD of sewage.
 - B) The Applicant shall operate the sewage treatment system to treat the sewage so as to achieve the following standards.

Sr.No	Parameters	Standards (mg/l)
1	Suspended Solids	Not to exceed 100
2	BOD 3 days 27°C	Not to exceed 30
3	COD	Not to exceed 100

- C] The treated sewage shall be recycled for secondary purposes to the maximum extent and remaining shall be discharged on land for gardening within premise after confirming above standards. In no case, sewage shall find its way for gardening / outside factory premises.
3. The Board reserves its rights to review plans, specifications or other data relating to plant setup for the treatment of waterworks for the purification thereof & the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions. The Applicant shall obtain prior consent of the Board to take steps to establish the unit or establish any treatment and disposal system or an extension or addition thereto.
 4. The industry shall ensure replacement of pollution control system or its parts after expiry of its expected life as defined by manufacturer so as to ensure the compliance of standards and safety of the operation thereof.
 5. The Applicant shall comply with the provisions of the Water (Prevention & Control of Pollution) Act, 1974 and as amended, by installing water meters and other provisions as contained in the said act:

Sr. No.	Purpose for water consumed	Water consumption quantity (CMD)
1.	Industrial Cooling, spraying in mine pits or boiler feed	0.00
2.	Domestic purpose	0.50
3.	Processing whereby water gets polluted & pollutants are easily biodegradable	1.70
4.	Processing whereby water gets polluted & pollutants are not easily biodegradable and are toxic	0.00
5.	Gardening	0.3

6. The Applicant shall provide Specific Water Pollution control system as per the conditions of EP Act, 1986 and rule made there under from time to time/ Environmental Clearance/ CREP guidelines.

SCHEDULE-II**Terms & conditions for compliance of Air Pollution Control:**

1. As per your application, you have provided the Air pollution control (APC) system and erected following stack (s) to observe the following fuel pattern:

Stack No.	Source	APC System provided/proposed	Stack Height(in mtr)	Type of Fuel	Sulphur Content(in %)	Pollutant	Standard
S-1	Thermopack	Stack	10.00	LDO 400 Ltr/M	-	SO2	2.0 Kg/Day
S-2	Reactor	Scrubber		0 0 Ltr/M	-	Acid Mist	35 Mg/Nm ³

*Industry shall provide adequate capacity of air pollution control system to all gases/dust pollutants generating sources to control the emissions. *Industry shall ensure that there shall not be any type of fugitive emission due to said activity.

2. The Applicant shall provide Specific Air Pollution control equipments as per the conditions of EP Act, 1986 and rule made there under from time to time/ Environmental Clearance / CREP guidelines.
3. The applicant shall operate and maintain above mentioned air pollution control system, so as to achieve the level of pollutants to the following standards:

Parameters	Standards (unit)	
Total Particulate Matter	Not to exceed	50 mg/ Nm ³
Acid Mist	Not to exceed	35 mg/ Nm ³

4. The Applicant shall obtain necessary prior permission for providing additional control equipment with necessary specifications and operation thereof or alteration or replacement/alteration well before its life come to an end or erection of new pollution control equipment.
5. The Board reserves its rights to vary all or any of the condition in the consent, if due to any technological improvement or otherwise such variation (including the change of any control equipment, other in whole or in part is necessary).

SCHEDULE-III**Details of Bank Guarantees:**

Sr. No	Consent (C2E/C2O/C2R)	Amt of BG Imposed	Submission Period	Purpose of BG	Compliance Period	Validity Date
1	C to R	25000	15 days	towards O & M of pollution control system and compliance of consent condition	31.12.2028	31.03.2029

The above Bank Guarantee(s) shall be submitted by the applicant in favour of Regional Officer at the respective Regional Office within 15 days from the date of issue of Consent.

BG Forfeiture History

Srno.	Consent (C2E/C2O/C2R)	Amount of BG imposed	Submission Period	Purpose of BG	Amount of BG Forfeiture	Reason of BG Forfeiture
NA						

BG Return details

Srno.	Consent (C2E/C2O/C2R)	BG imposed	Purpose of BG	Amount of BG Returned
NA				

SCHEDULE-IV
General Conditions:

1. The Energy source for lighting purpose shall preferably be LED based
2. The PP shall harvest rainwater from roof tops of the buildings and storm water drains to recharge the ground water and utilize the same for different industrial applications within the plant
3. Conditions for D.G. Set
 - a) Noise from the D.G. Set should be controlled by providing an acoustic enclosure or by treating the room acoustically.
 - b) Industry should provide acoustic enclosure for control of noise. The acoustic enclosure/ acoustic treatment of the room should be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on higher side. A suitable exhaust muffler with insertion loss of 25 dB (A) shall also be provided. The measurement of insertion loss will be done at different points at 0.5 meters from acoustic enclosure/room and then average.
 - c) Industry should make efforts to bring down noise level due to DG set, outside industrial premises, within ambient noise requirements by proper siting and control measures.
 - d) Installation of DG Set must be strictly in compliance with recommendations of DG Set manufacturer.
 - e) A proper routine and preventive maintenance procedure for DG set should be set and followed in consultation with the DG manufacturer which would help to prevent noise levels of DG set from deteriorating with use.
 - f) D.G. Set shall be operated only in case of power failure.
 - g) The applicant should not cause any nuisance in the surrounding area due to operation of D.G. Set.
 - h) The applicant shall comply with the notification of MoEFCC, India on Environment (Protection) second Amendment Rules vide GSR 371(E) dated 17.05.2002 and its amendments regarding noise limit for generator sets run with diesel.
4. The applicant shall maintain good housekeeping.
5. The non-hazardous solid waste arising in the factory premises, sweepings, etc. be disposed of scientifically so as not to cause any nuisance / pollution. The applicant shall take necessary permissions from civic authorities for disposal of solid waste.
6. The applicant shall not change or alter the quantity, quality, the rate of discharge, temperature or the mode of the effluent/emissions or hazardous wastes or control equipments provided for without previous written permission of the Board. The industry will not carry out any activity, for which this consent has not been granted/without prior consent of the Board.
7. The Board reserves the right to review, amend, suspend, revoke this consent and the same shall be binding upon you.
8. The industry shall submit quarterly statement in respect of industries obligation towards consent and pollution control compliance's duly supported with documentary evidences (format can downloaded from MPCB official site).
9. The industry shall submit official e-mail address and any change will be duly informed to the MPCB.
10. The industry shall achieve the National Ambient Air Quality standards prescribed vide Government of India, Notification No. B-29016/20/90/PCI-L dated. 18.11.2009 as amended.
11. This consent should not be construed as exemption from obtaining necessary NOC/ permission from any other Government authorities.

12. The industry shall ensure replacement of pollution control system or its parts after expiry of its expected life as defined by manufacturer so as to ensure the compliance of standards and safety of the operation thereof.
13. You shall operate OCEMS installed for source emission round 'O' clock and transmit data online to CPCB and MPCB server. You shall also monitor effluent quality, stack emissions and ambient air quality monthly/quarterly. You shall conduct Dioxin Furan monitoring by third party NABL Accredited agency once in year and submit report to Sub Regional Officer.
14. You shall ensure collection, and segregation of BMW regularly to treat and dispose Off within 48 hrs from generation.
15. Whenever due to any accident or other unforeseen act or even, such emissions occur or is apprehended to occur in excess of standards laid down, such information shall be forthwith Reported to Board, concerned Police Station, office of Directorate of Health Services, Department of Explosives, Inspectorate of Factories and Local Body. In case of failure of pollution control equipments, the production process connected to it shall be stopped.
16. The applicant shall provide an alternate electric power source sufficient to operate all pollution control facilities installed to maintain compliance with the terms and conditions of the consent. In the absence, the applicant shall stop, reduce or otherwise, control production to abide by terms and conditions of this consent.
17. The industry shall recycle/reprocess/reuse/recover Hazardous Waste as per the provision contain in the Hazardous and Other Wastes (M & TM) Rules 2016, which can be recycled /processed /reused /recovered and only waste which has to be incinerated shall go to incineration and waste which can be used for land filling and cannot be recycled/reprocessed etc. should go for that purpose, in order to reduce load on incineration and landfill site/environment.
18. An inspection book shall be opened and made available to the Board's officers during their visit to the applicant.
19. You shall not Rent, Lend, Sell, Transfer or Close Down the facility or otherwise transport the Bio Medical waste for any other purpose without obtaining prior written permission of the MPC Board.
20. Separate drainage system shall be provided for collection of trade and sewage effluents. Terminal manholes shall be provided at the end of the collection system with arrangement for measuring the flow. No effluent shall be admitted in the pipes/sewers downstream of the terminal manholes. No effluent shall find its way other than in designed and provided collection system.
21. Neither storm water nor discharge from other premises shall be allowed to mix with the effluents from the factory.
22. The industry should not cause any nuisance in surrounding area.
23. The industry shall take adequate measures for control of noise levels from its own sources within the premises so as to maintain ambient air quality standard in respect of noise to less than 75 dB (A) during day time and 70 dB (A) during night time. Day time is reckoned in between 6 a.m. and 10 p.m. and night time is reckoned between 10 p.m. and 6 a.m.
24. You shall ensure that fugitive emissions from the activity are controlled so as to maintain clean and safe environment in and around the facility premises.

25. The applicant shall provide ports in the chimney/(s) and facilities such as ladder, platform etc, for monitoring the air emissions and the same shall be open for inspection to/and for use of the Board's Staff. The chimney(s) vents attached to various sources of emission shall be designated by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.
26. The Board reserves its rights to review plans, specifications or other data relating to plant setup for the treatment of waterworks for the purification thereof & the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions. The Applicant shall obtain prior consent of the Board to take steps to establish the unit or establish any treatment and disposal system or an extension or addition thereto
27. The applicant shall install a separate meter showing the consumption of energy for operation of domestic and industrial effluent treatment plants and air pollution control system. A register showing consumption of chemicals used for treatment shall be maintained.
28. The applicant shall bring minimum 33% of the available open land under green coverage/ plantation. The applicant shall submit a yearly statement by 30th September every year on available open plot area, number of trees surviving as on 31st March of the year and number of trees planted by September end.
29. The Board reserves its rights to review plans, specifications or other data relating to plant setup for the treatment of waterworks for the purification thereof & the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions.
30. The firm shall submit to this office, the 30th day of September every year, the Environment Statement Report for the financial year ending 31st March in the prescribed FORM-V as per the provisions of Rule 14 of the Environment (Protection) (second Amendment) Rules, 1992.
31. You should monitor effluent quality, stack emissions and ambient air quality monthly/quarterly. You shall conduct Dioxin Furan monitoring by third party NABL Accredited agency once in every year and submit report to Sub Regional Officer.
32. The Board reserves its rights to vary all or any of the condition in the consent, if due to any technological improvement or otherwise such variation (including the change of any control equipment, other in whole or in part is necessary).
33. The applicant shall provide facility for collection of environmental samples and samples of trade and sewage effluents, air emissions and hazardous waste to the Board staff at the terminal or designated points and shall pay to the Board for the services rendered in this behalf.
34. You shall obtain necessary prior permission for providing additional control equipment with necessary specifications and operation thereof or alteration or shall ensure replacement of pollution control system or its parts after expiry of its expected life as defined by manufacturer so as to ensure the compliance of standards and safety of the operation thereof.
35. You shall strictly comply with the Water (P&CP) Act, 1974, Air (P&CP) Act, 1981 and Environmental Protection Act, 1986 and industry specific standard under EP Rules 1986 which are available on MPCB website (www.mpcb.gov.in).
36. You shall create the Environmental Cell by appointing an Environmental Engineer and Chemist for looking after day-to-day activities related to compliance of CCA.

37. You should comply with the Hazardous and Other Wastes (M & TM) Rules, 2016 , Bio Medical Waste Management Rules,2016 and submit the Annual Returns as per Rule 6(5) & 20(2) of Hazardous and Other Wastes (M & TM) Rules, 2016 for the preceding year in Form-IV by 30th June of every year

This certificate is digitally & electronically signed.



Name and address of industry
M/s Amudan Chemicals Pvt
Ltd

Environment Audit report for FY-
2023-24

MPCB

The Pollution Audit Report submission to MPCB

To,
Member Secretary
Maharashtra Pollution Control Board,
Kalpataru Point, Sion Circle,
Mumbai 400 072

(Period from 01-04-2023 To 31-03-2024)

(A)	GENERAL
1	Name of the Industry: Amudan Chemicals Pvt. Ltd
	UAN No. of Consent to Operate issued by MPCB- MPCB-CONSENT-0000173336 Validity of Consent to Operate: 31-12-2028
2	Location (Address) of the Industry: Plot No. W-229, MIDC PHASE -II, Manpada Road, Dombivli (East), Dist -Thane Latitude and longitude of location: Latitude- 19.2059 Longitude- 73.1003
3	Registered Office Address: Plot No. W-229, MIDC PHASE -II, Manpada Road, Dombivli (East), Dist -Thane
4	Month & Year of establishment: 01-04-1995
5	Details of consents/authorization and its validity: 31-12-2028
6	- No. of workers employed : 3
7	- No. of electrical connections with service numbers: - Total connected load: 98.99 hp - Electric consumption per tones of product manufactured: - Percentage enhancement in energy: - Saving as compared to previous year:
8	Number of D.G. Set & their capacity : NA
9	Name/Residential address of all directors/partners: Mr. Malay Mehta Ms. Sneha Mehta
10	Telephone Nos: 9833525588 (Residential & Industrial) Fax No: E-mail of Industry : amudanchemicals@gmail.com E-mail of Partners/Directors: NA

Name and address of industry
M/s Amudan Chemicals Pvt.
Ltd

Environment Audit report for FY-
2023-24

MPCB

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11	No. of shifts & timings: 1 shift of 8 hrs.
12	Name & Address of the in charge of Environment/Safety Division/Cell/Unit: Mr. Malay Mehta
13	No. of days during which production activities were in operation during the Audit period covered: 280 days

Name and address of industry
M/s Amudan Chemicals Pvt
Ltd

Environment Audit report for FY-
2023-24

MPCB

14 Has the industry obtained ISO 9000/ISO 14000/OSHAS 18000/Any other EM Accreditation/Certification recognition? (if yes, please mention the year of certification and validity)

(B) PRODUCT DETAILS

1	Name of products(s) & installed capacity with Yield/purity per day:		
	Products	Maximum Quantity	UOM
	Tertiary Butyl Pivolate	1	MT/M
	Cummene Hydro Peroxide	1	MT/M
	Benzoyl Peroxide	1	MT/M
	Tertiary Butyl Octate	1	MT/M
	Aluminum Isopropoxide	1	Ton/M
	Di tertiary Butyl Peroxide	2	Ton/M
	Tertiary Butyl Per Benzoate	2	Ton/M
	Di Methyl phthalate	2	Ton/M
	Tertiary Butyl Hydro Peroxide	1	Ton/M
	Methyl Ethyl Ketone Peroxide	20	Ton/M
2	Name of all by products and its quantity per day: NA		
3	Date of commencement of production for each product. Whether production is as per consented quantity: 01-04-1995		
4	Give details of last three years of actual production quantity (it should be min and max per day or min and max per month, whichever mentioned in the consent) along with total Quantity produced during the years. NA		
5	All raw materials required per kg of the product(s) (It should be related with the by-products and hazardous waste also):		
	Raw Materials	Quantity	UOM
	Aluminum	2500	Kg/M
	Isopropyl Alcohol	13350	Kg/M
	Dimethyl Pthalate	15800	Kg/M
	Sulphuric Acid	880	Kg/M
	M. E. K	14800	Kg/M
	Hydrogen Peroxide	21600	Kg/M
	sulphuric acid	200	Kg/M
	Caustic soda	920	Kg/M
	Diethylen Glycol	11000	Kg/M
	T. Butyl Alcohol	1980	Kg/M
	sulphuric acid	300	Kg/M
	T. Butyl Alcohol	1300	Kg/M
	Hydrogen Peroxide	1280	Kg/M

Name and address of industry
M/s Amudan Chemicals Pvt
Ltd

Environment Audit report for FY-
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6	<p>-Whether the manufacturing process is continuous or batch wise: Batch wise -Indicate the batch capacity: 21 KL/M -If the process is in batch operation, no. of batches/month along with the duration of the completion of each batch: 7 batches per month Duration of completion of each batch – 3 days</p>																			
7	<p>-Detailed manufacturing process with schematic flow diagram:- -List of unit operation & processes & with all chemical reactions along with the time required (in hrs) for completion of each unit operation/process and the total time for completion of the entire batch: 3 days -Mass balance in respect of the quantity of water, input of raw materials and waste water Generation. (Attach separate sheet) Attached</p>																			
(C) WATER																				
1	<p>-The quantity of water consumed per day as well as per tones of product manufactured: -(Attach water balance diagram)* over the last three years (Source with qty and permission for water supply/usage):</p> <table border="1"> <thead> <tr> <th>Purpose for water consumed</th> <th>Water consumption quantity (CMD)</th> </tr> </thead> <tbody> <tr> <td>Domestic purpose</td> <td>0.50</td> </tr> <tr> <td>Processing whereby water gets polluted & pollutants are easily biodegradable</td> <td>1.70</td> </tr> <tr> <td>Gardening</td> <td>0.3</td> </tr> </tbody> </table>		Purpose for water consumed	Water consumption quantity (CMD)	Domestic purpose	0.50	Processing whereby water gets polluted & pollutants are easily biodegradable	1.70	Gardening	0.3										
Purpose for water consumed	Water consumption quantity (CMD)																			
Domestic purpose	0.50																			
Processing whereby water gets polluted & pollutants are easily biodegradable	1.70																			
Gardening	0.3																			
2	<p>The quantity of waste water (trade effluent) generated per tones of each product per day, as well as per batch* over the last three years:</p> <table border="1"> <thead> <tr> <th>Trade Effluent</th> <th>1.2 CMD</th> </tr> </thead> </table>		Trade Effluent	1.2 CMD																
Trade Effluent	1.2 CMD																			
3	<p>-The particulars of effluent treatment plant (Attach separate sheets):- NA -Name and Size of each unit:</p> <table border="1"> <thead> <tr> <th>Treatment unit</th> <th>Size (mxm)</th> <th>Retention time (hr)</th> </tr> </thead> <tbody> <tr> <td>Collection Tank</td> <td>5</td> <td>48</td> </tr> <tr> <td>Neutralization Tank</td> <td>1</td> <td>2</td> </tr> <tr> <td>Chemical Dosing Tanks</td> <td>0.2</td> <td>2</td> </tr> <tr> <td>Settling Tank</td> <td>2</td> <td>4</td> </tr> <tr> <td>Sludge Drying Bed</td> <td>0.5</td> <td>1</td> </tr> </tbody> </table> <p>- Capacity of ETP: 1.5 m3/day - Flow diagram & Hydraulic diagram, of ETP to be submitted: NA - Whether lighting arrangement around ETP is provided: NA - Whether separate energy meter is installed for effluent treatment plant. If yes, readings of the meter for consumption every month: NA - Whether flow meters are provided at the inlet and outlet of the ETP. Please indicate the type of the flow meter: NA - Comments about adequacy of ETP, considering inlet effluent quality and quantity: NA - Whether OCEMS is mandated? If yes, details of parameters along with connectivity</p>		Treatment unit	Size (mxm)	Retention time (hr)	Collection Tank	5	48	Neutralization Tank	1	2	Chemical Dosing Tanks	0.2	2	Settling Tank	2	4	Sludge Drying Bed	0.5	1
Treatment unit	Size (mxm)	Retention time (hr)																		
Collection Tank	5	48																		
Neutralization Tank	1	2																		
Chemical Dosing Tanks	0.2	2																		
Settling Tank	2	4																		
Sludge Drying Bed	0.5	1																		

Name and address of industry
M/s Amudan Chemicals Pvt
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	<p>status to MPCB and GPCB server.</p> <ul style="list-style-type: none"> - If ZLD (Zero liquid discharge) mandated? If yes, then if camera is installed? - If the industry is discharging to CETP? If yes, give following details – - 1. Positive discharge. - 2. Separation of high COD and low COD stream - 3. Provision of auto sampler - 4. Provision of non-return valve (NRV) with a two-way SCADA attached to CETP
4	The method of disposal of final treated effluent and the point of disposal (Please attach sketch): NA
5	The quality of trade effluent at the inlet and outlet of ETP and at various stages of treatment (Attach separate sheets): NA
6	The quantity and quality of sewage and its method of treatment and disposal (Attach separate sheets): a) As per norms : NA b) Total pollution load*: NA
7	The open area available for disposal of the treated effluent: NA
8	-Whether the quality of treated effluent meets the specified norms: NA -If no, the extent of deviation and reasons thereof: NA
9	Give comments on adequacy of STP: NA
10	-Improvement in effluent quality and quantity since previous environmental audit based on performance evaluation of effluent management systems: NA -If yes, provide details (Attach separate sheets): NA
11	-Retrofitting undertaken to improve performance of ETP: NA -If yes, provide details: NA
12	Major problems encountered during operation of effluent treatment facilities, if any and reasons thereof: NA
13	The details about the operator/chemist responsible for operation & maintenance of effluent treatment plant: NA - Name of the operators/employees: NA - Qualification & Experience of each Operator/employee whether trained in such operation or not: NA -Total cost incurred for treatment of effluent for last three years (Average cost per day): NA
14	Quantity of electricity and chemical consumption: NA
15	Whether environment monitoring cell exist? If yes, provide details- manpower, educational background etc.: NA
16	If CETP has done the industry's monitoring? - If yes, provide details: NA

(D) AIR

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1	No. of the flue gas stacks, their height (from ground level) nature & consumption of fuel: NA	
2	Source of emission, fuel consumption, expected pollutants, control systems provided, stack height?	
	Source of emission	Boiler (Not in Use)
	Fuel consumption	Diesel – 2.0 Ltr/hr
	Expected pollutant	TPM
	Control system provided	Chimney of 10.0 mtrs height has been provided
	Stack Height	10 M (above ground level)
3	The details pertaining to the stack monitoring facilities: NA	
4	Number of process stacks, their height (from ground level) source, expected pollutants (emission) & the details pertaining to the provisions of stack monitoring facilities, control measures provided?	
	Source of emission	Boiler (Not in Use)
	Fuel consumption	Diesel – 2.0 Ltr/hr
	Expected pollutant	TPM
	Control system provided	Chimney of 10.0 mtrs height has been provided
	Stack Height	10 M (above ground level)
5	The quality/ concentration of emission from each flue gas stack & the process stack & the extent of deviation from them: NA If OCEMS installed as per CPCB guidelines or not (17 categories)? NA	
6	If CAAQMS are provided in neighboring area? (wherever applicable): NA	
7	The ambient air quality within the factory premises, along with the number of ambient air quality monitoring stations outside the industry: NA	
8	If buffer zone is provided? If yes, give details. If green zone is provided? If yes, give details: NA	
9	Fugitive/ secondary emissions (VOC)- Source and control measures adopted? Suggest if any improvement needed: NA	
10	The details of air pollution control measures for all process & flue gas stacks, along with adequacy report: NA	

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11	-Improvement in emission quality since previous environmental audit based on performance evaluation of air pollution management system: NA -If yes, provide details. (Attach separate sheets) - average of last three years emissions quality: NA
12	Retrofitting undertaken to improve emission quality. If yes, provide details: NA
13	Major problems encountered during operation of control device, if any and reasons thereof: NA
NOTE : Total pollution load each for air, water and hazardous waste should have mentioned along with the quality of effluent, emission or solid waste as the case may be. Whether measures taken for reduction of pollution load.	
(E) HAZARDOUS (SOLID) WASTE:	
1	-The quantity, sources & characteristics of hazardous waste/solid waste from each process/source over the last three years. (Total sludge generation per ton of product): 3 Kg/M -Whether it is as per the consented quantity: NA Remarks about the quantity of hazardous waste generation: NA (It should be compared with generation of the category as well as quantity of the similar nature of industry)

2	<p>a) The method of storage, treatment & disposal of hazardous/solid waste: - The details should include area of storage and disposal and whether storage and disposal system is covered and made impervious (pucca): - Disposal to CHWTSDF - The quantity of Hazardous waste sent to TSDF/ (authorized) recyclers : 0.80 Kg/M - Please also indicate how the quantity of hazardous /solid shall be reduced in next three months: NA</p> <p>c) The data/information about leachate generation, quantity & characteristics and treatment facility: NA</p> <p>d) Preferred treatment mechanism depending upon characteristics of Hazardous waste (landfillable/incineration/processing/recycling) and actual treatment quantity by mode of treatment (1998 HW Rules have it)</p>																		
3	<p>The status of authorization under the Hazardous and Other Waste (Management and Trans boundary Movement) Rules 2016, for hazardous and other waste:</p> <table border="1" style="width: 100%;"> <tr> <td style="text-align: center;">35.3 Chemical sludge from waste water treatment</td> <td style="text-align: center;">50 Kg/M</td> </tr> </table> <p>Statutory submissions/ records maintenance at plant site- such as Records of form III, annual returns in form IV</p>			35.3 Chemical sludge from waste water treatment	50 Kg/M														
35.3 Chemical sludge from waste water treatment	50 Kg/M																		
4	<p>Plan, if any to reduce hazardous waste generation or its recycling: NA</p>																		
(F) Non-Hazardous Waste:																			
	<p>Quantity of non-hazardous waste generation in last three years: NA Disposal of the non-hazardous waste and mode of disposal: NA</p>																		
(G) ACCIDENTS																			
1	<p>The details of accidents (including fire) in the factory if any, root cause analysis & remedial measures taken to avoid such type of accidents in future - Incidents of spillages, leakages etc. and remedial measures thereof: NA</p>																		
(H) SAFETY MEASURES																			
1	<p>General Environment of the factory. Please tick () the appropriate column</p> <table border="1" style="width: 100%;"> <tr> <td>a. House Keeping</td> <td style="text-align: center;">Good</td> <td style="text-align: center;">Fair</td> <td style="text-align: center;">Poor</td> </tr> <tr> <td>b. Dustiness</td> <td style="text-align: center;">High</td> <td style="text-align: center;">Medium</td> <td style="text-align: center;">Low</td> </tr> <tr> <td>c. Lighting</td> <td style="text-align: center;">Good</td> <td style="text-align: center;">Fair</td> <td style="text-align: center;">Poor</td> </tr> <tr> <td>d. Ventilation</td> <td style="text-align: center;">Good</td> <td style="text-align: center;">Fair</td> <td style="text-align: center;">Poor</td> </tr> </table>			a. House Keeping	Good	Fair	Poor	b. Dustiness	High	Medium	Low	c. Lighting	Good	Fair	Poor	d. Ventilation	Good	Fair	Poor
a. House Keeping	Good	Fair	Poor																
b. Dustiness	High	Medium	Low																
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d. Ventilation	Good	Fair	Poor																
2	<p>Whether the following protective appliances are provided to all the persons</p> <table border="1" style="width: 100%;"> <tr> <td>Goggles</td> <td>Yes/No (Utilization level)</td> <td style="text-align: center;">10</td> </tr> <tr> <td>Gloves</td> <td>Yes/No (Utilization level)</td> <td style="text-align: center;">10</td> </tr> <tr> <td>Gumboot</td> <td>Yes/No (Utilization level)</td> <td style="text-align: center;">10</td> </tr> <tr> <td>Helmet</td> <td>Yes/No (Utilization level)</td> <td style="text-align: center;">10</td> </tr> <tr> <td>Skin Cream</td> <td>Yes/No (Utilization level)</td> <td style="text-align: center;">10</td> </tr> </table>			Goggles	Yes/No (Utilization level)	10	Gloves	Yes/No (Utilization level)	10	Gumboot	Yes/No (Utilization level)	10	Helmet	Yes/No (Utilization level)	10	Skin Cream	Yes/No (Utilization level)	10	
Goggles	Yes/No (Utilization level)	10																	
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Helmet	Yes/No (Utilization level)	10																	
Skin Cream	Yes/No (Utilization level)	10																	

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Soap	Yes/No (Utilization level)	10
Ear Plug	Yes/No (Utilization level)	10

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	Face Masks	Yes/No (Utilization level)	10
	Clothing	Yes/No (Utilization level)	10
3	The details of facilities for disaster management/gas leakage: NA		
4	Whether on site/off site emergency plans are prepared (if applicable) and are being implemented/upgraded regularly; please give details If safety plan is prepared? Name of responsible officer, Whether safety mock drills conducted? NA		
5	Whether records of occupational hazards are maintained? NA		
6	Preventive measures adopted to minimize occupational hazard: NA		

(I) REMEDIAL MEASURES

1	The details of sources; monitoring & measures taken for control of noise pollution in & around the industrial premises: NA		
2	The measures taken for prevention treatment & control of odor nuisance in & around the industrial premises: NA		
3	The details in respect of legal actions initiated in last three years, under the Water Act-1974, the Air Act-1981 & the EPA-1986: NA a) Details of compliances of directions (SCN/PD/ID) issued by the SPCB: NA b) Whether closure directions issued in last three years? If yes, compliance status of conditions mentioned in restart directions: NA		
4	The compliance report with respect to all the conditions of NOC/Consent(Under all the Acts)/ Bank Guarantee: NA		
6	-Whether insurance policy obtained under PLI Act (if applicable): Yes/No -If yes, provide details: NA		

(J) The name and address of the Consultant engaged by the Company/Industry, if any:

It is hereby declared that all the information submitted in and with respect to this format is correct and we will be responsible for any lapse regarding incorrect or incomplete information.

(A)			(B)		
Name & Signature of responsible persons of industry/organization/institute/CETP/TSDf with stamp.			Name & Signature of all the members of Audit Team		
Sr. No	Name	Sign.	Sr.No	Name	Sign.

HAZOP STUDY REPORT

For

M/s. AMUDAN CHEMICALS PVT LTD.

Plot No. 229, MIDC, Phase II, Manpada, Dombivli (E),

Dist: Thane-421 204.

DEC -2020

Prepared by

Mr. Dhananjay Jadhav

(DME/B. Tech (Mech)/ADIS)

DISH Certified Safety Auditor Register No. MS/DISH/SA/J-006/2019

M/s. DTECH ENGINEERING

dtepunc@gmail.com, dtepanvel@gmail.com Contact: 9011151300 / 9029101382

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2	ACKNOWLEDGMENT	6-7
3	MANUFACTURING ACTIVITY DETAILS	8-9
4	LIST OF RM AND FG PRODUCTS	10
5	PROCESS FLOW CHART	11 - 14
6	HAZOP STUDY FOR PRODUCTION PROCESSES OF ORGANIC PEROXIDES	15 - 106
7	MSDS <ul style="list-style-type: none">➤ Di Methyl Phthalate➤ Hydrogen Peroxide➤ Methyl Ethyl Ketone➤ Catalyst➤ Tertiary Butanol➤ Cyclo Hexanone➤ Acetyl Acetone➤ Diacetone Alcohol➤ Methyl Ethyl Ketone Peroxide (MEKP)➤ Di Tertiary Butyl Peroxide (DTBP)➤ Tertiary Butyl Hydrogen Peroxide (TBHP)➤ Acetyl Acetone Peroxide	--

HAZOP STUDY REPORT

Introduction on HAZOP Study

A hazard and operability study (HAZOP) is a structured and systematic examination of a complex planned or existing process or operation in order to identify and evaluate problems that may represent risks to personnel or equipment.

HAZOP addresses single failures, or multiple failures with a common cause leading to a deviation, but does not consider multiple, independent, coincident failures. These lower frequency events are outside the direct experience of most people and are better addressed by a risk analysis study, if warranted by the extent of the potential consequences.

1. What is 'HAZOP'?

"HAZOP" (hazard and operability) study of an operation is defined as follows

The application of the formal, systematic critical examination to the process of engineering intentions of a facility to assess the hazard potential of mal-operation or malfunctioning of individual items of equipment and the consequential effects on the facility as a whole." Incidentally, a "HAZOP" is defined as a physical situation with a potential for-

1. Human injury
2. Property damage
3. Damage to Environment
4. Lessening the ability to perform a prescribed function.

2. THE METHODOLOGY

HAZOP study is a procedure used to review the design and operations of a hazardous process facility. It is used to identify all possible causes of deviation from normal safe operation that could lead to any hazard/ environmental risk/operability problems etc. some of the causes may be unrealistic and so the desired consequences will be some deviations with both, causes that are conceivable and consequences that are potentially hazardous. These potential hazards are then noted for recommendations/ actions.

Having examined a part of the design, materials of construction, safety arrangements and recorded potential hazards associated with it, the attempts to find out the suitable modifications, improvements, measures, etc. which may be adopted to prevent deviations from the processes and engineering intentions and

HAZOP STUDY REPORT

consequent hazard and operability problems. After finalizing the recommendations, the study progresses to focus on the next part of the design. The examination is repeated until the whole plant has been studied.

HAZOP is a systematic and highly structured study with a critical approach to examine the process and engineering intentions of the process design. The most important of these terms are:

TERM	MEANING
Intention	The intention defines how the selected section / unit is Expected To Operate.
Deviation	These are departures from the intention which are discovered by systematically applying the guide words.
Causes	These are the reasons why deviations might occur. Once a deviation has been shown to have a conceivable or realistic cause, it can be treated as meaningful.
consequences	They are the results of deviations, should they occur.
Hazards	The consequences, which can cause damage, injury or loss.
Guide words	These are simple words, which are used to qualify the intentions in order to guide and stimulate the thinking process and to discover deviations. A list of guide words along with the likely causes is given in the table, on the preceding pages.

3. THE AIMS

The primary aims of HAZOP are:

1. To identify the cause of all deviations of changes from the design intent.
2. To determine all major hazard and operability problems associated with these deviations.
3. To decide whether action is required to control the hazard or operability problem.
4. To ensure that the actions decided upon are implemented and documented.

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4. THE PROCEDURE ADOPTED

The complete process studied is divided into discrete nodes. For each node, every parameter or guideword deviation is considered; for each cause, consequence, recommendations for actions are made, if the remaining level of risk is considered unacceptable.

5. THE STEPS USED

- The sequence of steps used to conduct the HAZOP is as follows:
 1. Select and confirm the scope of node.
 2. Explain the general design intentions and operating conditions of the node.
 3. Specify the node's process parameters.
 4. Select a process parameter (flow, Pressure etc.) and specify the design intention relating to this parameter.
 5. Apply a deviation (more, less etc.) to the parameter and develop meaningful causes, hazards of the deviations from the intension.
 6. Identify all scenarios, causes / hazards of the deviation from the intension.
 7. Identify all major consequences associated with each cause without regard to safeguards.
 8. Specify predominant safeguard against each consequence.
 9. Make recommendations to mitigate the consequences if the severity is unacceptable.
 10. Reiterate the above steps for other guidewords.
 11. Reiterate the above steps for all other nodes in review.
- The team should document all recommendations submitted during the study.
- When a study team decides that major redesign of a plant / Section is necessary, it records the parameters for the redesigning and a HAZOP review is required, when the redesign is complete.
- When the information data base contains a questionable fact, it is best to assume that it is correct and note that appropriate action with a rider to the effect that the data should be verified first.
- If the leader or any team member believes that a particular system of P & I diagram should not be studied by team either because it is identical to the system already studied or because it involves no additional hazards, this must be agreed upon by the team and the reasons recorded in the report.

HAZOP STUDY REPORT

➤ **Hazop guide words & parameters:**

Guide Word	Explanation
No or Not or More	Negation of the design intent
More	Quantitative increase
Less	Quantitative decrease
As well As	Qualitative increase, extra activity occurs
Part of	Qualitative decrease
Reverse	Opposite of the intention
Other than	Substitution

Parameter	Guide Words
FLOW	More
	Less / None
	Reverse
	Other than
Pressure / Vacuum	High
	Low
Temperature	High
	Low
Level	High
	Low
Composition (Quality)	Part of (something Missing)
	As well as (something Extra)
	Other than (something Different)
Others	Maintenance
	Corrosion/ Erosion
	Engineering issues / Drawing errors
	Static electricity
	Startup
	Shut down
	Sampling
	Fire Engulfment
	Spillage
	No agitation
Power failure	

HAZOP STUDY REPORT

ACKNOWLEDGMENT

The facility of M/s. Amudan Chemicals Pvt. Ltd. situated at Plot No.W-229, MIDC Phase-II, Dombivali, Tal. Kalyan, Dist- Thane. M/s Amudan Chemicals Pvt. Ltd. is a rising company and manufacturer of Organic Peroxides.

The Management is committed to the safety and health of its organization people and protection of environment and has taken adequate measures to ensure the same. However, as part of continual improvement of the prevailing EHS system the management felt the need to conduct Hazop – Risk Assessment from an external independent source and accordingly the audit was conducted by M/s Dtech Engineering.

M/s Dtech Engineering have conducted HAZOP Study on the information provided by the management and collected during the site round on 5th December, 2020.

We express our sincere thanks to Mr. Kirti Mehta (Occupier) Mr. Malay Mehta (Factory Manager), and other concerned section in-charges associated with the team for the help and co-operation extended during the Safety Audit, all relevant documents, and records were made accessible for scrutiny during HAZOP Study.

M/s Dtech Engineering wishes to thank the management of M/s. Amudan Chemicals Pvt. Ltd. for giving them an opportunity to carry out the HAZOP Study.

HAZOP STUDY REPORT

➤ TEAM INVOLVED IN THE HAZOP STUDY

• M/s. Amudan Chemicals Pvt. Ltd.

Mr. Kirti Mehta	Occupier
Mr. Malay Mehta	Factory Manager
Mr. Swapnil Shelavale	Production

• M/s Dtech Engineering

Mr. Dhananjay K. Jadhav	Safety Auditor
Mr. Avinash Suryavanshi	Safety Professional

HAZOP STUDY REPORT

MANUFACTURING ACTIVITY DETAILS

The facility of M/s. Amudan Chemicals Pvt. Ltd situated at Plot No W-229, MIDC Phase-II, Dombivali, Tal. Kalyan, Dist- Thane Pin - 421204.

M/s. Amudan Chemicals Pvt. Ltd was established in 1995. They are one of the India's leading manufacturer of Fiber Reinforced Polymer (FRP) catalysts. They manufactures chemicals which are used by their customers as key ingredients to make the products that they can use every day. Their manufacturing facility provides an optimum quality goods. With their advanced research and development facility, they provide unmatched quality products to customers. M/s Amudan Chemicals Pvt Ltd make sure that only optimum quality products are been delivered to their valued customers. This approach has helped them to maintain and enhance reputation in FRP industry.

In an endeavor to take this objective to next level M/s. Amudan Chemicals Pvt. Ltd. has erected venture into the manufacturing of Organic Peroxides, which are used to initiate a process called polymerization, which creates plastic polymers. Organic peroxides are essential in the manufacture of plastics like polystyrene, polyvinyl chloride and composite products like fiberglass.

HAZOP STUDY REPORT

PLANT CAPABILITIES

Salient features of manufacturing site

All the operations of M/s Amudan Chemicals Pvt. Ltd. are approved and certified MPCB and structure has been approved and is in accordance with MIDC.

- M/s. Amudan Chemicals Pvt. Ltd. holds all necessary licenses for handle, transport, store and treat hazardous materials.
- Membership of CETP & Mumbai Waste Management
- 1.5 KL reactor.
- 1.0 KL reactor.
- 2 glass lined reactor of capacity 200 L & 2 Glass Lined Reactors with 100 L Capacity
- Water jet vacuum pump
- Ice chilled water tank having capacity of 1.0 KL for effective cooling
- Thermic fluid Thermo pack boiler

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- **List of Raw Materials**

1. Di Methyl Phthalate
2. Hydrogen Peroxide
3. Methyl Ethyl Ketone
4. Catalyst
5. Tertiary Butanol
6. Cyclo Hexanone
7. Acetyl Acetone
8. Diacetone Alcohol

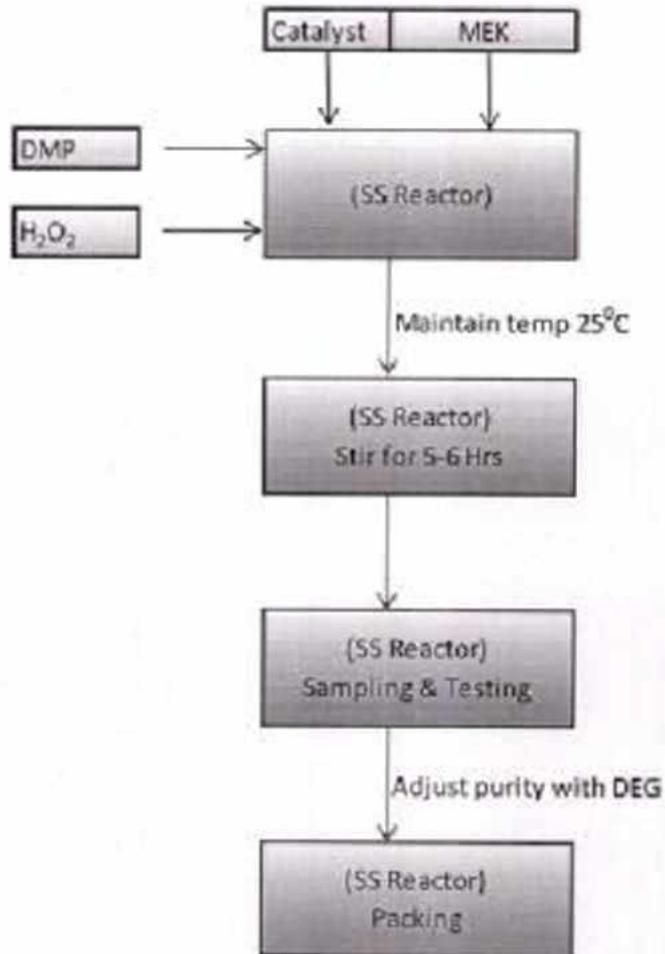
- **List of Finished Products**

1. Methyl Ethyl Ketone Peroxide (MEKP)
2. Di Tertiary Butyl Peroxide (DTBP)
3. Tertiary Butyl Hydrogen Peroxide (TBHP)
4. Acetyl Acetone Peroxide

HAZOP STUDY REPORT

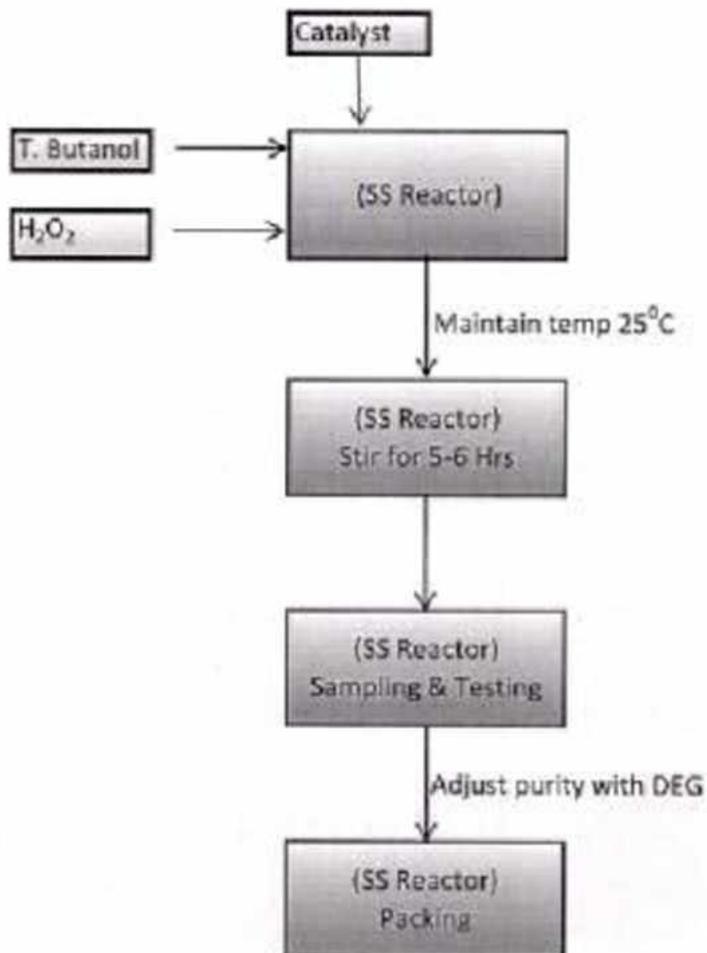
- **Process Flow Chart:**

1. Manufacturing of Methyl Ethyl Ketone Peroxide (MEKP)



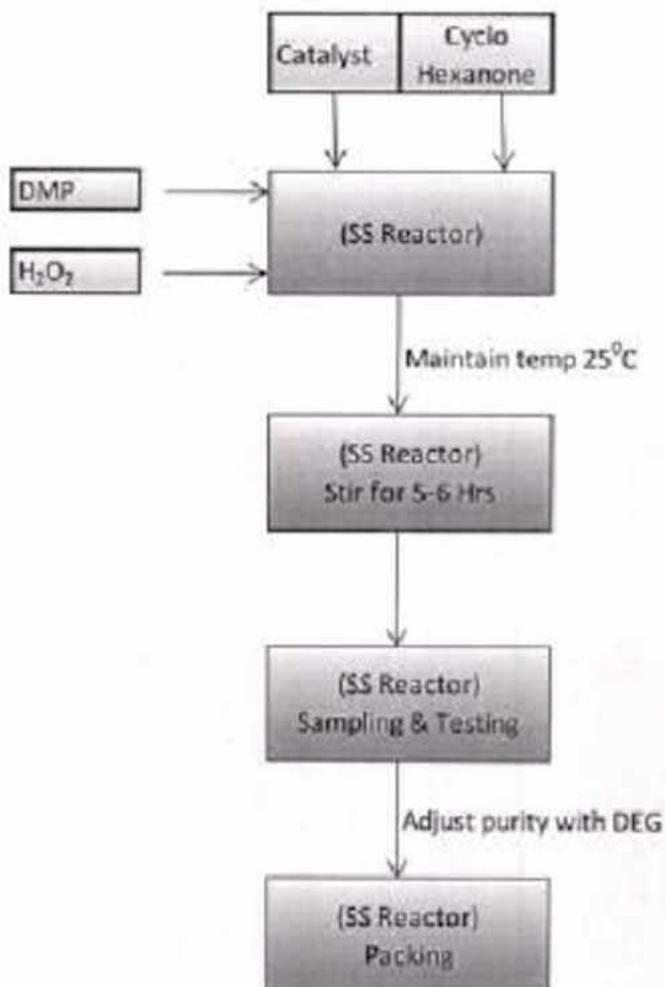
HAZOP STUDY REPORT

2. Manufacturing of Di Tertiary Butyl Peroxide (DTBP) / Tertiary Butyl Hydro Peroxide (TBHP)



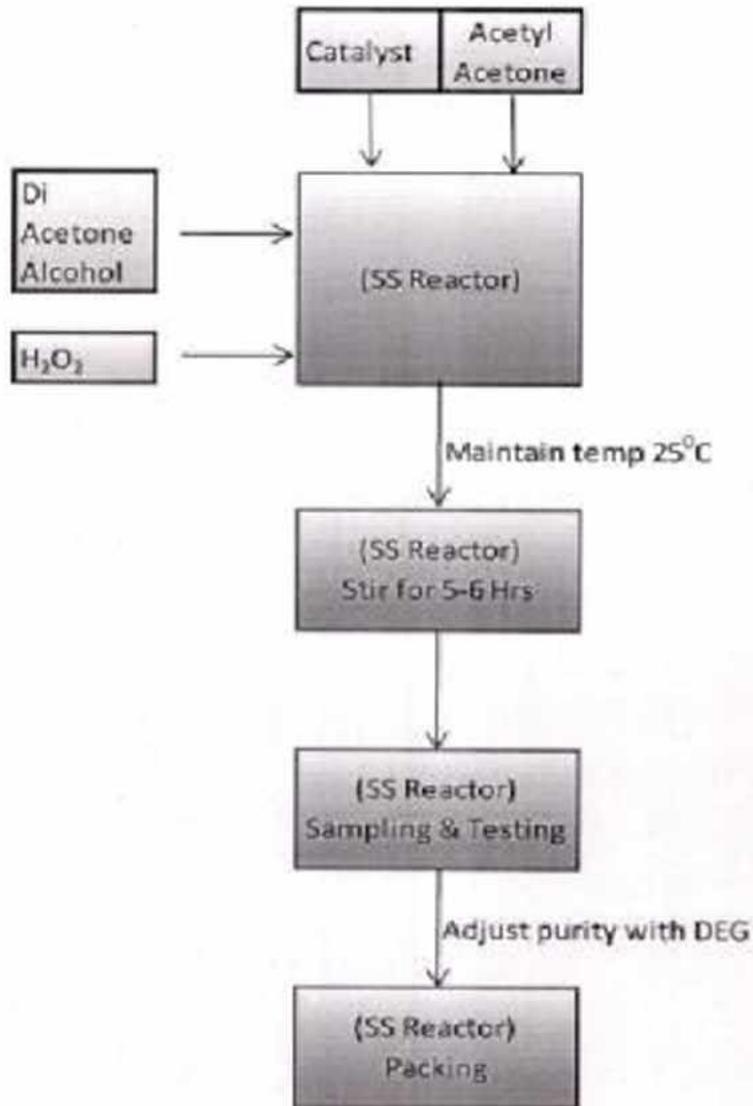
HAZOP STUDY REPORT

4. Manufacturing of Cyclo Hexanone Peroxide



HAZOP STUDY REPORT

5. Manufacturing of Acetyl Acetone Peroxide



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HAZOP STUDY

DEPARTMENT: Production	DATE: 05.12.2020
LOCATION: MIDC, Phase II Dombivali (E), Dist-Thane.	REFERENCE NO.: 00
MAIN ACTIVITY/PROCESS:	
BRIEF PROCESS: Production process for Organic Peroxides	
HAZOP TEAM: -	
M/s. Amudan Chemicals Pvt. Ltd.	
<ol style="list-style-type: none"> 1. Mr. Kirti Mehta – Occupier 2. Mr. Malay Mehta – Factory Manager 3. Mr. Swapnil Shelawale –Production In Charge 	
M/s. Dtech Engineering:	
Mr. Dhananjay K. Jadhav	
Mr. Avinash Suryavanshi	

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• Manufacturing of Methyl Ethyl Ketone Peroxide

1. Activity: - Charging of Di Ethyl Phthalate to Reactor under vacuum from drum

Guide Word	Type of Deviation	Typical Causes	Existing controls (safe guards)	Consequences	Action Required /Recommendation
None/ No/ Not	No transfer of Di Ethyl Phthalate	1. Human error 2. Wrong line up	1. Trained operator	1. No raw material will transfer	1. To check material is ready before transfer 2. Line trial shall be taken before charging
		3. Vacuum failure	1. Periodic PPM schedule for pump	1. No transfer due to pump under maintenance / breakdown	1. To check pump is ready for transfer 2. Line trial shall be taken before charging
		3. No electricity while charging	2. Nil	1. No transfer without electricity	1. DG back up within five minutes
More	More quantity of Di Ethyl Phthalate addition	1. More Di Ethyl Phthalate will transfer	1. Appropriate Quantity of raw material dispensing process. 2. Continuous supervision and quantity	1. More material addition over flow reactor 2. Material will buff in reactor and overflow outside area.	1. Level marking can be done inside the reactors on baffles 2. View glass with lamp provision 3. Batching Meter / Bar coding system can be implemented for dispensing of exact quantity and correct raw material. 4. Records filled and maintained by authorized personnel

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		verification /labeling system		
	2. More flow (Free flow leads to friction and resulted in to static charge generation) of raw material inside the reactor while charging	1. Trained operators to monitor addition rate.	1. Generation of static charge / splash fire	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards reactors wall side to charging line 3. Conductive Hoses shall be used for charging DEP 4. Double body earthing provision to process piping to reactor 5. Ensure provision of earthing jumpers on each flange of reactor and process piping 6. Define checking frequency of earthing continuity and records shall be maintained 7. SS dip rod with earthing shall be provided to drum while charging ,Flange guards shall be provided on each flange of reactor and process piping to avoid splashing hazard 8. Keep ready spill control kit. 9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 10. Ensure use of flameproof tools while doing any type of maintenance work 11. Avoid hammering / mechanical impact
	3. Static electricity	1. Trained Operators & Supervision	3. Fire and Explosion	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards Reactors wall side to charging line

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					<ol style="list-style-type: none"> 3. Ensure Double body earthing provision to process piping to reactor 4. Ensure use of conductive hoses while charging flammable chemicals 5. Ensure provision of earthing jumpers on each flange of Reactor and process piping 6. Define checking frequency of earthing continuity and records shall be maintained 7. SS dip rod with earthing shall be provided to drum while charging Di Ethyl Phthalate 8. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 9. Keep ready spill control kit. 10. Use of PPE's (Personal protective equipment) like Safety Goggles, Hand Gloves, Organic Vapour mask, safety shoes etc. 11. Ensure use of flameproof tools while doing any type of maintenance work 12. Avoid hammering / mechanical impact 13. Provision of Flameproof electrical fixtures 14. Provision of Fire Alarm Detection System / Fire Hydrant System / Auto Sprinkler system as per local statutory regulations
Human Error (In case of Manual charging)	1. Lack of Awareness / Knowledge / skill / Experience	1. Trained Operators & Supervision 2. Proper Labeling and dispensing	Exotherm may occur due to chemical incompatibility	<ol style="list-style-type: none"> 1. BMR (Batch Manufacturing Record) shall be maintained with continuous supervision 2. Chemicals shall be stored as per chemical compatibility 	

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			procedure in place		<ul style="list-style-type: none"> 3. High temperature / pressure alarm with hooter shall be provided 4. Ensure effective cooling system (Cooling Tower) provided instead of using ice water
More	Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	1.Trained Operator & Supervision	1. Spillage/ Overflow / Fire / Explosion / Chemical/vapour Exposure	<ul style="list-style-type: none"> 1. Spillage Control Kit required at each floor 2. Awareness Training on Spillage Control shall be provided. 3. Ensure proper use of PPE's like Safety shoes, Helmet, Hand Gloves and Safety Goggle, Organic vapour mask and flash fire suit etc.
Less	Less material will transfer	1. Less flow for transfer	<ul style="list-style-type: none"> 1. Appropriate Quantity of raw material dispensing process. 2. Periodic PPM schedule for pump 3. Appropriate Quantity of raw material dispensing process. 	<ul style="list-style-type: none"> 1. Delay in batch 2. Delay in batch 3. Quality of product disturbs. 	<ul style="list-style-type: none"> 1. Trained persons should be performed all activities. 2. Take preventive maintenance of transfer pump. 3. Before transfer check quantity of material.
		2.Pump failure	1. Periodic PPM schedule for pump	1. No transfer due to pump under maintenance / breakdown	<ul style="list-style-type: none"> 1. To check pump is ready for transfer 2. Line shall be taken before charging

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		3. Transfer line damaged while transfer	1. Proper assessment for line design & MOC	<ol style="list-style-type: none"> 1. Fire & explosion 2. No transfer due to transfer line fractured. 3. Raw material to be spilled. 4. Raw material splashes on operator 	<ol style="list-style-type: none"> 1. Conductive hoses shall be used for charging flammable chemicals 2. Line trial shall taken before charging / transfer 3. Ensure provision of earthing jumpers on each flange of Reactor and process piping 4. Define checking frequency of earthing continuity 5. SS dip rod with earthing shall be provided while charging DEP to Reactor 6. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 7. Keep ready spill control kit. 8. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 9. Keep ready safety shower and eye wash assembly near transfer of material
		4. 200 lit drums leaked or torn while transfer or tilt and spill of raw material	1. Inspection of packing material prior to acceptance	<ol style="list-style-type: none"> 1. Delay for batch 2. Spill of raw material 3. Fire and Explosion 	<ol style="list-style-type: none"> 1. Secondary Containment provision shall be made to avoid spillage 2. Spill control kit shall be kept ready

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Reverse	1.Reverse flow of material raw material from Reactor to drum	1. Failure of Isolation valve.	1. Only Isolation valve provided.	1. Delay transfer	1. Trained Personnel
As well as	Other material will transfer	1.Human error 2.Other raw material kept near to transfer area	1.Trained personnel 2. Isolating transfer area.	1. Incompatibility	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorised person only
Part off	One of Material Missed	1.Human error	1. Appropriate Quantity and List of raw material Charging process	1. Batch Failure	1. Proper Supervision required while transfer of raw material
Other than	Other material will transfer	1.Human error	1.Trained personnel	1. Incompatibility	1.Trained personnel
Other than	Other raw material charged	Human Error (wrong selection of raw material).	Unknown consequences incoming stage	1.Labeling procedure is in place. 2.Done by and checked by provision in BMR.	1.No Recommendation
Others	Inadequate Inertisation	Impure Nitrogen	Fire Hazard	NA	1. Before charging raw material into Reactor Inertisation instruction to be incorporated in BMR.

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					<p>2.Oxygen Analyzer provision can be made after Nitrogen receiver</p> <p>3.Use of PPE's - (Flash fire suit,Safety goggle, face shield, helmet, safety shoes)</p> <p>4.Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, or Sprinkler system as per Local regulations</p>
	Faulty N ₂ Flow meter	Fire Hazard	NA		<p>1.Visually Inspection done before use.</p> <p>2. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, PA system, Sprinkler system as per Local regulations</p>
Non dissipation of Static charge	Improper Earthing and bonding	Fire Hazard	<ol style="list-style-type: none"> 1. Double Earthing provided to Reactor and vessel. 2. Spill control kit is available. 3. PPEs (Safety goggle, face shield, helmet, safety shoes) 	<p>1. Earthing & Bonding to be checked before charging raw materials" instructions shall be added in BMR (General Instructions).</p>	
Inadequate Maintenance / Mechanical Disintegrity	Clamp failure / improper fitting.	DEP get leaked, resulted into spillage	<ol style="list-style-type: none"> 1.Trained operator performs the activity. 2. View glass is available on charging line after 	<ol style="list-style-type: none"> 1.Fixed or permanent piping arrangement is recommended for raw material transferring and dispensing activity. 2. Ensure line Trial before charging / transferring 	

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				valve 3.Spill control kit is available. 4.PPE's (Safety goggle, face shield, helmet, safety shoes)	
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2. Activity: - Charging of Hydrogen Peroxide to Reactor under vacuum from drum

Guide Word	Type of Deviation	Typical Causes	Existing controls (safe guards)	Consequences	Action Required /Recommendation
None/ No/ Not	No transfer of Hydrogen Peroxide	1. Human error 2. Wrong line up	1. Trained operator	1. No raw material will transfer	1. To check material is ready before transfer 2. Line trial shall be taken before charging
		3. Vacuum failure	3. Periodic PPM schedule for pump	2. No transfer due to pump under maintenance / breakdown	1. To check pump is ready for transfer 2. Line trial shall be taken before charging
		3. No electricity while charging	4. Nil	1. No transfer without electricity	1. DG back up within five minutes
More	More quantity of Hydrogen Peroxide addition	1. More Hydrogen Peroxide will transfer (Fast addition)	1. Appropriate Quantity of raw material dispensing process. 2. Continuous supervision and quantity verification /labeling system	1. Exothermic Reaction 2. More material addition over flow reactor 3. Material will buff in reactor and overflow outside area.	1. Ensure suitable utility media arrangement for effective cooling. It is recommended to use cooling tower / Chilled water plant instead of ice cooling system. 2. Audio-visual alarm provision in case of rise in temperature. 3. Level marking can be done inside the reactors on baffles 4. View glass with lamp provision

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					<ol style="list-style-type: none"> 5. Batching Meter / Bar coding system can be implemented for dispensing of exact quantity and correct raw material. 6. Records filled and maintained by authorized personnel 7. All process equipment vent shall be outside plant and flame arrestors shall be provided at end of vent line. 8. All pressure vessels and process equipments shall be tested through Competent person 9. All indicative type instruments like Pressure Gauge, Temperature indicators shall be calibrated at regular intervals
		<p>2. More flow (Free flow leads to friction and resulted in to static charge generation) of raw material inside the reactor while charging</p>	<ol style="list-style-type: none"> 1. Proper Flow and head parameter designed. 2. Double body earthing provision to process piping to reactor 	<p>1. Generation of static charge / splash fire</p>	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards reactors wall side to charging line 3. Conductive Hoses shall be used for charging H₂O₂ 4. Ensure provision of earthing jumpers on each flange of reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained 6. SS dip rod with earthing shall be provided to drum while charging, Flange guards shall be provided on each flange of reactor and process piping to avoid splashing hazard 7. Keep ready spill control kit.

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					<ul style="list-style-type: none"> 8. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 9. Ensure use of flameproof tools while doing any type of maintenance work 10. Avoid hammering / mechanical impact
		3.Static electricity	1. Double body earthing provision to transferring pump and Reactor	3. Fire and Explosion	<ul style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards Reactors wall side to charging line 3. Ensure use of conductive hoses while charging flammable chemicals 4. Ensure provision of earthing jumpers on each flange of Reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained 6. SS dip rod with earthing shall be provided to drum while charging H₂O₂ 7. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 8. Keep ready spill control kit. 9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 10. Ensure use of flameproof tools while doing any type of maintenance work 11. Avoid hammering / mechanical impact 12. Provision of Flameproof electrical fixtures

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					13. Provision of Fire Alarm Detection System / Fire Hydrant System/ Auto Sprinkler system as per local statutory regulations
	Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	1.Trained Operators & Supervision 2.Proper Labeling and dispensing procedure in place	1. Exotherm may occur due to chemical incompatibility	<ol style="list-style-type: none"> 1. BMR (Batch Manufacturing Record) shall be maintained with continuous supervision 2. Chemicals shall be stored as per chemical compatibility 3. High temperature / pressure alarm with hooter shall be provided 4. Ensure effective cooling system (Cooling Tower) provided instead of ice water
More	Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	1.Trained Operator & Supervision	2. Spillage/ Overflow / Fire / Explosion / Chemical/vapour Exposure	<ol style="list-style-type: none"> 1. Spillage Control Kit required at each floor 2. Awareness Training on Spillage Control shall be provided. 3. Ensure proper use of PPE's like Safety shoes, Helmet, Hand Gloves and Safety Goggle, Organic vapour mask and flash fire suit etc.
Less	Less material will transfer	1. Less flow for transfer	<ol style="list-style-type: none"> 1. Appropriate Quantity of raw material dispensing process. 2. Periodic PPM schedule for pump 3. Appropriate Quantity of raw material 	<ol style="list-style-type: none"> 1. Delay in batch 2. Delay in batch 3. Quality of product disturbs. 	<ol style="list-style-type: none"> 1. Trained persons should be performed all activities. 2. Take preventive maintenance of transfer pump. 3. Before transfer check quantity of material.

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			dispensing process.		
		2. Pump failure	2. Periodic PPM schedule for pump	2. No transfer due to pump under maintenance / breakdown	1. To check pump is ready for transfer 2. Line shall be taken before charging
		3. Transfer line damaged while transfer	1. Proper assessment for line design & MOC	1. Fire & explosion 2. No transfer due to transfer line fractured. 3. Raw material to be spilled. 4. Raw material splashes on operator	1. Conductive hoses shall be used for charging flammable chemicals 2. Line trial shall taken before charging / transfer 3. Ensure provision of earthing jumpers on each flange of Reactor and process piping 4. Define checking frequency of earthing continuity 5. SS dip rod with earthing shall be provided while charging H ₂ O ₂ to Reactor 6. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 7. Keep ready spill control kit. 8. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 9. Keep ready safety shower and eye wash assembly near transfer of material
		4. 200 lit drums leaked or torn while transfer or tilt and	1. Inspection of packing material prior to acceptance	1. Delay for batch 2. Spill of raw material 3. Fire and Explosion	1. Secondary Containment provision shall be made to avoid spillage 2. Spill control kit shall be kept ready

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		spill of raw material			
Reverse	1.Reverse flow of material raw material from Reactor to drum	1. Failure of Isolation valve.	1. Only Isolation valve provided.	1. Delay transfer	1. Trained Personnel
As well as	Other material will transfer	1.Human error 2.Other raw material kept near to transfer area	1.Trained personnel 2. Isolating transfer area.	1. Incompatibility	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorised person only
Part off	One of Material Missed	1.Human error	1. Appropriate Quantity and List of raw material Charging process	1. Batch Failure	1. Proper Supervision required while transfer of raw material
Other than	Other material will transfer	1.Human error	1.Trained personnel	1. Incompatibility	1.Trained personnel
Other than	Other raw material charged	Human Error (wrong selection of raw material).	Unknown consequences incoming stage	1.Labeling procedure is in place. 2.Done by and checked by provision in BMR.	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorized person only

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Others	Inadequate Inertisation	Impure Nitrogen	Fire / Explosion Hazard	NA	<ol style="list-style-type: none"> 1. Before charging raw material into Reactor Inertisation instruction to be incorporated in BMR. 2. Oxygen Analyzer provision can be made after Nitrogen receiver 3. Use of PPE's - (Flash fire suit, Safety goggle, face shield, helmet, safety shoes) 4. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, or Sprinkler system as per Local regulations
		Faulty N2 Flow meter	Fire / Explosion Hazard	NA	<ol style="list-style-type: none"> 1. Visually Inspection done before use. 2. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, PA system, Sprinkler system as per Local regulations
	Non dissipation of Static charge	Improper Earthing and bonding	Fire / Explosion Hazard	1. Trained Operator	<ol style="list-style-type: none"> 1. Ensure Double Earthing provided to Reactor and vessel. 2. Ensure use of conductive hose while charging and or unloading of flammables 3. Ensure FLP electrical fixtures at processing areas 4. Proper Nitrogen inertization before charging H₂O₂ 5. Earthing & Bonding to be checked before charging raw materials" instructions shall be added in BMR (General Instructions).

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				<p>6. Ensure provision of Earthing jumpers and Earthing continuity shall be checked at regular intervals</p> <p>7. Spill control kit is available.</p> <p>8. PPEs (Safety goggle, face shield, helmet, safety shoes)</p>
Inadequate Maintenance / Mechanical Disintegrity	Clamp failure / improper fitting.	Hydrogen Peroxide get leaked, resulted into spillage/ Fire Hazard	<p>1. Trained operator performs the activity.</p> <p>2. View glass is available on charging line after valve</p> <p>3. Spill control kit is available.</p>	<p>1. Fixed or permanent piping arrangement is recommended for raw material transferring and dispensing activity.</p> <p>2. Ensure line Trial before charging / transferring</p> <p>3. Use of FLP spanners for maintenance / any mechanical purpose</p> <p>4. PPE's (Chemical protective clothing like chemical resistant suits, Full body pressure suit, Safety goggle, Organic vapour mask, Face shield, helmet, safety shoes)</p>
Human Error	Un skill / Lack of Knowledge / Experience	Fire / Explosion / Splashing Hazard	1. Trained operator performs the activity.	<p>1. Ensure skilled and qualified operator deputed for the work activity</p> <p>2. Training shall be provided to employees about hazards and consequences and trouble shooting</p> <p>3. Training records shall be maintained</p> <p>4. Ensure continuous supervision for critical operations like Nitrogen inertisation, addition of critical raw materials in case of exothermic reactions</p> <p>5. Training on Emergency Handling shall be provided</p>

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				<p>6. Suitable fire extinguishers like Mechanical Foam type fire extinguishers for liquid fire (Class-B) shall be provided at workplace</p> <p>7. Peroxides are corrosives and may cause severe injuries / burns in case of exposure so ensure use of PPE's like Chemical protective clothing - chemical resistant suits, Full body pressure suit, Safety goggles, Organic vapour mask, Face shield, helmet, safety shoes etc.</p> <p>8. Ensure provision of Safety Shower and Eye wash at workplace</p>
	Improper storage / Housekeeping	<p>1. Pressurization of Drum / can due to exposure to direct sunlight</p> <p>2. Fire / Explosion Hazard</p>	1. Trained operator performs the activity.	<p>1. Hydrogen Peroxide shall be stored in cool, dry and well ventilated area and away from flammables/ combustible substances, avoid direct exposure to sunlight</p> <p>2. Ensure continuous supervision and qualified operator/ staff for monitoring reactions</p> <p>3. Ensure FLP tools for any maintenance work</p> <p>4. Ensure proper earthing and bonding while handling flammables</p> <p>5. Ensure proper housekeeping at workplace</p>

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3. Activity: - Addition of Methyl Ethyl Ketone (MEK) from receiver to reactor by maintaining temperature 25°C

Guide Word	Type of Deviation	Typical Causes	Existing controls (safe guards)	Consequences	Action Required /Recommendation
No	No temperature	No meaningful deviation			
Less	Less (Low) Temperature	Malfunction of utility (Cooling water)	Trained operators and supervision	1.Exothermic Reaction 2 Material will buff in reactor and overflow outside area.	1.Ensure suitable utility media available effective cooling. It is recommended to use cooling tower / Chilled water plant instead of Ice cooling system. 2.Audio-visual alarm provision in case of rise in temperature.
		Temperature sensor failure	Trained operators and supervision	1.Exothermic Reaction 2.Fire / Explosion Hazard	1. Audio visual Alarm interlock to be provided for set temperature. 2. Calibration of Temperature sensor by Competent person 3. Reactor jacket provided with pressure gauge & temperature sensor
More	More quantity of MEK addition	1. More MEK will transfer (Fast addition)	1. Appropriate Quantity of raw material dispensing process. 2.Continuous supervision and quantity verification /labeling system	1.Exothermic Reaction 2.More material addition over flow reactor 3. Material will buff in reactor and overflow outside area.	1. Ensure suitable utility media arrangement for effective cooling. It is recommended to use cooling tower / Chilled water plant instead of Ice cooling system. 2. Audio-visual alarm provision in case of rise in temperature. 3. Level marking can be done inside the reactors on baffles 4. View glass with lamp provision

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					<ol style="list-style-type: none"> 5. Batching Meter / Bar coding system can be implemented for dispensing of exact quantity and correct raw material. 6. Records filled and maintained by authorized personnel 7. To know decomposition temperature, Differential Scanning Colorimetry (DSC) study shall be done 8. Safety Valve and Rupture Disc shall be provided to the reactors and to heat exchanger (If provided) to avoid any incident due to rise in temp, pressure or thermal decomposition 9. All process equipment vent shall be outside plant and flame arrestors shall be provided at end of vent line. 10. All pressure vessels and process equipments shall be tested through Competent person 11. All indicative type instruments like Pressure Gauge, Temperature indicators shall be calibrated at regular intervals 12. Audio visual Alarm, interlock to be provided in case process temp exceeds above operation temp. 13. Reactor jacket provided with pressure gauge & temperature sensor
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		2. More flow (Free flow leads to friction and resulted in to static charge generation) of raw material inside the reactor while charging	1. Proper Flow and head parameter designed. 2. Double body earthing provision to process piping to reactor	1. Generation of static charge / splash fire	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards reactors wall side to charging line 3. Conductive Hoses shall be used for addition of MEK 4. Ensure provision of earthing jumpers on each flange of reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained 6. SS dip rod with earthing shall be provided to drum while charging 7. Flange guards shall be provided on each flange of reactor and process piping to avoid splashing hazard 8. Keep ready spill control kit. 9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 10. Ensure use of flameproof tools while doing any type of maintenance work 11. Avoid hammering / mechanical impact
		3. Static electricity	1. Double body earthing provision to transferring pump and Reactor	3. Fire and Explosion	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards Reactors wall side to charging line 3. Ensure use of conductive hoses while charging flammable chemicals

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					<ol style="list-style-type: none"> 4. Ensure provision of earthing jumpers on each flange of Reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained 6. SS dip rod with earthing shall be provided to drum while charging MEK 7. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 8. Keep ready spill control kit. 9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 10. Ensure use of flameproof tools while doing any type of maintenance work 11. Avoid hammering / mechanical impact 12. Provision of Flameproof electrical fixtures 13. Provision of Fire Alarm Detection System / Fire Hydrant System/ Auto Sprinkler system as per local statutory regulations
	Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	<ol style="list-style-type: none"> 1.Trained Operators & Supervision 2.Proper Labeling and dispensing procedure in place 	5. Exotherm may occur due to chemical incompatibility	<ol style="list-style-type: none"> 1. BMR (Batch Manufacturing Record) shall be maintained with continuous supervision 2. Chemicals shall be stored as per chemical compatibility 3. High temperature / pressure alarm with hooter shall be provided 4. Ensure effective cooling system (Cooling Tower) provided instead of ice water

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As well as	Other material will transfer	1.Human error 2.Other raw material kept near to transfer area	1.Trained personnel 2. Isolated transfer area.	1. Incompatibility	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorized person only
Part off	One of Material Missed	1.Human error	1. Appropriate Quantity and List of raw material Charging process	1. Batch Failure	1. Proper Supervision required while transfer of raw material
Other than	Other material will transfer	1.Human error	1.Trained personnel	1. Incompatibility	1.Trained personnel
Other than	Other raw material charged	Human Error (wrong selection of raw material).	Unknown consequences incoming stage depends on chemical compatibility of material	1. Labeling procedure is in place. 2. Done by and checked by provision in BMR.	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorized person only
Others	Inadequate Inertisation	Impure Nitrogen	Fire / Explosion Hazard	NA	1. Before charging raw material into Reactor Inertisation instruction to be incorporated in BMR. 2. Oxygen Analyzer provision can be made at the top of reactor

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					<ol style="list-style-type: none"> 3. Use of PPE's - (Flash fire suit, Safety goggle, face shield, helmet, safety shoes) 4. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, or Sprinkler system as per Local regulations
		Faulty N2 Flow meter	Fire / Explosion Hazard	NA	<ol style="list-style-type: none"> 1. Visually Inspection done before use. 2. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, PA system, Sprinkler system as per Local regulations
	Non dissipation of Static charge	Improper Earthing and bonding	Fire / Explosion Hazard	1. Trained Operator	<ol style="list-style-type: none"> 1. Ensure Double Earthing provided to Reactor and vessel. 2. Ensure use of conductive hose while charging and or unloading of flammables 3. Ensure FLP electrical fixtures at processing areas 4. Proper Nitrogen inertization before addition MEK 5. Earthing & Bonding to be checked before charging raw materials" instructions shall be added in BMR (General Instructions). 6. Ensure provision of Earthing jumpers and Earthing continuity shall be checked at regular intervals 7. Spill control kit is available. 8. PPEs (Safety goggle, face shield, helmet, safety shoes)

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	Inadequate Maintenance/ Mechanical Disintegrty	Clamp failure / improper fitting.	Hydrogen Peroxide get leaked, resulted into spillage/ Fire Hazard	<ol style="list-style-type: none"> 1. Trained operator performs the activity. 2. View glass is available on charging line after valve 3. Spill control kit is available. 	<ol style="list-style-type: none"> 1. Fixed or permanent piping arrangement is recommended for raw material transferring and dispensing activity. 2. Ensure line Trial before charging / transferring 3. Use of FLP spanners for maintenance / any mechanical purpose 4. PPE's (Chemical protective clothing like chemical resistant suits, Full body pressure suit, Safety goggle, Organic vapour mask, Face shield, helmet, safety shoes)
	Human Error	Un skill / Lack of Knowledge / Experience	Fire / Explosion / Splashing Hazard	<ol style="list-style-type: none"> 1. Trained operator performs the activity. 	<ol style="list-style-type: none"> 1. Ensure skilled and qualified operator deputed for the work activity 2. Training shall be provided to employees about hazards and consequences and trouble shooting 3. Training records shall be maintained 4. Ensure continuous supervision for critical operations like Nitrogen inertisation, addition of critical raw materials in case of exothermic reactions 5. Training on Emergency Handling shall be provided 6. Suitable fire extinguishers like Mechanical Foam type fire extinguishers for liquid fire (Class-B) shall be provided at workplace 7. Ensure use of PPE's like Chemical protective clothing - chemical resistant suits, Full body

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					pressure suit, Safety goggle, Organic vapour mask, Face shield, helmet, safety shoes etc. 8. Ensure provision of Safety Shower and Eye wash at workplace
		Improper storage / Housekeeping	1. Pressurization of Drum / can due to exposure to direct sunlight. 2. Fire / Explosion Hazard	1. Trained operator performs the activity.	1. MEK shall be stored in cool, dry and well ventilated area and away from flammables/ combustible substances, avoid direct exposure to sunlight 2. Ensure continuous supervision and qualified operator/ staff for monitoring reactions 3. Ensure FLP tools for any maintenance work 4. Ensure proper earthing and bonding while handling flammables 5. Ensure proper housekeeping at workplace

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4. Activity: - Stir the reaction mass for 5-6 Hrs at 20-30 °C

Guide Word	Type of Deviation	Typical Cause	Consequence	Existing controls (safe guards)	Action required (Recommendation)
No	No Stirring(RPM)	Human Error /Agitator tripped	1. Reactor may get pressurized. 2. Poor heat transfer.	1. Continuous Supervision. 2. View glass is available on the reactor, 3. Activity is checked by second person.	1.Provision can be made for audio – visual alarm in case of tripping of reactor agitator
Less	Less Stirring(RPM)	Human Error (Wrong RPM selected)	1.Hot spot may generated. 2.Poor heat transfer.	1. Continuous Supervision. 2. View glass is available on the reactor, 3. Activity is checked by second person.	1.Provision can be made for audio – visual alarm in case of tripping of reactor agitator
More	More Stirring (RPM)	Human Error (Wrong RPM selected)	Reaction mass may decompose or may have quality impact	1. Continuous Supervision. 2. View glass is available on the reactor, 3.Activity is checked by second person.	1.Provision can be made for audio – visual alarm in case of tripping of reactor agitator

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5. Activity: - After testing, adjust purity with DEG

Guide Word	Type of Deviation	Typical Causes	Consequences	Existing controls (safe guards)	Action Required /Recommendation
No	No Quantity	Reactor charging valve closed	No EHS consequences	1.Trained Operators 2.Continuous supervision	Ensure Valve operation and proper line up cross verified physically
		Reactor bottom valve opened / dismantled	Spillage of DEG	1.Trained Operators 2. Continuous supervision	1. Reactor shall have double bottom valve with view glass 2.Spill control kit shall be made available at workplace 3.Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
More	More Qty	Not possible			
Less	Less Qty	Leakage in charging line	Spillage may cause exposure	1.Trained Operators 2. Continuous supervision	1.Ensure line trail before addition of reaction mass 2. Spill control kit shall be made available at workplace 3.Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
As well As	As well as Qty	Not possible			

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Part of	Part of Qty	Not possible			
Reverse	Reverse Qty	Not possible			
Other than	Other raw material charged	Human Error (wrong selection of raw material).	EHS Consequences based on compatibility or properties of raw materials	1.Trained Operators 2.Continuous supervision	1.Ensure permanent piping arrangement with correct tagging to avoid wrong line up 2.Ensure proper labeling and arrow marking on permanent piping
Others	Inadequate Maintenance/ Mechanical Disintegrity	Improper maintenance of transferring pump, flange fittings etc	Spillage, leakage or Splash Hazard, Exposure of Caustic	1.Trained Operators 2.Continuous supervision	1.Ensure Planned Preventive Maintenance as per schedule and record shall be maintained 2.Ensure line trail before transferring/charging activities
		Improper machine guarding	Physical injury	Not Available	All moving parts of machineries – Motor pulley guards, reactor and transferring pump shaft guards and other moving parts shall be properly guarded

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6. Collection of clear filtrate in to Drums

Guide Word	Type of Deviation	Typical Causes	Consequences	Existing controls (safe guards)	Action Required /Recommendation
No	No Qty	Reactor / Filtration vessel bottom valve malfunctioning	1. Hose pipe may get pressurized. 2. Spillage of reaction mass, 3. Fire and Health Hazard, 4. Property loss. 5. Drum may get over flow.	1. Trained operators 2. Calibrated SS vessel, 3. Standby vessels are available,	1. Ensure continuous supervision 2. Spill control kit shall be made available at workplace 3. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
		Bottom valve closed	1. Hose pipe may get pressurized 2. Spillage of reaction mass 3. Fire and Health Hazard 4. Property loss.	1. Trained operators 2. Calibrated SS vessel 3. Standby vessels are available.	1. Ensure continuous supervision 2. Spill control kit shall be made available at workplace 3. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
		Nutsch Filter outlet valve closed	May impact on quality and yield	1. Trained operators,	
		Vacuum pump failure	1. Negative pressure may build up inside Nutsch filter	1. Trained operators,	1. Ensure PPM of vacuum pump is done and records are maintained

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			2. Impact on quality and yield	2. Continuous supervision	2. Ensure Compound gauge is provided on Nutsch filter and is periodically calibrated through Competent person and records maintained
		Nutsch filter bottom valve opened.	1. Spillage/Leakage of finished product 2. Product loss	1. Trained operators, 2. Continuous supervision	Spill control kit shall be made available at workplace Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
Less	Less Qty	Hose pipe leakage	1. Spillage of finished product 2. Property loss.	1. Trained operators, 2. Continuous supervision	Fixed SS piping is to be used for filtration Spill control kit shall be made available at workplace Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
Less	Less Qty	Human Error	1. Hose pipe may get pressurized 2. Spillage of finished product 3. property loss	1. Trained operators, 2. Continuous supervision	Fixed SS piping is to be used for filtration Spill control kit shall be made available at workplace Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.

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More	More Qty	Human Error	Overflow of drums	1.Trained operators, 2.Continuous supervision	Spill control kit shall be made available at workplace Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
As well As	As well as qty	Not Applicable	Not Applicable	Not Applicable	
Part of	Not possible				
Reverse	Reverse Qty	Not possible			
Other than	Other solvent charged	Human Error	Hazards depends on compatibility or property of solvents, Impact on Quality and Yield incoming stages	1. Trained operators, 2.Done by check by procedure is in place.	Spill control kit shall be made available at workplace Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.

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• Manufacturing of Di Tertiary Butanol Peroxide / Tertiary Butanol Hydro Peroxide

1. Activity: - Charging of Tertiary Butanol to Reactor under vacuum from drum

Guide Word	Type of Deviation	Typical Causes	Existing controls (safe guards)	Consequences	Action Required /Recommendation
None/ No/ Not	No transfer of Tertiary Butanol	1. Human error 2. Wrong line up	1. Trained operator	1. No raw material will transfer	1. To check material is ready before transfer 2. Line trial shall be taken before charging
		3. Vacuum failure	5. Periodic PPM schedule for pump	3. No transfer due to pump under maintenance / breakdown	3. To check pump is ready for transfer 4. Line trial shall be taken before charging
		3. No electricity while charging	6. Nil	2. No transfer without electricity	2. DG back up within five minutes
More	More quantity of Tertiary Butanol addition	1. More Tertiary Butanol will transfer	1. Appropriate Quantity of raw material dispensing process. 2. Continuous supervision and quantity	1. More material addition over flow reactor 2. Material will buff in reactor and overflow outside area.	1. Level marking can be done inside the reactors on baffles 2. View glass with lamp provision 3. Batching Meter / Bar coding system can be implemented for dispensing of exact quantity and correct raw material. 4. Records filled and maintained by authorized personnel

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		verification /labeling system		
	2. More flow (Free flow leads to friction and resulted in to static charge generation) of raw material inside the reactor while charging	1. Trained operators to monitor addition rate.	1. Generation of static charge / splash fire	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards reactors wall side to charging line 3. Conductive Hoses shall be used for charging TERTIARY BUTANOL 4. Double body earthing provision to process piping to reactor 5. Ensure provision of earthing jumpers on each flange of reactor and process piping 6. Define checking frequency of earthing continuity and records shall be maintained 7. SS dip rod with earthing shall be provided to drum while charging, Flange guards shall be provided on each flange of reactor and process piping to avoid splashing hazard 8. Keep ready spill control kit. 9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 10. Ensure use of flameproof tools while doing any type of maintenance work 11. Avoid hammering / mechanical impact
	3. Static electricity	1. Trained Operators & Supervision	3. Fire and Explosion	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards Reactors wall side to charging line

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					<ol style="list-style-type: none"> 3. Ensure Double body earthing provision to process piping to reactor 4. Ensure use of conductive hoses while charging flammable chemicals 5. Ensure provision of earthing jumpers on each flange of Reactor and process piping 6. Define checking frequency of earthing continuity and records shall be maintained 7. SS dip rod with earthing shall be provided to drum while charging Tertiary Butanol 8. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 9. Keep ready spill control kit. 10. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 11. Ensure use of flameproof tools while doing any type of maintenance work 12. Avoid hammering / mechanical impact 13. Provision of Flameproof electrical fixtures 14. Provision of Fire Alarm Detection System / Fire Hydrant System / Auto Sprinkler system as per local statutory regulations
Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	1.Trained Operators & Supervision 2.Proper Labeling and dispensing	Exotherm may occur due to chemical incompatibility	<ol style="list-style-type: none"> 1. BMR (Batch Manufacturing Record) shall be maintained with continuous supervision 2. Chemicals shall be stored as per chemical compatibility 	

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			procedure in place		<ul style="list-style-type: none"> 3. High temperature / pressure alarm with hooter shall be provided 4. Ensure effective cooling system (Cooling Tower) provided instead of using ice water
More	Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	1.Trained Operator & Supervision	3. Spillage/ Overflow / Fire / Explosion / Chemical/vapour Exposure	<ul style="list-style-type: none"> 1. Spillage Control Kit required at each floor 2. Awareness Training on Spillage Control shall be provided. 3. Ensure proper use of PPE's like Safety shoes, Helmet, Hand Gloves and Safety Goggle, Organic vapour mask and flash fire suit etc.
Less	Less material will transfer	1. Less flow for transfer	<ul style="list-style-type: none"> 1. Appropriate Quantity of raw material dispensing process. 2. Periodic PPM schedule for pump 3. Appropriate Quantity of raw material dispensing process. 	<ul style="list-style-type: none"> 1. Delay in batch 2. Delay in batch 3. Quality of product disturbs. 	<ul style="list-style-type: none"> 1. Trained persons should be performed all activities. 2. Take preventive maintenance of transfer pump. 3. Before transfer check quantity of material.
		2.Pump failure	3. Periodic PPM schedule for pump	3. No transfer due to pump under maintenance / breakdown	<ul style="list-style-type: none"> 1. To check pump is ready for transfer 2. Line shall be taken before charging

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		3. Transfer line damaged while transfer	2. Proper assessment for line design & MOC	<ol style="list-style-type: none"> 1. Fire & explosion 2. No transfer due to transfer line fractured. 3. Raw material to be spilled. 4. Raw material splashes on operator 	<ol style="list-style-type: none"> 1. Conductive hoses shall be used for charging flammable chemicals 2. Line trial shall taken before charging / transfer 3. Ensure provision of earthing jumpers on each flange of Reactor and process piping 4. Define checking frequency of earthing continuity 5. SS dip rod with earthing shall be provided while charging Tertiary Butanol to Reactor 6. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 7. Keep ready spill control kit. 8. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 9. Keep ready safety shower and eye wash assembly near transfer of material
		4. 200 lit drums leaked or torn while transfer or tilt and spill of raw material	2. Inspection of packing material prior to acceptance	<ol style="list-style-type: none"> 4. Delay for batch 5. Spill of raw material 6. Fire and Explosion 	<ol style="list-style-type: none"> 3. Secondary Containment provision shall be made to avoid spillage 4. Spill control kit shall be kept ready

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Reverse	1.Reverse flow of material raw material from Reactor to drum	1. Failure of Isolation valve.	1. Only Isolation valve provided.	1. Delay transfer	1. Trained Personnel
As well as	Other material will transfer	1.Human error 2.Other raw material kept near to transfer area	1.Trained personnel 2. Isolating transfer area.	1. Incompatibility	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorised person only
Part off	One of Material Missed	1.Human error	1. Appropriate Quantity and List of raw material Charging process	1. Batch Failure	1. Proper Supervision required while transfer of raw material
Other than	Other material will transfer	1.Human error	1.Trained personnel	1. Incompatibility	1.Trained personnel
Other than	Other raw material charged	Human Error (wrong selection of raw material).	Unknown consequences incoming stage	1.Labeling procedure is in place. 2.Done by and checked by provision in BMR.	3.No Recommendation
Others	Inadequate Inertisation	Impure Nitrogen	Fire Hazard	NA	1. Before charging raw material into Reactor Inertisation instruction to be incorporated in BMR.

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					<p>2.Oxygen Analyzer provision can be made after Nitrogen receiver</p> <p>3.Use of PPE's - (Flash fire suit,Safety goggle, face shield, helmet, safety shoes)</p> <p>4.Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, or Sprinkler system as per Local regulations</p>
		Faulty N ₂ Flow meter	Fire Hazard	NA	<p>1.Visually Inspection done before use.</p> <p>2. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, PA system, Sprinkler system as per Local regulations</p>
Non dissipation of Static charge	Improper Earthing and bonding	Fire Hazard	<p>1. Double Earthing provided to Reactor and vessel.</p> <p>2. Spill control kit is available.</p> <p>3. PPEs (Safety goggle, face shield, helmet, safety shoes)</p>	<p>1. Earthing & Bonding to be checked before charging raw materials" instructions shall be added in BMR (General Instructions).</p>	
Inadequate Maintenance / Mechanical Disintegrty	Clamp failure / improper fitting.	Tertiary Butanol get leaked, resulted into spillage	<p>1.Trained operator performs the activity.</p> <p>2. View glass is available on charging line after</p>	<p>1.Fixed or permanent piping arrangement is recommended for raw material transferring and dispensing activity.</p> <p>2. Ensure line Trial before charging / transferring</p>	

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				valve 3.Spill control kit is available. 4.PPE's (Safety goggle, face shield, helmet, safety shoes)	
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2. Activity: - Charging of Hydrogen Peroxide to Reactor under vacuum from drum

Guide Word	Type of Deviation	Typical Causes	Existing controls (safe guards)	Consequences	Action Required /Recommendation
None/ No/ Not	No transfer of Hydrogen Peroxide	1. Human error 2. Wrong line up	1. Trained operator	1. No raw material will transfer	1. To check material is ready before transfer 2. Line trial shall be taken before charging
		3. Vacuum failure	7. Periodic PPM schedule for pump	4. No transfer due to pump under maintenance / breakdown	3. To check pump is ready for transfer 4. Line trial shall be taken before charging
		3. No electricity while charging	8. Nil	2. No transfer without electricity	2. DG back up within five minutes
More	More quantity of Hydrogen Peroxide addition	1. More Hydrogen Peroxide will transfer (Fast addition)	1. Appropriate Quantity of raw material dispensing process. 2. Continuous supervision and quantity verification /labeling system	1. Exothermic Reaction 2. More material addition over flow reactor 3. Material will buff in reactor and overflow outside area.	1. Ensure suitable utility media arrangement for effective cooling. It is recommended to use cooling tower / Chilled water plant instead of Ice cooling system. 2. Audio-visual alarm provision in case of rise in temperature. 3. Level marking can be done inside the reactors on baffles 4. View glass with lamp provision

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					<ol style="list-style-type: none"> 5. Batching Meter / Bar coding system can be implemented for dispensing of exact quantity and correct raw material. 6. Records filled and maintained by authorized personnel 7. All process equipment vent shall be outside plant and flame arrestors shall be provided at end of vent line. 8. All pressure vessels and process equipments shall be tested through Competent person 9. All indicative type instruments like Pressure Gauge, Temperature indicators shall be calibrated at regular intervals
		<p>2. More flow (Free flow leads to friction and resulted in to static charge generation) of raw material inside the reactor while charging</p>	<ol style="list-style-type: none"> 1. Proper Flow and head parameter designed. 2. Double body earthing provision to process piping to reactor 	<p>1. Generation of static charge / splash fire</p>	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards reactors wall side to charging line 3. Conductive Hoses shall be used for charging H₂O₂ 4. Ensure provision of earthing jumpers on each flange of reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained 6. SS dip rod with earthing shall be provided to drum while charging, Flange guards shall be provided on each flange of reactor and process piping to avoid splashing hazard 7. Keep ready spill control kit.

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					<ul style="list-style-type: none"> 8. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 9. Ensure use of flameproof tools while doing any type of maintenance work 10. Avoid hammering / mechanical impact
		3.Static electricity	1. Double body earthing provision to transferring pump and Reactor	3. Fire and Explosion	<ul style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards Reactors wall side to charging line 3. Ensure use of conductive hoses while charging flammable chemicals 4. Ensure provision of earthing jumpers on each flange of Reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained 6. SS dip rod with earthing shall be provided to drum while charging H₂O₂ 7. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 8. Keep ready spill control kit. 9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 10. Ensure use of flameproof tools while doing any type of maintenance work 11. Avoid hammering / mechanical impact 12. Provision of Flameproof electrical fixtures

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					13. Provision of Fire Alarm Detection System / Fire Hydrant System/ Auto Sprinkler system as per local statutory regulations
	Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	1.Trained Operators & Supervision 2.Proper Labeling and dispensing procedure in place	6. Exotherm may occur due to chemical incompatibility	<ol style="list-style-type: none"> 1. BMR (Batch Manufacturing Record) shall be maintained with continuous supervision 2. Chemicals shall be stored as per chemical compatibility 3. High temperature / pressure alarm with hooter shall be provided 4. Ensure effective cooling system (Cooling Tower) provided instead of ice water
More	Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	1.Trained Operator & Supervision	4. Spillage/ Overflow / Fire / Explosion / Chemical/vapour Exposure	<ol style="list-style-type: none"> 1. Spillage Control Kit required at each floor 2. Awareness Training on Spillage Control shall be provided. 3. Ensure proper use of PPE's like Safety shoes, Helmet, Hand Gloves and Safety Goggle, Organic vapour mask and flash fire suit etc.
Less	Less material will transfer	1. Less flow for transfer	<ol style="list-style-type: none"> 1. Appropriate Quantity of raw material dispensing process. 2. Periodic PPM schedule for pump 3. Appropriate Quantity of raw material 	<ol style="list-style-type: none"> 1. Delay in batch 2. Delay in batch 3. Quality of product disturbs. 	<ol style="list-style-type: none"> 1. Trained persons should be performed all activities. 2. Take preventive maintenance of transfer pump. 3. Before transfer check quantity of material.

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			dispensing process.		
		2. Pump failure	4. Periodic PPM schedule for pump	4. No transfer due to pump under maintenance / breakdown	<ol style="list-style-type: none"> 1. To check pump is ready for transfer 2. Line shall be taken before charging
		3. Transfer line damaged while transfer	2. Proper assessment for line design & MOC	<ol style="list-style-type: none"> 5. Fire & explosion 6. No transfer due to transfer line fractured. 7. Raw material to be spilled. 8. Raw material splashes on operator 	<ol style="list-style-type: none"> 1. Conductive hoses shall be used for charging flammable chemicals 2. Line trial shall taken before charging / transfer 3. Ensure provision of earthing jumpers on each flange of Reactor and process piping 4. Define checking frequency of earthing continuity 5. SS dip rod with earthing shall be provided while charging H₂O₂ to Reactor 6. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard. 7. Keep ready spill control kit, 8. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 9. Keep ready safety shower and eye wash assembly near transfer of material
		4. 200 lit drums leaked or torn while transfer or tilt and	2. Inspection of packing material prior to acceptance	<ol style="list-style-type: none"> 4. Delay for batch 5. Spill of raw material 6. Fire and Explosion 	<ol style="list-style-type: none"> 1. Secondary Containment provision shall be made to avoid spillage 2. Spill control kit shall be kept ready

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		spill of raw material			
Reverse	1.Reverse flow of material raw material from Reactor to drum	1. Failure of Isolation valve.	1. Only Isolation valve provided.	1. Delay transfer	1. Trained Personnel
As well as	Other material will transfer	1.Human error 2.Other raw material kept near to transfer area	1.Trained personnel 2. Isolating transfer area.	1. Incompatibility	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorized person only
Part off	One of Material Missed	1.Human error	1. Appropriate Quantity and List of raw material Charging process	1. Batch Failure	1. Proper Supervision required while transfer of raw material
Other than	Other material will transfer	1.Human error	1.Trained personnel	1. Incompatibility	1.Trained personnel
Other than	Other raw material charged	Human Error (wrong selection of raw material).	Unknown consequences incoming stage	1.Labeling procedure is in place. 2.Done by and checked by provision in BMR.	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorized person only

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Others	Inadequate Inertisation	Impure Nitrogen	Fire / Explosion Hazard	NA	<ol style="list-style-type: none"> 1. Before charging raw material into Reactor Inertisation instruction to be incorporated in BMR. 2. Oxygen Analyzer provision can be made after Nitrogen receiver 3. Use of PPE's - (Flash fire suit, Safety goggle, face shield, helmet, safety shoes) 4. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, or Sprinkler system as per Local regulations
		Faulty N2 Flow meter	Fire / Explosion Hazard	NA	<ol style="list-style-type: none"> 1. Visually Inspection done before use. 2. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, PA system, Sprinkler system as per Local regulations
	Non dissipation of Static charge	Improper Earthing and bonding	Fire / Explosion Hazard	1. Trained Operator	<ol style="list-style-type: none"> 1. Ensure Double Earthing provided to Reactor and vessel. 2. Ensure use of conductive hose while charging and or unloading of flammables 3. Ensure FLP electrical fixtures at processing areas 4. Proper Nitrogen inertization before charging H₂O₂ 5. Earthing & Bonding to be checked before charging raw materials" instructions shall be added in BMR (General Instructions).

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				<ol style="list-style-type: none"> 6. Ensure provision of Earthing jumpers and Earthing continuity shall be checked at regular intervals 7. Spill control kit is available. 8. PPEs (Safety goggles, face shield, helmet, safety shoes)
Inadequate Maintenance / Mechanical Disintegrity	Clamp failure / improper fitting.	Hydrogen Peroxide get leaked, resulted into spillage/ Fire Hazard	<ol style="list-style-type: none"> 1. Trained operator performs the activity. 2. View glass is available on charging line after valve 3. Spill control kit is available. 	<ol style="list-style-type: none"> 1. Fixed or permanent piping arrangement is recommended for raw material transferring and dispensing activity. 2. Ensure line Trial before charging / transferring 3. Use of FLP spanners for maintenance / any mechanical purpose 4. PPE's (Chemical protective clothing like chemical resistant suits, Full body pressure suit, Safety goggles, Organic vapour mask, Face shield, helmet, safety shoes)
Human Error	Un skill / Lack of Knowledge / Experience	Fire / Explosion / Splashing Hazard	<ol style="list-style-type: none"> 1. Trained operator performs the activity. 	<ol style="list-style-type: none"> 1. Ensure skilled and qualified operator deputed for the work activity 2. Training shall be provided to employees about hazards and consequences and trouble shooting 3. Training records shall be maintained 4. Ensure continuous supervision for critical operations like Nitrogen inertisation, addition of critical raw materials in case of exothermic reactions 5. Training on Emergency Handling shall be provided

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				<p>6. Suitable fire extinguishers like Mechanical Foam type fire extinguishers for liquid fire (Class-B) shall be provided at workplace</p> <p>7. Peroxides are corrosives and may cause severe injuries / burns in case of exposure so ensure use of PPE's like Chemical protective clothing - chemical resistant suits, Full body pressure suit, Safety goggle, Organic vapour mask, Face shield, helmet, safety shoes etc.</p> <p>8. Ensure provision of Safety Shower and Eye wash at workplace</p>
	Improper storage / Housekeeping	<p>1. Pressurization of Drum / can due to exposure to direct sunlight</p> <p>2. Fire / Explosion Hazard</p>	1. Trained operator performs the activity.	<p>1. Hydrogen Peroxide shall be stored in cool, dry and well ventilated area and away from flammables/ combustible substances, avoid direct exposure to sunlight</p> <p>2. Ensure continuous supervision and qualified operator/ staff for monitoring reactions</p> <p>3. Ensure FLP tools for any maintenance work</p> <p>4. Ensure proper earthing and bonding while handling flammables</p> <p>5. Ensure proper housekeeping at workplace</p>

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3. Activity: - Addition of Catalyst from receiver to reactor by maintaining temperature 25°C

Guide Word	Type of Deviation	Typical Causes	Existing controls (safe guards)	Consequences	Action Required / Recommendation
No	No temperature	No meaningful deviation			
Less	Less (Low) Temperature	Malfuction of utility (Cooling water)	Trained operators and supervision	1.Exothermic Reaction 2 Material will buff in reactor and overflow outside area.	1. Ensure suitable utility media available effective cooling. It is recommended to use cooling tower / Chilled water plant instead of Ice cooling system. 2.Audio-visual alarm provision in case of rise in temperature.
		Temperature sensor failure	Trained operators and supervision	1.Exothermic Reaction 2.Fire / Explosion Hazard	1. Audio visual Alarm interlock to be provided for set temperature. 2. Calibration of Temperature sensor by Competent person 3. Reactor jacket provided with pressure gauge & temperature sensor
More	More quantity of Catalyst addition	1. More Catalyst will transfer (Fast addition)	1. Appropriate Quantity of raw material dispensing process. 2.Continuous supervision and	1.Exothermic Reaction 2.More material addition over flow reactor	1. Ensure suitable utility media arrangement for effective cooling. It is recommended to use cooling tower / Chilled water plant instead of Ice cooling system. 2. Audio-visual alarm provision in case of rise in temperature. 3. Level marking can be done inside the reactors on baffles 4. View glass with lamp provision

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			quantity verification /labeling system	3. Material will buff in reactor and overflow outside area.	<ul style="list-style-type: none"> 5. Batching Meter / Bar coding system can be implemented for dispensing of exact quantity and correct raw material. 6. Records filled and maintained by authorized personnel 7. To know decomposition temperature, Differential Scanning Colorimetry (DSC) study shall be done 8. Safety Valve and Rupture Disc shall be provided to the reactors and to heat exchanger (If provided) to avoid any incident due to rise in temp, pressure or thermal decomposition 9. All process equipment vent shall be outside plant and flame arrestors shall be provided at end of vent line. 10. All pressure vessels and process equipments shall be tested through Competent person 11. All indicative type instruments like Pressure Gauge, Temperature indicators shall be calibrated at regular intervals 12. Audio visual Alarm, interlock to be provided in case process temp exceeds above operation temp. 13. Reactor jacket provided with pressure gauge & temperature sensor
		2. More flow (Free flow leads to friction and resulted in to static charge generation) of raw material	<ul style="list-style-type: none"> 1. Proper Flow and head parameter designed. 2. Double body earthing provision to process piping to reactor 	1. Generation of static charge / splash fire	<ul style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards reactors wall side to charging line 3. Conductive Hoses shall be used for addition of Catalyst 4. Ensure provision of earthing jumpers on each flange of reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained

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		inside the reactor while charging			<ol style="list-style-type: none"> 6. SS dip rod with earthing shall be provided to drum while charging 7. Flange guards shall be provided on each flange of reactor and process piping to avoid splashing hazard 8. Keep ready spill control kit. 9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 10. Ensure use of flameproof tools while doing any type of maintenance work 11. Avoid hammering / mechanical impact
		3.Static electricity	1. Double body earthing provision to transferring pump and Reactor	3. Fire and Explosion	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards Reactors wall side to charging line 3. Ensure use of conductive hoses while charging flammable chemicals 4. Ensure provision of earthing jumpers on each flange of Reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained 6. SS dip rod with earthing shall be provided to drum while charging Catalyst 7. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 8. Keep ready spill control kit. 9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc.

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					<ul style="list-style-type: none"> 10. Ensure use of flameproof tools while doing any type of maintenance work 11. Avoid hammering / mechanical impact 12. Provision of Flameproof electrical fixtures 13. Provision of Fire Alarm Detection System / Fire Hydrant System/ Auto Sprinkler system as per local statutory regulations
	Human Error (In case of Manual charging)	<ul style="list-style-type: none"> 1.Lack of Awareness/ Knowledge / skill / Experience 	<ul style="list-style-type: none"> 1.Trained Operators & Supervision 2.Proper Labeling and dispensing procedure in place 	5. Exotherm may occur due to chemical incompatibility	<ul style="list-style-type: none"> 1. BMR (Batch Manufacturing Record) shall be maintained with continuous supervision 2. Chemicals shall be stored as per chemical compatibility 3. High temperature / pressure alarm with hooter shall be provided 4. Ensure effective cooling system (Cooling Tower) provided instead of ice water
As well as	Other material will transfer	<ul style="list-style-type: none"> 1.Human error 2.Other raw material kept near to transfer area 	<ul style="list-style-type: none"> 1.Trained personnel 2. Isolated transfer area. 	1. Incompatibility	<ul style="list-style-type: none"> 1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorized person only
Part off	One of Material Missed	1.Human error	<ul style="list-style-type: none"> 1. Appropriate Quantity and List of raw material Charging process 	1. Batch Failure	<ul style="list-style-type: none"> 1. Proper Supervision required while transfer of raw material

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Other than	Other material will transfer	1.Human error	1.Trained personnel	1. Incompatibility	1.Trained personnel
Other than	Other raw material charged	Human Error (wrong selection of raw material).	Unknown consequences incoming stage depends on chemical compatibility of material	1. Labeling procedure is in place. 2. Done by and checked by provision in BMR.	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorized person only
Others	Inadequate Inertisation	Impure Nitrogen Faulty N ₂ Flow meter	Fire / Explosion Hazard	NA	<ol style="list-style-type: none"> 1. Before charging raw material into Reactor Inertisation instruction to be incorporated in BMR. 2. Oxygen Analyzer provision can be made at the top of reactor 3. Use of PPE's - (Flash fire suit, Safety goggle, face shield, helmet, safety shoes) 4. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, or Sprinkler system as per Local regulations 5. Visual Inspection shall be done before use 6. Ensure availability of Portable Fire Extinguishers, Fire Hydrant System, Smoke detectors, PA system, Sprinkler system as per Local regulations
	Non dissipation of Static charge	Improper Earthing and bonding	Fire / Explosion Hazard	1. Trained Operator	<ol style="list-style-type: none"> 1. Ensure Double Earthing provided to Reactor and vessel. 2. Ensure use of conductive hose while charging and or unloading of flammables 3. Ensure FLP electrical fixtures at processing areas 4. Proper Nitrogen inertization before addition Catalyst

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					<ol style="list-style-type: none"> 5. Earthing & Bonding to be checked before charging raw materials" instructions shall be added in BMR (General Instructions). 6. Ensure provision of Earthing jumpers and Earthing continuity shall be checked at regular intervals 7. Spill control kit is available. 8. PPEs (Safety goggles, face shield, helmet, safety shoes)
	Inadequate Maintenance/ Mechanical Disintegrty	Clamp failure / improper fitting.	Hydrogen Peroxide get leaked, resulted into spillage/ Fire Hazard	<ol style="list-style-type: none"> 1. Trained operator performs the activity. 2. View glass is available on charging line after valve 3. Spill control kit is available. 	<ol style="list-style-type: none"> 1. Fixed or permanent piping arrangement is recommended for raw material transferring and dispensing activity. 2. Ensure line Trial before charging / transferring 3. Use of FLP spanners for maintenance / any mechanical purpose 4. PPE's (Chemical protective clothing like chemical resistant suits, Full body pressure suit, Safety goggles, Organic vapour mask, Face shield, helmet, safety shoes)
	Human Error	Un skill / Lack of Knowledge / Experience	Fire / Explosion / Splashing Hazard	<ol style="list-style-type: none"> 1. Trained operator performs the activity. 	<ol style="list-style-type: none"> 1. Ensure skilled and qualified operator deputed for the work activity 2. Training shall be provided to employees about hazards and consequences and trouble shooting 3. Training records shall be maintained 4. Ensure continuous supervision for critical operations like Nitrogen inertisation, addition of critical raw materials in case of exothermic reactions 5. Training on Emergency Handling shall be provided

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					<p>6. Suitable fire extinguishers like Mechanical Foam type fire extinguishers for liquid fire (Class-B) shall be provided at workplace</p> <p>7. Ensure use of PPE's like Chemical protective clothing - chemical resistant suits, Full body pressure suit, Safety goggles, Organic vapour mask, Face shield, helmet, safety shoes etc.</p> <p>8. Ensure provision of Safety Shower and Eye wash at workplace</p>
		<p>Improper storage / Housekeeping</p>	<p>1. Pressurization of Drum / can due to exposure to direct sunlight</p> <p>2. Fire / Explosion Hazard</p>	<p>1. Trained operator performs the activity.</p>	<p>1. Catalyst shall be stored in cool, dry and well ventilated area and away from flammables/ combustible substances, avoid direct exposure to sunlight</p> <p>2. Ensure continuous supervision and qualified operator/ staff for monitoring reactions</p> <p>3. Ensure FLP tools for any maintenance work</p> <p>4. Ensure proper earthing and bonding while handling flammables</p> <p>5. Ensure proper housekeeping at workplace</p>

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4. Activity: - Stir the reaction mass for 5-6 Hrs at 20-30 °C

Guide Word	Type of Deviation	Typical Cause	Consequence	Existing controls (safe guards)	Action required (Recommendation)
No	No Stirring(RPM)	Human Error /Agitator tripped	1. Reactor may get pressurized. 2. Poor heat transfer.	1. Continuous Supervision. 2. View glass is available on the reactor. 3.Activity is checked by second person.	1.Provision can be made for audio - visual alarm in case of tripping of reactor agitator
Less	Less Stirring(RPM)	Human Error (Wrong RPM selected)	1.Hot spot may generated. 2.Poor heat transfer.	1. Continuous Supervision. 2. View glass is available on the reactor. 3.Activity is checked by second person.	1.Provision can be made for audio - visual alarm in case of tripping of reactor agitator
More	More Stirring (RPM)	Human Error (Wrong RPM selected)	Reaction mass may decompose or may have quality impact	1. Continuous Supervision. 2. View glass is available on the reactor. 3.Activity is checked by second person.	1.Provision can be made for audio - visual alarm in case of tripping of reactor agitator

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5. Activity: - After testing, adjust purity with DEG

Guide Word	Type of Deviation	Typical Causes	Consequences	Existing controls (safe guards)	Action Required /Recommendation
No	No Quantity	Reactor charging valve closed	No EHS consequences	1.Trained Operators 2.Continuous supervision	Ensure Valve operation and proper line up cross verified physically
		Reactor bottom valve opened / dismantled	Spillage of DEG	1.Trained Operators 2. Continuous supervision	1. Reactor shall have double bottom valve with view glass 2.Spill control kit shall be made available at workplace 3.Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
More	More Qty	Not possible			
Less	Less Qty	Leakage in charging line	Spillage may cause exposure	1.Trained Operators 2. Continuous supervision	1.Ensure line trail before addition of reaction mass 2. Spill control kit shall be made available at workplace 3.Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
As well As	As well as Qty	Not possible			
Part of	Part of Qty	Not possible			

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Reverse	Reverse Qty	Not possible			
Other than	Other raw material charged	Human Error (wrong selection of raw material).	EHS Consequences based on compatibility or properties of raw materials	1.Trained Operators 2.Continuous supervision	1.Ensure permanent piping arrangement with correct tagging to avoid wrong line up 2.Ensure proper labeling and arrow marking on permanent piping
Others	Inadequate Maintenance/ Mechanical Disintegrity	Improper maintenance of transferring pump, flange fittings etc	Spillage, leakage or Splash Hazard, Exposure of Caustic	1.Trained Operators 2.Continuous supervision	1.Ensure Planned Preventive Maintenance as per schedule and record shall be maintained 2.Ensure line trail before transferring/charging activities
		Improper machine guarding	Physical injury	Not Available	All moving parts of machineries - Motor pulley guards, reactor and transferring pump shaft guards and other moving parts shall be properly guarded

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6. Collection of clear filtrate in to Drums

Guide Word	Type of Deviation	Typical Causes	Consequences	Existing controls (safe guards)	Action Required /Recommendation
No	No Qty	Reactor / Filtration vessel bottom valve malfunctioning	1. Hose pipe may get pressurized. 2. Spillage of reaction mass, 3. Fire and Health Hazard, 4. Property loss. 5. Drum may get over flow.	1. Trained operators 2. Calibrated SS vessel, 3. Standby vessels are available.	1. Ensure continuous supervision 2. Spill control kit shall be made available at workplace 3. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggles/ Acid-alkali proof hand gloves ,safety shoes etc.
		Bottom valve closed	1. Hose pipe may get pressurized 2. Spillage of reaction mass 3. Fire and Health Hazard 4. Property loss.	1. Trained operators 2. Calibrated SS vessel 3. Standby vessels are available.	1. Ensure continuous supervision 2. Spill control kit shall be made available at workplace 3. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggles/ Acid-alkali proof hand gloves ,safety shoes etc.
		Nutsch Filter outlet valve closed	May impact on quality and yield	1. Trained operators,	No Recommendations
		Vacuum pump failure	1. Negative pressure may build up inside Nutsch filter	1. Trained operators, 2. Continuous supervision	1. Ensure PPM of vacuum pump is done and records are maintained 2. Ensure Compound gauge is provided on Nutsch filter and is

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			2. Impact on quality and yield		periodically calibrated through Competent person and records maintained
		Nutsch filter bottom valve opened.	1.Spillage/Leakage of finished product 2.Product loss	1.Trained operators, 2.Continuous supervision	1. Spill control kit shall be made available at workplace 2. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
Less	Less Qty	Hose pipe leakage	1.Spillage of finished product 2.Property loss.	1.Trained operators, 2.Continuous supervision	1. Fixed SS piping is to be used for filtration 2. Spill control kit shall be made available at workplace 3. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
Less	Less Qty	Human Error	1.Hose pipe may get pressurized 2.Spillage of finished product 3.property loss	1.Trained operators, 2.Continuous supervision	1. Fixed SS piping is to be used for filtration 2. Spill control kit shall be made available at workplace 3. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.

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More	More Qty	Human Error	Overflow of drums	1.Trained operators, 2.Continuous supervision	1. Spill control kit shall be made available at workplace 2. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
As well As	As well as qty	Not Applicable	Not Applicable	Not Applicable	
Part of	Not possible				
Reverse	Reverse Qty	Not possible			
Other than	Other solvent charged	Human Error	Hazards depends on compatibility or property of solvents,Impact on Quality and Yield incoming stages	1.Trained operators, 2.Done by check by procedure is in place.	1. Spill control kit shall be made available at workplace 2. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.

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• Manufacturing of Acetyl Acetone Peroxide

1. Activity: - Charging of Di Acetone Alcohol to Reactor under vacuum from drum

Guide Word	Type of Deviation	Typical Causes	Existing controls (safe guards)	Consequences	Action Required /Recommendation
None/ No/ Not	No transfer of Di Acetone Alcohol	1. Human error 2. Wrong line up	1. Trained operator	1. No raw material will transfer	1. To check material is ready before transfer 2. Line trial shall be taken before charging
		3. Vacuum failure	9. Periodic PPM schedule for pump	5. No transfer due to pump under maintenance / breakdown	5. To check pump is ready for transfer 6. Line trial shall be taken before charging
		3. No electricity while charging	10. Nil	3. No transfer without electricity	3. DG back up within five minutes
More	More quantity of Di Acetone Alcohol addition	1. More Di Acetone Alcohol will transfer	1. Appropriate Quantity of raw material dispensing process. 2. Continuous supervision and quantity verification /labeling system	1. More material addition over flow reactor 2. Material will buff in reactor and overflow outside area.	1. Level marking can be done inside the reactors on baffles 2. View glass with lamp provision 3. Batching Meter / Bar coding system can be implemented for dispensing of exact quantity and correct raw material. 4. Records filled and maintained by authorized personnel

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		<p>2. More flow (Free flow leads to friction and resulted in to static charge generation) of raw material inside the reactor while charging</p>	<p>1. Trained operators to monitor addition rate.</p>	<p>1. Generation of static charge / splash fire</p>	<p>1. Line trial shall be taken before charging / transfer</p> <p>2. J-bend provision towards reactors wall side to charging line</p> <p>3. Conductive Hoses shall be used for charging Di Acetone Alcohol</p> <p>4. Double body earthing provision to process piping to reactor</p> <p>5. Ensure provision of earthing jumpers on each flange of reactor and process piping</p> <p>6. Define checking frequency of earthing continuity and records shall be maintained</p> <p>7. SS dip rod with earthing shall be provided to drum while charging .Flange guards shall be provided on each flange of reactor and process piping to avoid splashing hazard</p> <p>8. Keep ready spill control kit.</p> <p>9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc.</p> <p>10. Ensure use of flameproof tools while doing any type of maintenance work</p> <p>11. Avoid hammering / mechanical impact</p>
		<p>3. Static electricity</p>	<p>1. Trained Operators & Supervision</p>	<p>3. Fire and Explosion</p>	<p>1. Line trial shall be taken before charging / transfer</p> <p>2. J-bend provision towards Reactors wall side to charging line</p> <p>3. Ensure Double body earthing provision to process piping to reactor</p>

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					<ol style="list-style-type: none"> 4. Ensure use of conductive hoses while charging flammable chemicals 5. Ensure provision of earthing jumpers on each flange of Reactor and process piping 6. Define checking frequency of earthing continuity and records shall be maintained 7. SS dip rod with earthing shall be provided to drum while charging Di Acetone Alcohol 8. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 9. Keep ready spill control kit. 10. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 11. Ensure use of flameproof tools while doing any type of maintenance work 12. Avoid hammering / mechanical impact 13. Provision of Flameproof electrical fixtures 14. Provision of Fire Alarm Detection System / Fire Hydrant System/ Auto Sprinkler system as per local statutory regulations
Human Error (In case of Manual charging)	<ol style="list-style-type: none"> 1. Lack of Awareness/ Knowledge / skill / Experience 	<ol style="list-style-type: none"> 1. Trained Operators & Supervision 2. Proper Labeling and dispensing procedure in place 	Exotherm may occur due to chemical incompatibility	<ol style="list-style-type: none"> 1. BMR (Batch Manufacturing Record) shall be maintained with continuous supervision 2. Chemicals shall be stored as per chemical compatibility 3. High temperature / pressure alarm with hooter shall be provided 4. Ensure effective cooling system (Cooling Tower) provided instead of using ice water 	

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More	Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	1.Trained Operator & Supervision	5. Spillage/ Overflow / Fire / Explosion / Chemical/vapour Exposure	<ol style="list-style-type: none"> 1. Spillage Control Kit required at each floor 2. Awareness Training on Spillage Control shall be provided. 3. Ensure proper use of PPE's like Safety shoes, Helmet, Hand Gloves and Safety Goggle, Organic vapour mask and flash fire suit etc.
Less	Less material will transfer	1. Less flow for transfer	<ol style="list-style-type: none"> 1. Appropriate Quantity of raw material dispensing process. 2. Periodic PPM schedule for pump 3. Appropriate Quantity of raw material dispensing process. 	<ol style="list-style-type: none"> 1. Delay in batch 2. Delay in batch 3. Quality of product disturbs. 	<ol style="list-style-type: none"> 1. Trained persons should be performed all activities. 2. Take preventive maintenance of transfer pump. 3. Before transfer check quantity of material.
		2.Pump failure	5. Periodic PPM schedule for pump	5. No transfer due to pump under maintenance / breakdown	<ol style="list-style-type: none"> 1. To check pump is ready for transfer 2. Line shall be taken before charging
		3. Transfer line damaged while transfer	3. Proper assessment for line design & MOC	<ol style="list-style-type: none"> 5. Fire & explosion 6. No transfer due to transfer line fractured. 7. Raw material to be spilled. 	<ol style="list-style-type: none"> 1. Conductive hoses shall be used for charging flammable chemicals 2. Line trial shall taken before charging / transfer 3. Ensure provision of earthing jumpers on each flange of Reactor and process piping 4. Define checking frequency of earthing continuity

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				8. Raw material splashes on operator	<ul style="list-style-type: none"> 5. SS dip rod with earthing shall be provided while charging DI ACETONE ALCOHOL to Reactor 6. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 7. Keep ready spill control kit, 8. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 9. Keep ready safety shower and eye wash assembly near transfer of material
		4. 200 lit drums leaked or torn while transfer or tilt and spill of raw material	3. Inspection of packing material prior to acceptance	<ul style="list-style-type: none"> 7. Delay for batch 8. Spill of raw material 9. Fire and Explosion 	<ul style="list-style-type: none"> 1. Secondary Containment provision shall be made to avoid spillage 2. Spill control kit shall be kept ready
Reverse	1. Reverse flow of material raw material from Reactor to drum	1. Failure of Isolation valve,	1. Only Isolation valve provided.	1. Delay transfer	1. Trained Personnel

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As well as	Other material will transfer	1.Human error 2.Other raw material kept near to transfer area	1.Trained personnel 2. Isolating transfer area.	1. Incompatibility	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorised person only
Part off	One of Material Missed	1.Human error	1. Appropriate Quantity and List of raw material Charging process	1. Batch Failure	1. Proper Supervision required while transfer of raw material
Other than	Other material will transfer	1.Human error	1.Trained personnel	1. Incompatibility	1.Trained personnel
Other than	Other raw material charged	Human Error (wrong selection of raw material).	Unknown consequences incoming stage	1.Labeling procedure is in place. 2.Done by and checked by provision in BMR.	No Recommendation
Others	Inadequate Inertisation	Impure Nitrogen	Fire Hazard	NA	1. Before charging raw material into Reactor Inertisation instruction to be incorporated in BMR. 2.Oxygen Analyzer provision can be made after Nitrogen receiver 3.Use of PPE's - (Flash fire suit, Safety goggle, face shield, helmet, safety shoes)

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					4.Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, or Sprinkler system as per Local regulations
	Faulty N ₂ Flow meter	Fire Hazard	NA		1.Visually Inspection done before use. 2. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, PA system, Sprinkler system as per Local regulations
Non dissipation of Static charge	Improper Earthing and bonding	Fire Hazard	1. Double Earthing provided to Reactor and vessel. 2. Spill control kit is available. 3. PPEs (Safety goggle, face shield, helmet, safety shoes)		1. Earthing & Bonding to be checked before charging raw materials" instructions shall be added in BMR (General Instructions).
Inadequate Maintenance/ Mechanical Disintegrity	Clamp failure / improper fitting.	DI ACETONE ALCOHOL get leaked, resulted into spillage	1.Trained operator performs the activity. 2. View glass is available on charging line after valve 3.Spill control kit is available. 4.PPE's (helmet, safety shoes)		1.Fixed or permanent piping arrangement is recommended for raw material transferring and dispensing activity. 2. Ensure line Trial before charging / transferring

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2. Activity: - Charging of Hydrogen Peroxide to Reactor under vacuum from drum

Guide Word	Type of Deviation	Typical Causes	Existing controls (safe guards)	Consequences	Action Required /Recommendation
None/ No/ Not	No transfer of Hydrogen Peroxide	1. Human error 2. Wrong line up	1. Trained operator	1. No raw material will transfer	1. To check material is ready before transfer 2. Line trial shall be taken before charging
		3. Vacuum failure	11. Periodic PPM schedule for pump	6. No transfer due to pump under maintenance / breakdown	1. To check pump is ready for transfer 2. Line trial shall be taken before charging
		3. No electricity while charging	12. Nil	3. No transfer without electricity	3. DG back up within five minutes
More	More quantity of Hydrogen Peroxide addition	1. More Hydrogen Peroxide will transfer (Fast addition)	1. Appropriate Quantity of raw material dispensing process. 2. Continuous supervision and quantity verification /labeling system	1. Exothermic Reaction 2. More material addition over flow reactor 3. Material will buff in reactor and overflow outside area.	1. Ensure suitable utility media arrangement for effective cooling. It is recommended to use cooling tower / Chilled water plant instead of Ice cooling system. 2. Audio-visual alarm provision in case of rise in temperature. 3. Level marking can be done inside the reactors on baffles 4. View glass with lamp provision 5. Batching Meter / Bar coding system can be implemented for dispensing of exact quantity and correct raw material.

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					<ol style="list-style-type: none"> 6. Records filled and maintained by authorized personnel 7. All process equipment vent shall be outside plant and flame arrestors shall be provided at end of vent line. 8. All pressure vessels and process equipments shall be tested through Competent person 9. All indicative type instruments like Pressure Gauge, Temperature indicators shall be calibrated at regular intervals
		<p>2. More flow (Free flow leads to friction and resulted in to static charge generation) of raw material inside the reactor while charging</p>	<ol style="list-style-type: none"> 1. Proper Flow and head parameter designed. 2. Double body earthing provision to process piping to reactor 	<p>1. Generation of static charge / splash fire</p>	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards reactors wall side to charging line 3. Conductive Hoses shall be used for charging H₂O₂ 4. Ensure provision of earthing jumpers on each flange of reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained 6. SS dip rod with earthing shall be provided to drum while charging, Flange guards shall be provided on each flange of reactor and process piping to avoid splashing hazard 7. Keep ready spill control kit. 8. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc.

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					<p>9. Ensure use of flameproof tools while doing any type of maintenance work</p> <p>10. Avoid hammering / mechanical impact</p>
		3. Static electricity	1. Double body earthing provision to transferring pump and Reactor	3. Fire and Explosion	<p>1. Line trial shall be taken before charging / transfer</p> <p>2. J-bend provision towards Reactors wall side to charging line</p> <p>3. Ensure use of conductive hoses while charging flammable chemicals</p> <p>4. Ensure provision of earthing jumpers on each flange of Reactor and process piping</p> <p>5. Define checking frequency of earthing continuity and records shall be maintained</p> <p>6. SS dip rod with earthing shall be provided to drum while charging H₂O₂</p> <p>7. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard</p> <p>8. Keep ready spill control kit.</p> <p>9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc.</p> <p>10. Ensure use of flameproof tools while doing any type of maintenance work</p> <p>11. Avoid hammering / mechanical impact</p> <p>12. Provision of Flameproof electrical fixtures</p> <p>13. Provision of Fire Alarm Detection System / Fire Hydrant System/ Auto Sprinkler system as per local statutory regulations</p>

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	Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	1.Trained Operators & Supervision 2.Proper Labeling and dispensing procedure in place	6. Exotherm may occur due to chemical incompatibility	<ol style="list-style-type: none"> 1. BMR (Batch Manufacturing Record) shall be maintained with continuous supervision 2. Chemicals shall be stored as per chemical compatibility 3. High temperature / pressure alarm with hooter shall be provided 4. Ensure effective cooling system (Cooling Tower) provided instead of ice water
More	Human Error (In case of Manual charging)	1.Lack of Awareness/ Knowledge / skill / Experience	1.Trained Operator & Supervision	6. Spillage/ Overflow / Fire / Explosion / Chemical/vapour Exposure	<ol style="list-style-type: none"> 1. Spillage Control Kit required at each floor 2. Awareness Training on Spillage Control shall be provided. 3. Ensure proper use of PPE's like Safety shoes, Helmet, Hand Gloves and Safety Goggle, Organic vapour mask and flash fire suit etc.
Less	Less material will transfer	1. Less flow for transfer	<ol style="list-style-type: none"> 1. Appropriate Quantity of raw material dispensing process. 2. Periodic PPM schedule for pump 3. Appropriate Quantity of raw material dispensing process. 	<ol style="list-style-type: none"> 1. Delay in batch 2. Delay in batch 3. Quality of product disturbs. 	<ol style="list-style-type: none"> 1. Trained persons should be performed all activities. 2. Take preventive maintenance of transfer pump. 3. Before transfer check quantity of material.

HAZOP STUDY REPORT

		2. Pump failure	6. Periodic PPM schedule for pump	6. No transfer due to pump under maintenance / breakdown	<ol style="list-style-type: none"> 1. To check pump is ready for transfer 2. Line shall be taken before charging
		3. Transfer line damaged while transfer	3. Proper assessment for line design & MOC	<ol style="list-style-type: none"> 9. Fire & explosion 10. No transfer due to transfer line fractured. 11. Raw material to be spilled. 12. Raw material splashes on operator 	<ol style="list-style-type: none"> 1. Conductive hoses shall be used for charging flammable chemicals 2. Line shall be taken before charging / transfer 3. Ensure provision of earthing jumpers on each flange of Reactor and process piping 4. Define checking frequency of earthing continuity 5. SS dip rod with earthing shall be provided while charging H₂O₂ to Reactor 6. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 7. Keep ready spill control kit. 8. Use of PPE's (Personal protective equipment) like Safety Goggles, Hand Gloves, Organic Vapour mask, safety shoes etc. 9. Keep ready safety shower and eye wash assembly near transfer of material
		4. 200 lit drums leaked or torn while transfer or tilt and spill of raw material	3. Inspection of packing material prior to acceptance	<ol style="list-style-type: none"> 7. Delay for batch 8. Spill of raw material 9. Fire and Explosion 	<ol style="list-style-type: none"> 1. Secondary Containment provision shall be made to avoid spillage 2. Spill control kit shall be kept ready

HAZOP STUDY REPORT

Reverse	1.Reverse flow of material raw material from Reactor to drum	1. Failure of Isolation valve.	1. Only Isolation valve provided.	1. Delay transfer	1. Trained Personnel
As well as	Other material will transfer	1.Human error 2.Other raw material kept near to transfer area	1.Trained personnel 2. Isolating transfer area.	1. Incompatibility	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorised person only
Part off	One of Material Missed	1.Human error	1. Appropriate Quantity and List of raw material Charging process	1. Batch Failure	1. Proper Supervision required while transfer of raw material
Other than	Other material will transfer	1.Human error	1.Trained personnel	1. Incompatibility	1.Trained personnel
Other than	Other raw material charged	Human Error (wrong selection of raw material).	Unknown consequences incoming stage	1.Labeling procedure is in place. 2.Done by and checked by provision in BMR.	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorized person only

HAZOP STUDY REPORT

Others	Inadequate Inertisation	Impure Nitrogen	Fire / Explosion Hazard	NA	<ol style="list-style-type: none"> 1. Before charging raw material into Reactor Inertisation instruction to be incorporated in BMR. 2. Oxygen Analyzer provision can be made after Nitrogen receiver 3. Use of PPE's - (Flash fire suit, Safety goggle, face shield, helmet, safety shoes) 4. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, or Sprinkler system as per Local regulations
		Faulty N2 Flow meter	Fire / Explosion Hazard	NA	<ol style="list-style-type: none"> 1. Visually Inspection done before use. 2. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, PA system, Sprinkler system as per Local regulations
	Non dissipation of Static charge	Improper Earthing and bonding	Fire / Explosion Hazard	1. Trained Operator	<ol style="list-style-type: none"> 1. Ensure Double Earthing provided to Reactor and vessel. 2. Ensure use of conductive hose while charging and or unloading of flammables 3. Ensure FLP electrical fixtures at processing areas 4. Proper Nitrogen inertization before charging H₂O₂ 5. Earthing & Bonding to be checked before charging raw materials" instructions shall be added in BMR (General Instructions).

HAZOP STUDY REPORT

				6. Ensure provision of Earthing jumpers and Earthing continuity shall be checked at regular intervals 7. Spill control kit is available. 8. PPEs (Safety goggle, face shield, helmet, safety shoes)
Inadequate Maintenance / Mechanical Disintegrty	Clamp failure / improper fitting.	Hydrogen Peroxide get leaked, resulted into spillage/ Fire Hazard	1. Trained operator performs the activity. 2. View glass is available on charging line after valve 3. Spill control kit is available.	1. Fixed or permanent piping arrangement is recommended for raw material transferring and dispensing activity. 2. Ensure line Trial before charging / transferring 3. Use of FLP spanners for maintenance / any mechanical purpose 4. PPE's (Chemical protective clothing like chemical resistant suits, Full body pressure suit, Safety goggle, Organic vapour mask, Face shield, helmet, safety shoes)
Human Error	Un skill / Lack of Knowledge / Experience	Fire / Explosion / Splashing Hazard	1. Trained operator performs the activity.	1. Ensure skilled and qualified operator deputed for the work activity 2. Training shall be provided to employees about hazards and consequences and trouble shooting 3. Training records shall be maintained 4. Ensure continuous supervision for critical operations like Nitrogen inertisation, addition of critical raw materials in case of exothermic reactions 5. Training on Emergency Handling shall be provided

HAZOP STUDY REPORT

				<p>6. Suitable fire extinguishers like Mechanical Foam type fire extinguishers for liquid fire (Class-B) shall be provided at workplace</p> <p>7. Peroxides are corrosives and may cause severe injuries / burns in case of exposure so ensure use of PPE's like Chemical protective clothing - chemical resistant suits, Full body pressure suit, Safety goggle, Organic vapour mask, Face shield, helmet, safety shoes etc.</p> <p>8. Ensure provision of Safety Shower and Eye wash at workplace</p>
	Improper storage / Housekeeping	<p>1. Pressurization of Drum / can due to exposure to direct sunlight</p> <p>2. Fire / Explosion Hazard</p>	1. Trained operator performs the activity.	<p>1. Hydrogen Peroxide shall be stored in cool, dry and well ventilated area and away from flammables/ combustible substances, avoid direct exposure to sunlight</p> <p>2. Ensure continuous supervision and qualified operator/ staff for monitoring reactions</p> <p>3. Ensure FLP tools for any maintenance work</p> <p>4. Ensure proper earthing and bonding while handling flammables</p> <p>5. Ensure proper housekeeping at workplace</p>

HAZOP STUDY REPORT

3. Activity: - Addition of Acetyl Acetone from receiver to reactor by maintaining temperature 25°C

Guide Word	Type of Deviation	Typical Causes	Existing controls (safe guards)	Consequences	Action Required / Recommendation
No	No temperature	No meaningful deviation			
Less	Less (Low) Temperature	Malfunction of utility (Cooling water)	Trained operators and supervision	1.Exothermic Reaction 2 Material will buff in reactor and overflow outside area.	3.Ensure suitable utility media available effective cooling. It is recommended to use cooling tower / Chilled water plant instead of Ice cooling system. 4.Audio-visual alarm provision in case of rise in temperature.
		Temperature sensor failure	Trained operators and supervision	1.Exothermic Reaction 2.Fire / Explosion Hazard	1. Audio visual Alarm interlock to be provided for set temperature. 2. Calibration of Temperature sensor by Competent person 3. Reactor jacket provided with pressure gauge & temperature sensor
More	More quantity of Acetyl Acetone addition	1. More Acetyl Acetone will transfer (Fast addition)	1. Appropriate Quantity of raw material dispensing process. 2.Continuous supervision and quantity verification /labeling system	1.Exothermic Reaction 2.More material addition over flow reactor 3. Material will buff in reactor and overflow outside area.	1. Ensure suitable utility media arrangement for effective cooling. It is recommended to use cooling tower / Chilled water plant instead of Ice cooling system. 2. Audio-visual alarm provision in case of rise in temperature. 3. Level marking can be done inside the reactors on baffles 4. View glass with lamp provision

HAZOP STUDY REPORT

					<ol style="list-style-type: none"> 5. Batching Meter / Bar coding system can be implemented for dispensing of exact quantity and correct raw material. 6. Records filled and maintained by authorized personnel 7. To know decomposition temperature, Differential Scanning Colorimetry (DSC) study shall be done 8. Safety Valve and Rupture Disc shall be provided to the reactors and to heat exchanger (If provided) to avoid any incident due to rise in temp, pressure or thermal decomposition 9. All process equipment vent shall be outside plant and flame arrestors shall be provided at end of vent line. 10. All pressure vessels and process equipments shall be tested through Competent person 11. All indicative type instruments like Pressure Gauge, Temperature indicators shall be calibrated at regular intervals 12. Audio visual Alarm, interlock to be provided in case process temp exceeds above operation temp. 13. Reactor jacket provided with pressure gauge & temperature sensor
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HAZOP STUDY REPORT

		2. More flow (Free flow leads to friction and resulted in to static charge generation) of raw material inside the reactor while charging	<ol style="list-style-type: none"> 1. Proper Flow and head parameter designed. 2. Double body earthing provision to process piping to reactor 	1. Generation of static charge / splash fire	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards reactors wall side to charging line 3. Conductive Hoses shall be used for addition of Acetyl Acetone 4. Ensure provision of earthing jumpers on each flange of reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained 6. SS dip rod with earthing shall be provided to drum while charging 7. Flange guards shall be provided on each flange of reactor and process piping to avoid splashing hazard 8. Keep ready spill control kit. 9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 10. Ensure use of flameproof tools while doing any type of maintenance work 11. Avoid hammering / mechanical impact
		3. Static electricity	<ol style="list-style-type: none"> 1. Double body earthing provision to transferring pump and Reactor 	3. Fire and Explosion	<ol style="list-style-type: none"> 1. Line trial shall be taken before charging / transfer 2. J-bend provision towards Reactors wall side to charging line 3. Ensure use of conductive hoses while charging flammable chemicals

HAZOP STUDY REPORT

					<ol style="list-style-type: none"> 4. Ensure provision of earthing jumpers on each flange of Reactor and process piping 5. Define checking frequency of earthing continuity and records shall be maintained 6. SS dip rod with earthing shall be provided to drum while charging Acetyl Acetone 7. Flange guards shall be provided on each flange of Reactors and process piping to avoid splashing hazard 8. Keep ready spill control kit. 9. Use of PPE's (Personal protective equipment) like Safety Google, Hand Gloves, Organic Vapour mask, safety shoes etc. 10. Ensure use of flameproof tools while doing any type of maintenance work 11. Avoid hammering / mechanical impact 12. Provision of Flameproof electrical fixtures 13. Provision of Fire Alarm Detection System / Fire Hydrant System/ Auto Sprinkler system as per local statutory regulations
	Human Error (In case of Manual charging)	<ol style="list-style-type: none"> 1.Lack of Awareness/ Knowledge / skill / Experience 	<ol style="list-style-type: none"> 1.Trained Operators & Supervision 2.Proper Labeling and dispensing procedure in place 	<ol style="list-style-type: none"> 5. Exotherm may occur due to chemical incompatibility 	<ol style="list-style-type: none"> 1. BMR (Batch Manufacturing Record) shall be maintained with continuous supervision 2. Chemicals shall be stored as per chemical compatibility 3. High temperature / pressure alarm with hooter shall be provided 4. Ensure effective cooling system (Cooling Tower) provided instead of ice water

HAZOP STUDY REPORT

As well as	Other material will transfer	1.Human error 2.Other raw material kept near to transfer area	1.Trained personnel 2. Isolated transfer area.	1. Incompatibility	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorized person only
Part off	One of Material Missed	1.Human error	1. Appropriate Quantity and List of raw material Charging process	1. Batch Failure	1. Proper Supervision required while transfer of raw material
Other than	Other material will transfer	1.Human error	1.Trained personnel	1. Incompatibility	1.Trained personnel
Other than	Other raw material charged	Human Error (wrong selection of raw material).	Unknown consequences incoming stage, depends on chemical compatibility of material	1. Labeling procedure is in place. 2. Done by and checked by provision in BMR.	1.Trained personnel 2.Raw material shall be stored at Designated place only, marked properly to avoid mix up and dispensing shall be done through Authorized person only
Others	Inadequate Inertisation	Impure Nitrogen	Fire / Explosion Hazard	NA	1. Before charging raw material into Reactor Inertisation instruction to be incorporated in BMR. 2. Oxygen Analyzer provision can be made at the top of reactor

HAZOP STUDY REPORT

					<ol style="list-style-type: none"> 3. Use of PPE's - (Flash fire suit, Safety goggle, face shield, helmet, safety shoes) 4. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, or Sprinkler system as per Local regulations
		Faulty N2 Flow meter	Fire / Explosion Hazard	NA	<ol style="list-style-type: none"> 1. Visually Inspection done before use. 2. Ensure availability of Portable fire extinguishers, Fire Hydrant System, Smoke detectors, PA system, Sprinkler system as per Local regulations
	Non dissipation of Static charge	Improper Earthing and bonding	Fire / Explosion Hazard	1. Trained Operator	<ol style="list-style-type: none"> 1. Ensure Double Earthing provided to Reactor and vessel. 2. Ensure use of conductive hose while charging and or unloading of flammables 3. Ensure FLP electrical fixtures at processing areas 4. Proper Nitrogen inertization before addition ACETYL ACETONE 5. Earthing & Bonding to be checked before charging raw materials" instructions shall be added in BMR (General Instructions). 6. Ensure provision of Earthing jumpers and Earthing continuity shall be checked at regular intervals 7. Spill control kit is available. 8. PPEs (Safety goggle, face shield, helmet, safety shoes)

HAZOP STUDY REPORT

	Inadequate Maintenance/ Mechanical Disintegrty	Clamp failure / improper fitting.	Hydrogen Peroxide get leaked, resulted into spillage/ Fire Hazard	<ol style="list-style-type: none"> 1. Trained operator performs the activity. 2. View glass is available on charging line after valve 3. Spill control kit is available. 	<ol style="list-style-type: none"> 1. Fixed or permanent piping arrangement is recommended for raw material transferring and dispensing activity. 2. Ensure line Trial before charging / transferring 3. Use of FLP spanners for maintenance / any mechanical purpose 4. PPE's (Chemical protective clothing like chemical resistant suits, Full body pressure suit, Safety goggle, Organic vapour mask, Face shield, helmet, safety shoes)
	Human Error	Un skill / Lack of Knowledge / Experience	Fire / Explosion / Splashing Hazard	<ol style="list-style-type: none"> 1. Trained operator performs the activity. 	<ol style="list-style-type: none"> 1. Ensure skilled and qualified operator Di Acetone Alcohol deputed for the work activity 2. Training shall be provided to employees about hazards and consequences and trouble shooting 3. Training records shall be maintained 4. Ensure continuous supervision for critical operations like Nitrogen inertisation, addition of critical raw materials in case of exothermic reactions 5. Training on Emergency Handling shall be provided 6. Suitable fire extinguishers like Mechanical Foam type fire extinguishers for liquid fire (Class-B) shall be provided at workplace 7. Ensure use of PPE's like Chemical protective clothing - chemical resistant suits, Full body

HAZOP STUDY REPORT

					pressure suit, Safety goggle, Organic vapour mask, Face shield, helmet, safety shoes etc. 8. Ensure provision of Safety Shower and Eye wash at workplace
		Improper storage / Housekeeping	1. Pressurization of Drum / can due to exposure to direct sunlight 2. Fire / Explosion Hazard	1. Trained operator performs the activity.	1. Acetyl Acetone shall be stored in cool, dry and well ventilated area and away from flammables/ combustible substances, avoid direct exposure to sunlight 2. Ensure continuous supervision and qualified operator/ staff for monitoring reactions 3. Ensure FLP tools for any maintenance work 4. Ensure proper earthing and bonding while handling flammables 5. Ensure proper housekeeping at workplace

HAZOP STUDY REPORT

4. Activity: - Stir the reaction mass for 5-6 Hrs at 20-30 °C

Guide Word	Type of Deviation	Typical Cause	Consequence	Existing controls (safe guards)	Action required (Recommendation)
No	No Stirring(RPM)	Human Error /Agitator tripped	1. Reactor may get pressurized. 2. Poor heat transfer.	1. Continuous Supervision. 2. View glass is available on the reactor. 3. Activity is checked by second person.	1. Provision can be made for audio - visual alarm in case of tripping of reactor agitator
Less	Less Stirring(RPM)	Human Error (Wrong RPM selected)	1. Hot spot may generated. 2. Poor heat transfer.	1. Continuous Supervision. 2. View glass is available on the reactor. 3. Activity is checked by second person.	1. Provision can be made for audio - visual alarm in case of tripping of reactor agitator
More	More Stirring (RPM)	Human Error (Wrong RPM selected)	Reaction mass may decompose or may have quality impact	1. Continuous Supervision. 2. View glass is available on the reactor. 3. Activity is checked by second person.	1. Provision can be made for audio - visual alarm in case of tripping of reactor agitator

HAZOP STUDY REPORT

5. Activity: - After testing, adjust purity with DEG

Guide Word	Type of Deviation	Typical Causes	Consequences	Existing controls (safe guards)	Action Required /Recommendation
No	No Quantity	Reactor charging valve closed	No EHS consequences	1.Trained Operators 2.Continuous supervision	Ensure Valve operation and proper line up cross verified physically
		Reactor bottom valve opened / dismantled	Spillage of DEG	1.Trained Operators 2. Continuous supervision	1. Reactor shall have double bottom valve with view glass 2.Spill control kit shall be made available at workplace 3.Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
More	More Qty	Not possible			
Less	Less Qty	Leakage in charging line	Spillage may cause exposure	1.Trained Operators 2. Continuous supervision	1.Ensure line trail before addition of reaction mass 2. Spill control kit shall be made available at workplace 3.Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
As well As	As well as Qty	Not possible			

HAZOP STUDY REPORT

Part of	Part of Qty	Not possible			
Reverse	Reverse Qty	Not possible			
Other than	Other raw material charged	Human Error (wrong selection of raw material).	EHS Consequences based on compatibility or properties of raw materials	1.Trained Operators 2.Continuous supervision	1.Ensure permanent piping arrangement with correct tagging to avoid wrong line up 2.Ensure proper labeling and arrow marking on permanent piping
Others	Inadequate Maintenance / Mechanical Disintegrty	Improper maintenance of transferring pump, flange fittings etc	Spillage, leakage or Splash Hazard, Exposure of Caustic	1.Trained Operators 2.Continuous supervision	1.Ensure Planned Preventive Maintenance as per schedule and record shall be maintained 2.Ensure line trail before transferring/charging activities
		Improper machine guarding	Physical injury	Not Available	All moving parts of machineries – Motor pulley guards, reactor and transferring pump shaft guards and other moving parts shall be properly guarded

HAZOP STUDY REPORT

6. Collection of clear filtrate in to Drums

Guide Word	Type of Deviation	Typical Causes	Consequences	Existing controls (safe guards)	Action Required /Recommendation
No	No Qty	Reactor / Filtration vessel bottom valve malfunctioning	<ol style="list-style-type: none"> 1. Hose pipe may get pressurized. 2. Spillage of reaction mass, 3. Fire and Health Hazard, 4. Property loss. 5. Drum may get over flow. 	<ol style="list-style-type: none"> 1. Trained operators 2. Calibrated SS vessel, 3. Standby vessels are available. 	<ol style="list-style-type: none"> 1. Ensure continuous supervision 2. Spill control kit shall be made available at workplace 3. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
		Bottom valve closed	<ol style="list-style-type: none"> 1. Hose pipe may get pressurized 2. Spillage of reaction mass 3. Fire and Health Hazard 4. Property loss. 	<ol style="list-style-type: none"> 1. Trained operators 2. Calibrated SS vessel 3. Standby vessels are available, 	<ol style="list-style-type: none"> 1. Ensure continuous supervision 2. Spill control kit shall be made available at workplace 3. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
		Nutsch Filter outlet valve closed	May impact on quality and yield	1. Trained operators,	No Recommendations
		Vacuum pump failure	1. Negative pressure may build up inside Nutsch filter	1. Trained operators,	1. Ensure PPM of vacuum pump is done and records are maintained

HAZOP STUDY REPORT

			2. Impact on quality and yield	2.Continuous supervision	2.Ensure Compound gauge is provided on Nutsch filter and is periodically calibrated through Competent person and records maintained
		Nutsch filter bottom valve opened.	1.Spillage/Leakage of finished product 2.Product loss	1.Trained operators, 2.Continuous supervision	1. Spill control kit shall be made available at workplace 2. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
Less	Less Qty	Hose pipe leakage	1. Spillage of finished product 2.Property loss.	1.Trained operators, 2.Continuous supervision	1. Fixed SS piping is to be used for filtration 2. Spill control kit shall be made available at workplace 3. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
Less	Less Qty	Human Error	1.Hose pipe may get pressurized 2.Spillage of finished product 3.property loss	1.Trained operators, 2.Continuous supervision	1. Fixed SS piping is to be used for filtration 2. Spill control kit shall be made available at workplace 3. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.

HAZOP STUDY REPORT

More	More Qty	Human Error	Overflow of drums	1.Trained operators, 2.Continuous supervision	1. Spill control kit shall be made available at workplace 2. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.
As well As	As well as qty	Not Applicable	Not Applicable	Not Applicable	
Part of	Not possible				
Reverse	Reverse Qty	Not possible			
Other than	Other solvent charged	Human Error	Hazards depends on compatibility or property of solvents, Impact on Quality and Yield incoming stages	1. Trained operators, 2.Done by check by procedure is in place,	1. Spill control kit shall be made available at workplace 2. Ensure Use of PPEs : Chemical splash proof apron / suit, Safety goggle/ Acid-alkali proof hand gloves ,safety shoes etc.

AMUDAN CHEMICALS PRIVATE LIMITED
STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED 31ST MARCH 2022

Particulars	Note No.	March 31, 2022		March 31, 2021	
		(Rs.'00')	(Rs.'00')	(Rs.'00')	(Rs.'00')
I Revenue from operations	22		31,851		1,81,831
II Other income	23		962		24
III Total Income (I + II)			32,933		1,81,854
IV Expenses:					
Cost of materials consumed	24	-		1,43,916	
Changes in the inventories	25	241		688	
Employee benefits expense	26	4,270		9,678	
Finance costs	27	15		37	
Depreciation and amortization expense	10	2,549		2,588	
Other expenses	28	19,618		16,966	
Total expenses			26,693		1,73,872
V Profit before exceptional and extraordinary items and tax (III-IV)			6,241		7,983
VI Exceptional items			-		-
VII Profit before extraordinary items and tax (V - VI)			6,241		7,983
VIII Extraordinary Items			-		-
IX Profit before tax (VII- VIII)			6,241		7,983
X Tax expense:					
(1) Current tax		1,450		1,250	
(2) Deferred tax		(56)		(332)	
(3) Prior Period Tax		(518)		-	
Profit (Loss) for the period from continuing operations (VII-VIII)			5,364		7,065
XII Profit/(loss) from discontinuing operations			-		-
XIII Tax expense of discontinuing operations			-		-
XIV Profit/(loss) from Discontinuing operations (after tax) (XII-XIII)			-		-
XV Profit (Loss) for the period (XI + XIV)			5,364		7,065
XVI Earnings per equity share:					
(1) Basic			357.60		470.97
(2) Diluted			357.60		470.97

**SIGNIFICANT ACCOUNTING POLICIES
NOTES ON FINANCIAL STATEMENT**

For and on behalf of
PARTY & COMPANY
CHARTERED ACCOUNTANTS
FRN NO.007286C

M. P. Pasad

Manish P. Pasad - PARTNER
MEMBERSHIP NO.102005
Date - 12/08/2022
Place - Mumbai



**FOR AND ON BEHALF OF THE BOARD OF
AMUDAN CHEMICALS PRIVATE LIMITED**

MALAY PRADIP MEHTA - Director (Din No. 07035609)

SNEHA MALAY MEHTA - Director (Din No. 09169193)



AMUDAN CHEMICALS PRIVATE LIMITED
STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED 31ST MARCH 2023

Particulars	Note No.	March 31, 2023		March 31, 2022	
		Rs. in '00	Rs. in '00	Rs. in '00	Rs. in '00
I Revenue from operations	22		48,760		31,961
II Other income	23		866		862
III Total Income (I + II)			49,626		32,823
IV Expenses:					
Cost of Trading Goods	24	525	-	-	-
Changes in the inventories	25	-	-	241	-
Employee benefits expense	26	8,988	-	4,270	-
Finance costs	27	514	-	15	-
Depreciation and amortization expense	10	2,112	-	2,549	-
Other expenses	28	25,988	-	19,618	-
Total expenses			38,102		26,693
V Profit before exceptional and extraordinary items and tax (III-IV)			11,524		6,241
VI Exceptional items			-		-
VII Profit before extraordinary items and tax (V - VI)			11,524		6,241
VIII Extraordinary items			-		-
IX Profit before tax (VII- VIII)			11,524		6,241
X Tax expense:					
(1) Current tax		2,950	-	1,450	-
(2) Deferred tax		95	-	(56)	-
(3) Prior Period Tax		438	3,461	(518)	877
XI Profit (Loss) for the period from continuing operations (VI-IX)			8,043		5,364
XII Profit(loss) from discontinuing operations			-		-
XIII Tax expense of discontinuing operations			-		-
XIV Profit(loss) from Discontinuing operations (after tax) (XII-XIII)			-		-
XV Profit (Loss) for the period (XI + XIV)			8,043		5,364
XVI Earnings per equity share:					
(1) Basic			538.17		367.60
(2) Diluted			538.17		367.60

SIGNIFICANT ACCOUNTING POLICIES
NOTES ON FINANCIAL STATEMENT

For and on behalf of
PARY & COMPANY
CHARTERED ACCOUNTANTS
FRN NO.007288C

M.P. Pasad

Manish P. Pasad - PARTNER
 MEMBERSHIP NO.102006
 Date - 29/05/2023
 Place :- Mumbai



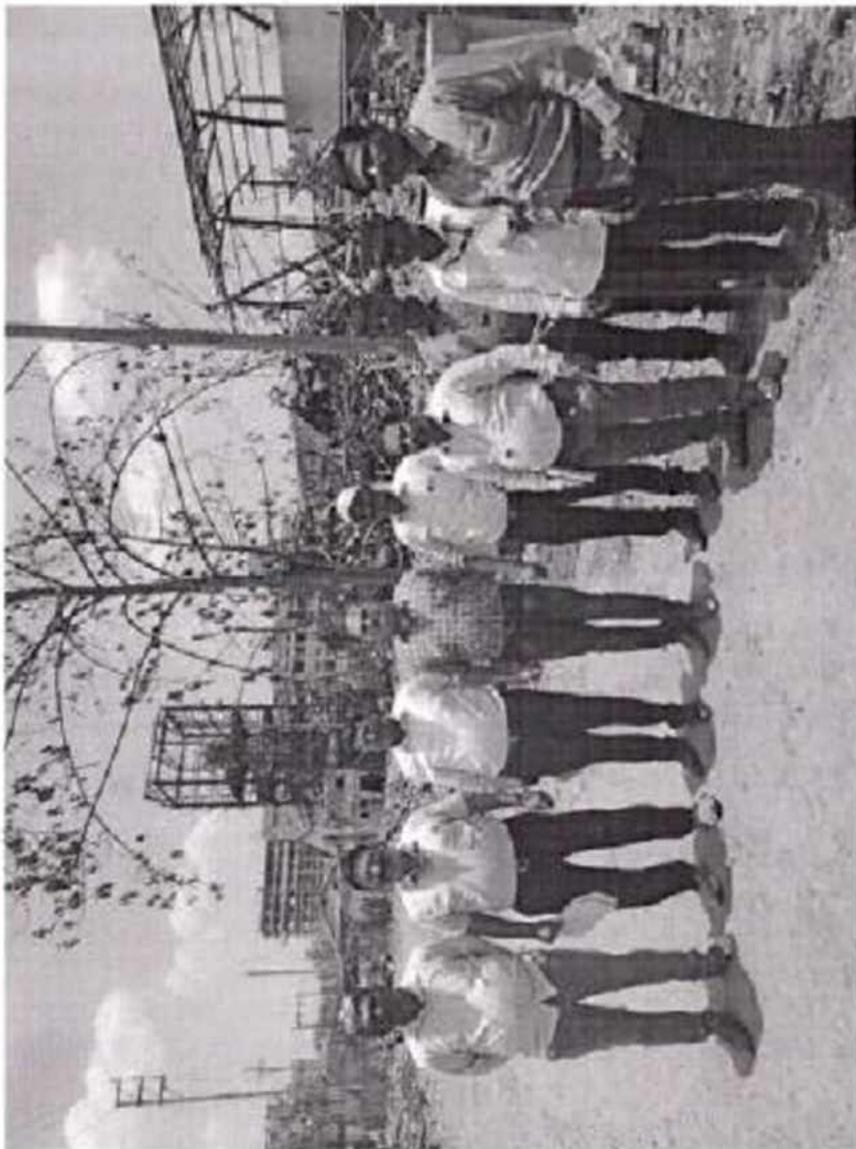
29 FOR AND ON BEHALF OF THE BOARD OF
 AMUDAN CHEMICALS PRIVATE LIMITED

M. Pradip Mehta

MALAY PRADIP MEHTA - Director (Din No. 07035609)

Sneha Malay Mehta

SNEHA MALAY MEHTA - Director (Din No. 09169193)











Government of Maharashtra
Directorate of Industrial Safety & Health
Office of Joint Director,

Industrial Safety & Health, 3rd Floor, Gandhi Tower, Near Joker Cinema, Bail Bazar, Kalyan
(W). Ph.no:- 0251-2207042, E-mail ID: jdishkalyan@gmail.com

By RPAD

No.JDISH/Visit/SGB/3335

Date - 4 JUN 2024

Forwarded the visit remarks dtd. 23/05/2024 to Occupier/Manager of M/s. Amudan
Chemicals Pvt Ltd., Plot No. W-229, M.I.D.C. Phase II, Manpada Road, Dombivali (East)
Kalyan, Tal - Kalyan & Dist-Thane 421204 pasting in Inspection Book & early compliance.

(S.G. Bhele)

Deputy Director,
Industrial Safety & Health, Kalyan

M/s. Amudan Chemicals Pvt Ltd.,
Plot No. W-229, M.I.D.C. Phase II, Manpada Road,
Dombivali (East) Kalyan
Tal – Kalyan & Dist-Thane 421204.

1. On receipt of the telephonic message from the MARG member from Dombivali, I, visited the factory on 23.05.2024 @ 2:00 PM to enquire into the explosion that took place in the factory @ 1:35 PM on the same day which resulted into fire and an offsite emergency.
2. Shri. D.B. Gore, Director, Directorate of Industrial Safety & Health, Maharashtra, Shri. S.S. Joshi, Jt. Director, Kalyan, Shri. L.K. Gorane, Dy. Director, DISH were also present at the accident spot.
3. A total of 13 workers died, and 67 persons were injured in this incident. The injured workers were immediately taken to AIMS Hospital, ICON Hospital, and Shastri Hospital KDMC and other hospitals in Dombivli east in after a rescue operation was launched. A total of 36 nearby industrial establishments have been verified by the Police department in connection with the blast incident, and the following industrial establishment workers were found missing. later, the dead bodies were identified by relatives /DNA sampling. Below is the list of deceased workers due to accident.

Sr. No	Name of deceased workers	Age	Sex	Name of the factory where the deceased worker was employed	Whether Factory Worker / Contract Worker	Whether Registered under ESIC/WC
1.	Mrs. Rohini Kadam	26	Female	Amudan Chemicals Pvt. Ltd.,	Staff	Registered under ESIC. INS.NO – 3417421857
2.	Mrs. Riddhi Khandwilkar	38	Female	Amudan Chemicals Pvt. Ltd.,	Staff	Registered under ESIC. INS.NO. – 3417421616
3.	Mr. Dhaval Vaghani	29	Male	Amudan Chemicals Pvt. Ltd.,	Staff	Not registered under ESIC.
4.	Mr. Ravi Rajbhar	45	Male	Amudan Chemicals Pvt. Ltd.,	Factory Worker	Registered under ESIC. INS.NO -

						3517457747 Page 210
5.	Mr. Satyanarayan Rajbhar	48	Male	Amudan Chemicals Pvt. Ltd.,	Factory Worker	Registered under ESIC. INS. NO – 3517457791
6.	Mr. Manoj Jondhale	54	Male	Amudan Chemicals Pvt. Ltd.,	Contract worker of Disha Enterprises	Registered under ESIC. INS. NO – 3417344667
7.	Mr. Sirajuddin Ahmed	24	Male	Amudan Chemicals Pvt. Ltd.,	Contract worker of Kishore Prabhakar Gulhane	Registered under ESIC. INS. NO – 3416976471
8.	Mr. Bharat Jaiswar	43	Male	Amudan Chemicals Pvt. Ltd.,	Contract worker of Kishore Prabhakar Gulhane	Registered under ESIC. INS. NO – 3416091051
9.	Mr. Manoj Chavan	35	Male	Amudan Chemicals Pvt. Ltd.,	Contract worker of Poonam Enterprises	Registered under ESIC. INS. NO – 3415848558
10.	Mr. Manish Kumar Das	22	Male	Amudan Chemicals Pvt. Ltd.,	Contract worker of Poonam Enterprises	Registered under ESIC. INS. NO – 3416802910
11.	Mr. Rakesh Rajput	49	Male	Saptavarna Colors Pvt. Ltd., W - 230, MIDC, Phase - 2, Dombivli,	Contract worker of Colourmax Dyestuff Pvt. Ltd.	Registered under ESIC. INS NO- 5609503478
12.	Mr. Vishal Poundwall	42	Male	Cosmos Company	Factory worker	Registered under ESIC. INS NO- 3417424412
13.	Mr. Jai Sarkar	26	Male	Cosmos Company	Factory worker	Registered under ESIC. INS NO- 3417428289

4. Kalyan Dombivli Municipal Corporation, Navi Mumbai Municipal Corporation, Ulhasnagar Municipal Corporation, Ambernath Municipal Council and NDRF Battalion No. 5 and TDRF had conducted rescue operations. On 25.05.2024 at 3.42 pm the said rescue operation was stopped.

List of Industrial establishments affected by the explosion & fire at M/s. Amudan
Chemicals Pvt. Ltd., Page 211

Sr. No.	Company Name and Address
1.	Wagjhai Enterprises Plot no. W-233, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Kalyan Tal – Kalyan & Dist-Thane 421204
2.	Neo orgo Chem LLP ,Plot No. W-222, Phase II,Dombivali PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
3.	Omega Fine Chemicals, Plot No. w-130,Phase II,Dombivali Dist. Thane
4.	Omega Fine Chemicals, Plot No. A-88,Phase II,Dombivali Dist. Thane
5.	Mehta corporation Plot no. W-228, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Kalyan Tal – Kalyan & Dist-Thane 421204
6.	Auto Car Color & Coating Pvt Ltd, Plot No.734, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Kalyan Tal – Kalyan & Dist-Thane 421204
7.	S.D.A. Industries Limited Plot no. W-227, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Kalyan Tal – Kalyan & Dist-Thane 421204
8.	Brisk Chemical,Plot No. W-221, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
9.	Modern Industrial Gases, W-170/1, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
10.	Mr. Vighnagar Chemicals, Plot no. W-225, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
11.	Vinayak Tech Plasticchem Pvt. Ltd., Plot no. W- 226, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
12.	Deccan Colors & Chemicals Pvt. Ltd. Plot no. W-232, M.I.D.C. Phase II, Manpada Road, Dombivali (East) Kalyan
13.	Saptavarna Colorants Pvt. Ltd. Plot no. W-130, Sonarpada, manpada Road, MIDC phase 2, Dombivali,
14.	Cosmos Engineering, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
15.	Kaushal Chemical, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane
16.	Metro godown, Mhatre copmpound, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane

5. Due to the high intensity of the said chemical accident, many houses and industrial establishments in the surrounding area have been damaged and lives have been lost. As per the report of the Revenue department, Kalyan Dombivli Municipal Corporation and Revenue Department had jointly conducted a panchnama of the incident site and a total of 980 properties of residents and commercial properties in the surrounding area. Out of 980 properties, 643 residential properties were minorly affected, and 337 commercial properties were also affected (298 commercial properties were minorly affected, 39 commercial properties were fully affected).

6. Observations at the affected M/s. Amudan Chemicals Pvt. Ltd., :

After the incidence following situation was found during the enquiry;

- i. The factory shed, the compound wall, factory building structure having 1 floor with MS platform was completely collapsed due to explosion.
- ii. A crater size of around 15 feet diameter & about 7 feet deep is formed due to explosion in the factory.
- iii. Due to explosion shock waves, the adjacent factories building, structures, roofs etc. collapsed, Glass window panels & door panels/shutters, etc, of the residential and commercial buildings in the surrounding area got damaged.
- iv. The GLR (3 KL) was totally shattered into pieces and the SS reactor (3KL) too was shattered into pieces. The MS platform along with the structure was thrown away from the actual location.
- v. The Di Methyl Phalate (DMP) tank exploded and was found ruptured. The MEK tank was thrown away at a distance of 12.8 meters from the actual location.
- vi. The SS reactor, which was not in use, located at a distance of 7 meters from the GLR, was thrown away at a distance of 70 meters, and the SS blender was thrown away at a distance of 100 meters from the actual location.
- vii. After explosion, the raw material finished product being combustible and flammable caught fire. This fire spread into the adjacent factories,
 - a) Saptavarna Colorants Pvt. Ltd.
Plot no. W-130, Sonarpada, manpada Road, MIDC phase 2, Dombivali,
 - b) Cosmos Engineering, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan,
Thane
 - c) Kaushal Chemical, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan,
Thane
 - d) K.G Chemicals, PHASE - II MIDC,SONARPADA,DOMBIVALI,Kalyan, Thane



A still Pics of M/s. Amudhan Chemicals, Before explosion



The devastated factory after explosion and fire



A crater formed due to the explosion of the reactor at the original position of the reactor



Rupture of 20 KL DMP tank



The dislocation MEK Tank from the original position

7. Visited the factory again on 25/05/2024 and 29/05/2024 to carry out further enquiry of incidence. The following activities were carried out during the visit.
 - i. I obtained the sketch of the actual layout, and machine layout showing the position of the storage tanks, SS reactor, glass line reactor, blender, chilling plant, office on the first floor, storage of raw material, and finished goods. (Annexure-1)
 - ii. I have collected information about the latest plan approved by my office, which shows that the Plans were revised vide letter no. DISH/PLN/DBD/147/2009/137 dtd. 22/05/2007. The approved plan shows that mixing vessels, reactor vessel, nutch filter, receiver, condenser, flask, baby boiler, oil expansion tank, vacuum pump etc. were installed in the premises. (Annexure- 2)
 - iii. I have obtained a report of examination of pressure vessel – SS reactor of 3 KL (Eq no. SSR-02 ID NO. PVO2,MOC-SS, installed in 2023), GLR reactor no. 3 KL (Eq no. GLR-01 ID NO. PV03,MOC-MS/GLR installed in 2023), Blending vessel 1.5 KL (Eq no. BV-

01 ID NO. PV04,MOC-SS, installed in 2005), SS reactor KL (Eq no. SSR-01 ID NO. PV01,MOC-SS), in form no-13 obtained from competent person Mr.Dhananjay Jadhav on dated 23/09/2023. The hydraulic examination, ultrasonic test was carried out on 23/09/2023, and it was observed that ultrasonic tests revealed that

Sr. no		Shell thickness	Dish thickness
1	SS reactor no. 2	4.2 mm 4.11 mm	4.22 mm, 4.30 mm
2	GLR reactor	16.02 mm 16.13 mm	18.22 mm, 18.30 mm

- iv. Risk Assessment & job safety analysis, HAZOP study, Safety Audit was carried out in Dec 2020 by Mr.Dhananjay Jadhav of M/s. Dtech Engineering.
- v. I have recorded the statement of Mr. Ganesh Ashok Musale, Supervisor of M/s. Amudan Chemicals Pvt Ltd., Dombivli.

8. From the above enquiries and the recorded statement it is revealed as follows:-

- a) The factory manufactures various organic peroxides such as Methyl Ethyl Ketone Peroxide (MEKP), Di Tertiary Butyl Peroxide (DTBP), Tertiary Butyl Hydro Peroxide (TBHP).
- b) On 23/05/2024, in the factory there was the following raw materials and finished goods were stored in the factory.

Sr. No.	Name of Chemicals	Mode of storage	Total quantity stored	remarks
1.	Methyl Ethyl Ketone (MEK)	SS tank of 20 KL capacity	10 MT	Raw Material
2.	Di Methyl Phalate (DMP)	SS tank of 20 KL capacity	20 MT	Raw Material
3.	Hydrogen Per Oxide (H ₂ O ₂)	40 Drums	7 to 8 MT	Raw Material
4.	DEG	40 Drums	9.5 MT	Raw Material
5.	TBA	40 Drums	6.6. MT	Raw Material
6.	Benzoyl Chloride	8 Drums	2 MT	Raw Material
7.	Sulphuric Acid	14 cans (63 kg each),	882 Kg	Raw Material
8.	Methanol	6 Drums	930 Kg	Raw Material
9.	Di Tertiary Butyl Peroxide (DTBP)	Plastic Cans	700 Kg	Finished Goods

10.	TBPB-	Plastic Cans	approx. 30 Kg	Finished Goods
11.	MEKP FG 50	Plastic Cans	3 MT	Finished Goods
12.	MEKP FG 40-	Plastic Cans	1.5 MT	Finished Goods
13.	MEKP LG- 1.5	Plastic Cans	1.5 MT	Finished Goods
14.	Cobalt		around 1.5 MT	Finished Goods

- c) The following equipment were installed and used in manufacturing activity on the ground floor in the shed.

Sr. No.	Name of equipment	Equipment ID	Installed on
1.	SS reactor of 3 KL	Eq no. SSR-02 ID NO. PVO2,MOC-SS	2023
2.	GLR reactor no. 3 KL	Eq no. GLR-01 ID NO. PV03,MOC-MS/GLR	2023
3.	Blending vessel 1.5 KL	Eq no. BV-01 ID NO. PV04,MOC-SS,	2005
4.	SS reactor 1 KL	Eq no. SSR-01 ID NO. PV01,MOC-SS	2005
5.	Vacuum pump and ejector (7HP & 5 HP)	-	
6.	Chilling Plant	42 TR	2023
7.	Cooling tower	--	--

Also, in front of the main gate inside the factory, there was an office on the first floor; next to the office was a store.

- d) The Factory is registered under Section 85 of the Factories Act, 1948 The factory is engaged in manufacturing activity in relation to Chemical Industries – Electrochemicals (Peroxides) industries listed under Sr. 17 of the First Schedule of the Factories Act, 1948.Hence the factory is carrying out Hazardous process as defined under section 2(cb) of the Factories Act, 1948.
- e) The factory license bearing no. 10018373 is found renewed till the year 2025. As per the application for renewal of licence in form No: - 01, it is revealed that Mr. Kirti Gokuldas Mehta, Director is the Occupier of the factory. But, as per letter dtd. 29/05/2024 by Mr Kirti Mehta it was reported that, he had resigned from the position of Director of M/s.

Amudan Chemicals Pvt. Ltd., and the same was accepted by Mr. Malay Mehta. Also, as per the Register of Companies, Mumbai, it is revealed that Mr Malay Pradeep Mehta and Mrs Sneha Malay Mehta are the Directors of the M/s. Amudan Chemicals Pvt. Ltd.. Hence, Mr. Malay Pradeep Mehta and Mrs. Sneha Malay Mehta are the occupiers as per Section 2 (n)(ii) of the Factories Act, 1948

- f) It is found from the office records that the occupier had not drawn an on-site emergency plan and detailed disaster control measures for his factory.
- g) On the day of incident 23/05/2024, at 1:30 PM, there was the manufacturing of TBHP in Glass Line reactor (3 KL) and the manufacturing of TBPB in the SS reactor (3 KL)
- h) On the day of the incident, 23/05/2024, the following workers were working in the factory incidental to the TBHP manufacturing process.

Sr. No.	Name Of Worker	Nature of work
1)	Mr. Ravi Rajbhar	Operator
2)	Mr. Satyanarayan Rajbhar	Operator
3)	Mr. Sirajuddin Ahmed	Helper
4)	Mr. Bharat Jaiswar	Helper
5)	Mr. Manoj Chavan	Helper
6)	Mr. Manish Kumar Das	Helper

- i) The manufacturing process of Tertiary Butyl hydrogen peroxide (TBHP) is a highly exothermic reaction. Exothermic reaction means the release of Heat during the reaction
- j) It was revealed from the recorded statement of Mr. Ganesh Musale, that workers were not fully aware of the risks involved in H₂O₂ and its reaction with sulphuric acid and TBA. Also, the workers, as stated above, had no formal education in the chemistry of reactions and handling of hazardous substances nor had qualifications and experience in handling hazardous substances and were not competent to supervise such handling within the factory.
- k) On the day of incidence there was no facility for control addition of sulphuric acid through an addition vessel /glass flask. sulphuric acid was directly charged into the reactor from the sulphuric acid carboys through vacuum charging.
- l) A safety relief valve was provided on the SS reactor (3 KL), but the rupture disc was not provided. In the Case of GLR (3 KL), neither a safety relief valve nor a rupture disc was provided on it.

- m) On the reactor system, there was no provision for an alarm and interlock such as a Utility failure alarm, agitator failure alarm, High-temperature alarm, or Alarm for a High rate of addition of limiting reactant, which is added at a controlled rate. Also, there was no control system installed in which the Raw material (limiting reactant) addition rate is controlled by the flow control loop. The controlling parameter is reactor temperature. Also, the flow control valve or on-off valve (interlocked with the reaction mass temperature and agitator tripping) was not installed on the reactor.
- n) As per the manufacturing process and process flow submitted vide renewal application form no. 100030712015 dtd. 11/09/2020 it was revealed that, the manufacturing process flow is as follows:
- Take sulphuric acid in the glass vessel cool it upto 6-10 °C, start addition of TBA over stir for 15-20 deg. Celsius. Start addition of Hydrogen peroxide, and maintain temperature 15 to 30 °C, Stir for 8 hrs. Stop stirring and separate out TBHP as per batch taken.
- But on 23/05/2024, it was revealed that, the manufacturing process flow is as follows:
- Take Hydrogen peroxide in the reactor cool it upto 17-18 °C, Start addition of sulphuric acid, and maintain temperature 25 to 30 °C, then add TBA into the reactor maintaining the temperature below 25° C Stir for 8-12 hrs. Stop stirring and separate out TBHP as per batch taken.
- o) Hydrogen peroxide is a strong oxidant with explosive risk. An increase in the temperature promotes the decomposition as well as a higher pH Value, for optimum stability, the pH range of hydrogen peroxide below 4.5. Above pH 5.0 decomposition increases sharply, for the commercial solution generally pH adjusts under 5.0. The Decomposition will produce a vast amount of gas which increase the pressure of the system, release very high heat. The impurities trigger the decomposition of hydrogen peroxide at low temperatures.
- p) Hydrogen peroxide with sulfuric acid to produce peroxy mono sulfuric acid (Piranha solution), Even small amounts of organics could make the piranha solution unstable
- q) S, Tert- Butyl Hydro peroxide bearing CAS no75-91-2 is having Flash point 43 °C , flammability limit 5%-100%, Auto Ignition 238°C, Boiling point 96° C. SADT > 60° C.
- r) As per MSDS, Tert- Butyl Peroxybenzoate (TBPB) is a organic peroxide bearing CAS no. 614-45-9 is having Flash point > 93 °C , SADT > 60° C. The TBPB batch was in SS reactor (3 KL) adjacent to the GLR reactor.
- s) As per MSDS, Solvent MEK is highly flammable liquid, having boiling point 78° C, flash point is -7 °C.

- t) As per MSDS, Dimethyl phthalate (DMP) is combustible liquid, having boiling point 282⁰ C, flash point is 146⁰ C, auto ignition temperature is 470⁰ C. It forms explosive mixtures with air on intense heating. A range from approx. 15 Kelvin below flash point is rated as critical.
- u) As per MSDS, Tert- Butanol bearing CAS no. 75-65-0 is having flash point 11⁰ C, auto ignition temperature is 490⁰ C, Boiling point is 83⁰ C. It is flammable, containers may explode when heated, vapours may form explosive mixtures with air.
- v) One chilling plant and one cooling tower were installed in the factory. Temperature was controlled via jacket cooling.

7) **Details of the TBHP Manufacturing Process-**

- a. TBHP reaction was carried out in GLR reactor 3 KL (Eq no. GLR-01 ID NO. PV03, MOC-MS/GLR installed in 2023).
- b. The brief of reactants added in GLR is H₂O₂ (1200 kg) + H₂SO₄ (300 Kg) + TBA (1260 Kg).
- c. First, H₂O₂ is added in GLR and chilled up to 17 to 18⁰ C. This addition was done on previous night i.e. on 22/05/2024.
- d. On the 23/05/2024, Mr. Ravi Rajbhar, Operator, Mr. Satyanarayan Rajbhar, Operator, Mr. Sirajuddin Ahmed, Helper, Mr. Bharat Jaiswar, Helper, Mr. Manoj Chavan, Helper, Mr. Manish Kumar Das, Helper were present.
- e. H₂SO₄ is added GLR maintaining the temperature below 25 to 30⁰ C. @ 9 am on 23/05/2024, the addition of 180 Kg of H₂SO₄ is completed. After 2 -2 ½ hours, another addition of the remaining 210 Kg of H₂SO₄ was made into the GLR (charging of 1 can of 63 Kg takes around 8-10 mins.) maintaining the temperature below 25 to 30⁰ C. After that TBA addition is started in the reactor maintaining the temperature below 25⁰ C (approximately 100 kg to 150 kg per addition)
- f. After completion of the addition of TBA, the reactor is maintained in stirring condition for 10 to 12 hrs.
- g. After that it is transferred to the mixing process in the blender and neutralise with Magnesium Carbonate and adjust PH.
- h. After Active Oxygen testing, add methanol as per requirement.
- i. **It is note that, at one batch around 1500 Kg of TBHP is obtained.**

The manufacturing process flow chart of TBHP is shown in **Figure below**

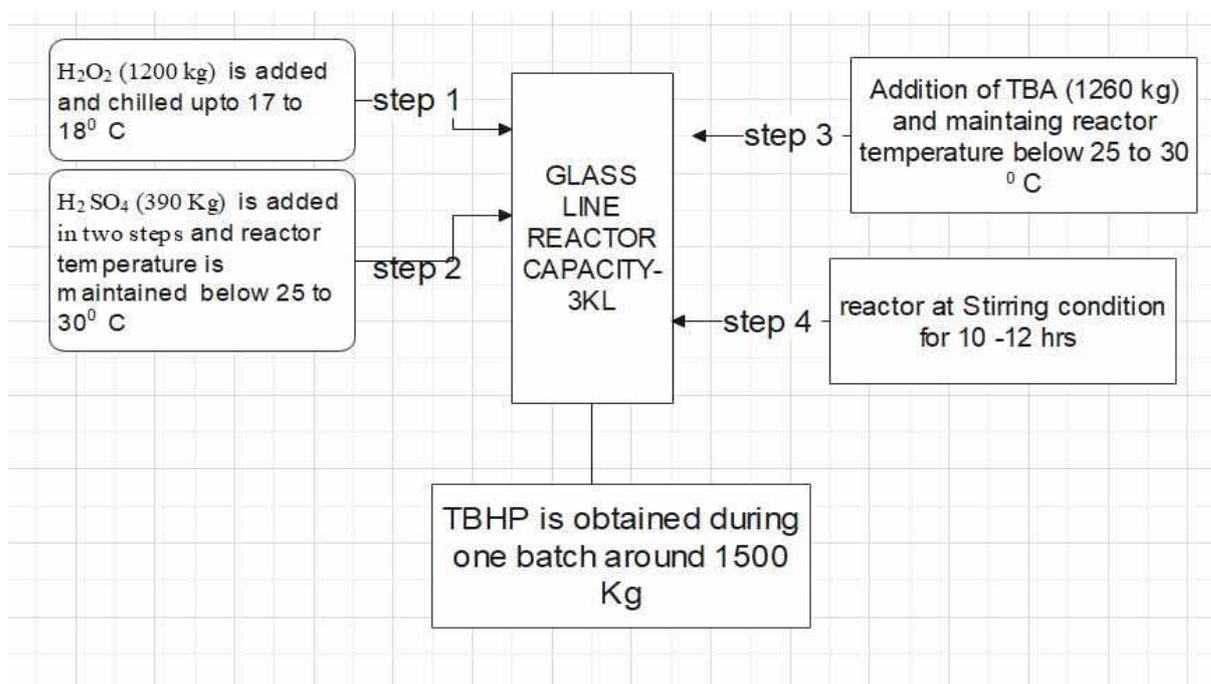


Figure - Manufacturing Process Flow Chart for TBHP

8) Details of the TBPB Manufacturing Process-

- a. TBPB reaction was carried out in SS reactor 3 KL (Eq no. SSR-02 ID NO. PVO2,MOC-SS, installed in 2023),
- b. The brief of reactants added in SSR is TBHP - N (450 kg) + Caustic Soda Solution + Benzoyl Chloride.
- c. Caustic Soda Solution (approx. 200 Kg) as per testing of TBHP -N added in SS reactor and maintain temperature below 20⁰ C.
- d. Addition of Benzoyl Chloride. Stir, maintaining the temperature 20-25⁰ C.
- e. The reactor is maintained in stirring condition for 9-12 hours. After completion of the reaction separate water from the product by layer separation.
- f. Material is transferred in the blender and then add magnesium sulphate for removing water content, After removing the water collect the filtrate via filter in 30 Kg Nutch filter

9) Occurrence of explosion and fire in the factory:

On 23/05/2024, The synthesis of Tertiary Butyl hydro peroxide (TBHP) was carried out in GLR (3 KL), and in the SS reactor (3 KL), the settling of TBPB was carried out.

- i. On 22/05/2024, at night in GLR (3KL), H₂O₂ (1200 kg) is charged and the temperature of the reactor was brought to around 17⁰ C. Also, in the SS reactor(3 KL) there was making of TBPB, and at night, there was the activity of the stirring of TBPB in SS reactor (3 KL),
- ii. On 23/05/2024 @ 09 am Mr. Ravi Rajbhar, operator, had cooled the reactor around 17⁰ C and charging of H₂SO₄ of around 180 KG was charged from the H₂SO₄ can with help of vacuum pump. The charging of 1 can (63 Kg) of H₂SO₄ takes around 15 minutes. Total 180 KG was charged from the 3 H₂SO₄. Cans taking around 40 to 45 minutes. Then, when the vacuum was released, there was an increase in temperature, and the temperature was maintained below 25⁰ C, and the stirring was carried out for around 2 to 2 1/2 hours.
- iii. Thus, the charging of the remaining 210 KG H₂SO₄ from the H₂SO₄ cans (3 & ½ cans) was carried out at 11:15 am, and the charging was finished @ 12:30 pm.
- iv. At 12:30 PM there was a lunch break till 1:00 PM. After lunch break TBA of around 100-150 Kg was charged into the reactor, soon after the charging was over by releasing vacuum, the temperature was increased rapidly leading to exothermic reaction @ 60 to 70⁰ C and to control runaway reaction cooling arrangement was insufficient. As the temperature increased, also inside the reactor pressure increased beyond bursting pressure of 95 Kg/cm² leading to the bursting of GLR (3KL).
- v. Due to the explosion of the reactor and the shock waves and tremendous heat, the adjacent SS reactor (3KL) containing TBPB also exploded due to the decomposition reaction of TBPB exceeding the SADT temperature of more than 60⁰ C.
- vi. Also, the MS tank containing DMP also exploded, leading to the rupture of the tank due to forming explosive mixtures with air on intense heating and the MEK tank was thrown away at a distance of 7 meters from the original position.
- vii. Due to the presence of combustible liquid, and flammable liquids at the premises, the fire started in the factory and spread rapidly to the adjacent factories. After the explosion followed by fire the workers of the adjacent factory informed the Fire brigade about the incident. The Fire brigade from Dombivili MIDC @ 1:50 PM reached the spot and started extinguishing the fire. Also, after some time other Fire brigade from Kalyan Dombivli Municipal Corporation, Navi Mumbai Municipal Corporation, Ulhasnagar Municipal Corporation, Ambarnath Municipal Council and NDRF Battalion No. 5 and TDRF had conducted rescue operations. On 25.05.2024 at 3.42 pm the said rescue operation was stopped.
- viii. The injured workers were immediately taken to AIMS Hospital, ICON Hospital, and Shastri Hospital KDMC and other hospitals in Dombivli east in after a rescue operation was launched. Out of 68 workers. One worker Mr. Jay Sarkar of M/s. Cosmos Engineering

succumbed to the burn injury on 29/05/2024 while treatment at the National Burn Centre, Airoli. A total of 13 workers died, and 67 persons were injured in this incident. Page 224

10) Observation of samplings Raw materials, finished goods of TBA, Hydrogen peroxide and hydrogen peroxide for simulation of accident scenario.

1. On 28/10/2022, I have collected samples from the thrown away reactor and the crater formed at the site. Also as per reactions carried out in GLR on the date of incidence, reaction mass of containing same raw materials and finished product was sent to the laboratory for examination to M/S GVS Cibatech, Bhandup for DSC analysis on 03/06/24. the result of the same was received at my office on 15/06/2024 (**Annexure -3**).
2. As per thumb rule calculation and ASME, the burst pressure of the reactor is calculated as below:

$$\begin{aligned}
 \text{Burst pressure} &= 2 eSt/D - 0.8t \\
 &= 2 \times 0.85 \times 75000 \times 0.75 / 70.86 - 0.8 \times 0.75 \\
 &= 1361 \text{ PSI} \\
 &= 95 \text{ Kg/cm}^2 \\
 e &= \text{welding efficiency} \\
 S &= \text{Tensile Strength} \\
 t &= \text{thickness of vessel} \\
 D &= \text{outside diameter of vessel}
 \end{aligned}$$

Even though we are getting, Burst pressure 95 Kg/cm². Considering vessel condition like life, welding joints, nozzle joints, dish end etc the vessel will burst at pressure exceeding 70 Kg/cm².

Conclusions from the results of collected samples, chemical analysis :

From the result of DSC test report from M/S. GVS Sebatech, Bhandup it is concluded that, there is violent / exothermic / runaway reaction of the carried out GLR up to temperature of 70 deg. cel. Thus, violent/runway/ exothermic reaction at this temperature occurred, leading to an increase in pressure inside the reactor beyond 80 Kg/cm². Heat generation rate and cooling capacity in the reactor are needed to assess the possibility of a runaway. Also, the additional cooling system was not in place to remove the heat generated during the runaway reaction. There was no controlled addition of sulphuric acid, and the sulphuric acid was charged into the reactor directly from the carboy through vacuum charging.

On the reactor system there was no alarm and interlock such as Utility failure alarm, agitator failure alarm, High temperature alarm, Alarm for High rate of addition of

limiting reactant which is added at controlled rate, Raw material (limiting reactant) addition rate should be controlled by flow control loop and FCV and/or On-Off valve interlocked with the reaction mass temperature and agitator tripping system was not available or installed on the reactor. Hence this accident has occurred

11) Contraventions:-

D) The contraventions of Provisions of Section 7 A- (2) (a) of the Factories Act 1948:-

On 23/05/2024, The synthesis of Tertiary Butyl hydrogen peroxide (TBHP) was carried out in GLR (3 KL), and in the SS reactor (3 KL), the settling of TBPB was carried out. On 22/05/2024, at night in GLR (3KL), H₂O₂ (1200 kg) is charged and the temperature of the reactor was brought to around 17⁰ C. Also, in the SS reactor(3 KL) there was making of TBPB, and at night, there was the activity of the stirring of TBPB in SS reactor (3 KL), On 23/05/2024 @ 09 am Mr. Ravi Rajbhar, operator, had cooled the reactor around 17⁰ C and charging of H₂SO₄ of around 180 KG was charged from the H₂SO₄ can with help of vacuum pump. The charging of 1 can (63 Kg) of H₂SO₄ takes around 15 minutes. Total 180 KG was charged from the 3 H₂SO₄. Cans taking around 40 to 45 minutes. Then, when the vacuum was released, there was an increase in temperature, and the temperature was maintained below 25⁰ C, and the stirring was carried out for around 2 to 2 1/2 hours. Thus, the charging of the remaining 210 KG H₂SO₄ from the H₂SO₄ cans (3 & 1/2 cans) was carried out at 11:15 am, and the charging was finished @ 12:30 pm. At 12:30 PM there was a lunch break till 1:00 PM. After lunch break TBA of around 100-150 Kg was charged into the reactor, soon after the charging was over by releasing vacuum, the temperature was increased rapidly leading to exothermic reaction @ 60 to 70⁰ C and to control runaway reaction cooling arrangement was insufficient. As the temperature increased, also inside the reactor pressure increased beyond 80 Kg/cm². The inside pressure due to the reaction would have increased beyond 80 Kg/cm², leading to the bursting of GLR (3KL).

On the 23/05/2024, safety relief valve was provided on the SS reactor (3 KL), but the rupture disc was not provided. In the Case of GLR (3 KL), neither a safety relief valve nor a rupture disc was provided on it. Also, on the reactor system there was no provision of alarm and interlock such as Utility failure alarm, agitator failure alarm, High temperature alarm, Alarm for High rate of addition of limiting reactant which is added at controlled rate, Raw material (limiting reactant) addition rate should be controlled by flow control loop. The controlling parameter is reactor temperature. And FCV and/or On-Off valve should be interlocked with the reaction mass temperature and agitator tripping.

The aforementioned causes contributed to this incident, so it was essential to make the following work system to ensure worker safety and the absence of any health risks. However, in this instance, the occupier failed to ensure safety of the workers and there was risk to their health while they were at work:

- a. There was no facility for control addition of sulphuric acid through an addition vessel /glass flask. sulphuric acid was directly charged into the reactor from the sulphuric acid carboys through vacuum charging.
- b. By providing alarm and interlock such as Utility failure alarm, agitator failure alarm, High temperature alarm, Alarm for High rate of addition of limiting reactant which is added at controlled rate, Raw material (limiting reactant) addition rate should be controlled by flow control loop.
- c. The controlling parameter being the reactor temperature. And FCV and/or On-Off valve should be interlocked with the reaction mass temperature and agitator tripping.

Thus, the occupier had failed to maintain the in safe working order as well as the system without risking the workers' health.

Hence Occupier of the factory have been contravened Provisions of section 7 A- (2) (a) of the Factories Act 1948 on the day of incidence.

II) The contraventions of Provisions of Section 7 (1) (b) of the Factories Act, 1948 It is reported that Mr Malay Pradeep Mehta and Mrs Sneha Malay Mehta are the Directors of the M/s. Amudan Chemicals Pvt. Ltd... As per Section 7 (1) of the Factories Act, 1948, Whenever Occupier begins to occupy any premises as factory, he shall send a written notice in form no. 1 as stated in Rule 14 of the Maharashtra Factories Rules 1963 at least 15 days before begins to occupy any premises as factory. The Occupier has not sent a written notice in form no. 1 containing the name and address of the Occupier; **hence, the provision of Section 7 (1) (b) of the Factories Act, 1948 is contravened.**

III) The contraventions of Provisions of Section 41-B (4) of the Factories Act, 1948

The factory is engaged in manufacturing activity in relation to Chemical Industries – Electrochemicals (Peroxides) industries listed under Sr. 17 of the First Schedule of the Factories Act, 1948.Hence the factory is carrying out Hazardous process as defined under section 2(cb) of the Factories Act, 1948.

It is revealed from the office records that the occupier had not drawn an on-site emergency plan and detailed disaster control measures for his factory. Thus, the occupier had not drawn an on-site emergency plan and detailed disaster control measures for the factory. **Hence the**

Occupier had contravened the provisions of Section 41-B (4) of the Factories Act, 1948. Page 27

IV) The contraventions of Provisions of Section 41-C (b) of the Factories Act, 1948

The factory is engaged in manufacturing activity in relation to Chemical Industries – Electrochemicals (Peroxides) industries listed under Sr. 17 of the First Schedule of the Factories Act, 1948. Hence the factory is carrying out Hazardous process as defined under section 2(cb) of the Factories Act, 1948.

It was revealed that workers were not fully aware of the risks involved in H₂O₂ and its reaction with sulphuric acid and TBA. Also, the workers, as stated above, had no formal education in the chemistry of reactions and handling of hazardous substances nor had qualifications and experience in handling hazardous substances and were not competent to supervise such handling within the factory. Thus, the occupier of a factory involving Hazardous process as stated above, had not appointed persons who possess qualification & experience in handling hazardous substances and are competent for such handling. **Hence the Occupier had contravened the provisions of Section 41-C (b) of the Factories Act, 1948.**

V) The contraventions of Provisions of Rule 4(2) of Maharashtra Factories Rules 1963

At the time of my visit it is found that, the plans of the were revised vide letter no. DISH/PLN/DBD/147/2009/137 dtd. 22/05/2007. The approved plan shows that mixing vessels, reactor vessel, nutch filter, receiver, condenser, flask, baby boiler, oil expansion tank, vacuum pump etc. were installed in the premises., The present factory machinery layout are not in conformity with the approved plans, it is seen that, On the ground floor, SS reactor of 3 KL (Eq no. SSR-02 ID NO. PVO2,MOC-SS, installed in 2023), GLR reactor no. 3 KL (Eq no. GLR-01 ID NO. PV03,MOC-MS/GLR installed in 2023) and SS tank of 20 KL capacity used for the storage of Methyl Ethyl Ketone (MEK), SS tank of 20 KL capacity used for the storage of Di Methyl Phalate (DMP) was installed in factory. Thus machinery layout are not in conformity with the earlier approved plans. **Therefore the Occupier has contravened the Provisions of Rule 4(2) of Maharashtra Factories Rules 1963.**

VI) The contraventions of Provisions of Rule 4(1) (d) of Maharashtra Factories Rules

1963 As per the manufacturing process and process flow submitted vide renewal application form no. 100030712015 dtd. 11/09/2020 it was revealed that, the manufacturing process flow is as follows:

Take sulphuric acid in the glass vessel cool it upto 6-10 0 C, start addition of TBA over stir for 15-20 deg. Celsius. Start addition of Hydrogen peroxide, and maintain temperature 15 to 30 0 C, Stir for 8 hrs. Stop stirring and separate out TBHP as per batch taken. But on 23/05/2024, it was revealed that, the manufacturing process flow is as follows:

Take Hydrogen peroxide in the reactor cool it upto 17-18 0 C, Start addition of sulphuric acid, and maintain temperature 25 to 30 0 C, then add TBA into the reactor maintaining the temperature below 250 C Stir for 8-12 hrs. Stop stirring and separate out TBHP as per batch taken.

Thus, there is change in manufacturing process of TBHP, But the occupier was using the premises as factory without getting plan approval from Jt. Director DISH, Kalyan regarding changes total or partial in manufacturing process. **Therefore, the Occupier has contravened the Provisions of Rule 4(1) (d) of Maharashtra Factories Rules 1963**

VII) The contraventions of Provisions of 73-N(1) of Maharashtra Factories Rules ,1963

The factory is engaged in manufacturing activity in relation to Chemical Industries – Electrochemicals (Peroxides) industries listed under Sr. 17 of the First Schedule of the Factories Act, 1948. Hence the factory is carrying out Hazardous process as defined under section 2(cb) of the Factories Act, 1948.

As per rule 73-N(1) of Maharashtra Factories Rules ,1963 , The occupier of a factory carrying on a 'Hazardous process' ought to be compiled and made known to workers individually through supply of booklets or leaflets the following information in relation to handlings of hazardous materials like methanol, IPA etc. Or any hazardous substances in the manufacture, transportation, storage and other processes of making TBHP, TBBP, MEKP:

- a) Information of Hazardous processes carried on in the factory.
- b) Location and availability of all materials Safety Data Sheets as per Rule 73-M.
- c) Material safety data sheets of raw materials and finished products and intermediates handled in manufacturing process at plant.
- d) Physical and health hazards arising out of the exposure to or handling of substance.
- e) Measures to be taken by the workers to ensure safe handling, storage and transportation of hazardous substance.
- f) Personnel protective equipments required to be used by workers employed in hazardous process or dangerous operation.

g) Sign and symptoms likely to be manifested on exposure to hazardous substances and to whom to report. Page 229

h) Measures to be taken by the workers in case of any spillage or leakage of hazardous substance.

But during enquiry it is found that the workers working on manufacturing process of synthesis of TBHP, TBBP, MEKP were not provided with information in relation to handling of hazardous materials like Hydrogen peroxide TBA, Sulphuric Acid, thus occupier of has contravened the provisions of the Rule 73-N(1) of Maharashtra Factories Rules, 1963.

VIII) The contraventions of Provisions of Rule 3 (b) of Maharashtra Factories (Safety Audit) Rules, 2014

The factory is engaged in manufacturing activity in relation to Chemical Industries – Electrochemicals (Peroxides) industries listed under Sr. 17 of the First Schedule of the Factories Act, 1948. Hence the factory is carrying out Hazardous process as defined under section 2(cb) of the Factories Act, 1948.

A safety Audit was carried out in Dec 2020 by Safety Auditor Mr Dhananjay Jadhav. In Dec 2022, Safety Audit was not carried out by the occupier of the factory. As per Rule 3 (b) of Maharashtra Factories (Safety Audit) Rules, 2014, The occupier of the factory shall arrange to carry out the safety audit externally, once in two years by the Safety Auditor as a measure for securing the safety of persons employed . But the Occupier had not arranged to carry out a Safety Audit externally once in two years by safety auditor **Therefore, the Occupier has the Provisions of Rule 3 (b) of Maharashtra Factories (Safety Audit) Rules, 2014**

IX) The contraventions of Provisions of Rule 115 (2) of Maharashtra Factories Rules, 1963

There was an explosion and fire on 23/05/2024 at 1:30 pm in the factory leading to the accident of 10 workers. I came to know about accident through telephonic message from the MARG member from Dombivali, @ 2:00 PM The notice of an accident should have been confirmed by the manager by sending a written report in form No. 24 within 12 hours of taking place of this accident as per provision of Rule 115 (2) of Maharashtra Factories Rules 1963. However, the written report in form No. 24 has not been submitted till date.

Thus the Manager had not submitted written report in form No. 24 within the prescribed time limit 12 hours, **the provisions of Rule 115 (2) of Maharashtra Factories Rules, 1963 have been contravened by the Manager of the factory.**

12) Remedial Measures:

To avoid the reoccurrence of such incidence in future following remedial measures are suggested:-

- i. The facility for control addition of sulphuric acid through an addition vessel /glass flask. Shall be made
- ii. On the reactor system provision of alarm and interlock such as Utility failure alarm, agitator failure alarm, High temperature alarm, Alarm for High rate of addition of limiting reactant which is added at controlled rate shall be provided.
- iii. Flow Control Valve and/or On-Off valve for raw material shall be installed such that raw material (limiting reactant) addition rate should be controlled by flow control loop. The controlling parameter is reactor temperature. And FCV and/or On-Off valve should be interlocked with the reaction mass temperature and agitator tripping.
- iv. A HAZOP study for the entire process shall be carried out by specialized expert and recommendations thereof shall be complied with.
- v. Workers and the operator shall be trained well-designed Training Program for operators & working staff regarding handling of hazardous chemicals & hazards associated with it, and the same shall be periodically refreshed with the latest information available within the scope.

13) Payment of Compensation and Ex-gratia:

The occupier is directed to -

1. Pay legal due compensation to heirs of diseased under intimation to this office.
2. Pay substantial sum of rupees as ex-gratia payment to heirs of diseased under intimation to this office.
3. Adequate Medical treatment shall be extended to the injured. Health progress of injured shall be reported periodically to this Directorate. Injured worker shall be paid their wages during medical leave.

14) Show Cause Notice :

The occupier may explain & show causes if any within 7 days that why legal action shall not be considered against him for the above said contraventions.


(S. G. Bhele.)
Deputy Director,
Industrial Safety and Health,
Kalyan



कर्मचारीराज्यबीमानिगम
(श्रमधर्मरोजगारमंत्रालय, भारतसरकार)
EMPLOYEES' STATE INSURANCE CORPORATION
(Ministry of Labour&Employment, Govt. of India)



उप क्षेत्रीय कार्यालय, ठाणे
प्लॉट: ए-12/1, एन आई डी सी, एन डी एस मार्ग,
वागले इन्स्टिट इन्फ्रस्ट्रक्चर क्रे पार्क, ठाणे (प.), महाराष्ट्र-
400604
Sub Regional Office, Thane
Plot No.-A-12/1, MIDC, LBS Marg, Next to Wagle Estate
Post Office, Thane(W), Maharashtra-400604

File No. 34/D/Miscellaneous/Benefit/2024

Date :-07-03-2025

To,
The Deputy Director,
Directorate of Industrial Health and Safety,
Government of Maharashtra,
Industrial, Energy and Labour Department,
Madam Kama Road,
Hutatma Rajguru Chowk, Mantralaya
Mumbai - 400032.

**Subject :- Reply to the question no 781 raised by Shri. Nanabhau Patole
and other M.L.A.**

- Ref. :- 1) लवेसू - 2025 / प्र. क्र. १२ / कामगार - 4 दिनांक 06/03/2025
2) सकाआ / कल्याण / लवेसुक्र. ७८१ / २०२५ / ९२४ दिनांक 06/03/2025
3) ससंऔसुवआ / अपघात / ६४३० / २०२४ दिनांक 19/12/2024

Sir / Madam,

With reference to the above mentioned subject the information sought about the Insured Person injured in the Amudan Chemical Blast occurred on 23/05/2024 covered under the Employees State Insurance Act are as under :-

Sr. No.	Name of I.P. and Insurance No.	Status
1)	Manoj Jondhale, 3417344667	Funeral Expenses of Rs.15,000/- paid and Pension paid till the month of February 2025.
2)	Bharat Jaiswar, 3416091051	Funeral Expenses of Rs.15,000/- paid and Pension paid till the month of February 2025.
3)	Ravi Rajbhar, 3517457747	Funeral Expenses of Rs.15,000/- paid and pension claim not received from the dependents.
4)	Vishal Paudwal 3417424412	Funeral Expenses claim and pension claim not received from the dependents.
5)	Jay Sarkar	Funeral Expenses claim and pension claim not

	3417428289	received from the dependents.
6)	Satyanarayan Rajbhar 3517457791	Funeral Expenses of Rs.15,000/- paid and Pension claim documents are under scrutiny.
7)	Sirajuddin Ahmed 3416976471	Funeral Expenses of Rs.15,000/- paid and Pension disbursement under process.
8)	Rohini Kadam 3417421857	Funeral Expenses not claimed and pension claim documents are under scrutiny.
9)	Riddhi Khanvilkar 3417421616	Funeral Expenses claim and pension disbursement under process.
10)	Manish Kumar Das 3416802910	Funeral Expenses not claimed and pension claim documents are under scrutiny.
11)	Manoj Chavan 3415848558	Funeral Expenses not claimed and pension claim documents are under scrutiny.
12)	Rakesh Rajput 5609503478	Funeral Expenses of Rs.15,000/- paid and pension claim not received from the dependents.

This is issued with the approval of the competent authority.

Digitally signed by
ANTRIKSH KUMAR
Date: 07-03-2025
17:09:01 (Antriksh Kumar)
DEPUTY DIRECTOR

Copy to - 1) Assistant Labour Commissioner, Office of the Assistant Labour Commissioner, Kalyan, Government of Maharashtra, Sai Vihar Building, 2nd Floor, above Hotel Gurudev, Shivaji Path, Kalyan (West) - 421301.



प्रात,

जिल्हाधिकारी,
जिल्हाधिकारी कार्यालय,
ठाणे - ४००६०१.



सत्यमेव जयते

मुख्यमंत्री सचिवालय Page 233

मंत्रालय, मुंबई ४०० ०३२

www.maharashtra.gov.in

दिनांक : २५ जून, २०२४

विषय :- मुख्यमंत्री सहाय्यता निधीतून अर्थसहाय्य.

संदर्भ :- १) आपले पत्र क्र.सामान्य/टे-१/जि.आ.आ./डॉ.ब्ला.२३मे/कावि-३७७, दि.२४.०५.२०२४
२) या कार्यालयाचे पत्र क्र. मुमनि-१०२३/ठाणे/प्र.क्र.३०/निधी कक्ष/१११, दि.२९.०५.२०२४
३) आपले पत्र क्र. जिकाठा/सामान्य/क-४/टे-८/मु.मं.स.नि./संकीर्ण/कावि-४४२/
२०२४, दि.१९.०६.२०२४

महोदय,

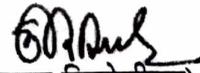
उपरोक्त संदर्भ क्रमांक १ येथील प्राप्त अहवालानुसार दिनांक २३.०५.२०२४ रोजी सोनारपाडा, डॉबिवली एमआयडीसी फेज दोन या ठिकाणी असलेल्या अंबर केमिकल कंपनीत रिअॅक्टरचा स्फोट होऊन भीषण आग लागून दुर्घटना घडल्याचे कळविले आहे. या प्रकरणी मा. मुख्यमंत्री महोदयांनी घोषणा केल्यानुसार या दुर्घटनेत ओळख पटलेल्या १) रोहीणी चंद्रकांत कदम व २) रिध्दी अमित खानविलकर यांच्या कुटुंबियांना मुख्यमंत्री सहाय्यता निधीतून प्रत्येकी रु.५,००,०००/- (रुपये पाच लाख फक्त) यानुसार एकूण रु.१०,००,०००/- (रुपये दहा लाख फक्त) इतके अर्थसहाय्य संदर्भ क्रमांक २ अन्वये आपल्या बँक खाती वर्ग करण्यात आले असल्याचे कळविण्यात आले आहे.

२. उपरोक्त संदर्भ क्रमांक ३ येथील प्राप्त अहवालानुसार उपरोक्त परिच्छेदात नमूद दोन मृत वगळून उर्वरित ११ मृतांच्या कुटुंबियांना या प्रकरणी मा. मुख्यमंत्री महोदयांनी घोषणा केल्यानुसार मुख्यमंत्री सहाय्यता निधीतून प्रत्येकी रु.५,००,०००/- (रुपये पाच लाख फक्त) यानुसार एकूण रु.५५,००,०००/- (रुपये पंचावन्न लाख फक्त) इतके अर्थसहाय्य मुख्यमंत्री सहाय्यता निधीच्या स्टेट बँक ऑफ इंडियाच्या असलेल्या मुंबई शाखेतून आपल्या नावे, स्टेट बँक ऑफ इंडिया, ठाणे शाखेतील बँक खाते क्रमांक १११००५२७१२४ मध्ये परस्पर वर्ग करण्यात आले आहे.

३. उपरोक्त संदर्भीय पत्रान्वये आपण पाठविलेल्या अहवालानुसार आवश्यक ती संपूर्ण पडताळणी करून अर्थसहाय्याचे वाटप करण्यात यावे. मृत व्यक्तीचे प्रकरणी पोलीस पंचनामा, मृत्यु प्रमाणपत्र, पोस्ट मार्टेम रिपोर्ट इत्यादी आवश्यक ती कागदपत्रे (Hard Copy) या कार्यालयात पाठविण्यात यावी. तसेच अर्थसहाय्य मंजूर प्रयोजनाकरीता वापरण्यात आल्याबद्दल विनियोगाचे प्रमाणपत्र सादर करण्यात यावे. मृतांच्या कायदेशीर वारसांस अर्थसहाय्य प्राप्त झाल्याबद्दल महसूल मुद्रांकित पावती या सचिवालयास सत्वर पाठवावी. तसेच निधीच्या रक्कमेचा विनियोग तात्काळ न झाल्यास सदर रक्कम मुख्यमंत्री सहाय्यता निधीच्या खाते क्र. १०९७२४३३७५१, स्टेट बँक ऑफ इंडिया, फोर्ट मुंबई, मुख्य शाखा, या खात्यात तात्काळ वर्ग करून या सचिवालयास तसे अवगत करावे.

कृपया अर्थसहाय्य प्राप्त झाल्याची पोच पावती द्यावी.

आपला,


(कैलास बिलोणीकर)
सह सचिव



महाराष्ट्र शासन

औद्योगिक सुरक्षा व आरोग्य संचालनालय

कामगार भवन, ५वा मजला, ब्लॉक-ई, सी-२०, बांद्रे-कुर्ली संकुल, बांद्रे(पूर्व), मुंबई - ४००-०५१.

दू.क्र.९१ २२ ३५००८४५४/९१ २२ ३५०८ २५०६/ ९१ २२ ३५१२ ८४८३/९१ २२ ३५१३ १५०३/

२६५७२५०४/०९/२२/५८, Email-dirdish.mum-maha@gov.in

क्र. संऔसुवआ/निरीक्षण/NGT/१२१५ १३६-२०२४/ २०९

दि.दिनांक:-

15 JAN 2025

प्रति,

श्री.स.ग.भैले,
उप संचालक,
औद्योगिक सुरक्षा व आरोग्य,
कल्याण.

विषय :- मा.राष्ट्रीय हरित लवाद, पश्चिम विभाग, खडपीठ, पुणे यांच्याकडील मूळ अर्ज क्र.१२१/२०२४ व मूळ अर्ज क्र.१३६/२०२४ बाबत.

संदर्भ :- संचालनालयास प्राप्त दि.२०/१२/२०२२ रोजी अॅडव्होकेट श्री.जयदिप ठक्कर, यांचेकडून प्राप्त ई-मेल.

उपरोक्त विषयासंदर्भात आपणांस कळविण्यात येते की, मा.राष्ट्रीय हरित लवाद, पुणे यांच्याकडील मूळ अर्ज क्र.१२१/२०२४ व मूळ अर्ज क्र.१३६/२०२४ यांच्याकडील सुनावणीसाठी आपण मा.संचालकांच्या अनुमतीने कोर्टाचे कामकाज पहावे व यासंदर्भात लदर केस संदर्भातील न्यायालयीन स्थिती व निवाड्याबाबत अवगत करावे.तसेच संचालकांच्यावतीने प्रतिज्ञापत्र दाखल करण्यासाठी आपणांस प्राधिकृत करण्यात येत आहे.

(दिपक पोकरे)

संचालक,

औद्योगिक सुरक्षा व आरोग्य,

महाराष्ट्र राज्य, मुंबई

मराठी पत्रव्यवहाराचे स्वागत आहे. मराठीतून पत्रव्यवहार करावा!



सत्यमेव जयते
महाराष्ट्र शासन

औद्योगिक सुरक्षा व आरोग्य संचालनालय

कामगार भवन, ५वा मजला, ब्लॉक-ई, सी-२०, वांद्रे-कुर्ला संकुल, वांद्रे(पूर्व), मुंबई - ४०० ०५१.

दू.क्र.९१ २२ ३५००८४५४/९१ २२ ३५०८ २५०६/ ९१ २२ ३५१२ ८४८३/९१ २२ ३५१३ १५०३/

२६५७२५०४/०९/२२/५८, Email-dirdish.mum-mh@gov.in

क्र. संऔसुवआ/निरीक्षण/NGT/१२१-२०२४/ १३५५

/६, दिनांक:-

19 MAR 2025

प्रति,

सह संचालक,
औद्योगिक सुरक्षा व आरोग्य,
कल्याण.

INDUSTRIAL SAFETY & HEALTH
KALYAN

Inward No.:-

Date :- 24 MAR 2025

Factory Sr. No.:-

विषय :- मा.राष्ट्रीय हरित लवाद, पश्चिम विभाग, खंडपीठ, पुणे यांच्याकडील मूळ अर्ज
क्र.१२१/२०२४ व मूळ अर्ज क्र.१३६/२०२४ बाबत.

संदर्भ :- १. संचालनालयास प्राप्त दि.२०/१२/२०२२ रोजी अॅडव्होकेट, हाय कोर्ट,
श्री.जयदिप ठक्कर, यांचेकडून प्राप्त ई-मेल.

२. आपला दिनांक १२/०३/२०२४ रोजीचा प्राप्त ई-मेल.

उपरोक्त विषयासंदर्भात आपणांस कळविण्यात येते की, मा.राष्ट्रीय हरित लवाद, पश्चिम विभाग, खंडपीठ, पुणे यांच्याकडील मूळ अर्ज क्र. १२१/२०२४ यांच्याकडे संचालकांच्यावतीने दाखल करावयाचा आपण सादर केलेला संदर्भ क्र. २ मधील प्रतिज्ञापत्राचा मसुदा मंजूर करण्यात येत आहे.

श्री. भेले, उप.सं.

मंजूर मसुदाप्रमाणे प्रतिज्ञापत्र मा. राष्ट्रिय
हरित लवाद न्यायालयात दाखल करावे.

१३/०३/२५

(दिपक पोकळे)

संचालक

औद्योगिक सुरक्षा व आरोग्य

महाराष्ट्र राज्य, मुंबई.