

TOR 13. Risk assessment for storage and handling of hazardous chemicals/solvents . Action plan for handling & safety system to be incorporated.

1. Risk assessment: - Risk is the combination of the severity of hazard and probability of the occurrence of the incident. Risk assessment is the process of evaluating the potential risks that may be involved in the activity or project. There are several methods for evaluation of risks; here we give numerical values to the severity of the hazard and the probability or frequency of occurrence hazardous event. Then to evaluate the risk by assigning a number to a level of Hazard and also to the Probability or frequency of occurrence of the hazardous event as given in the rating scale. The product (combination) of the two will give us an idea about the risk level as below

2. Rating scale

2.1 **Level of Hazard** - Negligible - 1, Low - 2, Moderate – 3, High - 4
Excessive - 5

2.2 **Probability Frequency-** Once in more than five years, Rare - 1 , Once in a year, Low - 2 , Once in a Month, Moderate – 3, Once in a week, High – 4, Very Frequently, Very High - 5

2.3 **Rating Score Scale** - 1 to 5 - low risk, 6 to 10 – Medium risk, 10 and above – High risk.

3. Managing the risk: - To manage the risk, it is necessary to know the potential hazards and the probability of occurrence the hazardous event. Then you determine the risk level by combination (multiplication) of the above. This will give you risk rating and say if the risk is low, medium or high. Then manage the risk as follows . these are also called 4 T's of managing the risk. (Treat, transfer, Tolerate and Terminate)

3.1 You live with the low risk activities. (Tolerate)

3.2 Manage the medium risk activities, by suitable control and mitigation measures which are describe below after the risk assessment. (Treat)

3.3 Avoid or eliminate high risk activities or transfer them somewhere else (Terminate or Transfer)

4. Risk Assessment: - Risk_assessment of the hazards involved in various activities in operation phase is given in the table below. The mitigation and control measures

are given in para 5 , after risk assessment. After the control measures the risks become tolerable. Hence it is a requirement for the project proponent that all the actions and measures are required to be taken to make the risk tolerable and manageable. This will ensure accident free operation with good work conditions for years together.

Table No. - Risk assessment –operation phase

Sr. No.	Process/Activity	Hazard involved	Risk	Level	Probability/Frequency	Risk rating
1	Transportation of raw material and chemicals	Spillage of material during transportation.	Exposure of the liquid chemical can cause injuries and burn. Especially acetic acid, Pyridine, Hydrochloric acid etc. The liquid material spillage can cause land pollution, air pollution due to spread of vapors of the chemicals.	Low – minor leakage 2	Once or twice in a year 3	6
				High – Heavy leakage 5	Rare less than once in five years 1	5
2	Unloading of material from road tanker/truck	Leakages of liquid material during transfer – unloading using hose. Risk of fire.	Exposure to toxic vapors and fumes as highly hazardous materials like acetic acid, ethanol, P-toluene sulphonic acid is handled. Health risk to workers.	High 4	Once in five year or rare 1	4
3	Storage of raw material and finished product	Spillage of material during handling. The material may catch fire as	Exposure to toxic vapors and fumes. Health risk to workers.	Moderate to high 4	Once or twice in a year 3	12

Sr. No.	Process/Activity	Hazard involved	Risk	Level	Probability/Frequency	Risk rating
		some chemicals like Pyridine, Ethanol are flammable Health risks in case of contact with material.	Risk of catching fire	Very high 5	Rare, less than once in five years 1	5
4	Use of electrically operated machines and pumps	Hazards due to electrical shock	Electrical shock can result in serious injury or can be fatal	Moderate to high 4	Low less than one in a year 2	8
5	Degradation or contaminated by incompatible material. Uncontrolled reaction.	Possibility of runaway reaction Possibility of deterioration of product quality and generation of process waste (Hazardous)	Risk of fire, injury and health problems to workers.	High to excessive 5	Rare with the control measures 1	5
6	Disposal of solid and hazardous waste like packing material and used chemical drums.	Exposure to toxic remains of material. Injury while handling solid and hazardous waste drums.	Health effect and minor injury	Moderate 3	Once or twice in a year, moderate 3	9
7	Reactor operation	Overheating of material may cause runaway reaction and generation of hazardous waste due to bad quality of material.	Health risks to workers.	Moderate 3	Once in more than five years, Rare 1	3
		Spillage of material while transferring and charging the material to reactor. Generation of	Health risk due to inhalation of toxic vapors while charging the material in the reactor	High 4	High, very frequent 4	16

Sr. No.	Process/Activity	Hazard involved	Risk	Level	Probability/Frequency	Risk rating
		vapors, fumes while charging liquid methylene chloride to reactor.				
8	Storage and handling of finished goods.	Chances of spillage while transferring from reactor to storage drum or container. Chances of accident while transporting the goods.	Injury to workers. Health risks are also involved.	Very Low 1	Low 2	2
10	Operation of DG set and rotating machines	Generation of noise due to rotating machines/DG set.	Impairment of hearing	Moderate 3	Once or twice in a week 4	12

5. Action Plan and safety systems for Handling and storage of hazardous chemicals

The US Amino being a bulk drug manufacturing industry, it is handling toxic raw materials and chemicals, Safety is given utmost priority while storage, transfer and handling these hazardous chemicals. The following precautions are taken and safety procedures are to be followed to avert any untoward incident.

- 5.1 The toxic and hazardous chemicals are stored separately and in well covered storage shed to protect them from direct sunlight.
- 5.2 The area is well ventilated to keep the concentration level of toxic chemicals well below the PEL Values. (permissible exposure)
- 5.3 Compatibility is taken care while deciding storage location of individual chemicals. The flammable chemicals are stored away from oxidizing chemicals like hydrogen peroxide and nitrates.
- 5.4 The MSDS of all the chemicals stored are available at the point of use, and the people are trained in MSDS.
- 5.5 Sufficient Number of fire extinguishers is available in the storage area. All the staffs in the stores area is well trained in fire fighting as well as first aid.
- 5.6 Safety shower and eyewash is readily available near the storage area and periodic inspection/ testing is done to keep them in working at all the times.

- 5.7 First aid box is available in the stores.
- 5.8 Required antidotes stock is maintained in First aid room or in the stores as per requirement.
- 5.9 The storage stock level of highly hazardous chemicals is maintained minimum to keep the hazard level low.
- 5.10 Sufficient stock of emergency PPEs like canister mask, escape mask, breathing suit is maintained and all people working in the stores are well trained in the use of these safety PPEs.
- 5.11 All chemical storage containers are well marked identified with name label and other GHS hazardous symbols and Pictograms are followed.
- 5.12 People are required to take bath if they are exposed to toxic chemical
- 5.13 A separate lunch room is provided to the workers as to avoid any remote chance of food getting contaminated with toxic chemical. People are advised to wash their hands thoroughly before taking lunch or tea.
- 5.14 All the transfer operations are mechanised as far as possible.
- 5.15 All the electrical fittings are in the stores in operation area are flameproof.
- 5.16 The electrical circuit is protected by use of ELCB and MCB.
- 5.17 As the operations are done in closed manner, it is transferred using pump in order to avoid spillage.
- 5.18 The reactor controls are made automatic as far as possible and there is high temperature and high level alarms are fitted on the reactor.
- 5.19 The DG set is equipped with aquatic enclosure to keep the noise level low.
- 5.20 Periodic maintenance of the DG set and other rotating machinery is done to keep the noise level low.
- 5.21 Smoking is strictly prohibited in the factory premises.
- 5.22 Nobody is allowed to carry any lighter or match box inside the factory premises in order to control the source of ignition and avoid the fire.
