

## **Risk Analysis- Sulfuric Acid**

### **Sulfonation of LAB with 98% Sulfuric Acid**

- Being exothermic reaction, Sulfonation reaction has the potential hazard of causing serious accident.
- Detailed systematic HAZOP study will be carried out for Sulfonation reaction.
- Sulphuric Acid (SA) handling, starting from unloading of tanker will also be included.
- All the recommendations of study including the following most important will be implemented, (but not limited to) to ensure that there is no accumulation of un-reacted material under any circumstances.
- All necessary instrumentation, alarms and interlocks necessary will be installed on the reactor, like feed flow control, reactor temp control, utility failure and agitator failure alarm and interlock with reactant feed.
- Level measurement on the feed tank and interlock with Sulfuric Acid transfer pump, overflow line to the Sulfuric Acid storage tank.
- Dump tank provision below the reactor.
- Establishing Standard Operating Procedure, based on HAZOP and making sure it is not violated.

### **Sulfuric Acid transport and handling- Guidelines for Transportation**

- It will be ensured that during the transportation contents are not spilled and the tanker is properly sealed for tampering.
- Personnel, including the driver and cleaner are properly trained about the hazardous properties of the material being carried and for transport of hazardous material, Sulphuric Acid in particular.
- Tanker must be RTO approved and tested frequently for integrity.
- Vehicle must have safety equipment/PPEs, and antidote if necessary.
- The driver must possess a valid driver's license.
- The maximum speed limit is prescribed.
- Driver will be instructed to park the tanker at safe place and they should be available in the near vicinity.
- TREM (Transport Emergency) cards are to be provided to the drivers

### **Labeling Guidelines for Tanker Carrying Sulphuric Acid**

**There are two types of labeling requirements for the tanker carrying Sulphuric Acid.**

- Labeling transport vehicles.- All hazardous Material containers must be clearly marked with current contents.
- The markings must be waterproof and firmly attached so that they cannot be removed. Previous content labels shall be obliterated when the contents are different. As far as possible dedicated tanker will be used for Sulphuric Acid transport.
- Proper marking of containers is essential. - Color code is to be provided to the tanker to indicate the type of material present in that. –Containers that contain Hazardous Material shall be labeled with the words "HAZARDOUS MATERIAL" in Vernacular language,

Hindi / English. Proper HAZCHEM label will be painted on the tanker. The information on the label must include the code number of the Material, the Material type, Nh, Nf and Nr rating the symbol for the hazardous property.

- The label must withstand the effects of rain and sun.

#### **The following are the requirements for labeling**

- Acid supplier and the company will finalize the route and timing required. With modern gadgets like Global Positioning System (GPS) the location of vehicles will be monitored.
- Emergency contact phone numbers of specific and responsible personnel, who are trained and can deal with emergency, from the supplier and the company, shall be available with the driver, cleaner etc.
- The phone number of concerned Regional Officer of the SPCB, Fire Station, Police Station and other agencies will also be available with the driver.
- Program for training the driver on, safe driving, road safety, hazardous properties of Sulphuric Acid, safety precautions and Dos and Don'ts will be conducted by the company.

#### **Care to be taken of Sulfuric Acid Exposure**

**SULPHURIC ACID Initial Isolation Distance 45.7 M and Proactive distance 640 Meters in case of 250 to 1000kg spillage.**

- Exposure to sulfuric acid can occur as skin/bodily contact, ingestion or inhalation of vapors.
- Each type of exposure can pose serious hazards to your health and should be managed immediately and appropriately by a medical professional to minimize damage and health risks.
- **Skin Contact** – If sulfuric acid comes into contact with your skin, immediately flush the affected area gently with lukewarm water for at least 30 uninterrupted minutes. Seek medical attention immediately.
- **Eye Contact** – If sulfuric acid gets into your eyes, immediately flush the eye(s) with water for at least 30 minutes. Seek medical attention immediately.
- **Ingestion** – If you ingest sulfuric acid, rinse your mouth immediately with water. Do not induce vomiting. Continually rinse your mouth with water and seek medical attention as soon as possible.
- **Inhalation** – If you inhale sulfuric acid aerosols, seek fresh air and medical attention immediately

#### **On-site Emergency Plan**

**On site Emergency plan will be prepared as per the guidelines given in the factory Act Schedule 6 (Rule 12.6)**

**Aim:** To act correctly within shortest possible time to contain emergency, minimize the damage to life and property by maximizing internal resources

- The important elements of the plan are to identify emergencies, likely emergencies and corresponding actions/ mitigation measures to be initiated, define Emergency organization Roles and Responsibilities of Key Personnel and Essential Employee. Communications during Emergency, define Emergency Shutdown procedures of Plant & Control of situation. Rescue Transport & Rehabilitation.
- Based on Plant/factory organization, Emergency organization chart is finalized with and their duties are defined.
- Site Controller.
- Incident Controller for respective plant areas.
- Emergency Control Center (ECC) is established/identified from where all the activities and communication activities are controlled.
- All the important plant, plant personnel, factory and important company officials, emergency telephone numbers of plant personnel, police station, hospitals, govt officials is readily available, plant/factory layout with escape routes and assembly points are available.
- List of trained firefighters, rescue trained (first aid trained) personnel is available.
- All operations to control emergency, rescue communication with external authorities is controlled from this location.
- Conducting Mock drill regularly and learning and improving from the same are very important for effective implementation of plan during actual emergency.
- On- Site Management Plan.
- Locate the emergency, if possible and eliminate it.
- Minimize the effects of the accident on the people and property.

### **Identification and assessment of Hazards**

- Fire & Explosion possibilities in Storage and Handling of Sulfuric acid.

### **Emergency control center**

Security Main Gate Office will be as the “EMERGENCY CONTROL CENTRE”

The Center will have following information for the on-site emergency plan

- Master plan of the works showing different locations, where hazardous materials are stored / processed.
- Sources of Personal Protection Equipment, portable fire extinguishers, and other safety material.
- Fire fighting system and sources of water.
- Plan of the works with safe distance areas, escape routes, assembly points.
- List of key personnel and their telephone numbers.
- List of Government officials, other areas of help – their telephone numbers.
- Updated Nominal roll of the employees and other visitors.
- Communication facilities like phones, mobile phones, walkie-talkie sets etc.

### **Responsibility of work's manager**

- Prepare on-site emergency plan and revise it from time to time (once in 6 months).
- Conduct regular mock drills.
- Educate / train all the employees regarding on-site emergency plan.
- Submit copy of “on-site emergency plan” and mock drill to Chairman / District Disaster Plan, Deputy Chief Inspector of factories Office.
- Stock necessary PPE for fire fighting.
- Device data collection forms for collecting data during emergency.
- Ensure the details given in displayed / kept in Emergency Control Centre.

### **Site Incident Controller**

- Receives a call from security supervisor.
- After a brief visit to incident site, decides and advises chief incident controller to declare emergency.
- Controls the emergency by coordinating various activities through his teams.
- Advises to chief incident controller lifting of emergency.
- Reviews and prepares a detailed report on the incident and submits to “Chief Incident Controller”.

### **Safety & Emergency Team**

- Device methods to isolate emergency and movement of people.
- Provide necessary safety data to site controller.
- Provide required PPE.
- Provide time to time information to site incident controller.
- Shift/cordon off flammable materials from the danger zone.
- Put off power supply wherever not required.

### **First Aid Team**

- Provide first aid / medical care to persons injured inside factory.
- Keep a list of people sent for outside treatment and other welfare measures undertaken.
- Maintain the list of people inside premises and sent out including visitors.
- Provide time to time information to site incident controller.
- Act as per the instructions of site incident controller.
- Keep a list of essential staff required to assist during emergency.

### **Fire team & Security team**

- Control the emergency by fire fighting. Give a call to mutual aid if required.
- Move people to safe areas specified by safety and engineering teams.
- Control the movement of traffic at Gate.
- Provide time to time information to site incident controller.

### **Off Site Management Plan**

The main objectives of the off-site emergency plan are

- To save lives and injuries.
- To prevent or reduce property losses and
- To provide for quick resumption of normal situation or operation.
- Off site Management plan will be monitored by Local Crises Group; under the Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996.
- Mock drills help to familiarize employees with their roles, and prove the current accuracy of the details of the OEP (Off Site Emergency Plan).
- Mock drills will be conducted periodically.
- A detail report of the mock drill conducted will be available to the concerned authority.
- Major Fire and Minor Fire mock drills will be conducted once in three months and one month respectively.
- Inform site incident controller the incident and call him to site of incident.
- Act as per the directive of Site incident controller.
- Rush fire-fighting team to site of incident and start fire-fighting operation.
- Rush security team to cordon off the incident site.
- Move non-essential employees to assembly point.
- Regulate the traffic at gates.
- Keep the escape routes and roads free from obstruction.
- Make transport facilities for transporting non-essential employees.
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### **Fluoride Management Plan [Removal of Fluoride from the Scrubber Effluent]**

- The effluent from the scrubber will be treated for removal of fluoride.
- The scrubber effluent will be mixed with lime and allowed to settle in a settling tank.
- The sludge from the settling tank will be compound of calcium and fluoride. ( $\text{CaSiF}_6$ ).
- This will be passing through a filter press. The clear water will be reused in the scrubber and the cake will be disposed off CHWTSDF.
- The quantity of  $\text{CaSiF}_6$  generated on daily basis will be (5000 Kg/day).

### Flow Sheet for Management of Fluoride

