Risk Assessment and Disaster Management Plan
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1 Risk Assessment

1.1 Scope

The Risk Assessment covers risks due to storage and handling of hazardous substances in the proposed BMW TF.

Storage and handling of HSD poses fire hazards. Storage and handling of the other hazardous - Caustic lye (scrubbing medium) pose human exposure hazards. Causes, possible loss of containment, exposure scenarios and preventive measure of the hazards due to storage of hazardous chemicals is discussed in the section.

1.2 Methodology

The Risk Assessment has been carried out using the following methodology.

a. Hazardous chemicals are chemicals which are listed by name (in Schedule 2 and/or 3) or satisfy criteria (part I or II, Schedule 1) in the MSIHC Rules, 1989 (amended 2000).

b. Loss of containment scenarios are identified for the chemicals

c. credible and worst case release and event scenario (fire, explosion, etc.) are modeled

d. extent of vulnerability to other plant facilities is assessed

e. response strategy is recommended

1.3 Hazardous Chemicals and Condition of Storage

Hazardous chemicals are proposed to be stored and handled in the unit are given in Table 1.

Table 1. Hazardous Chemicals proposed to be Stored and handled in the proposed BMW TF

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Chemical</th>
<th>MSIHC Rules reference</th>
<th>Quantity</th>
<th>Storage</th>
<th>Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Diesel (HSD) Fuel</td>
<td>Schedule 1, Part I, (b) Flammable chemicals, (iv) highly flammable liquids</td>
<td>200 l x 2 drums</td>
<td>Covered shed near the incinerator over spill containing pallets</td>
<td>Flammable</td>
</tr>
<tr>
<td>3</td>
<td>Caustic lye (scrubbing medium)</td>
<td>Schedule 1, Part II, 571 Sodium hydroxide</td>
<td>35 l x 15 carboys</td>
<td>Designated area in the covered shed over spill containing pallets</td>
<td>Corrosive/ Oxidising agent</td>
</tr>
</tbody>
</table>
1.3.1 Basic Storage Safety
HSD and Caustic lye will be stored in their original drums/carboys under atmospheric pressure (with
decantation holes tightly stoppered) and shall not be decanted in another container inside the TF premises.
The drums/carboys will be placed over spill containing pallets in a designated, well-aspirated and well-
illuminated area with impervious flooring. Electrical connections in the area will be firm and well
cladded/conduted.

Handling of HSD and transferring to the incinerator day tank (typically 990 l capacity) will be carried out
with permanently affixed rubber hoses or GI threaded joint pipes using a hand cranked sudan pump. The
MS drum will be taken to a kerbside fuel dispensing station for refilling in an open cargo vehicle whereby
it could be refilled while placed in the vehicle.

Caustic lye will be handled by personnel wearing neoprene gloves and spill apron. The carboys will be
moved inside the premises to the site of mixing in the scrubbing medium preparation tank in a
wheelbarrow. The carboy will not be rinsed. It will be stoppered again and returned back to the supplier
for reuse.

1.3.2 Fire Fighting System
Fire fighting system of the TF will comprise sufficient numbers of portable fire extinguishers of B
(chemical powder) and C (carbon dioxide) type, placed in the facility is such a way that one does not have
to travel more than 30 m to access an extinguisher. One non-protein foam type fire extinguisher will be
placed near the HSD storage area. As the incinerator is a very hot device, fighting any fire in the
incinerator with water will be harmful and hazardous.

1.3.3 F Loss of Containment Scenarios and Hazards
Loss of containment scenarios are relevant only for flammable chemicals, namely HSD. Caustic lye does
not pose any hazard other than loss of containment per se. It can be transferred back in the carboy in case
of loss of containment, and its exposure to humans can be contained in any spill/leak event in accordance
with its MSDS information. Loss of containment scenarios for HSD as identified for CA modeling are
given in Table 2.

Table 2. Loss of Containment Scenario Identified

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Chemical</th>
<th>Scenario Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HSD</td>
<td>Worst case Catastrophic failure of the HSD tank inside the dyke, vapors</td>
</tr>
</tbody>
</table>
Above assumed scenario has been modeled on consequence analysis modeling application - USEPA Aloha 5.4.7, September 2016 release for Pasquill and Gifford atmospheric stability class D – Neutral for conservative atmospheric dispersion scenarios. The consequence footprints for the scenario for HSD is given in Figure 1.

**Figure 1. Consequence Footprint for HSD**

1.3.4 F Interpretation of CA Footprints

Total loss of containment in the case of unlikely worst case scenario will drain all the flammable liquid into the spill containing palette. Modelled vapor cloud between LEL and UEL around the pallet (capable to sustain a flame burn) will be within 10 m of the source. A non-protein foam type portable extinguisher will be sufficient to fight fires from this scenario.
2. Disaster Management Plan

2.1 Introduction
Disaster is a major emergency in plants, which has the potential to cause serious injury or loss of life, both inside and outside the works. It would normally require the assistance of outside emergency services to handle it effectively. Emergency may be caused by a number of different factors, e.g. machine failure, human error, earthquake, vehicle crash or sabotage, and so on.

A disaster occurring in the BMW TF may affect/cause
- several sections within it
- serious injuries / loss of lives
- extensive damage to property
- serious disruption outside the works area

It requires the best use of internal resources and may need outside resources in case of offsite severity to handle it effectively. It is therefore, necessary to ensure safety and reliability of the TF operations through a systematic study based on mathematical modeling to identify possible failures and prevent their occurrence before disaster.

2.2 Need for On-site Disaster Management Plan
Risk profile of the proposed BMW TF project is limited to storage and handling of HSD and caustic lye.

All the chemicals are proposed to be stored much below the threshold quantity as mentioned in Schedule III, Part II, Sr. 3 of the MSIHC Rules, 1989 (amended 2000), thus excluding the facility from being classified as a Major Accident Hazard unit. An on-site emergency plan has nevertheless be prepared.

2.3 Disaster Control Philosophy
The principal strategy of Disaster Management Plan is prevention of the identified major hazards. Since these hazards can occur only in the event of loss of the chemicals from its containment, one of the key objectives of technology selection, project engineering, construction, commissioning and operation is “Total and Consistent Quality Assurance”. The project authority is committed to this philosophy right from the conceptual stage of the plan so that the objective of prevention can have ample opportunities to mature and be realized in practice.
The second control strategy adopted for reducing potential emergencies is “Minimization of Operation Inventories of Hazardous Substances” both in process plants as well as in storage within limits of viability of continuous operation.

Another control measure that will be adopted is “Early Detection of any accidental leak and activation of well structured, resourced and rehearsed On-Site Emergency Plan” to intercept the incident with speed and ensure safety of employees, operating plants, public and environment as a matter of priority.

2.4 Vulnerable Units and Zones
The maximum credible accident and consequence analysis carried out needing consideration in the DMP is HSD and Caustic lye storage. General hazard protection systems for hazardous storage are as follows:

- Restricted handling entry
- Spill containing pallet
- PCC/concrete paved surface in the designated storage area

2.5 Emergency Plan
The objective of the emergency plan is to make use of the combined resources of the BMW TF and the outside services to achieve the following:

- Affect the rescue and medical treatment of casualties
- Safeguard TF workers
- Minimize damage to property and the environment
- Initially contain and ultimately bring the incident under control
- Identify the affected
- Provide authoritative information to the news media
- Preserve relevant records and equipments for the subsequent enquiry into the cause and circumstances of emergency

2.5.1 Reporting of Incidents
A. Major Site Incidents
The Site Manager at the TF is required to ensure that TF is devised for action in the event of fire, major site incident or necessity for evacuation procedure. These plans must be communicated to all staff and rehearsed from time to time.
• Firefighting training and the formation of fire-fighting team on a voluntary basis will be encouraged by the Site Management.
• All accidents and dangerous occurrences will be reported immediately to the Site Manager who will implement an established procedure to ensure that an investigation takes places and recommendations are made to prevent recurrence.

B. Reporting of Accidents and Dangerous Occurrences
All accidents in the BMW TF shall be reported in accordance with BMWM Rules, 2016, Form I, under Rules 4(o), 5(i) and 15 (2). Major accident has been defined in the Rules as “accident occurring while handling of bio-medical waste having potential to affect large masses of public and includes toppling of the truck carrying bio-medical waste, accidental release of bio-medical waste in any water body but exclude accidents like needle prick injuries, mercury spills;”. Rule 15 Accident Reporting mentions “(1) In case of any major accident at any institution or facility or any other site while handling bio-medical waste, the authorised person shall intimate immediately to the prescribed authority about such accident and forward a report within twenty-four hours in writing regarding the remedial steps taken in Form I. (2) Information regarding all other accidents and remedial steps taken shall be provided in the annual report in accordance with rule 13 by the occupier.”

Risks associated with exposure of Bio-medical waste have been addressed in a separate and specific RA given in Appendix V Risk Assessment and Disaster Management Plan for Breach of Containment of Bio-medical Waste of Annex IV Compliance to Additional ToRs for EIA.

2.5.2 On-site Emergency Planning
The obligation of an occupier of hazardous chemicals to prepare an on–site emergency plan is stipulated in Rule 13 of the MSIHC Rules, 1989. Section 41B (4) of the Factories Act, 1948 (as amended) also states that every occupier is to draw up an on-site emergency plan with detailed disaster control measures. It is therefore necessary to develop an on-site disaster management plan through a systematic study of the hazard possibilities.

2.5.3 Control Requirement of an On-site Emergency Plan
The Disaster Management Plan will set out the way in which designated people at the site of the incident can initiate supplementary action both inside and outside the works at an appropriate time. An essential element of the plan will be to make safe the affected TF, for example by shutting down. The plan will contain the full sequence of key personnel to be called in from other sections or form off-site.
Management will ascertain that sufficient resources exist at their works to carry out the plan for various assessed incidents in conjunction with preliminary services, for example, sufficient fire extinguishers for firefighting.

### 2.5.4 Alarm and Communication Mechanism

Communication is crucial factor in handling an emergency. As a general practice, all employees will be able to raise an emergency alarm so that the earliest possible action can be taken to control the situation. There will be an adequate number of points from where the alarm can be raised either directly by activating an audible warning or indirectly, viz. a signal or message to the permanently manned location.

### 2.5.5 Control Center

The Emergency Control Center is the place from where the operations to handle the emergency are coordinated. An Emergency Control Center (ECC) will be established and equipped with relevant data and equipment to assist the control center personnel in disaster management. The Emergency Control Center will be manned by Senior Shift Incharge of the TF, and the senior officers of the other services.

Other personnel will not have access to the control center. Emergency Control Center will be sited in an area of minimum risk and preferably close to the main gate to allow for easy access to fire and rescue tenders. Emergency Control Center will contain:

- An adequate number of external and internal telephones / mobile phones
- Public address system
- A few copies of the on-site emergency plan
- Note pads, pens and pencils to record messages received and any instructions for delivery by runners
- Rolls of employees
- Addresses of the employees
- List of key personnel, their addresses and telephone numbers.
- A tape recorder with battery and cassettes on which the incident occurred, actions being taken and progress can be recorded
- Torches, explosimeters, personnel protective equipment, artificial respirators, gas masks, emergency lights etc.
- Two suitable emergency control center sites within power station complex will be:
2.5.6 Roles and Responsibilities (Proposed)
Senior Shift Incharge will take overall control of the works during emergency as CIC/WIC and will operate from Emergency Control Center (ECC).

Respective Unit Incharges will immediately assume specific roles and emergency management responsibilities. The Roles and Responsibilities of the TF personnel can be defined only after the commissioning of the plant.

2.5.7 Emergency Response Facilities (Proposed)
Preliminary facilities envisaged are
- Emergency shutdown procedure
- A fire and emergency alarm system
- Adequate supply of protective clothing and breathing apparatus will be made available to all personnel of emergency team
- On-site first aid and treatment center with round the clock medical attendance

2.5.8 Outline of Key Emergency Actions
The on-site emergency will in all probability commence with a major spill of hazardous chemical like HSD, Sodium hypochlorite, etc. or fire in the HSD inventory. In accordance with the detail on-site emergency plan, the following key personnel will immediately take control of the emergency.
- Emergency Security Controller will commence his role from the main gate office.
- Incident Controller will rush to the scene of emergency.
- Personnel/Administration Incharge

As soon as key emergency personnel will take up positions in their respective locations, the management of the incident will commence with the site main controller performing the lead functions.

At the site of incident, the incident controller will directly handle the emergency with the help of specific support groups.
At the security gate office the Security Incharge and Personnel/Administration Incharge will get in contact with various external agencies as per requirements.

2.5.9 Updating of On-site Plan
On-site plan will be updated based on modifications in the factory or at-least once a year on specific authorization of Site Manager. Record to this effect will be maintained and revisions of Emergency Plan shall be circulated.

2.5.10 Mock Drill for Rehearsing On-site Plan
A mock drill to rehearse on-site plan with a view to train and make the personnel aware of the procedure in case of emergency will be carried out by Site Manager. The drill will be conducted seriously and lessons learnt will be analyzed and corrective actions will be taken. The record of rehearsal will be maintained.

2.5.11 Transport
Vehicles, ambulances and cars available with the TF, will immediately be made available for disaster management. Additional transport based on requirement will be requisitioned.