# GAIL (India) Limited

## Gas Processing Unit, Vijaypur

## Medium Expansion Foam Generator (MEFG) Foam Flooding System for Naphtha Storage

### 1. Background

Company Name : Gail (India) Limited

Industry : Oil and Gas

Location : Vijaipur, Madhya Pradesh

Facility Type : Gas Processing Unit

### 2. Introduction:

Naptha is produced in the LPG Recovery units which is stored in fixed roof storage tanks. Given the high flammability Naptha, Gail, Vijaipur recognized the critical importance of effective fire protection measures to mitigate potential hazards and ensure the safety of our personnel and assets.

### 3. Problem Statement

The existing fire protection system for the Naptha storage dyke area was primarily based on traditional water-based methods, which might not be sufficient to suppress fires involving Naptha. As naphtha being a liquid hydrocarbon, during course of an incident such as spillage, foam application is required so as to cover the surface of the burning liquid and inhibiting its oxygen supply. OISD 116 clause 6.7 and Petroleum Installations T4S Guidelines Part III Sec 4, has also suggested use of Medium expansion foam generators as spill fire protection in Dyke area of Liquid Hydrocarbon storage tank.

### 4. Solution

Medium Expansion Foam Generators with foam tank and inline inductor were identified as an effective solution to address spill fire protection challenges. The foam generated by these systems forms a thick blanket over the burning surface, cutting off the oxygen supply and suppressing the fire.

The installation of Medium Expansion Foam Generators (MEFG) serves several important objectives, primarily centered around fire safety, hazard mitigation, and emergency response. Here are some common objectives for installing MEFG systems:

- Fire Suppression
- Protection of Personnel
- Preventing Fire Spread
- Cooling and Vapor Suppression
- Rapid Response
- Protection of Assets
- Enhanced Safety in High-Risk Environments
- Compliance with Regulations
- Effective Emergency Management
- Reduced Water Usage

## 5. Medium Expansion Foam Generator Calculation

- Dyke Area = 72 M x 40 M = 2880 M2, Height = 1m, Thus volume = 2880m3
- Volume of the tank foundation = 308m3, Thus effective volume of the dyke = 2880-308 = 2572m3
- Capacity of a naphtha tank = 1662.5m3.
- Considering worst case scenario i.e. whole of the product gets spilled into the dyke, thus the level up to which the dike will be filled by product = 1662.5/2572 ~ 0.6m. Thus, foam submergence level = 1-0.6 = 0.4m.
- Thus, the volume to be filled up = 2572×0.4 = 1029 ~ 1030m3
- Consider MX generator of capacity 1200 lpm capacity with an expansion of 1:40, capacity of each generator.
- 1200 x 40 = 48000 lpm = 48 M3/ min.
- Submergence time is the time from start of the system to when the submergence volume is filled up i.e. the top of the pipes are covered with MX foam. Assuming a 10-minute submergence time in our case, the number of MX generators will be:
- 1030 M3/ (48 M3/ min x 10 min) = 2.1 ~ 2 Pourers
- Time of operation considered: 30 min (in line with OISD provisions)

- Total foam solution required: 1200 lpm x 2 x 30 min = 72m3
- Total foam concentrate required 72 x 0.03 = 2.1m3 (if using 3% AFFF)

## 6. Implementation

- 2 Nos. MEFG with necessary specifications was procured through C&P department after taking necessary approvals from HOD(F&S), Finance and the Management.
- 2 foam tanks were fabricated inhouse with the help of mechanical department.
- Spare hose boxes and inline inductors were attached on trailer foam tanks (one on each tank) with the help of mechanical department.
- SOP for operation of the whole foam flooding system constructed was formulated which is as follow :

– Foam trolley will be equipped with a hose box, take one hose and connect it to the nearest Hydrant .

– After connecting it to Hydrant connect its other end to the Inline inductor fixed on foam trolley.

– Take another Hose from the hose box and connect its one end to inline inductor and other end to Foam Generator.

– Now operate the Hydrant to start the foam flooding system.

## 7. Outcome

The installation of Medium Expansion Foam Generators significantly enhanced spill fire protection capabilities at Naptha Storage Tanks. The foam generator system provided an effective and rapid response to potential spill fires, reducing the risk of fire-related incidents, property damage, and harm to personnel.

## 8. Conclusion

The successful implementation of Medium Expansion Foam Generators showcased the importance of proactive fire protection measures in Gail, Vijaipur's dealing with hazardous materials. Gail, Vijaipur decision to upgrade our spill fire protection system highlighted our commitment to safety and risk mitigation, setting a positive example for similar facilities in the industry.