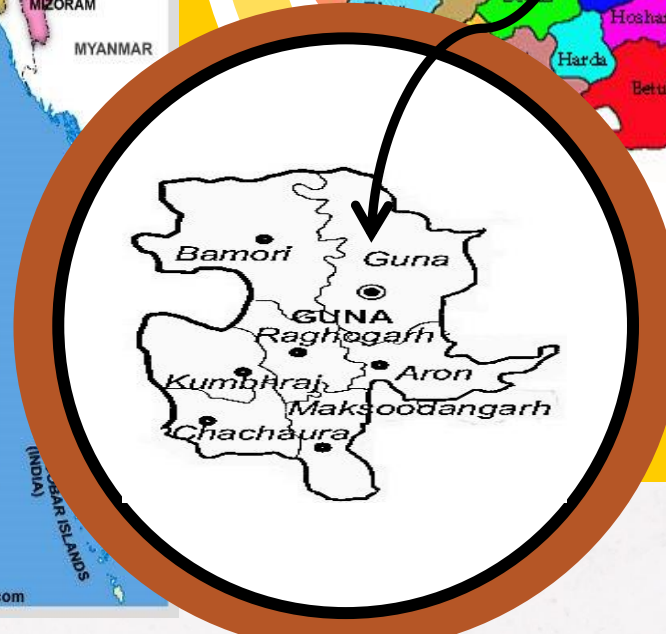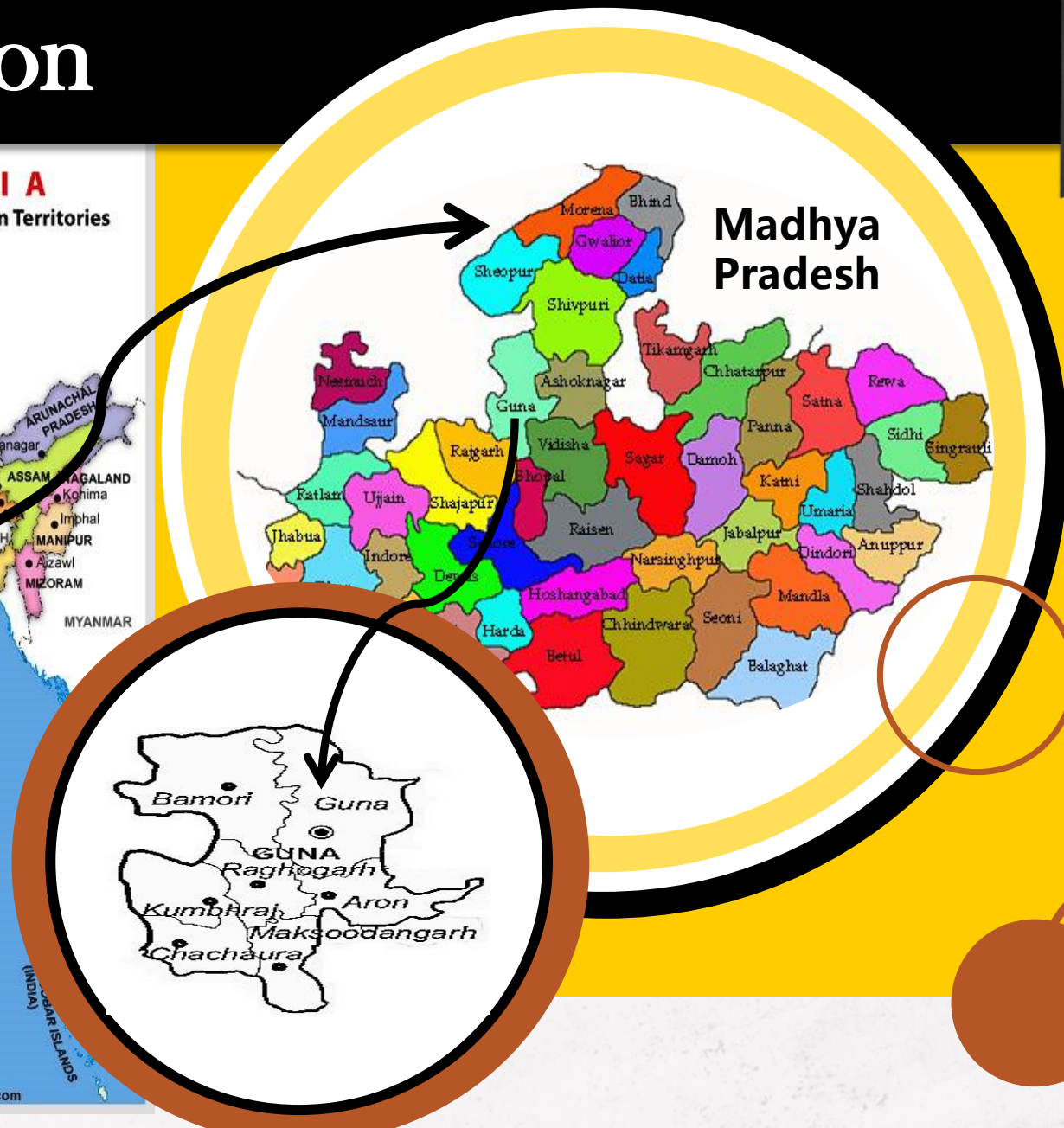Gail (India) Limited, Vijaipur

CASE STUDY

Safety Innovation Award - 2023 organized by Safety & Quality Forum, The Institution of Engineers (India)

MEFG Foam Flooding System for Naptha Storage Dyke Area

Gas Processing unit, GAIL (India) Limited, Vijaipur

2023

Geographical Location

About Gail (India) Ltd. Vijaipur

1. Natural Gas compressor stations

2. Gas Processing (LPG Recovery) Units

3. C2/C3 Recovery Unit

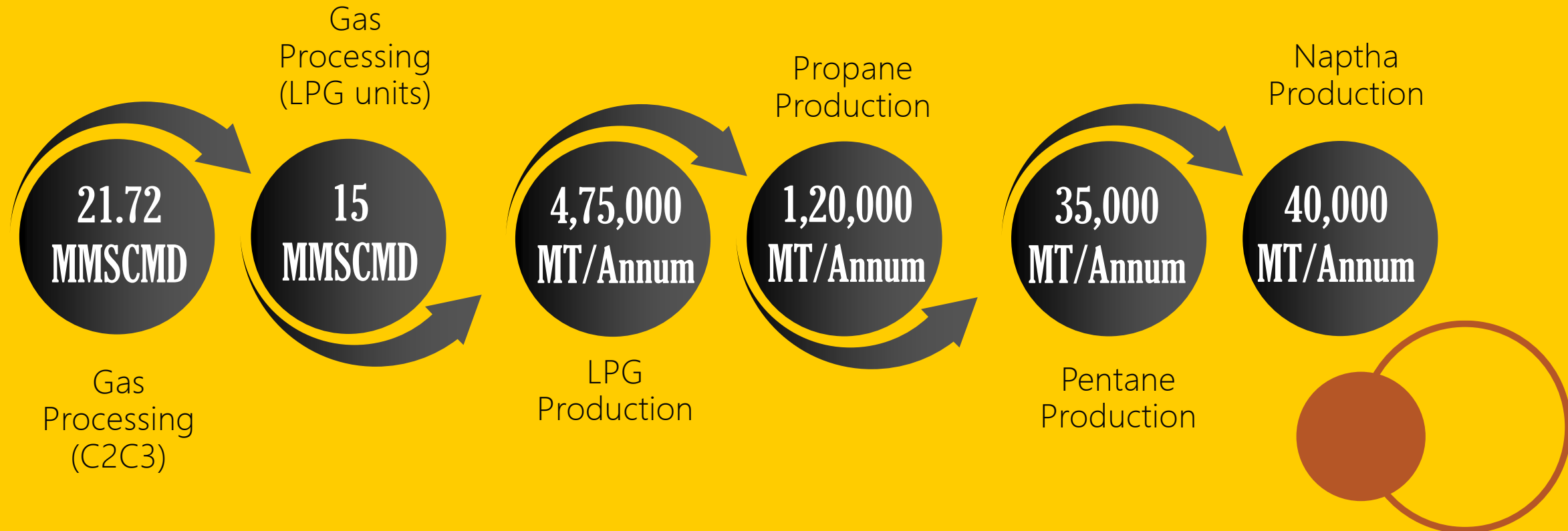4. IOPS & Other Utility Units

Plant Area: 155 ha

Total: 401.63 ha

Capacity of Plants

In GPU (LPG-Recovery) & C2-CC3 Plant Extraction / Recovery LPG/Pentane/Ethane /Propane & Naphtha from Natural gas including onward transmission of Ethane (C2) and Propane (C3) to GAIL Pata through underground pipe line takes place.

Gas Processing (LPG units)

Propane Production

Naptha Production

21.72 MMSCMD

15 MMSCMD

4,75,000 MT/Annum

1,20,000 MT/Annum

35,000 MT/Annum

40,000 MT/Annum

Gas Processing (C2C3)

LPG Production

Pentane Production

Storage Area

LPG — 8 Spheres

Propane — 3 Spheres

C2C3 — 3 Spheres

Naptha — 2 Tanks

Pentane — 5 Bullets

Problem Statement

- Given the high flammability Naptha, Gail, Vijaipur recognized the critical importance of effective fire protection required at the dyke area.
- The existing fire protection system was primarily based on traditional water-based methods.
- OISD 116 clause 6.7 and Petroleum Installations T4S Guidelines Part III Sec 4 suggested use of MEFG.

2*1662 M³
(2 X 1000 MT)

Medium Expansion Foam Generator

Protection of Personnel

Enhanced Safety in High-Risk Environments

Preventing Fire Spread

Fire Suppression

Protection of Assets

Cooling and Vapor Suppression

Rapid Response

- Medium Expansion foam generators are designed to expand foam solution into a stable aggregation of bubbles with discharge expansion ratios from 20:1 up to 200:1
- The foam generated by these systems forms a thick blanket over the burning surface, cutting off the oxygen supply and suppressing the fire.

Solution

Placing MEFG with foam tank and inline inductor
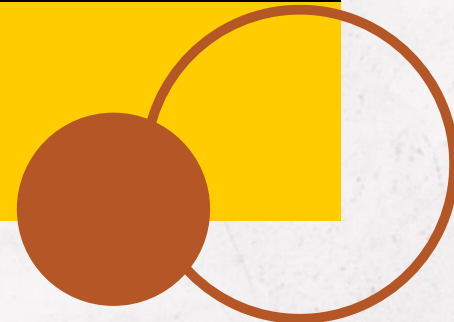
MEFG Calculations

- Dyke Area = 72 M x 40 M = 2880 M2, Height = 1m, Thus volume = 2880m^3

- Volume of the tank foundation = 308m^3, Thus effective volume of the dyke = 2880-308 = 2572m^3

- Capacity of a naphtha tank = 1662.5m^3.

- 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 ~ 1030m^3

- Consider MX generator of capacity 1200 lpm capacity with an expansion of 1:40, capacity of each generator.

- 1200 x 40 = 48000 lpm = 48 M^3/min.
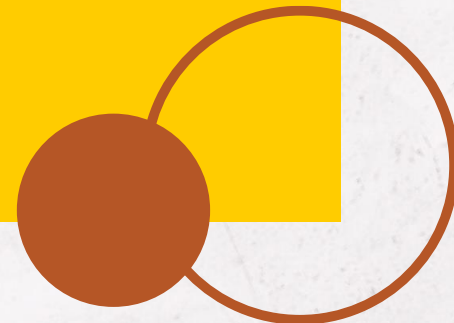
MEFG Calculations

- 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 M^3/ (48 M^3/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 = 72m^3

- Total foam concentrate required 72 x 0.03 = 2.1m^3 (if using 3% AFFF)

Executing the Solution
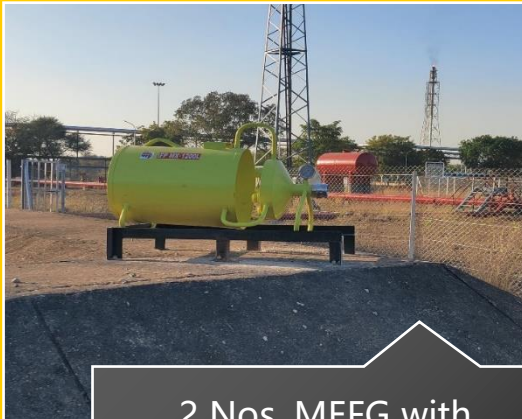
2 Nos. MEFG with necessary specifications was procured through C&P department after taking necessary approvals from competent authorities.

2 spare trolley mounted foam tanks were utilized for foam compound storage.

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.

Standard Operating Procedure

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.

Outcome

Benefits

INTANGIBLE BENIFITS
Hydrocarbon spill fire in Naptha storage dyke area is a huge threat to life and property, this system will help in mitigating the risk and achieving safety.

TANGIBLE BENIFITS
The trailer foam tanks equipped with inline inductors and hose boxes was constructed through inhouse fabrication.
Such equipment's market cost is approx. Rs: 7.5 Lakh each. As a result Rs 15 Lakhs were saved by inhouse construction of the setup instead of procuring it.

THANK YOU