# CHAPTER-2
# BACKGROUND

## 2.1 DESCRIPTION OF THE FACILITY:

At the time of the incident the IOC Sanganer Marketing Terminal had been in operation for almost 12 years, and was spread over a plot area of approx., 120 acres. The plot housed the facilities for the marketing terminal i.e. the 11 storage tanks for SKO, MS and HSD, the truck loading facilities for delivery of these products into truck and product pumping facilities to the neighbouring installations of HPCL and BPCL through pipeline. In addition the plot accommodated the facilities for pipeline division which operated the cross country pipeline, viz. the Koyali Sanganer product pipeline feeding this terminal. The marketing terminal occupied 105 acres and the pipeline division facilities were located in 15 acres in the north east corner of the facility.

The location was chosen at Sanganer as the plot was far away from the then residential localities of Jaipur city and at that time there were no neighbouring industries or factories located within few Kms from the plot boundary at that time. Subsequently a large industrial area was developed by the State Government all around the terminal area.

It was the first automated oil terminal in the country (with storage capacity of slightly over 1 lac KL) and had been doing an annual through put of approximately 11 lac KL. This Terminal was fed by the Koyali – Sanganer Product Pipeline and received products (MS, HSD and SKO) from the Koyali Refinery. The terminal also used to receive and distribute lube oils in drums through trucks

The terminal delivered petroleum products through tank trucks to retail outlets and also supplied lube oil to local market.

The Terminal also supplied petroleum products to the neighbouring terminals of other oil companies. BPCL – Sanganer Terminal is dependent entirely on receipt of products from this IOCL Terminal. Until recently the HPCL Jaipur terminal in Sanganer in close proximity was also solely dependent on supplies from this facility only. After the commissioning of the Mundra- Delhi pipeline (MDPL) , the HPCL's Jaipur terminal at Sanganer has been closed down for operations since the commissioning of HPCL's own pipeline terminal at Bagaru is only 30 Km from Jaipur.

The IOC crude oil pipeline which runs from Mundra to Mathura and Panipat Refineries also passes through this Terminal and a pipeline booster pumping station of the pipeline division was also located and operated within this marketing terminal of IOC. Accordingly, IOC Jaipur facility, in addition to being a marketing terminal also accommodated the critical crude pumping stations to the two major refineries at Mathura and Panipat.

## 2.2 MARKETING TERMINAL:

### 2.2.1 Storage facilities:

The storage facilities originally consists of 9 number of tanks for petroleum products and subsequently 2 Number tanks for MS tanks were added followed by one more tank (not yet commissioned) under pipeline division for receiving the pipeline interface.

Table 2. 1 Overground Tankage details

| S.No. | Material Stored | Nominal capacity (m3) | Nos. | Ht. (m) | Dia (m) | Type | Tank Nos. |
|---|---|---|---|---|---|---|---|
| 1 | Motor spirit | 6,110<br>+<br>8400 | 2<br><br>3 | 15<br><br>15 | 24<br><br>28 | Floating<br>**Roof**<br>**-do-** | 401 A/B/C/<br><br>409A/B |
| 2 | SKO | 5,080 | 3 | 20 | 18 | Cone Roof 2 | 402 A/B/C |
| 3 | HSD | 20,000 | 3 | 20 | 36 | Cone Roof | 403 A/B/C |
| | Total Cap. | 1,10,370 | | | | | |
| | Fire Water | 2,460 | Two | 18 | 14 | Cone Roof | T-401 A/B |
| | Total: | 4920 | | | | | |

In addition to the above, there are 5 nos. of underground tanks, each of 70KL capacity for storage of Petroleum product and Anhydrous alcohol

Tanks of each product were grouped together in independent dykes. The capacity of the dykes as per statues and such as to hold the volumes of the largest tank within the dyke in case of leak from a tank.

Each tank had facilities of three modes of operations i.e. pipeline receipt, inter tank transfer and despatch (through tank lorries and pipeline). The facility was designed in a way that at one time, only one mode of despatch will be carried out i.e. either tank lorry or pipeline transfer. Each mode of operation was achieved by positive isolation of the tank,

from other operation modes, using two isolation valves (gate type) and a blind in between them. The first isolation valve on the tank was provided as a motor operated gate valve (MOV) and the second one (Line Valve) is a hand operated gate valve (HOV) with a Hammer Blind Valve between the MOV and HOV (See **Appendix-2** for Hammer Blind Valve drawing).

As per the original design feature, the Motor Operated Valve (which moves because of the action of a motor) can be operated either remotely from the control room for closing the valve or locally by the operation of push button's. There are three push buttons, one for opening the valve when it is pushed, the other for closing the valve when it is pushed and the third for Pausing the movement when it is pushed (stopping the valve movement). The valve can also be operated by means of a hand wheel just like any other hand operated valve. The valve was to close automatically in case of power failure as per original design feature.

At the time of the incident, and for the past several years, the facility of remote closing of the valve from control room and automatic closure of the valve on power failure has not been operational (as reported in interviews this facility has been made defunct since 2003).

The Hammer Blind Valve drawing is shown in Appendix-2. As can be seen from the drawing, there is a hollow wedge (open eye) and a solid wedge (solid eye) to be used, depending on whether one wants to block the line or make the line through for flow. When the Hammer Blind is being reversed from open to close or vice versa, there is a time when both wedges are pulled out of the valve's body and the pipeline in effect is open to atmosphere. The design of the valve is such that in a 10" pipeline a Hammer Blind opening to the atmosphere when both wedges are out, will be fairly large, approximately measuring 12"x 6".

The blind provided at the terminal between two isolated valves is a hammer – blind type valve which most likely was chosen on account of ease of operations enabling rapid opening and closing. The piping and instrumentation provided for each tank (**refer P&ID in Figure 1**) is similar for all the tanks.

### 2.2.2 Other Associated Facilities:

#### 2.2.2.1 Pump House

The pump house accommodates 9 pumps, three number dedicated for each products i.e. (MS, HSD and SKO). These pumps are general electric driven centrifugal type.

#### 2.2.2.2 Truck Loading Facility (TLF):

The thirty numbers loading gantries are provided for truck loading of MS, SKO and HSD. These consisted of 30 loading bays with 33 loading points.

#### 2.2.2.3 Exchange Pit:

For pipeline transfers at the south battery limit, an exchange pit is provided consisting of 2 number isolation valves (HOV) again with a hammer blind type valve for positive isolation, on each of the product transfer pipelines.

#### 2.2.2.4 Control Room:

The control room consisted of digital screens and other instruments including emergency shut down provision for the entire installation.

## 2.3 BUSINESS COMMUNITY CENTRE (BCC)

This terminal also had the Business Community Centre (BCC), which housed the back up for the corporate ERP system. BCC was provided with a DG set to provide necessary power back up, which was designed to start on auto mode in case of power failure in BCC.

The corporate ERP was based on the system by SAP. The terminal was equipped with a Tank Farm Management System (TFMS) which covered tank gauging (mechanical float system), tank lorry filling operations and gate entry records for lorries. However this TFMS was not integrated with corporate ERP system (SAP) due to which the data on tank dips needed to be entered manually (daily once in the morning).

## 2.4 FIRE PROTECTION SYSTEM

The fire water system for marketing division comprised of two number fire water tanks, three number main pumps (diesel operated), two number jockey pumps (diesel operated) fire water network, foam shed and spray rings around the tanks (MS & Diesel) for cooling purpose in case of adjoining product tank fire. The fire water system was adequate to provide primary protection for four hours, as stipulated in the OISD standard.

The fire water system for pipeline division comprised of one fire water tank, two main pumps (diesel operated), fire water network etc.

Both the fire water systems were interconnected including the fire water tanks.

## 2.5 SAFETY SYSTEM

The safeguards provided in the design for the storage and despatch systems for the facility are indicated in Table 2.1 below:

**Table 2.1 Control Room Safety Feature**

| Location | Interlock/Hardware | Corrective Action | Status prior to accident |
|---|---|---|---|
| Tanks | High High Level | Closes Motor operated valves at inlet and outlet of tanks | **Status post 2003 not known at the time of incident |
| | Low low level | Trips connected pumps to avoid pump damage | --do-- |
| | Motor operated valve | Can be closed/started from Control Room as well as locally | **Defunct since Many years earlier |
| | Hand operated Valve | Position is entered in control room based on inputs from field operator | Not known |
| Pump House | Emergency push buttons | Shut down the pumps in the event of an emergency | **Reportedly Functioning” |

As per original design, safety facilities were provided in the control room included: auto shut off switch which put off the entire system as well as can make the electrical isolation of the terminal in case of emergency. These were found functional during first OISD External Safety Audit (ESA) in August 1997 and second ESA in October 2003.

All the interlock and safety systems sometime after October 2003 were disconnected and were defunct. No records or information thereof were

available at the site. The site management were not aware of the safety features in the control room as seen during their interviews.

Only emergency shut down push buttons for shutting down TLF Pumps were reportedly functional prior to the incident.

## 2.6 DRAINAGE SYSTEM

The drainage facility of the tank farms was designed to channel any leaks from valves, flanges, instruments connection, vents and drains, as well as rain water to a pit (sand trap) located in tank bund area. After going through the sand trap the drained material can be diverted either to an oily water soil or to the stormed water channel through diverter valves provided outside the dykes. In normal operation both the valves are to be kept shut.

The overall plant layout is shown in **Figure.2.** The storm water system is shown in **Figure 3.**

## 2.7 ENTRY / EXITS

The Terminal facility was provided with three gates, two on the south west side and one on the north east side. Entry, however, was only through a single gate, south west. The second south west gate is kept locked and the north east gate (emergency gate) was walled up.

## 2.8 EFFLUENT TREATMENT FACILITY

Oily waste water from pump house area and tankage area is routed via a close system to a RCC sump in the ETP area. It is then pumped by effluent feed pumps to the inlet of Tilted Plate Interceptors, wherein the

free oil droplets are intercepted and form a floating layer of oil, which is skimmed through rotatable skim pipes. The de-oiled water flows over adjustable where sockets in the effluent chamber and sent to the effluent pit for disposal via the storm water channel, while oil is routed to an underground drum, from where it is periodically loaded via a submerged pump into a truck for outside sale.

Contaminated rain water flows through a storm water sewer network, which comprises a number of open drains. Initially, the water is sent to ETP and after visual check do not indicate the presence of oil, it is diverted to the storm water channel for discharge outside the plant.

## 2.9 PERSONNEL

The Jaipur Terminal worked under the overall guidance of the General Manager, Rajasthan State Office. The organogram showing the positions and the levels of personnel connected with the Jaipur terminal also indicating the role and responsibility is attached as **Appendix 3**. The Terminal is headed by a Senior Terminal Manager (STM), who reports to the Chief Operations Manager, Rajasthan State Office (RSO). The Senior Manager (Terminal) who is also in the same job group as the Senior Terminal Manager reports to the Senior Terminal Manager. Apart from this there are 10 other officers with different responsibilities and 24 blue collar workers and 4 clerical staff.

The terminal operated on 3 shifts for the terminal operation with the timings 6.00 am to 2.00 pm, 2.00 pm to 10.00 pm and 10.00 pm 6.00 am, TLF (Truck Loading Facility operation was restricted to the morning general shift operation i.e. from 8.00 am. To 5.00 pm. The three shift operations were manned by one officer and three operators in each shift. The control room was supposed to be manned but there was no

dedicated person and, occasionally, when all the four people were out in the field for different jobs, it remained unmanned.

## 2.10 PIPELINE DIVISION

### 2.10.1 Control Room:

A separate control room for pipeline division housed SCADA panel along with the tank details which used to indicate all tank levels from the TFMS.

### 2.10.2 Storage facilities:

The pipeline division was close to commissioning a new tank (12$^{th}$ tank in the terminal) newly constructed for storing pipeline inters face products.

### 2.10.3 Pumping facilities:

The booster pumping station for crude oil consisting of two diesel driven pumps was located in a pump house.

## 2.11 CORPORATE SET UP

The IOC corporate Operations function organogram as received from IOCL is attached as **Appendix. 4**.

## 2.12 MAJOR FIRE INCIDENTS

A list of major fire incidents for the period 1991 -2009 in the oil sector in the country is attached as **Appendix. 5.**