# CHAPTER 8
# REVIEW OF SAFETY MANAGEMENT SYSTEM

## 8.1 SAFETY POLICY

The company has a well formulated safety policy which reads as under:

"Indian Oil Corporation is committed to conduct business with strong environment conscience ensuring sustainable development, safe workplaces and enrichment of quality of life of employees, customers and the community. We, at Indian Oil, believe that good S, H & E performance is an integral part of efficient and profitable business management. We shall:

- establish and maintain good standards for safety of the people, the processes and the assets

- comply with all Rules and Regulations on Safety, Occupational Health and Environment Protection

- Plan, design, operate and maintain all facilities, processes and procedures to secure sustained Safety, Health and Environment Protection

- Remain trained, equipped and ready for effective and prompt response to accidents and emergencies

- Welcome audit or our S, H & E conduct by external body so that stakeholder confidence is safeguarded

- Adopt and promote industry best practices to avert accidents and improve our S,H & E performance

- Remain committed to be a leader in Safety, Occupational Health and Environment Protection through continuing improvement

- Make efforts to preserve ecological balance and heritage".

However, the Committee did not find any evidence of display of the safety policy within the site premises. On questioning on some of the supervisory staff, none of them could recount any of the tenets contained in the safety policy.

## 8.2 OISD STANDARDS

The Committee reviewed all applicable OISD Standards, Guidance Notes and Recommended Practice. Though all Marketing Installations were observed to use Hammer Blind Valves (IOC Jaipur had almost 30 valves), but no mention of Hammer Blind is available in the standards on their Installations, their Operating Practice and Maintenance/Inspection. Probably, Industry so far neither had any Risk Perception on it nor any reported case of failure or leakages so far any where in the Marketing terminals & Refineries (in case they are also using).

## 8.3 EXTERNAL SAFETY AUDIT

1. A pre-commissioning safety audit of Jaipur IOC Terminal was conducted by OISD as per established procedure in 1995.

2. A post commissioning full safety audit (the first one) was carried out by OISD in August 1997. The Safety Audit Team after audit noted the systems provided in the control room of the terminal and made following observations:

a. "ensures very high level of security and safety for the terminal"
b. "gives on-the-spot picture of the various operational activities"
c. "provides auto shut off switch which puts off the entire system as well as can make the electrical isolation of the terminal in case of emergency which can be spotted on fire alarm panel stationed inside the control room".

3. A second external safety audit by OISD was carried out in October 2003. The audit team noted that the terminal has been honoured (by Ministry of Labour with national Safety Award consecutively for the last three years) and also that it was recognised as "Best All India M&I Terminal". The audit team, however, made some specific recommendations, and most important of which stated that "***considering extensive facilities over a large area, it requires very close and continuous supervision and maintenance functions need to be further strengthened"***. ***The audit had also pointed out that five MOVs were found defective and cabling of MOVs needed rectification"***. The audit team's observations including the above one were communicated by OISD to IOCL at highest level in 2003.

4. After 2003 there was no external safety audit done for the marketing location

5. The OISD external safety audit of Pipelines Division in Sanganer station location was separately carried out in February 2001 and in April 2006. In the 2006 safety audit the lack of adequate training for fire fighting activities in the location was brought out.

## 8.4 INTERNAL SAFETY AUDIT

1. The Terminal was also subjected to periodic Multi Disciplinary Audit (MDA) by IOC's in-house experts. Though a number of such audits appear to have taken place at regular intervals, only the last MDA report of last audit carried out in February 2009 was made available to the investigating team (This report indicated that earlier MDA was conducted in December 2007). However, this audit report format at various places was too general and did not focus on the most critically important areas, viz, operation, fire fighting & safety, emergency and disaster management etc. Further, it appears the audit was done in a very ritualistic manner as neither the documents and procedures related to operation were adequately examined nor were field interviews conducted. To give an example under Sl.No.1.2 Procedures under Para (a) under point 'operation', the audit team noted that "the operating procedures are well defined and manuals are available and accessible plant/facility-wise". However, in actual practice "Standard Operating Procedures" (SOP) for specific operations which is a foremost requirement for safe operation of such hazardous facilities, did not exist. Further, operating manual referred to in audit report, was very general, which had been prepared by the consultant (EIL) during Project handover. On completion of the project, such documents provide only guidelines to senior operating personnel based on which specific "Standard Operating Procedures (SOP)" need to be developed "which it appears was not done". Similarly, in the same para while the audit team noted that "fire fighting and safety procedures" are well defined it did not observe that any trained fire fighting personnel are available in the terminal round the clock, nor that any specific training had been imparted to Security staff (who all are ex-service men capable of being trained) to make them competent to act as first responders during fire or any such emergency event. The audit team also observed that

"emergency and disaster management plan" are well defined but failed to indicate that this plan does not consider a major MS leak resulting in a large vapour cloud and the measures needed to deal with it. This very important aspect was surprisingly overlooked inspite of the fact that the audit was done by experts in February 2009 over three years after a major Vapour Cloud Explosion (VCE), very similar to what happened in Jaipur, occurred in Buncefield Petroleum Product Terminal near Heathrow Airport in U.K.

Multi Disciplinary Audit (MDA) was observed to be based on tick mark basis on a preformatted check list.

2. Neither the OISD audits, nor the MDA made any observations on the operating risks of Hammer Blind valve. Perhaps this was because there had been no reported case of leak or failure so far either from Marketing terminals or Refineries, where these are being used since long for positive isolation for quality control. It would be pertinent to note that OISD audit in 2003 pointed out that "defective MOV cabling needs rectification". Had this been done the "Loss of containment" could have been mitigated to "a very large extent.

   During the mock drills conducted in the installation the aspect of full emergency shut down of the system was not included as a part of mock drill.

   Audit was also silent on the adequacy of the Plant drainage system, tank dyke operations/maintenance and tank earthing protection system. They have made no mention of the appropriateness of operations training, or about the safety perceptions/attitude and the alertness of the operating staff. The audits were also silent about the absence of site specific Standard Operating Procedures (SOPs) in the installation. The Committee

was told that safety meetings were regularly held among the appropriate team members and were being recorded for necessary dissemination of communication and follow up on the pending items. However, none of these could be shown to the Committee as it was mentioned by IOC that these were destroyed by the fire/explosion. No clarifications were forthcoming on the circulation list of the minutes of these meetings. (State office also could not show us any records of safety meetings available).

## 8.5 HAZOP AND SAFETY STUDIES

- As per the information given to the Committee by IOC, only one Hazop study has been done on the installation. The Hazop study booklet handed over to the committee does not indicate who or which agency has done the study and when (the date) of the study was done.
- The report though titled “HAZOP Study” does not include any “Hazop work” but contains “Consequence Analysis
- Internal safety audit report of February 2009 gave a positive indication of almost all the aspects listed in the audit check list. The audit did not show any major shortcomings in the systems, procedures or practices though post incident the investigation now points towards these deficiencies.
- The Committee did not receive any evidence showing that a Job Safety Analysis of the Hammer Blind Operation had been done in the past.
- No standard operating procedures were available specific to the terminal. In response to our queries, the Committee was informed that they follow procedures from past practice only.
- Safety audit done internally apparently has no record of Hammer Blind operation, drainage system, its maintenance and operation. Also, the audit study does not cover tankage and earthing connections.

## 8.6 EMERGENCY / DISASTER MANAGEMENT PLAN

The Disaster Management Plan (DMP) booklet which is also undated appears to be generalised and not specific to the site. A lot of general items are mentioned not specific to the site, e.g. references to railway siding which is not there, hoses for loading and unloading when there is not even an unloading operation, LPG carousels, FO/LDO etc. The DMP also does not have any page numbers.

The Committee was surprised to read the comments in the DMP which reads as under:

"The long term view could be to slowly shift away the depot to a safer location well away from the city centre to avoid the hazard due to operations, roads/rail tanker movement etc., in such dense populated areas."

1. The primary purpose of Emergency/Disaster Management Plan (DMP) is to conceive all possible/credible incident scenarios and stipulate the required mitigating measures. The present DMP prepared for Jaipur oil terminal, submitted to investigation team substantially falls short of this objective. Among the credible incident scenarios a major loss of containment of MS inside tank farm area as well as the possibility of spread of MS either through open storm water drain or through a channel has not been considered. Accordingly, no mitigation measures were specified in the DMP, which, if done, and fire responders adequately trained would have in all likelihood either prevent it or greatly mitigate it the present accident.

2. Most important fact to be borne in mind is that volatile petroleum products such as MS will form substantial amount of vapour if it is allowed to leak for considerable amount of time, and further if the leak is allowed to

spread beyond dyke to a larger area. The vaporisation rate in the present case was faster as the MS pool resulting from loss of containment was not confined to the dyke but spread on a much larger area of the Terminal Plot through open storm water drains. Further high pressure vertical jet emanating from Hammer Blind lead to a higher rate of evaporation. This clearly shows that the Emergency Disaster Management Plans in future should take into account a possibility of vapour cloud formation leading to an explosion.

## 8.7 COMMUNICATIONS

The shift log entry system should clearly communicate to the next shift control officer, the operational and maintenance status of the terminal in a comprehensive and fool proof manner. In shift log books, the position of the important items, valves, pumps etc., if different from the earlier shift, should be clearly noted so that following Shift Officer gets clear understanding.

VHF handsets were available in shifts only with the officer and not with the operators. However, the electrical contractor's man responsible for DG set and fire water pump operations had one set, while another handset was with the Security at main gate and the third one was with the Pipeline gate Security staff. In order to ensure effective and continuous communication amongst all operating personnel, individual hand sets should have been provided to all the operators.

Though other sets were available at the terminal, they remained in the control room in the evening shift but were not used by the operators. If communication was there with all the operators the following would have most likely happened:

a) A.B. Gupta could have found out KR Meena's location and called him;
b) R N Meena could have disclosed his problem and actions;
c) A.B. Gupta would have been able to ask his operators to locate the BPCL officer and thereby he need not leave his supervision at site.

## 8.8 TRAINING OF OPERATORS AND OFFICERS / MANAGERS RESPONSIBLE FOR TERMINAL

From the records available it appears that:

- Safety training was not compulsory for everyone.
- Proceedings of Safety Committee meetings in the Terminal were not circulated widely to State office.
- A minimum training requirement per year per person was not visible (training records prior to 2002-03 not available).
- RN Meena had only one day safety training and KR Meena had attended two training programs - one on health care, other on customer relationship (no training on PLT operation or related safety)
- Performance appraisal – no operator has contributed any suggestions for any improvement
- Some operators had no training even for three years
- Due to company transfers there were far too many officers with insufficient length of experience in the Jaipur terminal.
- Qualifications not matching in many cases with job requirements e.g. maintenance being looked after by Managers with B.Com qualification and with no experience in maintenance function & M.A. in Public Administration being in-charge of safety
- Most operators had not even finished school level education and had no technical or science based qualifications.

- Vital activities of operating Firefighting System, electrical/instrumentation maintenance of Safety systems were entrusted to Contractors of inadequate expertise/experience/manpower.
- OISD has been active in conducting yearly workshops/symposiums regularly and has in these programmes covered the lessons learnt from various incidents around the world such as BP Texas, Buncefield (U.K.) and other major fire incidents within the country. These programs are widely attended by officers across the industry, at different levels and are meant to disseminate this information in the ranks and file in the respective organizations. However from the information gathered, even the senior level personnel in the Terminal and State office did not show familiarity with even the one large similar incident of 2005 in Buncefield, UK. There was no evidence of company having taken steps to disseminate such information from the OISD sessions widely within the organization.

- An established procedure to check safety competence of senior managers in running hazardous facility such as oil terminal either does not exist or if exists is ineffective.

## 8.9 MANAGEMENT OF CHANGE (MOC)

It was observed that safety shut down system envisaging closure of all Motor Operated Valves (MOV) at the inlet and outlet, immediate to the tanks was provided in design and installation but had been decommissioned, a few years ago, probably after 2003, due to some operational issues. The exact timing of the above is not known to the current operating officers of Jaipur and no records could be traced even from the State/Head Office. Such critical emergency shut down system from the original design and installation, when **removed,** should have followed the Management of Change procedure, as per OISD GDN 178

going through the full analysis and various approvals of the appropriate authorities. This aspect has been an important component of any safety management system ever since the Flixborough accident in UK in 1974.

## 8.10 PERFORMANCE EVALUATION

The Performance Evaluation System for Group D, E, F Managers which includes Terminal in charges (Sr. Terminal Managers) has identified 17 Key Result Areas, which by the sheer number, does not provide for a focused approach. Safety is one of the 17 parameters and 5% of weight age. In the performance criteria the overall evaluation carries 60% weight age, which means safety carries only 3% of weight-age from overall evaluation.

## 8.11 MANPOWER

Jaipur Installation had a manpower of 12 officers including Installation Manager, 24 Blue Collar Workers (BCWs) and 4 White Collar Workers (WCWs). Though the Committee was informed that the Control Room of the facilities was manned, there was no dedicated manning with clear roles and responsibilities. Shift operations were supposed to be manned by one officer and 3 BCWs. It appeared that persons would sit in the control room as and when available. With 24 BCWs and observing that the shift people had frequent Over Time, it was felt that out of 24 people, more people were probably would have been on General Shift operations for tank truck loading. With 3 BCWs on relieving duty, it comes to a minimum requirement of 12 persons out of 24. It was observed that one of the deceased men, Mr. K.R. Meena, was on Over Time from the 1st shift to the second shift and this was happening over the last 3 days. Similarly, it was observed that Mr. K.N. Agarwal, who came on duty for the

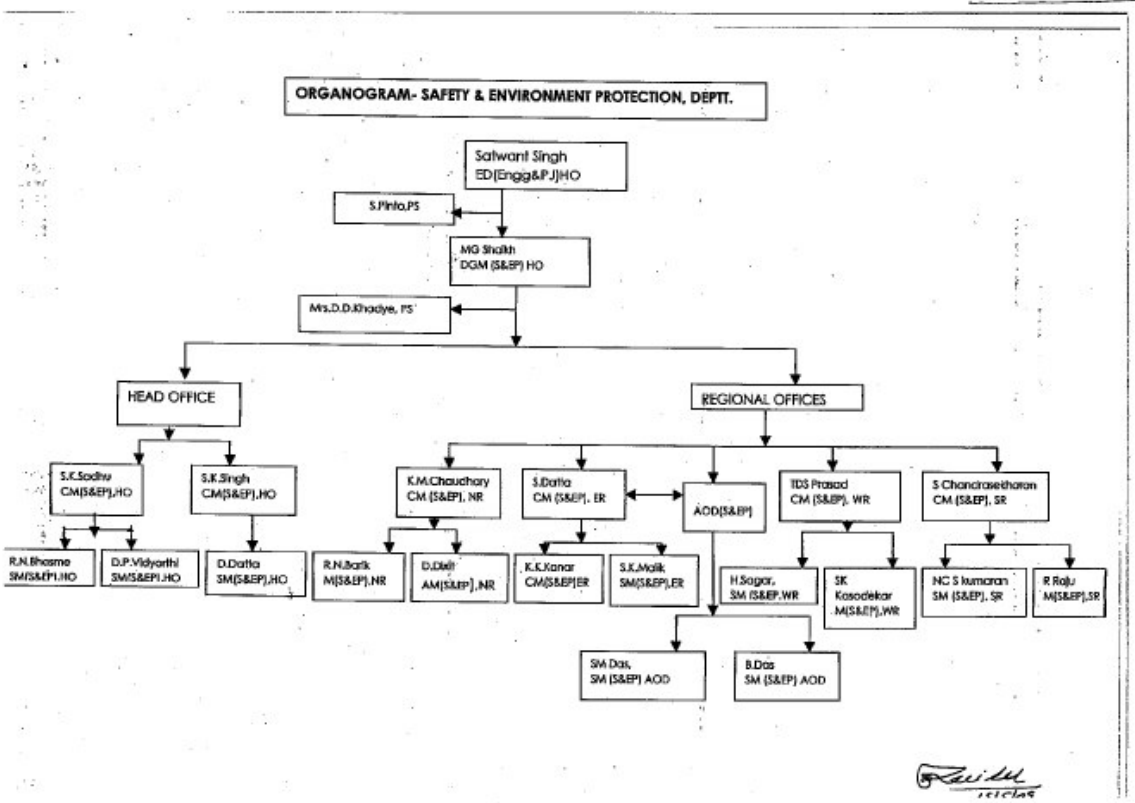
2nd shift, though on relieving duty, went home to perform puja without appropriate permission, although he had been advised to stay on at the plant in view of two PLT operations planned in the evening. Mr. K.N Agarwal was also supposed to be on overtime in the third shift.

## 8.12 TRANSFER POLICY

It was also observed that too many transfers and new placements had taken place in the year 2009 and some of the placements were done with persons who had no appropriate background (for e.g. one person with a B.A. qualification was placed in Maintenance Management). It was also observed that while placing people on the job, there was no certification system in vogue specifically for the technical jobs**.**

## 8.13 SAFETY ORGANOGRAM (Marketing Division}

ANNEXURE – A



## 8.14 COORDINATION BETWEEN MARKETING AND PIPELINE DIVISION

Based on the different interviews and people's specified different timings, it could be deduced that Chief Operations Manager (Pipeline), was leaving at around 6.15 p.m., from his Pipeline Division which is situated at the corner of the Marketing Installation of IOC, Jaipur, at the time when the leakage/commotion took place. It was mentioned in the statement that the Chief Manager had done several communications to various levels like security, his officers at the pipeline control room and Sr. Terminal Manager (Marketing). There is no information that he did a turn around and got back to the job which may be due to several reasons like not being aware of the complications of the tankage operations. It is felt by the team that generally, two departmental set-ups such as Marketing group and pipeline group generally operate on Silo rather than having the corporate functional attitude and it is a suggestion that for reducing this type of attitude and behaviour, the organization should be looking at how to make a better interface of these groups while working in a single location/cluster e.g. there could have been a common control room for both Marketing and Pipeline divisions rather than at 2 different corners in the same installation.

## 8.15 OIL ACCOUNTING PROCEDURE

It was observed that Oil Accounting Procedure was not fool proof. In the Jaipur Installation, the tanks were provided with mechanical float gauge having local indication and also connected to the control room operating monitor console, through TFMS (Tank Farm Management System), displaying tank dips every 15 minutes (as mentioned by IOC). Tank dips also get duplicated at pipeline control room at every 1 minute. We could not lay our hands on both the hard disks of the operating console, to analyze the actual situation (pipeline's hard disk was retrieved on

24/12/2009 and it is in police custody). The SAP ERP system was not directly connected with TFMS to have the Real Time data visibility. Daily, data used to get uploaded into SAP manually, every morning, by the Marketing Installation and as well as by the Pipeline division. There is observed to be a discrepancy between these two sets of data and more so, when the tank was in custody at pipeline, marketing installation used to maintain a constant dip though the tank used to be operating and dips are changing.

It is observed through the collected log book that they had a system of planning dip checks almost once in the month and used to record the Drift (the variation between TFMS and physical verification data) which used to be generally 1mm to 2mm, except on some occasional case, where Tanks 409 A/B had shown even 10 mm variation (this is based on last 3 sets of data observed).

On various queries about the stock loss daily reconciliation and their actual over the month, the Committee got contradictory data. Sr. Terminal Manager denied that any abnormality was ever observed. However, the Committee found on subsequent discussions with Chief Operations Manager, State Office, that there was a stock loss audit on 18/7/09 and it was observed then, that there were losses of MS, in the month of June and July 2009. Not satisfied with the explanations given by the STM, the Chief Operations Manager had directed that a second audit be done to establish the factual position regarding the losses.

The Committee during the process of interviewing the Chief Operations Manager was handed over a copy of a note (**Appendix 12**) in which the GM (RSO) had said that the check must be further carried out.

The team noted that the tank farm management data did not automatically updated in the SAP System and had to be done manually. Therefore, there was always a possibility that the data could have been adjusted.

## 8.16 TANK INVENTORY

After pilferage case initiated by the CBI, management should have taken corrective measures through online tank level monitoring (possible by installing radar gauges) and integrated the same with SAP. This can help in detection of pilferages/deviations if it happens. It is suggested that a core group should be formed to study this aspect in detail.