SAFETY ALERT

OISD/SA/2020-21/POL/02 Dt.17.02.2021

INTRODUCTION:-

Incident Title: Motor Spirit (MS) spillage from Tank
Location: POL Terminal
Date & Time: 23.08.20 at about 10:50 hrs.
Loss/Outcome: 75.02 KL MS loss (46.86 lakhs). No injury, fatality, or fire.

INCIDENT DETAIL:-

- The incident happened when Double Block and Bleed Valve (DBBV) was being fitted as the second valve in the new 16" diameter delivery line of MS tank T-18, containing 1607 KL of product, and its Remote operated shut-off valve (ROSOV), fitted earlier as tank body valve, got opened inadvertently.
- Earlier during the tank outage, this new delivery nozzle was fabricated on 20.03.20. The location only installed Remote operated shut-off valve (ROSOV) then as a body valve and temporarily blanked spool piece after ROSOV with blind flange for future installation of DBBV.
- The location re-commissioned the tank on 04.07.20 due to operational exigency and continued using the old delivery line. Air connection was given to this pneumatically operated ROSOV on 10.07.20.
- One manually operated isolation (ball) valve was installed in this airline near the ROSOV and kept closed. The electrical connection required for energizing the solenoid valve was not given.
- On 23.08.20, the blind flange was removed at about 09:50 hrs. ROSOV was found closed and there were no traces of product in the spool piece.
- However, during the erection job of DBBV, at about 10:50 hrs, the ROSOV got opened inadvertently.
- The product inside the Tank gushed out, spilling inside the dyke enclosure and into the TLF Pumphouse manifold area through the open delivery line laid axially with the spool piece of ROSOV.
- The leakage was stopped at about 11:04 hrs by de-pressurizing the air receiver unit of ROSOV.
- Within 14 minutes, 356.1 KL of MS spilled from the Tank. 281.08 KL MS was salvaged thereafter, resulting in a product loss of 75.02 KL (46.86 lakhs). There was no injury, fatality, or fire.

MAJOR INCIDENT OBSERVATIONS:-

- The blind flange of the spool piece connected to ROSOV was opened to fit the DBBV despite the level of the product inside the Tank was 632.2 cm (1607 KL).
- The regular Project Engineer was not available and the job was executed by an Operations Officer on a make-shift basis.
- The DBBV erection job was being carried out without the direct supervision of the company official.
- DBBV was not fitted during the ROSOV erection job even though valves were available at the site. There was a five-month time gap between fabricating delivery nozzle on Tank & fitting ROSOV, giving airline connection to ROSOV and fixing DBBV.

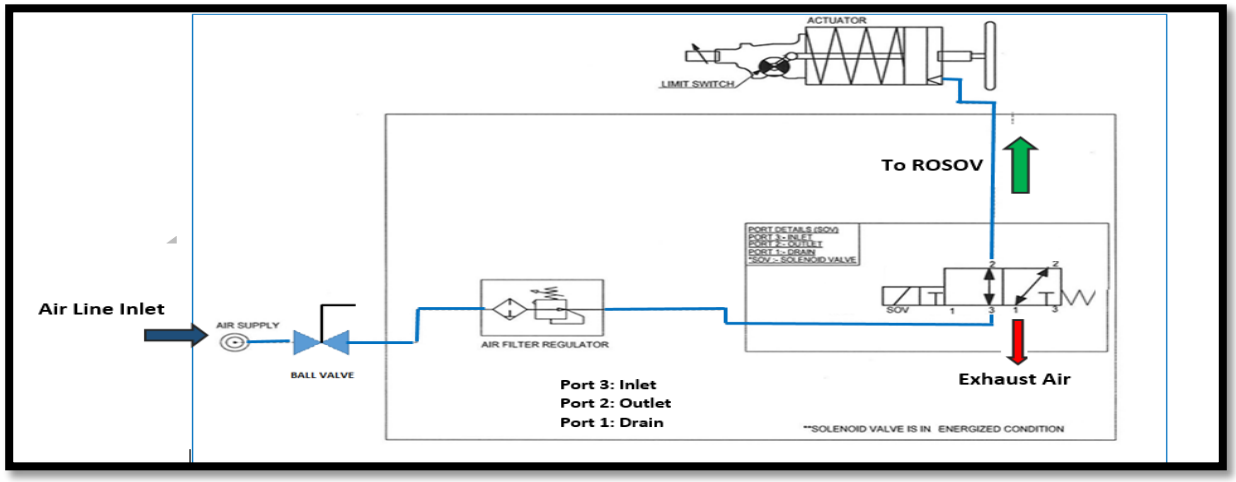
- The installation and air connection jobs of ROSOV were done in the absence of an Original Equipment Manufacturer (OEM) representative.

- ***ROSOV was not pneumatically isolated.***

- When the isolation (ball) valve in its air supply line was accidentally opened, ROSOV opened leading to spillage from the Tank.
- Closed-circuit television (CCTV) footage could not identify how this manually operated isolation (ball) valve got accidentally opened.
- The job description in the work permit did not cover the specific job of fixing the DBBV in MS Tank T-18. The spillage of product from the Tank, if ROSOV gets opened due to accidental operation of the airline valve, was not assessed during the preparation of Job Safety Analysis (JSA).
- Though the majority of the product was contained within the dyke, some product spilled outside the dyke through the delivery line section (Fig. 1), laid on the downstream of ROSOV axially in line to the spool piece. The flange joints of this pipeline were loosely fitted leading to the product leak inside the TLF Pumphouse manifold area.
- The 281.08 KL of total 356.1 KL MS (79%) was salvaged using gully suckers & hydro-jet pumps. The product was pumped back to tanks in a safe manner by blanketing spilled product with foam continuously. The salvaging operation was completed the next day on 24.08.20 at around 15:00 hrs.

INVESTIGATION OF ROSOV FAILURE:-

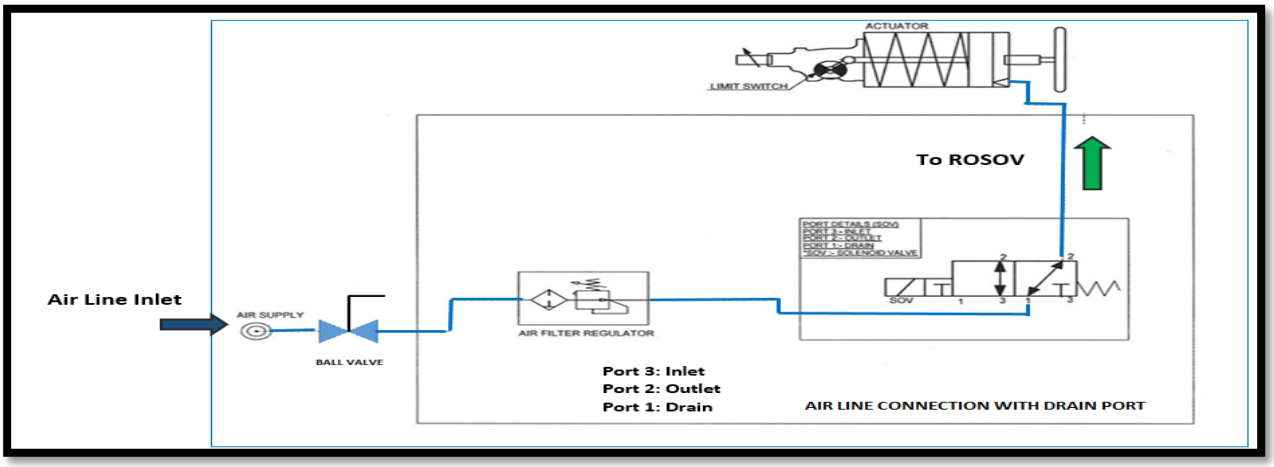
- The schematic layout of the single solenoid valve type ROSOV is shown in Fig. 2. The figure shows the solenoid valve (having three ports) in the energized state.



(Fig. 2: Correct connection of energized solenoid valve)

- The airline is connected to port 3 (inlet) of the solenoid valve through the Air Filter Regulator (AFR). When the solenoid valve is electrically energized, ports 2 (outlet) & 3 (inlet) are connected and port 1 is blocked. Air will be flowing from port 3 to port 2 and ROSOV will open. When the solenoid valve is electrically de-energized, port 2 & port 1 (drain) is connected and port 3 is blocked. Air will be vented out from port 2 to port 1 and ROSOV will close.

- In ROSOV of MS tank T-18, the airline connection was wrongly given to port 1 (drain) instead of port 3 (inlet). Port 1 is directly connected to the air chamber of ROSOV through port 2. The air traveled to the air chamber of the ROSOV directly, on the opening of the airline, even though the solenoid valve was electrically de-energized, resulting in the instant opening of ROSOV.



(Fig. 3: Wrong connection of solenoid valve of ROSOV of MS tank T-18)

ROOT CAUSE OF THE INCIDENT (REASONS FOR FAILURE):-

- The DBBV erection work was executed even though the level of the product in the Tank was above the height of Tank nozzles. There is no internal guideline or Standard Operating Procedure for carrying out the dismantling or erection of the valves of a Tank currently under operation/having a product level more than its nozzle height.
- The pneumatic line connection to ROSOV was not isolated.
- The airline connection was wrongly given to port 1 (drain) instead of port 3 (inlet) of the solenoid valve (Refer Fig. 3) which resulted in the opening of ROSOV even though the solenoid valve was in the de-energized state. These wrong interconnections of ports of solenoid valves occurred at the Factory level which highlights the gaps in the vendor's internal product Quality Management System and Third Party Inspection (TPI) carried out by the party assigned by HPCL at the Factory level.

MAJOR RECOMMENDATIONS

- SOP to be developed for carrying out any repair/ modification jobs in the storage tank or associated pipeline. The SOP shall bring out the requirement of emptying/degassing or bringing the level of the product in the tank below the nozzle level (as the case may be) based on hazard analysis.
- During execution of jobs in a storage tank having product, the ROSOV/DBBV valves shall be isolated from their energy sources (like pneumatic/electrical).
- To ensure ROSOV is fail-safe as per clause 7.6.2.(iii) of OISD-STD-244.
- The process of Factory Acceptance Testing (FAT) & Site Acceptance Test (SAT) of critical equipment needs to be implemented robustly.
- Critical equipment should be commissioned in the presence of an OEM representative.
- Work permits for critical/non-routine jobs shall be issued only after a thorough Job Safety Analysis (JSA).
- Critical jobs to be carried out only under the personal supervision of the designated & competent Officer.
- Necessary training to be imparted to officers executing the job.
- Proper communication about job responsibilities shall be ensured whenever there is a change in assignment.