

Case of MS tank Fire - Is it knowledge gap?

- *Are we learning from previous incidents of similar nature? This incident could have easily been averted!*
- *Disregard to the extant systems & procedures are major area of concern.*

1. The incident

A major fire broke out on the very 1st day of the Year 2015 at one of the Oil installation at Southern part of India. The incident took place at MS tank nozzle during simultaneous operation of product (MS) transfer and removal of tank body valve (MOV). Fire was extinguished with help of external assistance after 40 minutes.

2. The affected site



Fire mark at the affected tank nozzle; Non-flame proof electrical JB

The photographs above indicate the fire mark at the tank nozzle area and use of prohibited non-FLP electrical JB inside dyke area.

3. After effect of the incident

- ❖ Six contract workmen, immediately, were admitted to local hospital- some with 50-60% burn injuries.
- ❖ Immediate suspension of entire operations in the installation.
- ❖ Feeding the market from alternate supply source.

4. Sequence of events leading to the fire incident

- ❖ *Installation was carrying out decommissioning of hydrocarbon storage tanks in order to install upgraded equipment for enhancing in- built tank safety.*
- ❖ *Prior to the incident, installation of up-graded equipment was completed for some other AG tanks.*
- ❖ *To empty out this particular tank (containing product of class-A service), initially up-to the suction level, product was withdrawn thru' in built close system.*
- ❖ *For emptying the out the left over tank bottom quantity (approx.150 kl), portable pump motor was being used for transshipment of product to tank truck at outside of tank dyke area using hose connections.*
- ❖ *Portable pump motor set including non-FLP type electrical junction box was placed inside the tank dyke area.*

- ❖ *Pump suction was connected with tank water draw off line through rubber hose and another hose from pump delivery line was connected to a TT compartment parked outside of dyke area. The latter part of hose connecting to the TT compartment from top was plastic make.*
- ❖ *Few truckloads of product were transferred using the same process and the next truck was being loaded.*
- ❖ *While the product transfer operation was in progress, another simultaneous operation, removal of tank body valve (MOV), was also being carried out.*
- ❖ *Immediately, upon removal of tank nozzle valve (MOV), suddenly there was a flash fire near pump motor set/JB area which propagates to tank nozzle area.*

5. Loss

- ❖ Two contract workmen succumbed to burn injuries latter on in the hospital.
- ❖ Suspension of entire operations for more than a week.
- ❖ Product and property loss.

6. Significant observations

A. At site

- ❖ *Roof of the tank was resting on the long leg. Manholes were kept closed. ROSOV on adjacent receipt line (12 inch dia.) was kept closed; however, end flanges at tank nozzle & pipeline were not blanked off.*
- ❖ *MOV on delivery line (12 inch dia.) was taken off using chain pulley. Post fire incident, tank nozzle flange and p/l end flange were blanked off.*
- ❖ *Pump motor (FLP) was used for transfer of left over tank bottom MS. Electrical JB (non FLP) with burnt cables and burnt hoses were lying inside the dyke area at close proximity of the valve manifold. Cable connections to JB were without double compression gland and observed to have gaps at cable entry. The electrical motor was found not earthed.*
- ❖ *Electrical JB was kept within 2-3 meters from the tank nozzle valve where MOV was removed.*
- ❖ *Pump suction to tank water draw off line was connected using rubber hose. However, hose connection from pump delivery to TT compartment was partly rubber make and partly plastic make towards end connection into the TT compartment.*
- ❖ *Tank truck was being loaded from top and was not was not earthed during loading operation.*
- ❖ *Non-sparking tools were not used during removal of tank MOV.*

B. Documentations

- ❖ *Hot work permit issued to the contractor was observed to be for multiple sites in place of site specific work permit.*

- ❖ *There was no record of tool box talks with regard to associated hazard before commencement of work at site.*
- ❖ *Document verification reveals that on an average 10-15 days' time was taken for execution of similar jobs for other tanks. Whereas, in the extant case, duration taken for carrying out similar nature of job was much less (~ 3-4 days).*
- ❖ *Though work permit was issued only to the Engineering contractor but workmen of housekeeping & Haulage contractor were also working at the site.*

7. Cause analysis of the fire

A. Primary cause

The most likely cause of the fire is due to propagation of vapour from inside the tank immediately through the open nozzle (after removal of MOV) which came in contact with spark emanated from non-FLP electrical JB/Connections during transfer using pump motor set to tank truck. *It may be mentioned that use of Non FLP electrical JB together with loose electrical termination joint inside the dyke for emptying out the tank is gross violation of SOP.*

B. Root cause of the fire

- ❖ Lack of awareness & adequate Knowledge led to use of improper equipment,
- ❖ Simultaneous operation of jobs including MS pumping out with improper equipment & removal of MOV is highly risky & hazard prone,
- ❖ Spark generated from non-FLP electrical JB provided the source of ignition,
- ❖ Gushing out of MS vapour from the open nozzle of the tank,
- ❖ Negligence in proper supervision by all concerned,
- ❖ Non adherence to SOPs for carrying out such jobs and absence of Job safety analysis.

8. Learning from the incident

- ❖ Simultaneous activities involving pumping out of highly volatile Motor Spirit with improper & not-fit-for-the-purpose equipment with source of ignition at close vicinity to Hydrocarbon vapour is a strict **NO**. In this case, while dropping of tank Body MOV, electrical source was operated on/off in close proximity of MOV which is not only risky but highly unsafe.
- ❖ Non FLP electrical JB together with loose connections is strictly prohibited inside tank farm area or at any other area/equipment having possible source of hydrocarbon.
- ❖ Electrical JB, even if it is FLP type, should be kept much away from the source of hydrocarbon at upwind direction of hydrocarbon source. In this case, electrical JB should have been placed outside the tank dyke area.

- ❖ Wire connections (electrical) to JB and motor must be thru' double compression gland so as to ensure FLP status of the equipment. In this case, cable entry to the JB was observed to be having loose ends.
- ❖ Work at hazardous area in an Oil installation, must be carried out under strict supervision of company officer(s) ensuring laid down procedure and should not be left to Contractor's representative.
- ❖ Job safety analysis i.e. tool box talk must be done for contractor's workmen prior to undertaking any maintenance jobs.
- ❖ The risks associated with any job must be identified and explained to the working group.
- ❖ Work permit must be received by the concerned company officer for the job in conformity to the OISD STD 105. In this case, representative of third party was the receiver.
- ❖ Motor and truck must be earthed at least by two earth connections.
- ❖ Plastic hose material is strictly prohibited for handling Petroleum products.
- ❖ Coupling guards must be ensured for pump/motor to avoid accidents.

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