

Flash Fire at LPG Tank Truck Loading Gantry

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A. Introduction:

There was a flash fire at Tank Truck Loading gantry at one of the Bottling Plants in which the driver of Bulk TT suffered burn injury and subsequently succumbed to the said injuries. Another driver also sustained minor burn injuries during the incident.

B. Incident / Sequence of events:

- On the date of incident in the morning shift, 6 nos. of bulk tankers were taken inside the plant after due physical checking of the tankers and verification of the documents by the Officer assigned to look after Bulk loading. The tankers were taken for loading operation. Another 6 nos. of tankers were also physically checked; documents verified for arranging the next batch of loading operation.
- The subject bulk TT, in which the flash fire took place, was at bay no.5. The Operator assigned to bulk loading section advised the driver at bay no.5 that the loading operation of the said bulk TT have been completed and that he has closed the manifold valve of the bulk TT as well as the isolation valve of the loading arm. He also instructed the driver to wait there and proceeded to bay no.2 for some other job.
- Around this time, the driver of the bulk TT at bay no.5 decoupled the loading arm in spite of the absence of the operator when the flash fire took place in which the driver was engulfed and sustained severe burn injury. The rear wheels of the bulk TT also caught fire during the incident.
- There was a siren and due to breaking of the QB, the sprinkler started automatically in the bulk TT loading gantry. To control the fire of the tyres, 75 kg DCP was operated and the fire was extinguished within 5 minutes.
- Meanwhile the driver of another bulk TT rushed to extend help to the TT driver at bay 5 and managed to remove his cloths that were on fire. In the process, this driver too sustained minor burn injury.
- The drivers were immediately rushed to the hospital; the driver at bay 5 who sustained about 70% burn injury succumbed to death after 11 days during treatment.

C. Critical observations:

- The loading arms deployed at the bulk TT loading bays have quick release couplings which connects via specially made flange attachment with the bulk TTs. As per the design, the coupling has an interlock to prevent liquid flow out of the arm content even if the said content has not been flared off. In normal circumstances, during decoupling of loading arm, the internal plunger is supposed to go back on the polyurethane seat so as to close the flow of the LPG completely so that decoupling from the tanker flange can take place safely.
- All the couplings were procured from M/s Alfa Process Controls, U K.
- The main reason of the LPG leakage (of loading arm content only) was the failure of the said interlock of the coupling. It appears that LPG gushed out with high velocity under the operating pressure and the same resulted in recoil of the loading arm and/or the coupling. Due to this recoil of the loading arm and/or the coupling, it might have collided with the adjoining structure resulting in a source of ignition creating the flash fire with the leaking LPG pool creating enough vapour to produce a combustible mixture in the open.
- The LPG might have also pooled by gravity near the tyres of the TT and thus with the flash fire the wheels of the TT caught fire.

D. Root Cause Analysis:

- As per SOP, the loading arm must be depressurized to remove the residual LPG content by cold flaring after completion of every loading operation. This step of SOP was not followed.
- This coupled with the failure of the interlock of the quick release coupling, the arm content of LPG leaked in open. The consequent recoil of the arm / coupling caused metal to metal contact with the structure and created spark that led to flash fire.
- The operation was done by a driver instead of plant operator which was a deviation of SOP.

E. Learnings:

- The SOP must be followed i.e. the cold flaring of LPG from the metallic arm before decoupling of the loading arm from the Tank Truck.
- The decoupling operation shall be done by the trained manpower assigned for the job.
- Since the couplings were imported long back at the time of commissioning of the plant, availability of quality spare in adequate quantity must be ensured for all such couplings so that timely maintenance work for enhanced reliability and integrity of the said couplings can be undertaken.

- As the interlock system of these couplings is the critical feature for mitigation of the risk of leakage of liquid LPG in the open, periodic preventive maintenance schedule needs to be drawn in consultation with the OEM for all such couplings.
- The bulk TT loading of LPG is a critical activity; the work needs to be supervised by capable technically qualified dedicated officer so that such violation of SOP does not recur.
- The concerned driver was helped during the fire by driver of another bulk TT but the helper, the second member of the crew of this bulk TT, is conspicuous by his absence. The SOP must specifically ensure his presence in the vicinity of the bulk TT under loading to lend immediate support in case of such exigencies.