

Case Study - Fire incident at CCR Unit

Dharmvir

1.0 Introduction:

A major fire took place in CCR unit at level transmitter (LT) of the 2nd stage suction Knock-Out Drum (KOD) of Net Gas Compressor. The fire continued for about one hour. Subsequently the CCR unit brought under shut down for carrying out the maintenance jobs. Two contractor workers, who were working at the level transmitter, got burn injury and were shifted to hospital.

2.0 Incident:

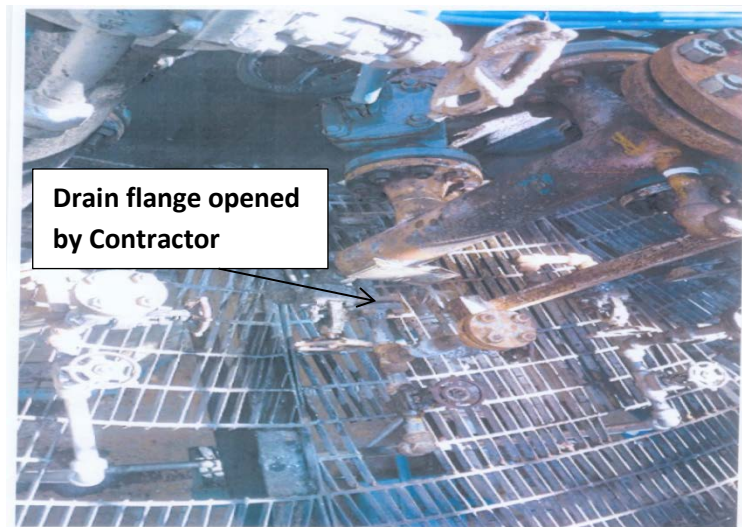
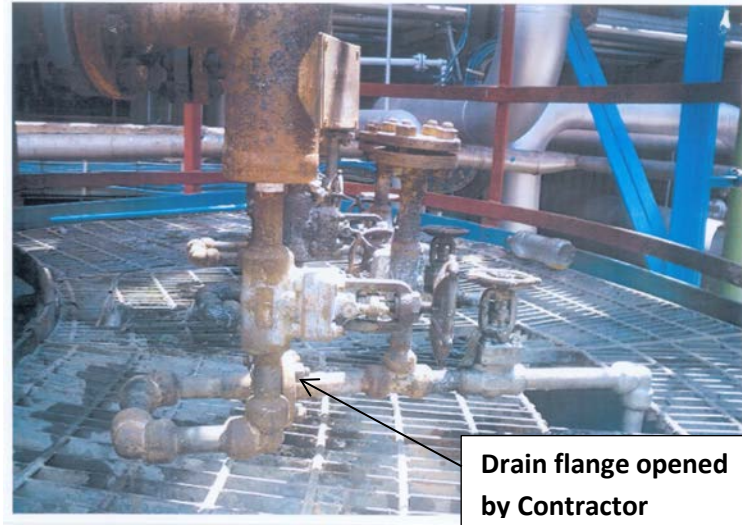
The CCR unit was commissioned as a part of MS quality up-gradation project. Unit was running normal since last M&I.

On the day of incident, the job for calibration of LT was taken up as per Preventive Maintenance (PM) calendar by Instrument Department. The net gas compressor no. 2B was running at the time of incident and 2A was standby. Checking was being carried out for LT-1B when the fire broke out. The job started around 2 PM. This LT was forced (bypassed from DCS) at 9.30 hours and permit was issued at 9.45 hours (for both V-02 & V-03 LTs) by Operations Department. The LT was isolated by Operation Department by closing the valves and depressurizing the line to flare; contractor workers carried out the activities.

Permit was issued by Operation Department to Company's Instrument Supervisor. In turn, he handed over the permit to Contractor Supervisor. Being a Cold Work permit, as per prevailing practice of the refinery, it was not recorded in Fire Station. The following sequence of events emerged:

- Job of two level trolls of V-02 was completed before lunch.
- At around 12:30 hours, Operation Department isolated the level trolls of V-03 by closing the valves connected with KOD (A & B). There were three numbers of level trolls i.e. LT-1A, LT-1B and LT-1C.
- At the time of work, the unit was on usual operation.
- The contractor workers started the preventive maintenance job for LT-1B after lunch.
- As per the prevailing practice, they opened the flange connected to the flare line and poured naphtha in the level troll from the open flange for calibration of the LT. After calibration, they tried to drain the naphtha hold-up in the LT to CBD but didn't succeed since the drain line was choked.
- Thereafter, the flange in the drain line was opened to empty out naphtha from the level troll to atmosphere (instead of CBD), when fire erupted @ 15:45 hours.

- Operations Department took immediate action for emergency shutdown of the unit and depressurised the KOD-03 to flare. Fire fighting by Fire & Safety department also started.



3.0 Root cause of the Fire:

- Passing of valve(s) from KOD-03, which was at a pressure of 15 Kg/cm² (g) at the level troll, resulted in accumulation of H₂ into the level troll. In fact KOD-03 was isolated by closing a single valve without any positive isolation.

- Opening of the flange on the drain line resulted in release of H₂ and Naphtha from the level troll which caught fire either by auto-ignition or due to generation of spark while hammering the line by non-sparking tools to de-choke the line.

4.0 Recommendations:

- a) Procedure for undertaking preventive maintenance of level trolls in a running unit handling hydrogen must be reviewed. In OISD-STD-153, maintenance is suggested only during turnaround of the unit. Since two isolation valves have not been considered in the design, undertaking any such job is totally unwarranted.
- b) Entire PM Job list must be reviewed by all concerned department and all critical jobs must be identified. Proper Job Safety Analysis (JSA) must be carried out before commencement of any job.
- c) All critical jobs must be undertaken under strict supervision. Responsible officers from Operations/Maintenance must periodically check such critical activities; F&S must also check & monitor such activities.
- d) Proper Work Permit must be issued with clearance from Operation Department in writing.
- e) Proper tools & PPEs for contractor workers must be provided. Use of non-sparking tools is mandatory particularly while working in hydrogen environment.
- f) Safety training of all contractor & it workers must be ensured before issuing gate pass. In many refineries there is a system of endorsing safety training provided on the gate-pass which should be considered.