

CASE STUDY

OISD/CS/2021-22/P&E/06

Dt.:19/01/2022

INTRODUCTION

Title: Explosion in Furnace box.

Location: Refinery

Loss/ Outcome: Hydrocarbon Explosion, Unit outage & production loss, damage of equipment & property.

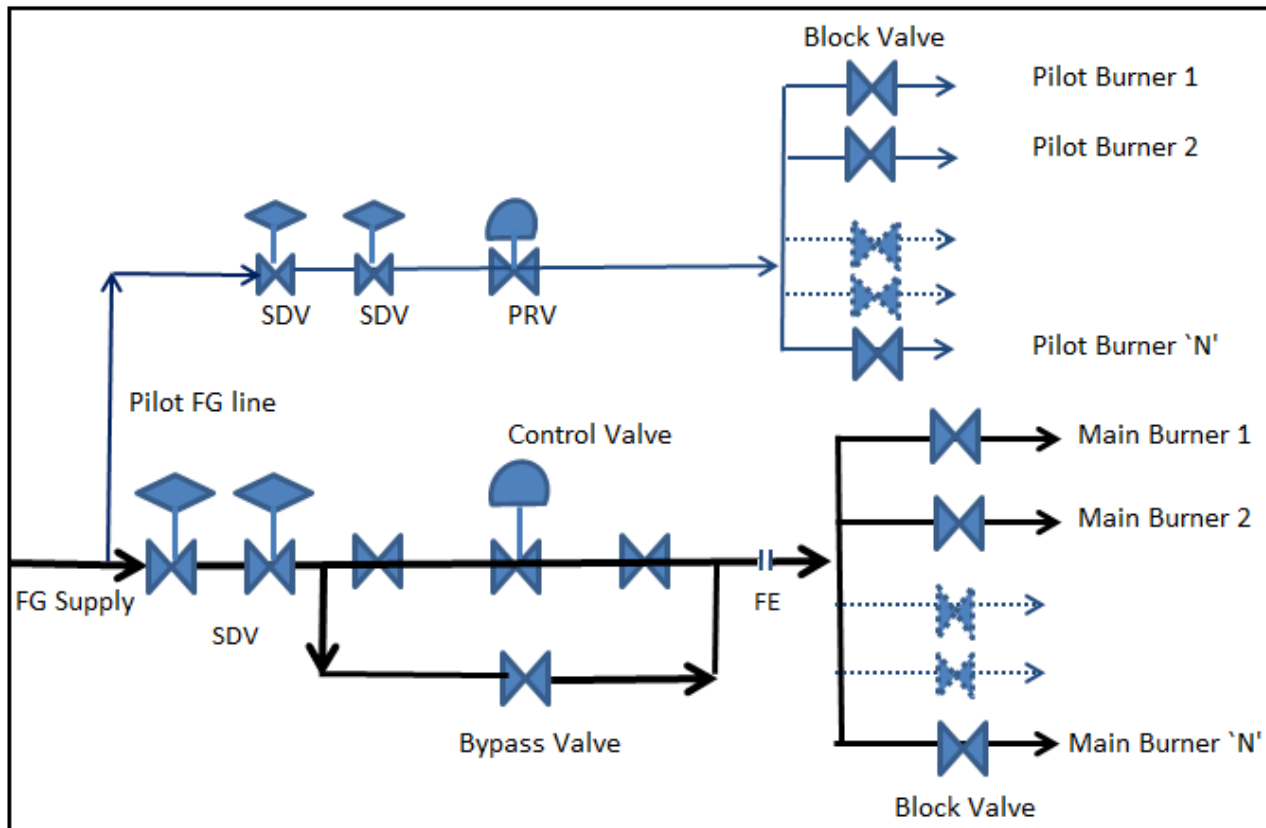
BRIEF OF INCIDENT:

Unit was under start-up after long Turn Around (TA) shutdown. During lit-up of furnace burner, explosion in furnace box took place. As such there was no fire, necessitating normal fire fighting.

Due to impact of the blast, furnace got opened up from shell joint & refractory bricks got scattered in nearby areas. Extensive equipment and property damage was suffered; Also, a number of people got injured.



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This information should be evaluated to determine if it is applicable in your operations, to avoid recurrence of such incidents.*



OBSERVATIONS / SHORTCOMINGS

- There was unobstructed flow & accumulation of Fuel Gas (FG) inside the furnace box for about 40 Minutes prior to going for burner lit-up. This happened due to lapse in checking the FG circuit line up to burners before burner lit-up activity, as a result of which, following three conditions were met simultaneously, namely :-
 - FG line SDV was open,
 - FG Control valve was passing and/or bypass valve was open/ partially open,
 - At least one of the burner block valve was in open condition.
- No steam purging of furnace was done just before burner lit-up. It was done about 1.5 hours earlier.
- Flow indication of FG through burners for about 40 minutes (without burners being lit-up) was not noticed at DCS panel and no alarm was raised.
- Lighting of main burner was done without lit-up of Pilot burner against SOP guideline.

CONCLUSION / ROOT CAUSE

Spark generated from the portable ignitor used for main burner lit-up led to ignition and explosion of the HC mixture, that had accumulated inside the furnace box as noted under 'Observation'.

RECOMMENDATIONS

- Furnace burner lit-up to be considered as one of the most critical & hazardous activity in any process unit. All the sequential steps to be reviewed and suitably incorporated in the

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SOP; Implication of each step of SOP should be in full knowledge of all the concerned operating personnel.

- Another checklist / SOP for DCS monitoring to be prepared for checking of the critical instrument tags before and during furnace lit-up operation.
- Before and after furnace purging, critical physical checking to be done to ensure that burner block valves are fully closed.
- After furnace box purging is completed, pilot burner should be lit-up without much time delay.
- Main burner should be lighted from its pilot burner only.
- Refresher training to be provided to each employee involved in operating a process unit to assure that the employee understands and adheres to the current operating procedures of the process.
- Only manpower related to commissioning/ start up activity should be allowed to be present in the plant.

Further, it is to be ensured that no manpower intensive job / assembly is allowed in the vicinity (including nearby units) to contain the initial risk/ hazard during critical activities like unit start-up/ commissioning.
