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HAZOP Study of Mounded LPG Tank

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***Abstract*: Hazard and Operability Analysis (HAZOP) is a structured and systematic technique for system examination and risk management. In particular, HAZOP is often used as a technique for identifying potential hazards in a system and identifying operability problems likely to lead to nonconforming products. HAZOP is based on a theory that assumes risk events are caused by deviations from design or operating intentions. Identification of such deviations is facilitated by using sets of "guide words" as a systematic list of deviation perspectives. This approach is a unique feature of the HAZOP methodology that helps stimulate the imagination of team members when exploring potential deviations.**

***Keywords*: hazard and operability analysis, refinery, hazard identification and risk analysis, code of practice.**

1. Introduction

In refinery as well as in petrochemical industry safety of the plants primarily relies on the application of various codes of practice or design, which are based upon the wide experience and knowledge of professional experts and specialists in the industry. This will be also supported by the experience of local plant managers, engineers and operators who have direct experience in the relevant plant operation. In all new projects, and in some cases modifications to existing plants, embody some element of change and the degree of change is often considerable.

Hazard and Operability Study (HAZOP) defined as: A hazard is any object or operation that could possibly cause an accident or accidental release of toxic, flammable or explosive chemicals that may injure humans or cause a loss of properties. Operability is the functionality that could possibly otherwise lead to a violation of environmental, health or safety regulations or negatively impact profitability if something went wrong.

In HAZOP studies Multi-disciplinary team using a structured approach systematically examines all relevant parts of a design. Throughout this examination procedure a full description of the process, analytically questions of every part is to be discover and decides whether these deviations can give rise to hazards or operational/maintenance problems.

Number of questions are formulated around the guidewords/deviations. The guidewords/deviations are used to confirm that the questions will discover ways in which the process could deviate from the design intent. In this study some of the causes of a deviation may be unrealistic and derived consequences irrelevant, which are not to be considered further. There may be a deviation with both possible causes and potentially hazardous consequences. This HAZOP study identifies problem areas and does not seek engineering solutions.

2. Methodology

The methodology for the HAZOP was as adopted internationally as per guidelines of ICI, UK and CCPS, AICHE. Hazard and operability (HAZOP) study was undertaken by the application of a formal, systematic, and critical examination of the process and engineering intentions of process design. The potential for hazard was thus assessed and malfunctions of the individual items of equipment and the consequences for a whole system were identified. The examination of the design was structured around a specific set of guidewords, which ensure complete coverage of all possible problems while allowing sufficient flexibility for an imaginative approach.

Table 1
Guide Word/Deviation used for HAZOP

Guide Word Code	No.
More Flow	01
Less / No Flow	02
Reverse Flow	03
Other Than Flow	04
High Pressure	05
Low Pressure	06
High Temperature	07
Low Temperature	08
High Level	09
Low Level	10
Composition	11
Startup / Shut down	12
Maintenance	13
Leakage/Rupture	14
Sampling	15
Corrosion / Erosion	16
Drawing Error	17

The overall aims that a HAZOP study addresses are:

i. To identify all deviations from the way the design is expected to work, their causes and all the hazards and operability problems associated with these deviations.
ii. To decide whether action is required to control the

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hazard or the operability problem and if so to identify the ways in which the problems can be solved.

iii. To identify cases where a decision cannot be made immediately and to decide on what information or action is required.

3. General Recommendations

1. Need to conduct scheduled inspection and testing of Pressure Gauge, Safety Relief Valve (SRV) of compressor, of mounded tank to be carried out.
2. Need to conduct inspection and maintenance schedule for EFCVs and ROVs which is to be strictly followed.
3. Need periodic maintenance of Roto gauge to be carried out

Table 2
Summary of significant elements of the HAZOP study

Unit	Causes	Hazard	Consequences
Bullet (Mounded storage vessel)	Overfilling Pressure increase in bullet Instrumentation failure Operator error External fire Corrosion	Release of pressurized LPG into atmosphere	Jet fire / Flash fire
Vapour & Liquid Pipelines	Rupture of hose Gasket failure Leak at flanges Wrong line-up Non adherence to SOP for sampling	Release of pressurized LPG into atmosphere	Flashfire/ Dispersion

4. Conclusion

This paper presented an overview on HAZOP study of mounded LPG tank.

References

[1] Hazard Identification and Risk Analysis-Code of Practice: IS 15656:2006
[2] HAZOP Guide to Best Practice by EPSC
[3] P&IDs of mounded LPG tank.