

Case Study of Hazard and Operability Study (HAZOP) for Plant of Recovering LPG from Natural Gas

1. About Installation

The natural gas is processed to recover LPG, Special boiling Point Solvent (SBP) and Pentane.

2. About Assignment

Hazard and Operability (HAZOP) Study is carried out by examining each part of the plant and recorded any potential hazard associated with it. The purpose of examination is to identify all possible deviations from the way the design is expected to work and all hazard associated with these deviations. In this way HAZOP study helps to find the "weak link" in a plant and to provide a basis for developing procedural or engineering controls to remove or lessen the risks from the identified problem area.

HAZOP study involves a set of standardized GUIDEWORDS, which are used to initiate the discussion in the team. All possible deviations in process parameters in a reactor or a pipeline are considered to determine their causes and consequences. If a hazard is identified, first the existing protective measures are analyzed with respect to the intensity of the hazard. If the protective measures are not adequate, recommendations are given to mitigate the hazard

HAZOP Guide Words & Possible Deviations

Guide Word	Deviation
None	No forward flow when there should be, i.e., no flow or reverse flow.
More of	More of any relevant physical property than there should be, e.g. higher flow (rate or total quantity), higher temperature, higher pressure, higher viscosity, etc.
Less of flow	Less of any relevant physical property than there should be for e.g. lower rate or total quantity, lower temperature, lower pressure, etc.
Part of	Composition of system different from what it should be, for e.g., change in rate of components, component missing, etc.
More than	More components are present in the system than there should be, for e.g., extra phase present (vapor, solid), impurities (air, water, acids, corrosion products), etc.
Other than	What else can happen apart from normal operation, e.g. start-up, shutdown, up rating, low rate running, alternative operation mode, failure of plant services, maintenance, catalyst change, etc.

Hazard & Operability Study require prior understanding of the behavior and hazards of the hazardous chemicals being used in the plant, which mainly include:

- Physical & Chemical Properties
- Fire & Explosion Characteristics
- Toxicological Properties, if any

3. How did we execute?

First HAZOP sheets are prepared and then the team discusses on possibilities of occurrence of various deviations from the intended operating conditions by employing the Guidewords; thereafter response of the control equipments for these deviations is analyzed. Then,

consequences of the deviations are examined for vulnerability towards occurrence of unsafe situations and suggestions are made to improve system reliability, only if required.

For HAZOP sheet preparation, the variable parameters like pressure, temperature, flow, concentration are considered. And each variable is considered for each equipment/process by applying the above guidewords wherever applicable.

Example of HAZOP sheet preparation on Feed Gas Chiller on one variable and guideword (i.e. Variable- flow and guideword – No)

Parameter	Guide Words (deviation)	Possible causes	Possible consequences	Measures/Existing facilities safeguard	Action/ Corrective Measures Required
Flow of gas from chiller	No	1. Gate valve provided in out put line of filter may close.	1. Operability problem. 2. Filter may get damage. 3. Level in separator – I decreases. 4. Less temperature of liquid feed to the LEF column.	1. Pressure gauge-1203 are provided in out put pipe line of filter. 2. Differential pressure transmitter - 1301/1302 on chiller. 3. Differential pressure alarm high PDAH-1301/1302 4. Level alarm low low LALL-1302, 1303 5. Temperature element – 1301,1305,1303, 1302. 6. Temperature indicator – 1301 7. Temperature alarm low low TALL-1303/1302	

5. Recommendations

1. All the Measuring instruments should be regularly maintained and periodically calibrated so that reading will be visible and measurable.
2. The colour coding for all pipeline should be properly done and should be specific for each product to prevent any confusion.
3. Acid storage and handling area should be regularly checked for corrosion, leakages etc and should be properly maintained.
4. Equipment (either manual or working) manual should be available to the concerned persons.
5. Weeds, grass, shrubs or any combustible material should be removed from the plant premises in order to avoid spreading of fire , during any fire hazard.
6. Electrical Cable conduits should be periodically checked and maintained properly.
7. During loading operation in Tank Truck shed earthing should be strictly followed to prevent from static electricity hazard.
8. Redundant pipelines (2" HDPE Pipeline) present in acid dosing areas should be removed from the plant to avoid confusion. And newly installed ½" SS Pipeline should be properly clamped.
9. The plant was well maintained and same is recommended for future also to prevent the any disaster.



SEE- Tech Solutions Pvt. Ltd

Solution Providers for Energy Conservation & Plant Safety Improvement
 "Let's Conserve", 11/5, MIDC Infotech Park, Near VRCE Telephone Exchange,
 South Ambazari Road, NAGPUR - 440 022, (INDIA)

Tele: +91-712-2222177, Fax +91-712-2225293,

E-Mail: seemil_ngp@sancharnet.in

Web: www.letsconserve.org