Risk Assessment (HAZOP Study) Method for Decanting LPG From Dispatching Unit to Road Tanker

Sandeep Yadav
Assistant Professor
Department of Fire Technology and Safety Engineering
IES-IPS Academy, Indore (M.P), India

Abstract

The aim of this (HAZOP) hazard operability study risk assessment method is to highlighting the safety aspect while decanting LPG from dispatching unit to road tanker. The LPG gas is highly flammable and have potential hazard of explosion, (BLEVE) boiling liquid expanding vapor explosion. this explosion may cause to fatality and heavy property damage so that we have applied this risk assessment (HAZOP) method to find out all relevant potential risk to it and also given required control measure to reduce or eliminate risk of fire and explosion in order to make the decanting process of LPG safe.

Keywords: BLEVE, HAZOP, LPG, Risk Assessment

I. INTRODUCTION

The use of LPG gas prevail in industry now a days it replaced fuel such as coal, wood etc. it is used in different-different industry for different-different purpose such as in CNC gas cutting machine, Furness, paint shop, canteen and many more. To make this gas available in the plant transportation and decanting process is required which is having risk of leakage, there is one more risk of developing electrical charge in tanker which can be cause to source of ignition and because of this fire can take place. This fire can turn into explosion or (BLEVE) boiling liquid expanding vapor explosion. This would have different different effect according to quantity of LPG in tanker. In some cases it turns in major accident and cause heavy property damage, loss of lives, harm to environment. for avoiding these accident it is important to seek all risk related to operation so that suitable control measure can be suggested. In order of this (HAZOP) hazard operability study (risk assessment method) plays significant role. The purpose of applying (HAZOP) method to identify potential hazard and risk associated with decanting process of LPG in order to keep process safe. For this purpose I have given control measures for avoiding accident.

II. METHOD

The hazard operability method is careful examination which is performed by multi-disciplinary team to collect necessary information related to process so as to find out all potential hazard involve in the process. HAZOP is quantitative risk assessment method which can be performed to make sure that existing design and operating process is safe. it is also performed to improve safety of existing facility most importantly it is conducted to find out deviation in typical operation and operational failure.

This method involves several steps which are:-
1) Select segment/division of plant on which HAZOP is performed.
2) Identify normal operating process of segment.
3) Find out the deviation by setting or apply appropriate guide word.
4) Identify all possible causes of failure of system.
5) Identify all possible consequence of deviation.
6) Identify what action taken and action required to avoid accident.

A. Some Guide Words are:-

<table>
<thead>
<tr>
<th>Guide word</th>
<th>Meaning</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO or NOT</td>
<td>The complete exclusion of these objectives.</td>
<td>No part of intent or change takes place.</td>
</tr>
<tr>
<td>MORE</td>
<td>Quantity increase.</td>
<td>This shows increase in quantity such as mass or in property such as temperature.</td>
</tr>
</tbody>
</table>
In this paper I have described hazardous process involve in decanting highly flammable LPG gas and how it is done safely. Detail process description:-

1) Transfer of LPG gas from dispatcher to road tanker.
2) Transportation of LPG from the dispatcher to receiving plant.
3) Transfer of LPG from road tanker to storage area.

Fig. 1: Block dia. of Decanting process of LPG safely

<table>
<thead>
<tr>
<th>Guide word</th>
<th>Deviation</th>
<th>Possible cause</th>
<th>Consequence</th>
<th>Action taken</th>
<th>Action required</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>No material</td>
<td>Error in dispatch</td>
<td>1. Possibility of vacuum and subsequent entry of air 2. Material loss</td>
<td>Nothing special</td>
<td>1. Tank should be weighted before decanting. 2. While decanting tank liquid and vapor line should be connected.</td>
</tr>
</tbody>
</table>
## Risk Assessment (HAZOP Study) Method for Decanting LPG From Dispatching Unit to Road Tanker

<table>
<thead>
<tr>
<th>Guide word</th>
<th>Deviation</th>
<th>Possible cause</th>
<th>Consequence</th>
<th>Action taken</th>
<th>Action required</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>No Flow</td>
<td>1. Hose pipe block. 2. Shut off valve closed. 3. Pump problem.</td>
<td>1. Pump cavitations and vibration. 2. Possibility of air entry.</td>
<td>Nothing special</td>
<td>1. Line should be provided with sight glass. 2. Hose pipe end should be kept plugged with stopper.</td>
</tr>
<tr>
<td>LESS</td>
<td>Less Flow</td>
<td>1. Strainer choked. 2. Partial blockage</td>
<td>Process disturbance</td>
<td>Nothing special</td>
<td>1. The strainer should be cleaned periodically. 2. Check list ensure that all valves in the line are open.</td>
</tr>
<tr>
<td>MORE</td>
<td>More Flow</td>
<td>1. Excessive differential pressure 2. Pump surging</td>
<td>1. Excessive static electricity charge may ignite the leak gas</td>
<td>Flanges provided with jumper</td>
<td>1. Conductivity of the hose should be checked up periodically. 2. Earth resistance of line should be checked up. 3. Ensure that jumpers are provided in all the flanges. 4. Proper bonding of union joints should be ensured.</td>
</tr>
<tr>
<td>MORE</td>
<td>More pressure</td>
<td>Due to thermal expansion of liquid trapped between any two valve</td>
<td>Pressurization and subsequence bursting of the line</td>
<td></td>
<td>1. pressure indicators should be provided.</td>
</tr>
<tr>
<td>AS WELL AS</td>
<td>Leakage</td>
<td>Leakage from flare, Union joints, hose</td>
<td>Spillage and Possibility of fire</td>
<td>Single valve isolation provided</td>
<td>1. Two isolation valve should be provided in each cold flare line. 2. The cold flare lines should be protected against breaking in stormy weather. 3. Union joints should be replaced by flange joints. 4. Hose should be tested after every three months to ensure that it bears a pressure of 37.5Kg/cm².</td>
</tr>
</tbody>
</table>
IV. RECOMMENDATION

1) Tank should not fill more than 90%.
2) LPG road tanker must have spark arrester.
3) While decanting gas, tanker should be properly have earthing system.
4) Driver must have special license for carrying such hazardous gas.
5) Emergency plan should always be available while decanting LPG.
6) The pressure of storage tank and road tanker should be equal before begin decanting process.
7) Decanting process must be performed under competent person.
8) Ensure that source of ignition have been isolated.
9) Standard operating procedure should be displayed.
10) Hose should be checked periodically.
11) Wooden blocks or chocks should applied to avoid roll over.
12) Ensure that transporter emergency card is available in crew cabin.
13) Decanting process should be avoided in night time.
14) Each valve used in decanting process should be checked before begin decanting process.

V. CONCLUSION

In this paper I have represent hazard operability study (HAZOP) method to identify unexpected deviation while decanting LPG and take action required reducing risk. The hazard operability study is basically performed at design stage, it is qualitative analysis and helps to develop tree diagram for fault tree analysis which can further help to do quantitative analysis such as fire and explosion modeling.

This method helps to identify potential hazard related any system or process and contributes to recommend control measures.

REFERENCES