

Hazard Identification and Risk Assessment in City Gas Distribution Networks

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Abstract: *The catering of energy at all level to every corner of the every geographical area is at its peak by means of city gas distribution project. Since, the present work is aimed at propose a resilience assessment methodology for natural gas distribution networks. To analysis hazards is one of the most important components of natural gas distribution network. Since, it is important to predict these probable accidents and plans to prevent them. To analysis the hazards associated with operation and maintenance using a dedicated Hazard identification Sheet covering the hazard, severity, probability, overall risk rating which all includes reflect that area to be worked to mitigate the risk or eliminate the hazard. To understand the nature of risks and inherent hazards associated with operation and maintenance of city gas distribution networks sufficient journals were studied based on that possible hazards which can occur during the operation and hidden risks were identified. For the identified risks and hazards was rated according to its severity and listed out on hazard identification sheet. To mitigate/eliminate those identified risks and hazards appropriate recommendations will be given in conclusion and residual risk assessment to be calculated.*

Keywords: geographical area

I. INTRODUCTION

Gail Gas Ltd is a wholly owned subsidiary of GAIL (India) Limited is in the process of supplying natural gas to the domestic, commercial, industrial and CNG for vehicle transport Sections within the geographical area of Bengaluru city. Natural gas from GAIL pipeline network (Dabhol Bengaluru pipeline network) is received at the city gate station outside Bengaluru city limits at sulivara which is approximately away from 35km. The gas pressure is reduced from around 92kg/cm² to 19Kg/cm² and supplied to Bengaluru city gas distribution network. The Bangalore city gas distribution network is a pipeline running along the outer ring road of Bengaluru city. There are tap-off points at Prem Nagar, BEL Road, Nagawara, KR Puram, Whitefield, Marathahalli, HSR Layout and RT Singa Sandra. This network supports 03nos of CNG Stations which supplies CNG to vehicles and various industries. This supply involves further pressure reduction 4-5Kg/cm² through district regulation stations. The network also provides natural gas supply to various housing societies & individual houses at the pressure of 21milli bar. A House hold supply at this level of pressure is termed as PNG (Piped Natural Gas). There are arrangements of transportation of CNG through LCV tanker trucks for consumption of various industries at booster stations near retail outlets and decompression unit. GAIL Gas has been selected for implementation of City Gas Distribution (CGD) projects in cities like, Bangalore, Kota, Dewas, Sonipat, and Meerut in the first round of bidding by the Petroleum & Natural Gas Regulatory Board (PNGRB). GAIL Gas supply CNG & PNG (industrial, commercial and household customers) to the aforesaid cities.

II. LITERATURE REVIEW

As a part of the study a range of journals and other published materials were referred. The most relevant sources of information were selected for the review based on their applicability in the area of focus.

Mr. Nikhbhakt, Mr. Ali Sayyah, and Mr. N. Zulkifli [2010] : on Hazard identification and accident analysis on city gate station in natural gas industry and it is aimed to analysis hazards in one of the most important components of



natural gas distribution network which is city gate station (C.G.S). Since, it is important to predict these probable accidents and plan to prevent them.

Mr. Gaur and Mr. N Dubey [2017] : on Risk modelling and its monitoring in natural gas transmission pipelines of city gas distribution networks which describes To Analysis the hazards associated with operation and maintenance using a dedicated Hazard Identification Sheet covering the hazard, severity, probability, overall risk rating.

R Tamil Selvan, Dr.Nehal Anwar Siddiqui [2017]: on Risk Assessment of Natural Gas Gathering Station & Pipeline Network describes Risk assessment is one of the main tool followed by oil and gas industries in order to assess the hazards and risk in their facilities worldwide. Qualitative and quantitative risk assessments are carried out at various phases of the process industry from conceptual stage, design stage, construction stage, operational stage, decommissioning stage etc. The quantitative risk assessment is directed during the detailed design stage uses to decide the spacing and layout out of equipment's for safe operation and maintenance of oil and gas industries.

Ismail, Mohd Azril, Kamal Imran [2018]: A Risk Assessment in Natural Gas Supply which states to identify the risk of natural gas supply. In view of this, there are risks faced by producer in dealing with the supply of natural gas. The risk can be categorized as market risk, supply risk, and transportation risk. Market risk refers to the risk of macroeconomic, supply risk refers to risk of physical distribution in gas supplies and transportation risk refers to a set of accidental leakage scenarios that happen when the delivering occur.

III. PROBLEMS IDENTIFIED IN TRANSMISSION OF GAS

Hazards:

- Leakage in gas pipeline due to line puncture.
- Leakage in compressor.
- Leakage in dispenser.
- LCV Cascade filling- Leakage.

Risks due to Gas Leakage:

- Jet Fire due to Gas line puncture.
- Fire due to leakage in compressor.
- Fire due to leakage in dispenser.
- Fire due to leakage during LCV Filling & unloading.

IV. OBJECTIVES

- The primary objective of HIRA is to identify the inherent risk and hazard associated with it.
- To understand the nature of risk of all operation involved in it.
- To calculate the level of risk of all the activities.
- To provide the recommendations to mitigate the potential of risk / hazards.
- To calculate the residual risk level.

V. CONCEPT AND METHODOLOGY

Hazard is anything (condition, practice, Behavior, etc.) that has potential to cause harm including injury, disease, death, environmental, property and equipment damage. Risk is the likelihood, or possibility, that harms (injury, disease, death, damage) may occur from exposure to a hazard. Hazard Identification is a systematic process of examining each work area and work task for the purpose of identifying all the hazards which are 'inherent' in the activity/ job. Risk Assessment is a systematic process of assessing the risks associated with each of these hazards identified so that the nature of risk can be understood. This includes the nature of the damage/harm that may result from the hazard, the severity of that damage /harm and the likelihood of this occurring. Risk Control is details out taking actions to eliminate safety and health risks so far as is reasonably practicable. Where risks cannot be eliminated, then implementation of control measures is required, to minimize risks so far as is reasonably practicable.



Keywords

Activity	It defines the basic work being carried out.
Concern	It defines the possible hazard that may occur during carrying out the activity
Impact explanation	It defines the consequence /loss that may occur because of the hazard.
Probability Rating	It defines the chances of occurrence of a particular hazard.
Severity Rating	It defines the extent of damage /loss in case a hazard occurs.
Overall Risk Rating	It is overall figure of Probability Rating times the Severity Rating.
Existing Control Measures	It defines those control measures which are already in place/existing to mitigate a particular hazard

Risk Matrix is the Risk Matrix defines various levels of Severity and Probability of Occurrence which are as under
Categorization of Probability of occurrence:

Probability of occurrence	Rating
Once in a year	1
Once in six months	2
Once in three months	3
Once in a month	4

Categorization of Severity:

Severity	Rating
No injury only material loss	1
Minor to moderate injury or health effects OR Minor asset damage	2
Moderate to severe injury or health effects OR Major asset damage	3
Permanently disabling injury or fatality OR complete loss of asset	4

The overall Risk Ranking is as under:

Risk Ranking	Rating
1-3	Acceptable
4-7	Moderate
8-12	High
13-16	Unacceptable

The overall Risk Matrix is as under:

FREQUENCY	4	Moderate	High	Unacceptable	Unacceptable
	3	Acceptable	Moderate	High	High
2	Acceptable	Moderate	Moderate	High	
1	Acceptable	Acceptable	Acceptable	Moderate	
	1	2	3	4	
	SEVERITY				

The Residual Risk Ranking is as under:

Risk Ranking	Rating
1-3	Tolerable
4-16	Intolerable



Step 1: Hazard Identification

The purpose of hazard identification is to identify and develop a list of hazards for each job in the organization that are reasonably likely to expose people to injury, illness or disease if not effectively controlled. Workers can then be informed of these hazards and controls put in place to protect workers prior to them being exposed to the actual hazard.

Step 2: Risk Assessment

Risk assessment is the process used to determine the likelihood that people exposed to injury, illness or disease in the workplace arising from any situation identified during the hazard identification process prior to consideration or implementation of control measures. Risk occurs when a person is exposed to a hazard. Risk is the likelihood that exposure to a hazard will lead to injury or health issues. It is a measure of probability and potential severity of harm or loss

Step 3: Risk control

Risk control is the process used to identify, develop, implement and continually review all practicable measure for elimination or reducing the likelihood of an injury, illness or diseases in the workplace.

Step 4: Implementation of Risk Controls

All hazards that have been assessed should be dealt in order of priority in one or more of the following hierarchy of controls

The most effective methods of control are:

- Elimination of hazards
- Substitute something safer
- Use engineering/design controls
- Use administrative controls such as safe work procedures.
- Protect the workers i.e. by ensuring competence through supervision and training, etc.

Each measure must have a designated person and date assigned for the implementation of controls. This ensures that all required safety measures will be completed.

Step 5: Monitor and Review

Hazard identification, risk assessment and control are an on-going process. Therefore, regularly review the effectiveness of your hazard assessment and control measures. Make sure that you undertake a hazard and risk assessment when there is change to the workplace including when work systems, tools, machinery or equipment changes. Provide additional supervision when the new employees with reduced skill levels or knowledge are introduced to the workplace.

VI. CONCLUSION

Hence the rapid change of technology the in these days, it is important to bring the operational deviations under control. The assessment like this always produces optimum results to maintain the system safe and healthy by breaking out the process of it step by step. The primary objective of the assessment is not only to find and removal of the risks, hazards but also to provide safe working environment to all those engaged directly or indirectly during the process. By adhering the protocols which prescribed for the activities will tremendously produce the results in avoidance of unforeseen incidents.

Further, the hazards and risks associated with the operation and maintenance were identified and mitigated by providing appropriate control measures. Also the residual risk assessment also carried out to justify the integrity of the assessment.



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