

**Risk Management for Natural Gas pipeline in CGD industry at Green
Gas limited**

Shubhanshu Srivastava (Roll No R107213014)

Under the guidance of

Dr.N.A Siddiqui & Mr.Dharani Kumar

University Petroleum & Energy Studies
Dehradun

Certificate

This is to certify that Mr. Shubhanshu Srivastava, student of M.Tech Disaster Management Roll Number R107213014 second year, University of Petroleum and Energy Studies, Dehradun has carried out his major project on topic for entitled **“Risk Management for Natural Gas pipeline in CGD industry at Green Gas limited”** under my supervision.

Report embodies result of original work and study carried out by student himself. The performance of candidate was excellent during this period.

I wish him all success in his life.

Date -13/4/2015



Mr Samit pandey

Manager O&M

Green Gas Limited,

Lucknow.

Declaration

I shubhanshu Srivastava student student of university of petroleum and energy studies persuing M.Tech in Disaster Management(Second Year) declare that project on **Risk Management of Natural Gas pipeline in CGD industry at Green Gas Limited** under guidance of **Mr Samit Pandey(Manager, O&M)** is completely performed by me.

And work in itself is completely original .

Shubhanshu Srivastava

MTech Disaster Management

UPES,Dehradun



Acknowledgement

This project is successfully completed with valuable contribution and inputs provided by many people directly and indirectly. I sincerely acknowledge all the supports and inputs of all the associated people throughout the project.

First and foremost I thank **S.P Shama (MD,GGL)** for allowing me to do my major project at Green Gas Limited and express my sincere thanks to the HR department also to introduce me to the Central UP Gas Ltd. and providing us this great opportunity to learn.

In the addition to this I express our gratitude to my external guide, **Mr. Samit Pandey,(Manager O&M)**,internal guide **Mr Dharani Kumar(Assistant Professor,HSE Dept.)** for his invaluable time he devotes in delineating the objectives and the scope of the project and providing me his guidance throughout the project. It is due the forthcoming discussions with him which have enabled us to successfully complete this project.

I also acknowledge Mr. Vinay Bharadwaj(assistant manager,technical),Mr Anubhav Mishra(Assistant,O&M) who helped us making this project a successful endeavour.

I am also thankful to “University of Petroleum and Energy Studies,Dehradun”, for providing me with an opportunity to pursue our major project and providing me with the sufficient help whenever required.

As everybody has supported me throughout the project, it is very difficult to mention all the associated here, I hereby submit my sincere thanks to all the GGL employees and staff for their kind support and help. It was a learning and wonderful experience with you all. Thank you.

Table of contents

Declaration	ii
Acknowledgement	iii
List of Figures And Table	vi-vii

Chapter No.	Title	Page number
1	Company Overview	1-8
1.1	CNG stations	
1.2	PNG installation	
1.3	Detailed process description	
1.4	Safety design features	
2	Abstract	9
3	Introduction	10-11
4	Literature Survey	12-36
4.1	Historical background of CGD industry,	
4.2	City gas distribution	
4.3	Energy resouces	
4.4	Natural gas value chain,	
4.5	CGD infrastructure	
4.6	Health and safety issues in CGD industry.	
4.7	Risk assessment for NG pipeline	
5	Materials and Method	37-59
5.1	Gas modelling with help of GasWorks 9.0	
5.2	HAZOP for PNG network	
5.3	Development of bow tie diagram including PEAR analysis	
5.4	FTA for pipeline rupture	
5.5	Dispersion modelling using ALOHA	

5.6	RCA	
6	Results and discussion	60-89
6.1	Gas modelling with help of GasWorks 9.0	
6.2	HAZOP in PNG network	
6.3	Development of Bow Tie diagram including PEAR analysis	
6.4	FTA for pipeline rupture	
6.5	Dispersion modelling using ALOHA	
6.6	RCA	
7	Conclusion and summary	90-103
7.1	Gas modelling with help of GasWorks 9.0	
7.2	HAZOP in PNG network	
7.3	Development of Bow Tie diagram including PEAR analysis	
7.4	FTA for pipeline rupture	
7.5	Dispersion modelling using ALOHA	
7.6	RCA	
8	References	104-105

LIST OF FIGURES AND TABLES

- List of Figures

S.No	Figure number	Description	Page number
1	Figure 1.1	Schematic diagram for CGD	6
2	Figure 3.1	RISK ANALYSIS,RISK ASSESSMENT,RISK MANAGEMENT	11
3	Figure 4.1	Exploration of different forms of ng	15
4	Figure 4.2	Natural gas value chain	19
5	Figure 4.3	Supply chain in NG industry	30
5	Figure 4.4	Ng from wellhead to consumption	35
6	Figure 4.5	Comparison of number of serious incidents of gas distribution,gathering ,and transmission pipeline	36
7	Figure 5.1	Schematic diagram dor cgd	43
8	Figure 5.2	Methodology for hazop	44
9	Figure 5.3	Methodology for bow tie analysis	45
10	Figure 5.4	Fault tre diagram	48
11	Figure 5.5	Symbology used in fta	49
12	Figure 5.6	Gaussian distribution and gaussian spread	51
13	Figure 5.7	Cloud spread as result of gravity	52
14	Figure 5.8	Methodology for RCA	59
15	Figure 6.1	Pressure caliberation at different nodes	60
16	Figure 6.2a Figure 6.2b Figure 6.2c	Piping network Adding of regulator Total connected network	61 62 62
17	Figure 6.3a Figure 6.3b	Pipeline layed area Distribution of pipeline	63 63

	Figure 6.3c	Distribution of pressure in region	64
18	Figure 6.4	Distance between two places	65
19	Figure 6.5	Description of Active bow tie window	79
20	Figure 6.6	Bow tie analysis at basic level	79
21	Figure 6.7	Bow tie analysis for ng pipeline rupture	80
22	Figure 6.8	Competencies of workers	82
23	Figure 6.9	Effectiveness level in code	82
24	Figure 6.10	Personnel employed in work	83
25	Figure 6.11	Control type with respect to colour coding	83
26	Figure 6.12	Risk register	84
27	Figure 6.13	Pipeline leakage scenario	90
28	Figure 6.14	Threat zone	91
29	Figure 6.15,i Figure 6.15,ii	Thermal radiation zone Thermal radiation at a point	91 91
30	Figure 6.16	Source strength	91

List of tables

S .no	Table number	DESCRIPTION	PAGE NUMBER
1	Table 1.1	Ggl's cng station	2-3
2	Table 4.1	Composition of natural gas	16-17
3	Table 5.1	Guideworks and their description in hazop	39-40
4	Table 5.2	Type of source,toxic scenerios,fire scenerios,explosion scenerios	54
5	Table 5.3	Scenario for over pressure and its expected damage	54
6	Table 5.4	Amount f radiation intensity and its effect on human body	55
7	Table 6.1	Colour coding and	81

		description of boxes in bow tie diagram	
8	Table 7.1	Risk matrix for the people	98
9	Table 7.2	Risk matrix for environment	99
10	Table 7.3	Risk matrix for asset	99
11	Table 7.4	Risk matrix for reputation	100
12	Table 7.5	Solution assessment report	102

