

Analysis of Oil and Natural Gas Pipeline Failures in USA

Shiva Sunder and C. Vipulanandan, Ph.D., P.E.
 Texas Hurricane Centre for Innovative Technology (THC-IT)
 Department of Civil and Environmental Engineering
 University of Houston, Houston, TX, 77204-4003
 Tel: (713)743-4291 Email Address: ssunder@mail.uh.edu

Abstract

In this study, the reason, frequency and the damages caused due to the failure in pipeline carrying natural gas, oil and other petroleum products have been investigated. Data consisting of a list of over 100 pipeline failures have been analyzed. It is to be noted that as the years progressed, the failure in oil and natural gas pipelines have been minimized. Results also showed that, the central, south and north east part of USA are the places most prone to the pipeline failures, however, the in the recent years the pipeline failure has reduced all over the country.

1. Introduction

Pipelines play a major role in the transport of oil and natural gas in USA. It is to be noted that the main causes for the failure of oil pipelines are rupture of pipes or explosion resulting in fire or detection of leaks. The data collected have the damages caused to human life by pipeline failures that have occurred for the past one decade only. The data has been grouped into two main categories. The pipelines carrying natural gas and pipelines carrying crude oil and other gas and petroleum products such as gasoline, liquid and gaseous propane etc., and some hazardous chemicals like anhydrous ammonia etc., however reason for a few pipeline failure which is not obtained have been excluded. Also some pipelines whose content is unknown has been added to oil/others group in this analysis.

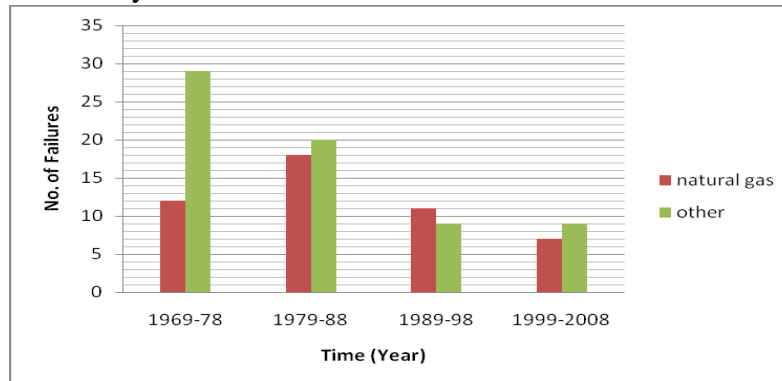


Figure 1: Failure of Oil and Natural Gas Pipelines since 1969

It is to be noted from Figure 1 that maximum of 41 pipeline failures occurred between 1969 to 1978. But as time progressed, the pipeline accidents reduced to only 20 and 16 between 1989 to 1998 and 1999 to 2008 respectively. From the graph it is also to be noted that the natural gas pipeline failure is less compared to oil and other petroleum products related pipeline failures except from 1989 to 1998 where there is a marginal variation of 2 oil/petroleum products pipeline less than natural gas pipeline.

2. Objective

The objective of this study was to investigate the trend in the oil and natural gas pipeline failures in USA. The damages and the causes for the failures are also briefly investigated.

3. Result and Analysis

From Figure 2a it is to be noted that majority of 8 Natural gas Pipelines failed in North-eastern

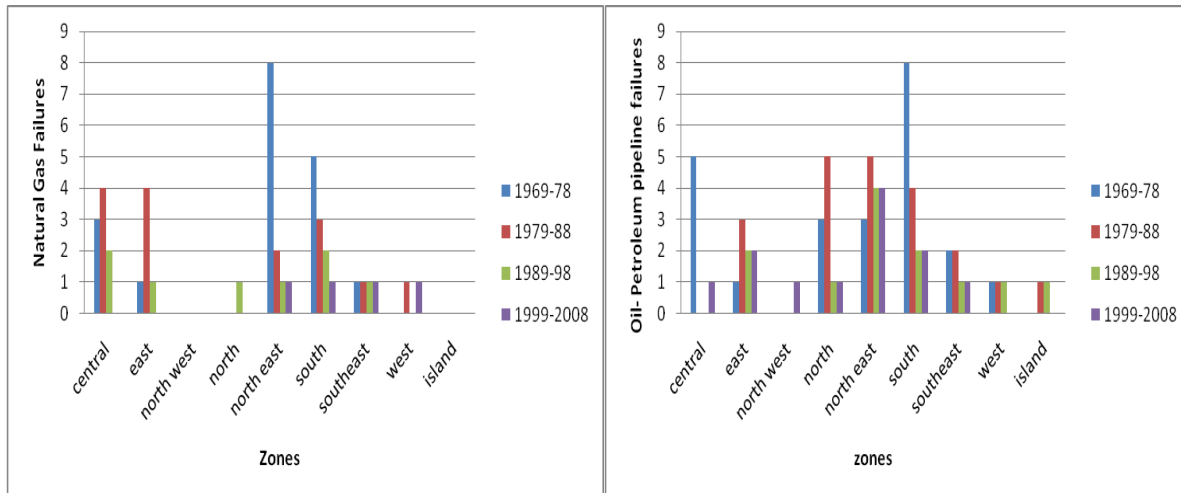


Figure 2: a) Natural gas Pipeline Failure Spread over US. b) Oil/Petroleum Products Pipeline Failure Spread over US

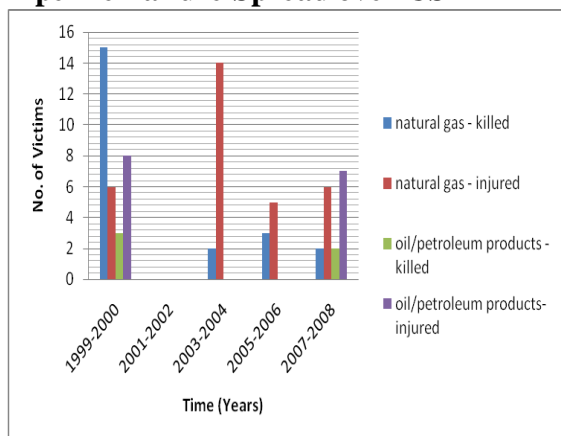


Figure 3: Victims due to pipeline failure

part of US during the years 1969-78 and none was reported failed in the North-western part. However, in 1979-88, central and eastern part recorded constant failures of 4. Southern and North-eastern part are the only region where natural gas pipeline failure has occurred on all the decades under study. Similarly, South holds highest number of other pipeline failures of 8 during 1969-78. It is also to be noted that since 1978 the pipeline failure had been detected in the central part only after 1999.

Also there is a consistent amount of failure in the north-eastern part of the country. The western part recorded a very less failure count of 1 during the decades 1969-78, 1979-88 and 1989-98. Figure 3 gives a brief overview of the injuries and fatalities caused by the pipeline failures that lead to explosion, fire, gas leak etc.,. The fatalities caused by natural gas leakage was detected to be as high as 15 during the years 1999-2000. And during the year 2003-04 also, the injuries due to natural gas leak was 14. Pipelines carrying other materials did contribute to damages to human life but were not that high except for 2007-08, 1999-2000 where the injuries were 7 and 8 respectively.

4. Conclusions

On the whole, the amount of pipeline failures have been reduced over the period of time, but the damages to human life is yet to be fully controlled. Most of the injuries and deaths take place owing to fire resulting in explosion and failure of pipeline. There has been consistent amount of failure of pipelines in the North-eastern part of USA.

5. Acknowledgement

The study was supported by the Texas Hurricane Center for Innovative Technology (THC-IT).

7. References

1. http://www.nts.gov/Publictn/P_Acc.htm - National Transportation Safety Board.