

Construction Method of Risk and Emergency System for Long Distance Natural Gas Pipeline

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Abstract

In order to overcome the risk of long-distance natural gas pipeline, this paper puts forward a new construction method of long-distance natural gas pipeline risk and emergency system. This construction method comprehensively analyzes the risk types of natural gas pipeline, including gas transmission station, gas transmission pipeline, natural disaster and third-party damage. In addition, the construction method also describes the emergency system of natural gas pipeline from four dimensions, namely risk elimination stage, emergency preparation stage, emergency response stage and recovery stage. The research results show that the construction method can effectively control the risk of natural gas pipeline so as to ensure the normal operation of natural gas pipeline.

Keywords

Long distance transportation; Natural gas; Natural gas pipeline; Risk; Emergency system.

1. Introduction

In the process of social development, natural gas is an indispensable and important part, the natural gas consumption market has gradually attracted people's attention, and the national natural gas consumption level is also higher and higher. In order to meet the increasing demand of natural gas consumption market, natural gas pipeline has also attracted the attention of a large number of researchers. However, it is worth noting that there are certain risks in the use of natural gas pipelines, such as flammable and explosive, high-energy and high-pressure, toxic and harmful. At the same time, some problems will inevitably appear in the process of using natural gas pipeline, such as natural gas leakage, natural gas pipeline rupture. At present, as the driving force of national economic development, the use of energy also presents a significant upward trend with the development of economic society. In addition, the prosperity of natural gas consumption market also makes people have to pay attention to the potential risks in the process of natural gas pipeline transportation, so as to avoid economic losses and casualties. In order to scientifically and effectively reduce the risk coefficient of long-distance natural gas pipeline and effectively control the use risk of natural gas pipeline, this paper puts forward a new construction method of natural gas pipeline risk and emergency system.

2. Definition of Natural Gas Pipeline

Natural gas pipelines, also known as gas pipelines, are designed to transport natural gas from production sites or processing plants to cities or industrial enterprises. At the same time, globally, the number and length of natural gas pipelines account for about half of all pipelines in the world. The

starting point of the natural gas pipeline is the natural gas exploitation site or natural gas processing station, and its terminal point is the city's gas distribution center or the natural gas pipeline of the enterprise.

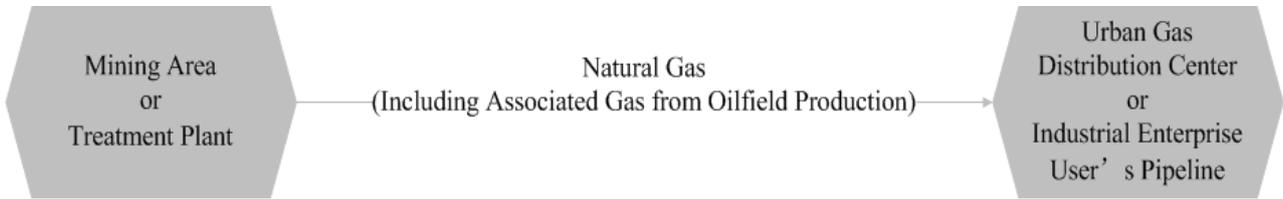


Fig. 1 Starting Point and Key Points of Natural Gas Pipeline

Using natural gas pipeline to transport natural gas has many advantages, such as low transportation cost, small floor area, construction period, large transportation volume, high safety and low loss. In addition, it is very important to use natural gas pipelines to transport natural gas, which will not lead to waste water, waste gas and solid waste. Therefore, natural gas pipeline is an excellent means to transport natural gas, which greatly reduces the risk factor of natural gas leakage, and its pollution to the surrounding environment is very light [1]. In addition, under most severe weather conditions, the natural gas pipeline can still operate smoothly and transport natural gas to its destination safely and efficiently. In addition, once the natural gas pipeline is completed, the later maintenance workload is small, which also makes the subsequent cost of natural gas pipeline low. At the same time, with the progress of science and technology, the natural gas pipeline can also be combined with the major science and technology, which also facilitates the supervision and management of natural gas pipeline transportation.

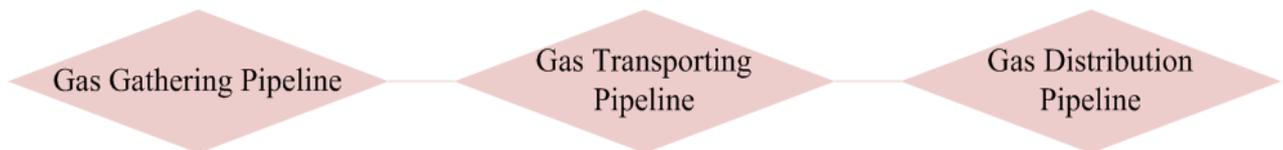


Fig. 2 Main types of natural gas pipelines

3. Risks of Natural Gas Pipeline

In real life, people living in the city use natural gas resources to carry out a series of practical activities, which will make life more convenient. However, it is worth noting that in the process of using natural gas, there are many potential risks, such as production and transportation. These potential risks will greatly affect people's lives. In order to prevent the occurrence probability of these risks from the source, it is necessary to have an in-depth and comprehensive understanding of the risks existing in natural gas pipelines. At present, the risks of natural gas pipeline can be divided into four aspects: gas transmission station, gas transmission pipeline, natural disaster and third-party damage [2].

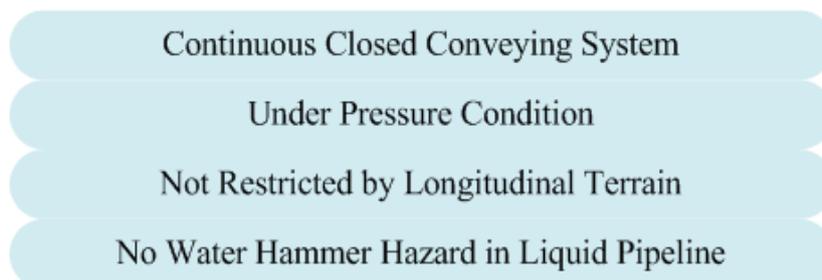


Fig. 3 Characteristics of natural gas pipeline

3.1 Gas Transmission Station

In the early stage of the construction of natural gas transmission station, many designers only conduct in-depth research and Analysis on the structure of natural gas production in the process of design, but such a way can not ensure that the design of natural gas transmission station can meet the current social demand and standards for natural gas and other energy production. From a long-term point of view, at present, many areas of natural gas transmission stations are lack of long-term planning and design, which means that with the completion of natural gas transmission stations put into use, it will inevitably pose a threat to the personal safety of staff and surrounding residents [3].

When the natural gas transmission station is working, its air compressor is affected by many factors, such as vibration sound, pressure, low temperature, etc., which also leads to the high frequency of air compressor failure. In addition, some gas transmission stations have quality problems, such as design quality, installation quality, material quality, etc., which will seriously threaten the safety of natural gas pipeline connection. If the sealing welding equipment or filtering equipment in the natural gas pipeline has faults, the natural gas in the pipeline can not be discharged in time, and then the accident of natural gas leakage will occur. In addition, special attention must be paid to the cleaning work of natural gas transmission stations. If the cleaning work is not scientific, it may lead to equipment damage or failure, and then accidents will occur. In addition, the automatic pressure detection system is an important part of the natural gas transmission station, and is also the key equipment in the natural gas transportation link. If due to the improper operation of the staff, it is likely to cause damage to the equipment in the gas transmission station, and even cause fire [4].

3.2 Gas Pipeline

For natural gas pipeline, if corrosion occurs, it will affect the thickness of pipeline inner wall and pipeline inner wall, thus greatly increasing the frequency of explosion accidents. Generally, the corrosion of natural gas pipeline can be divided into two types, namely external corrosion and internal corrosion. In terms of severity, the damage degree of natural gas pipeline caused by internal corrosion is higher than that caused by external corrosion. In addition, because the natural gas pipeline is buried underground, the different composition of the surrounding soil will also have a serious impact on the natural gas pipeline, especially the microorganisms and bacteria in the soil.

3.3 Natural Disaster

During the construction of natural gas pipeline, other practical activities may also be carried out around the pipeline, such as mining, construction, etc. these activities may have an impact on the construction of the pipeline, or even lead to the bending or deformation of the pipeline. At the same time, some construction activities will damage the pipeline construction to a certain extent. In addition, after the completion of natural gas pipeline construction, when these pipelines transport natural gas, they need to pass through various regions, and the terrain structure and geological conditions of different regions are also quite different, especially the terrain structure of some areas is relatively complex, which will inevitably damage the natural gas pipeline. In addition, the weather conditions in some areas are relatively bad, and the natural gas pipeline in a long-term harsh environment will inevitably produce all kinds of damage. At the same time, in some areas, natural disasters occur frequently, such as earthquakes, floods, etc., which will seriously damage the safety of natural gas pipelines, and even lead to natural gas pipeline rupture and other phenomena [5].

3.4 Third-Party Damage

In addition to gas transmission stations, gas pipelines and natural disasters will have a greater adverse impact on natural gas pipelines, there are also third-party damage will have adverse effects on natural gas pipelines. Specifically speaking, the third-party damage refers to the construction of roads along the line, mining of surrounding mines and other human activities, which will not only have a negative impact on the natural gas pipeline in the construction process, but also have an impact on the completed natural gas pipeline, thus increasing the investment cost of natural gas pipeline.

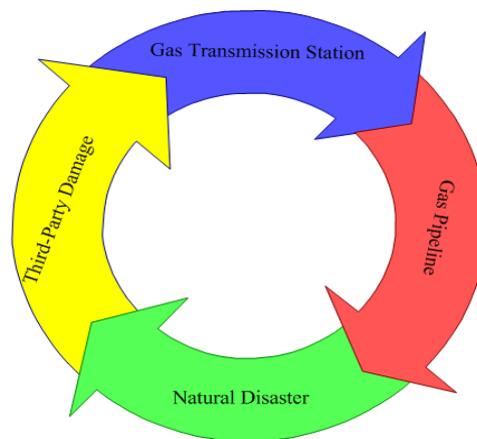


Fig. 4 Risks of natural gas pipeline

4. Risk and Emergency System of Long Distance Natural Gas Pipeline

4.1 Risk Elimination Stage

The ultimate purpose of risk elimination stage is to reduce the harm of natural gas pipeline risk to personnel as much as possible. In the stage of risk elimination, corresponding measures should be taken to reduce the potential risk of natural gas as much as possible. In addition, compared with other stages, the risk elimination stage is a very long process, in which a lot of people are involved. In the risk elimination stage, the staff must review and analyze the natural gas pipeline in detail, and evaluate the hazard factors existing in the natural gas pipeline [6]. For the staff, the most important thing is to control the risk with high frequency and high risk coefficient scientifically and effectively. In general, the staff must read the regular inspection of each major part of the gas pipeline, especially in the surrounding densely populated areas. At the same time, the staff should objectively repair and replace the natural gas pipeline according to the evaluation results.

4.2 Emergency Preparation Stage

The purpose of emergency preparation stage is to improve the disaster prevention and relief ability of governments, communities, emergency workers and surrounding residents. Therefore, in the emergency preparation stage, relevant staff will popularize all kinds of knowledge training and emergency drills related to natural gas pipeline for governments at all levels, communities, emergency workers and surrounding residents. At the same time, relevant staff will also provide financial support and technical support for governments at all levels, communities, emergency workers and surrounding residents. However, it is worth noting that the emergency planning stage does not mean that only preparatory work needs to be done in this period, which runs through all major work links. At the same time, it also requires that emergency preparations must be made after the construction of natural gas pipelines. In addition, emergency preparedness mainly consists of four parts: preparation, planning, evaluation and evaluation. For example, in the emergency preparation stage, the staff need to carefully learn and memorize the various types of disasters that may occur in the natural gas pipeline, such as poisoning, explosion, etc., and learn how to make accurate and scientific risk assessment on the consequences of these disasters.

4.3 Emergency Response Stage

The purpose of the emergency response stage is to minimize the harm caused by the accident. Therefore, the emergency response stage begins after the natural gas pipeline accident. At the same time, the ultimate goal of the emergency response stage is to quickly rescue the scene personnel and

reduce the adverse consequences of the accident as much as possible. In addition, in the emergency response stage, the main departments involved are the emergency management department, which needs to develop a scientific and reasonable emergency rescue plan in combination with the specific group of accidents. At the same time, the Department also needs to provide all kinds of emergency rescue resources for the accident scene, such as technology, personnel, funds, etc., so that the emergency rescue work can be completed in the shortest possible time [7].

4.4 Recovery Phase

After the occurrence of natural gas pipeline accident, in the emergency response stage and after the completion of property protection, rescue and transfer of field personnel, on-site personnel placement and other links, it enters the post accident recovery stage. However, some large accidents may take a long time to enter the recovery phase. At the same time, as the third stage, the boundary between the emergency response stage and this stage is not obvious. In addition, it is worth noting that while dividing the two stages, it is also necessary to scientifically and accurately assess the damage to the personal safety and property safety of on-site personnel according to the specific situation of the scene at that time. Only in this way can we ensure the smooth progress of the risk and emergency measures of natural gas pipeline.

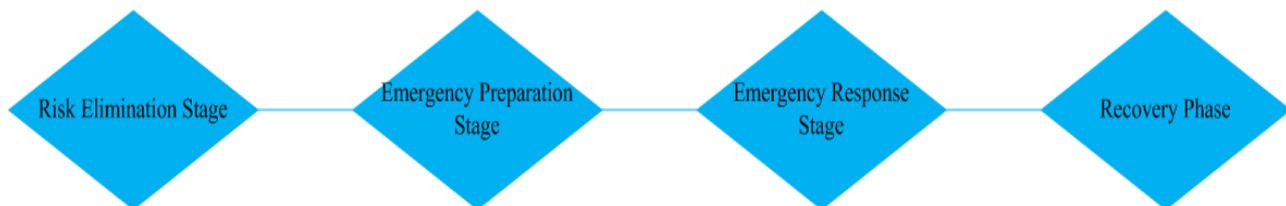


Fig. 5 Risk and emergency system of long distance natural gas pipeline

5. Summary

To sum up, for a country, the quality of natural gas pipeline and its transportation level are important standards to measure the level of national economic development. In addition, the construction and later operation of natural gas pipelines must be strictly controlled. For the staff, they must have a comprehensive and systematic understanding of the risks of the natural gas pipeline, and understand the emergency measures and rescue measures after the natural gas pipeline accident. At the same time, the country and people must improve their awareness of prevention and use natural gas in a scientific way.

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