

Explore the Current Situation and Optimization Urban Gas Transmission and Distribution Pipe Network

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Abstract

As one of the clean energy sources, natural gas is widely used in life, so that the gas transmission and distribution pipe network inside the city becomes larger and more complicated. The construction of gas transmission and distribution network has a huge investment, so optimizing gas transmission and distribution network can promote economic development and reduce environmental pollution. In this paper, the status quo of urban gas transmission and distribution network is analyzed and the optimization method is explored.

Keywords

Urban gas transmission; Distribution pipe network; Optimization method.

1. Introduction

The rapid development of the world has brought about serious energy problems. The exploitation and use of large amounts of coal and oil have caused global warming and energy shortage. People attach more importance to the development concept of low carbon and environmental protection. At this time, natural gas, as a new clean energy, appears in the public eye. It not only brings convenience to people's life, but also has less pollution to the environment. Because natural gas is clean energy and its combustion products have little pollution to the environment, and the calorific value released by combustion is high, it is widely used in life. The city's underground distribution network has become intricate. Gas has a certain loss in pipeline and a lot of funds are invested in complex pipeline construction. In order to reduce the funds and improve the gas transmission efficiency, we need to explore ways to improve the transmission and distribution technology. One important link is to optimize the design of the urban gas transmission and distribution pipe network, and to optimize and plan the pipe network.

2. Urban Gas Transmission and Distribution Pipe Network System

2.1. Status Quo of Urban Gas Transmission and Distribution Pipe Network

The main function of urban gas transmission and distribution pipe network is to produce and transport gas to industrial households for their daily life. The urban gas transmission and distribution pipe network is composed of a large number of gas pipes connecting the gas source points and the gas consumption nodes. In recent years, urbanization has been continuously expanded, the old city has also been renovated, and the gas pipeline has been re-laid. With the development of cities, road construction and building construction are likely to cause damage to pipeline, causing gas leakage and causing safety problems. And the power grid transformation will also have a certain impact on the operation of gas pipe network. The normal service time of the pipeline is 20-30 years, but due to various reasons such as pipeline corrosion and gas leakage along the pipeline, the service life of the gas pipeline will be reduced, which will not only waste money but also affect people's life to a certain extent.

2.2. Classification of Urban Gas Pipe Network System

2.2.1 Classification of gas pipe lines

The classification of gas pipeline can be classified to their use, laying mode and gas transmission pressure.

First, according to the use of classification: according to the long-distance pipeline and close use can be divided into long distance gas transmission, close use as urban gas for urban pipeline, there are still a part of industrial and commercial users.

Classified according to laying mode:(1) Underground gas pipeline (2) Overhead gas pipelines

Classified according to gas transmission pressure.

2.2.2 Urban gas pipe network system and selection

Composition of urban gas transmission and distribution system: the gas transmission and distribution system is mainly composed of electric gas pipe network, gas distribution stations and gas pressure station. However, different pressure levels cause different devices, and different types of pressure regulating stations and pressure regulating devices. There are also storage and distribution stations for storage and distribution devices, departments for monitoring the flow of gas and timely dispatching in case of major accidents, and monitoring and dispatching centers. Timely repair out of the site maintenance management center.

Factors to be considered in the selection of the gas pipe network system (1) the situation of the gas source: the type and nature of the gas source, the supply volume and supply pressure, the development of the gas source or the planning of the replacement of the gas source. (2) City: The current size of the city, the future planning of the city, the distribution of the building, the road blocks, the number of the population and the distribution of the population density. (3) To optimize on the basis of the original city, it is necessary to understand the current gas supply equipment in the city. (4) The three major users of residential, industrial and commercial gas use needs are different. Therefore, it is necessary to clearly know the gas use requirements of different types of users. After investigation, different supply routes can be selected to meet the requirements of various users.

Due to the different between urban gas pipe network and long-distance transmission pipeline, the transmission and distribution of long-distance transmission pipeline is difficult to be applied to the gas pipe network. The biggest difference between the two lies in the pressure grade and pipeline material selection. Therefore, if gas enterprises want to establish an integrity management system, they should consider the current situation of the city's gas pipe network and its characteristics. The establishment of the integrated gas management system should consider the different gas pressure levels. For example, the pressure level of the high-pressure or second high-pressure pipeline is 0.4Mpa-4.0Mpa. Due to the range of the pressure level, the high-pressure or second high-pressure pipeline can be regarded as the long-distance gas pipeline. The mater selection of the pipeline under different pressures is different, for example, the material of the medium pressure gas pipeline is polyethylene pipe (PE pipe). In order to monitor pipeline risks, open leak detection is used for low voltage pipeline, and enhanced line patrolling is performed.

3. Analysis of Problems in Urban Gas Pipe Network

3.1. The Management of Underground Pipe Network Is Not Standardized Enough

With the development of economy, the scale of urban development is gradually, and the construction of gas transmission and distribution pipe network also has a new development when the use of gas increases. However, there are also problems such as non-standard and non-

unified management of underground gas transmission and distribution pipe network, as well as non-standard and non-unified management during construction. In urban construction, underground pipelines have all kinds of problems such as occupying pressure, which may lead to leakage of gas pipelines and threaten the safety of users' gas use.

3.2. Non-standard Problems in the Construction of Gas Pipe Network.

May occur during the construction of groove depth is not enough, no backfill in accordance with the requirements and the lack of sand filling protection, welding is not standard, not according to the requirements of pipeline corrosion treatment, these problems will increase the risk of pipe work main reason is the city gas pipeline network construction in the construction process of non-standard problem is not only a homework personnel itself is unqualified and professional skills Part of the reason is the lack of attention to the quality and safety of the construction, construction supervision personnel and technical personnel on the site of the negligence of the construction quality, did not do a good job of supervision.

3.3. The Problem of Illegal Construction

Now on the edge of the rural and urban there are many irregularities of temporary venues, appeared to illegal to tie up the gas pipeline and gas facilities closed, in case of gas leakage these illegal buildings will breakdown maintenance and regular maintenance inspection operation inconvenience, and are likely to result in pipeline damage occurs when an illegal construction leakage, serious accident.

4. Exploration and Significance of Optimization of Urban Gas Pipe Network

4.1. Optimization Method of Pipe Network

The optimization method includes the traditional method and the intelligent optimization algorithm. The traditional method includes the enumeration method and the generalized simplified gradient method (GRG). Dynamic programming method, the fastest descent method. Intelligent optimization algorithms include BP neural network, genetic algorithm and simulated annealing algorithm.

4.2. Optimal Design of Pipe Network

The purpose of planning urban gas transmission and distribution network is to save more investment in meeting users' basic demand for gas and to simplify the complex urban gas transmission and distribution network. In the project as far as possible to reduce the investment of funds, but the pipe network system should be safe, economic and stable requirements. To optimize the urban gas transmission and distribution pipe network, it is necessary to ensure that the conveying pressure and flow can be supplied to residents. On this basis, the existing pipeline distribution structure is analyzed, the flow and pressure distribution of the gas system are analyzed, and the number and location of the pressure regulating stations are planned and determined. With the development of artificial intelligence, using artificial intelligence to choose the optimal construction scheme is the future development of the pipeline network.

The construction of urban gas transmission and distribution pipe network is usually laid underground along the green belt or sidewalk, and the exact location of the pipeline is determined after the indoor gas pipe network system is determined. The line of gas transmission and distribution pipeline network is related to the construction number of regulating stations, and the construction location of storage and distribution stations, gate stations and tuning stations should be observed. Different pressure levels have an impact on

the layout of the main line and pipeline of the gas transmission line, and the location of the pipeline should be reasonably determined

4.3. Reasonable Scheduling and Distribution of Pipe Network System

In city gas lines, scheduling and distribution departments to provide reference data for pipeline network, is an important part of engineering construction, for the moment, can according to the different level of city pipe network schedule, can be manually controlled gas peak, in different areas of the city to avoid the gas peak time, reduce the distribution pipe network pressure.

According to different levels of gas pressure, there will be great differences in the plane layout. The medium pressure transmission and distribution pipe network mainly supplies the areas that use gas in the city, such as residential areas and commercial areas. The low repulsion pipe network is mainly arranged in remote places to avoid areas with large traffic flow. Far from the center of the city. High pressure gas pipeline by king risk coefficient is very high, so high pressure distribution line should be decorated in areas far from the city, laying on the edge of the city, extends to the city to set aside a safe distance from within and pipe network shape should be circular, is to use gas peak adjustment in the city traffic points later, ensure the operation of the pipeline.

4.4. Explore the Significance of Pipeline Network Optimization.

The location and quantity of storage and distribution stations and pressure regulating stations can be reasonably arranged through the optimization design of urban number allocation. To meet the basic people use the use of gas pressure and the use of gas volume. With the construction of the city, to the construction of gas pipeline network is gradually increased, in optimizing the design of city gas pipeline network, to the demand of city gas is calculated, the workload is huge amount of calculation, calculation and optimization algorithm to use computer, to solve human problems, improve the efficiency of optimization design scheme and pipeline transport. Using software to calculate the diameter and size of the gas pipe network, it can reduce the use of metal and reduce the investment cost. In order to control capital investment.

5. Conclusion

Gas as a clean energy has low emissions, easy to use, and the characteristics of the high resource utilization, can solve people's demand for energy, but according to the current situation of gas pipeline network, there are many factors that can influence the operation of gas pipeline network, timely find out the problems existing in the urban pipeline network now and optimization of city pipe network system, fundamentally solve the problem of running. If necessary, formulate the best optimization plan based on the existing environment. (This paper is supported by the Innovation and Entrepreneurship Training Program of University of Science and Technology Liaoning 202010146579)

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