Analysis on the Causes of the third party destruction of City Gas Pipelines and Research on Countermeasures

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Abstract. While the universal application and rapid development of natural gas have improved people's living standards, it has also improved the traditional energy structure and contributed to environmental protection. However, with the increasing speed and scale of urban gas engineering construction, the safety maintenance and prevention of gas pipelines that follow are particularly important for gas companies. In particular, the third-party construction unit does not pay enough attention to the gas pipeline network, and it is easy to cause damage to the pipeline network during construction and cause gas pipeline leakage accidents. This paper uses big data technology to find the key elements of third-party construction and construction damage risks in massive data, builds a high-prone construction area model and construction damage risk model, provides countermeasures against damage risks, and improves the effectiveness and prevention of external damage risks. Targeted, reduce the frequency and extent of damage to gas pipelines and facilities, and ensure the safe operation of the gas pipeline network.

Keywords: City gas pipeline, Three-way construction, Damage analysis, Precaution.

1. Analysis on the Causes of the Third Party Destruction of City Gas Pipe
Because the third-party construction unit does not pay enough attention to the gas pipeline network, it is easy to cause damage to the pipeline network during construction and cause gas pipeline leakage accidents. According to statistics of major oil and gas pipeline leakage accidents that have occurred in the past 10 years, this article found that oil and gas pipeline accidents caused by third-party construction accounted for approximately 36% of the total number of accidents. Once urban gas pipelines are damaged by third-party construction, especially urban high-pressure gas pipelines and important medium-pressure trunk pipes (such as the out-station medium-pressure trunk pipes of emergency gas source stations in gate stations), it will not only affect the normal use of gas users near the accident area. Gas may also cause gas explosion accidents or other secondary disasters, causing huge losses to people’s lives and property, businesses, and society.

2. Research on preventive measures for third-party damage to urban gas pipelines
At present, the gas company has a large number of third-party construction cooperation data and sample data of construction damage incidents, supplemented by certain external big data of the enterprise, and conducts multi-dimensional statistical analysis on the characteristics of third-party construction and...
construction damage. The key influencing factors are excavated and identified, the failure consequences of construction damage are classified and evaluated, and the correlation between each key influencing factor and the failure consequences is studied, so as to construct a third-party construction damage risk prediction model and a third-party construction high-prone area prediction model; Under the guidance of the model, combined with China’s current gas pipeline management and operation system and related laws and regulations, the internal and external risk prevention and emergency measures are proposed to reduce the third-party construction damage of the gas pipeline, reduce the probability of accidents, and improve the active service. The safety and economy of pipeline operation will enhance corporate risk control capabilities and safeguard the safety of people’s lives and property.

3. Research on countermeasures for third-party damage to urban gas pipelines
In recent years, the Gas Company Group Company has mastered a large amount of third-party construction cooperation original data, supplemented by certain external big data of the enterprise, and used unstructured data processing technology to structure the massive amount of unstructured sample data from multiple data sources and multiple business fields, and use professional data analysis and mining tools to conduct exploratory and confirmatory mining analysis, extract classification factors related to the frequency of construction activities from the time and space dimensions, and explore the characteristics and laws of third-party construction.

Through the effective integration of a large number of third-party construction damage event sample data mastered by the Gas Company Group in recent years, unstructured and loosely coupled sample data are processed to generate structured and tightly coupled sample data, from the time of damage, the area where damage occurs, and the Perform statistical analysis on sample data in multiple dimensions such as location, construction type, construction unit, policy event impact, municipal engineering impact, construction remaining issues, etc., excavate the characteristics and rules of third-party construction damage to gas pipelines, and identify the key to construction damage accidents Influencing factors.

4. Research on prevention and countermeasures of construction damage risk
Under the guidance of the third-party construction damage risk prediction model and the third-party construction high-incidence area prediction model, combined with my country's current gas pipeline management and operation system and various management systems of the gas group company, from the perspective of optimizing gas pipeline operation management measures, put forward targeted risk prevention and emergency measures recommendations, provide a comprehensive and feasible basis for the daily operation management, inspection, maintenance and replacement of gas pipelines, and carry out effective risk control for the damage of gas pipelines by third-party construction.

5. Conclusion
The gas company group excavates the characteristics of third-party construction and the characteristics of third-party construction damage, identifies the key influencing factors of third-party construction damage to gas pipelines, and analyzes the correlation between the key influencing factors of construction damage and the consequences of construction damage failure; build a third party The prediction model for the high-incidence area of construction realizes the prediction of the high-incidence area of the third-party construction activities in Beijing; the construction of a third-party construction damage risk prediction model to realize the classification of the construction damage risk of specific construction activities; and from the optimization of the construction cooperation management system and the optimization of pipeline Operation management measures and other perspectives put forward targeted internal and external risk prevention and emergency measures to reduce third-party construction damage to gas pipelines, reduce the probability of accidents, improve the safety and economy of existing pipeline operations, and enhance corporate risk control capabilities and maintenance. The safety of people's lives and property.
References

[1] Kaiming He, Xiangyu Zhang, Shaoqing Ren, Jian Sun. "Delving Deep into Rectifiers: Surpassing Human-Level Performance on ImageNet Classification," 2015 IEEE International Conference on Computer Vision (ICCV), Santiago, Chile, Dec. 2015.

J. I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

[2] Nitish Srivastava, Geoffrey Hinton, Alex Krizhevsky, Ilya Sutskever, Ruslan Salakhutdinov. "Dropout: A Simple Way to Prevent Neural Networks from Overfitting," Journal of Machine Learning Research, Vol. 15, No. 56, pp: 1929-1958, 2014.

[3] Adam Paszke, Sam Gross, Francisco Massa, *et. al.* "PyTorch: An Imperative Style, High-Performance Deep Learning Library," Advances in Neural Information Processing Systems, pp: 8024-8035, 2019.

[4] Construction technology and quality control of gas pipeline engineering[J]. Zhou Pan. Housing and Real Estate. 2019(31).

[5] Discussion on the design and construction management of urban gas pipelines[J]. Zhang Qinqiang. Chemical Management. 2019(33).