Comprehensive data fusion and analysis methods for pipeline corrosion protection

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Abstract As an important infrastructure for oil and gas energy transmission, the safety and reliability of pipelines are very important for modern industrial systems. Corrosion is one of the main factors affecting the safe operation of pipelines throughout their service lifecycle, so effective corrosion management is the key to ensuring pipeline integrity. With the development of various monitoring and surveying technologies and the improvement of corrosion management standards, pipelines have accumulated a large amount of corrosion-related monitoring and surveying data, and operation and maintenance records as the increase of service cycle, including cathodic protection data, corrosion data, soil data, interference data, repair records, retrofitting records, etc. The diversity and complexity of these data pose challenges to the integration and mining analysis. The purpose of this paper is to explore the comprehensive data fusion and analysis methods of pipeline corrosion protection, and to propose a set of systematic data storage, cleaning processing, spatiotemporal alignment and mining analysis processes by discussing the problems faced at the data level, analysis level and management level. This paper first analyzes the types and characteristics of pipeline corrosion-related data, then proposes a series of methods such as data preprocessing, data fusion, correlation analysis and data application, and finally discusses the application value and potential challenges of these methods in actual pipeline corrosion management scenarios. The results show that through comprehensive data fusion and scientific analysis, the efficiency and accuracy of pipeline corrosion management can be improved in cost-effective way, and scientific decision-making support can be provided for the safe operation of pipelines.

Keywords Pipeline, corrosion management, data fusion, data processing, correlation analysis

Reference

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