

Research and Development of Gas and Pipeline Technical Standard Content Reveal Technology and System

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Abstract: Traditional standard retrieval methods and systems presented in various papers are widely used based on the standard titles and the keywords. However, these methods may be inapposite to modern pipeline engineers, especially for the ones who want find the requirements details of pipeline standards as fast as possible. In recent years, a number of projects have been funded to develop a Gas and Pipeline Standard Content Reveals System in PetroChina. This paper covers the development process of the system. The development of Gas and Pipeline Standard Content Reveals System involves ontology knowledge, technical details picking up and reveals system, and the process is as follows. Firstly, standard retrieval methods are reviewed. Then pipeline ontology knowledge is built as standardization objects. So the gas and pipeline standard content reveals system can be designed and developed with powerful database. It is believed that the approach to show the standard content presented in this paper may lay the initial basis for the important assist system for pipelines engineers.

Introduction

Traditional standard retrieval methods and systems presented in various papers are widely used based on the standard titles and the keywords. However, these methods may be inapposite to modern pipeline engineers, especially for the ones who want find the requirements details of pipeline standards as fast as possible.

Features and Limitations of Traditional Standard Retrieval System

Construction and maintenance of the standard retrieval system are essential to standard informationalization. CNPC and other companies all have set up the standard retrieval system to mainly provide the functions such as standard bibliography search and query, full-text browse and download, information publish and technical forums. Traditional standard retrieval mode based on basic field information only can provide retrievals of standard names and keywords, of which shortcomings are as follows: It cannot reach precise search of technical standard contents. It can neither search Technical indicators of different standards nor achieve comparison of the same technical index between different standards

Status of Standard Content Reveal Technology

As a new standard retrieval technology, the standard content reveal technology can realize efficient standard information retrieval of basic field information and important Technical indicators through systematic reveal and effect organization of standard Technical indicators. In China, only the China National Institute of Standardization has preliminarily applied the Standard content reveal technology in national standards of food and agricultural products and built an appropriate reveal system platform to realize reveals [1] of standard content indexes. No commercial database is developed based on the technology abroad.

Functions of Standard Content Reveal Technology

Standard content reveal technology mainly overcomes the shortcomings of the traditional retrieval mode to achieve the following three functions[2].

Precise positioning and retrieval of Technical indicators in standard contents.

Retrieval of standard systems related to Technical indicators.

Comparison of the same technical index in different standards.

Development of Technical Standard Content Reveal Technology and System for Natural Gas and Pipeline

Overall Technical Route

For applications of the Standard content reveal technology in the natural gas and pipeline area, a feasible technical route must be developed based on features of gas and pipeline standards rather than experience of the other technical areas, as shown in Figure 1. It is difficult for the gas and pipeline Standard content reveal technology to build the gas and pipeline standard knowledge system (ontology) and reveal style.

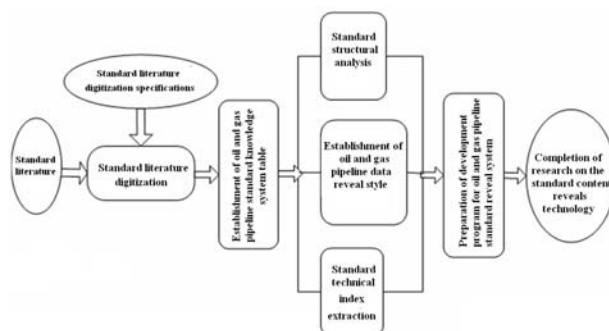


Figure 1 Technical Route for Research and Development of Standard content reveal technology and System

Establishment of Gas and Pipeline Standard Knowledge System (Ontology)

Gas and pipeline standard knowledge system (ontology) is the standardization object and basic element of the standard reveal. The gas and pipeline standard knowledge system table shall be established based on status of gas and pipeline specialty, industry habits and general retrieval habits and by using existing mature professional classification results as far as possible to ensure its practicality and usability.

Establishment of Gas and Pipeline Data Reveal Style

Gas and pipeline data reveal style is the frame structure by which different standards are comparable and the important framework containing reveal properties and indexes. Establishment of the gas and pipeline data reveal style mainly follows 7 basic steps, as follows:

① To classify existing gas and pipeline standards based on the professional subject scope and distribution[3].

② To analyze style features of standards within the same subject scope and determine whether the standards within the same subject scope (such as the pipeline operation standards) are further need to be divided into different categories based on professional characteristics and style structure similarity. For example, the pipeline operation standards can be divided into two major categories of gas pipeline operation and liquid pipeline operation based on the above analysis[4].

③ To analyze style features of all standards in the same category, extract style elements of each standard and merge similar ones of different standards in the category[5].

④ It is required to fully consider professional elements and structural elements for establishment of style structure table. There shall be a strict logical relationship between style elements at different levels.

⑤ Level 1 style elements for each category of standards shall cover all contents of the category to ensure integrity of standard knowledge; style elements at Level 2, Level 3 and other levels shall follow intercommunity, that is, the standards containing the same Level 1 style elements all shall provide the style elements at Level 2, Level 3 and other levels below Level 1.

⑥ Names of style elements at each level shall follow generality. User retrieval portals can increase by modifying style structure and adding synonyms for each style element according to standard content and expertise.

⑦ Establishment of the style structure table is basically completed through the above work. In the latter indexing, the style structure table shall be adjusted constantly to better meet the needs for retrieval.

Basic Functions of Gas and Pipeline Standard Content Reveal System

The Standard content reveal technology is applied in the gas and pipeline area to complete development of the gas and pipeline standard content reveal system based on the established gas and pipeline technical standard knowledge system (ontology), gas and pipeline data reveal style and function design of the reveal system.

Simple retrieval of reveal system

When in need of simple retrieval, click on the left Simple Retrieval of Reveal System to enter the simple retrieval interface. Then, input keywords into the input box of subject terms, separate them by spaces, select With Upper Standards and With Lower Standards and click on the retrieval button to search results, as shown in Figure 2.



Figure 2 Simple Retrieval Interface of Reveal System

Advanced retrieval of reveal data

When in need of advanced retrieval, click on the left Advanced Retrieval of Reveal Data to enter the advanced retrieval interface, as shown in Figure 3.

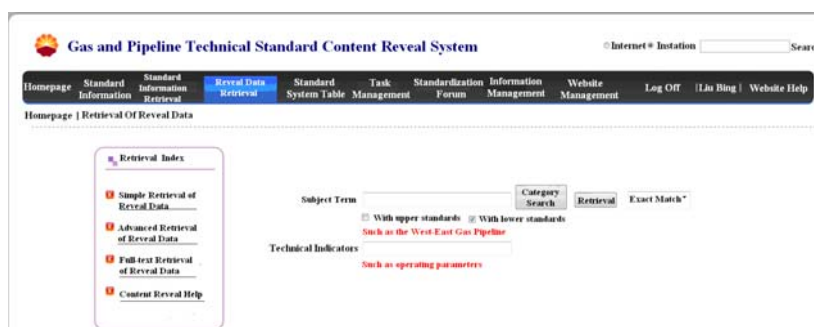


Figure 3 Interface for Advanced Retrieval of Reveal Data

Advanced retrieval uses two query modes, namely direct query and wizard query. When in need of the direct query, input the query object (ontology) into the input box of subject term and the query index into the input box of index. If the subject term is West-East Gas Pipeline and the index

Pipeline Control and Operations, select With Upper Standards and With Lower Standards and click on the Retrieval to search results.

When in need of the wizard query, input keywords into the subject term bar. If the Category Search button is clicked with the keyword of West-East Gas Pipeline, the upper ontology, ontology and lower ontology will be displayed on the left side of result column and the ontology's features and indicators be displayed respectively in the options of the Features and Indexes in the Property Bar, as shown in Figure 4.

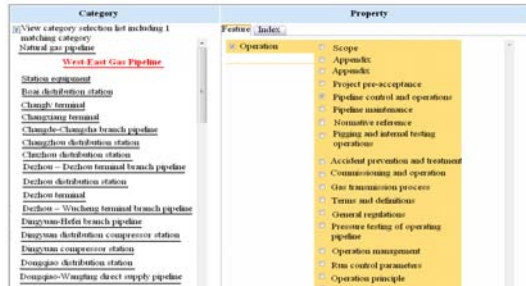


Figure 4 Wizard Query Interface for Advanced Retrieval of Reveal Data

After the index or feature is selected, click on the button Retrieval to search results, as shown in Figure 5. In the retrieval results, click on standards in the source column to connect the standard bibliography page.

Standard Category	Retrieval Object	Property Type	Technical Indexes	Contents	Notes to Contents	Resources	Related Standards	Standard System
Enterprise-Oil	West-East Gas Pipeline	Operation: Pipeline Control and Operations	Control mode	Pipeline operation control uses three modes of control: control, station control and local control.		QSY 11871.2009		2011/2 Standard System Management Regulation
Enterprise-Oil	West-East Gas Pipeline	Operation: Pipeline Control and Operations	Dispatching management	Dispatching management is followed and requires remote operation without approval by the dispatching center. When access leads, force, equipment and other emergency work in the station, immediately report the IED system. The on-duty operator in the station shall report to the dispatching center timely after the operation is completed.		QSY 11871.2009		2011/2 Standard System Management Regulation

Figure 5 Advanced Retrieval Results of Reveal Data

Application Prospect of Gas and Pipeline Standard Content Reveal Technology

Application Value and Significance

Standard informationalization is the basic method and important foundation for standard work. The content reveal technology developed can meet the higher requirements of vast pipeline engineering personnel for the standard retrieval to provide value-added standard retrieval services.

Prospects

The standard content reveal system is the latest development direction of standard information retrieval. It is believed that a professional, powerful, user-friendly and easy - to - use platform will be completed; the standard reveal technology widely applied and standard informationalization enter a new history development stage in the near future.

References

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