Development and Research of Petrochemical Database System Based on Wastewater Pollutant Composition Analysis

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Abstract

In order to adapt to the development of information technology, to break the oil data isolation between multiple systems caused by the data stack, "data island" the status quo, this paper proposes an improved adaptive framework of wastewater treatment, and based on this framework construction a set of feasible comprehensive database management system, oil will cover all the data in the field of oil to oil comprehensive database, realize data unified management, unified maintenance;And through the establishment of a reasonable data retrieval mechanism, to provide a strong data support for the petroleum information system, so that it can meet the needs of information applications.

Keywords: Wastewater Treatment, Data Integration, Petroleum Information, Comprehensive Database

1. Introduction

With the development of petroleum technology and information technology, petroleum information is acquired through complex ways, with numerous data types and huge data scale. Petroleum data itself is a typical and complex multi-source heterogeneous big data system.Although the construction of petroleum informationization started late in Guangxi, it attaches great importance to informationization.In order to adapt to the development of information technology, Guangxi plans to build a set of practical and feasible petroleum core database system to collect all data related to the petroleum field into the petroleum core database, so as to realize unified management and maintenance of data.And through the establishment of a reasonable data retrieval mechanism, to provide a strong data support for the petroleum information system, so that it can meet

the needs of information applications[1].

2. Overall framework design of petroleum comprehensive database

2.1. Framework design structure of traditional petroleum comprehensive database

In the country and the oil industry, on the basis of relevant database standard, combined with the actual needs of guangxi beibu gulf, supported by mature business technology and standard system, realize to the oil industry standardization, normalization of all kinds of data and the spatial organization and structure, the formation of oil data unified storage, unified management and maintenance[2], to support the generation of information product, a new generation of oil business application oriented and multimodal information and service, are shown in figure 1 below is the frame structure of the traditional oil comprehensive database:
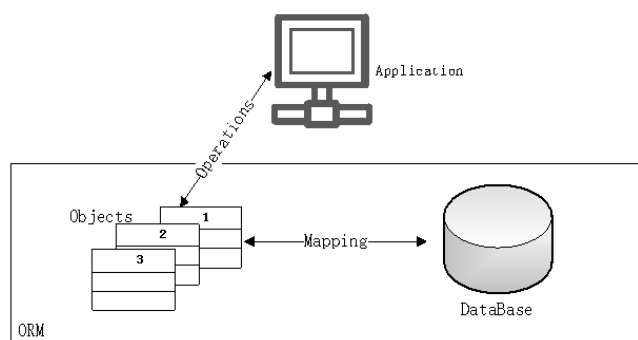
Figure 1. Framework design structure of petroleum integrated database.

As shown in figure 1, the overall structure of Guangxi Petroleum comprehensive database adopts hierarchical structure.The basic principle of layering is that the layers of the system are relatively independent; Any layer of the system depends only on the layer below it, and is completely independent of the layer above it. It is very beneficial to the logical design and implementation of the system, and can effectively isolate the problems that need to be solved at different levels. The system is divided into data application layer, data management layer, data resource layer and operation environment from top to bottom.

2.2. Connotation of petroleum information integrated database management

Petroleum information is the main basis for petroleum scientific research, teaching, engineering design, planning and management, environmental measurement and evaluation, sustainable development of petroleum economy and environmental conditions assurance of military petroleum, so the collection, processing and database construction of petroleum scientific data have great social scientific significance and urgent national needs[3].As is known to all, physical petrology is the basis of petroleum scientific research and application, and petroleum hydrology data with sea water temperature, salinity, density and other parameters as the core are the main background information of climate and petroleum environmental ecological research, environmental forecast and evaluation, engineering design, disaster reduction and prevention, and military petroleum

environmental condition assurance.The following figure 2 is the prototype of the wastewater treatment technology we applied:
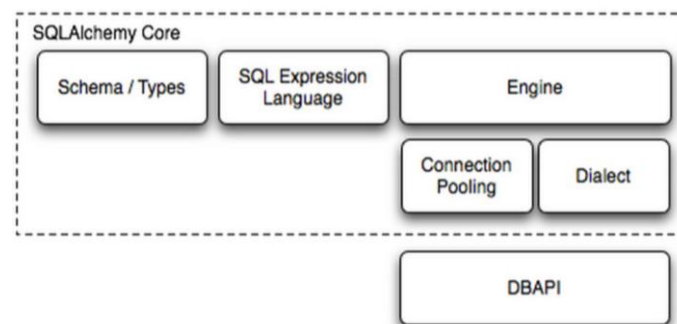

Figure 2. Data summary of wastewater treatment technology applications.

In addition to the parts shown in the figure 2 above, the Bohai, Yellow, East and South China Seas in China are part of the world's oceans, whose changes are interrelated and deeply influenced by the world's oceans.In order to study and predict the changes of petroleum environment in China's offshore and adjacent oceans, large-scale long-term and synchronous petroleum observation must be carried out.Such an oil survey requires huge investment, and it is impossible for any unit, department or even country to carry out large-scale oil research on its own or on the basis of unsystematic data.Therefore, the construction of petroleum hydrological database not only has important use value, but also has expensive output value and significant social commonality. At the same time, it must be carried out in accordance with scientific and reasonable construction norms[4]. The measurement object in Figure 3 is the wind speed measurement of the database management system:
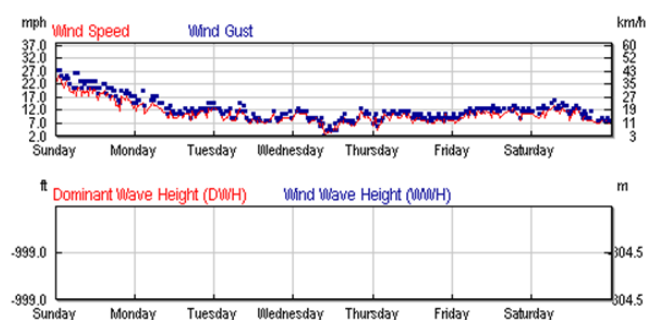

Figure 3. Comprehensive petroleum data detection based on wastewater treatment technology.

As shown in Figure 3, international petroleum hydrology information is the main data source of petroleum hydrology database.International petroleum hydrologic data are of various types, with long time series, wide spatial distribution, huge information and rapid accumulation.The data come from dozens of countries and regions around the world; The instruments used vary widely; The methods of data collation are different; The calculation methods and formulas of derived parameters are different. The interpolation method of the standard layer based on the measured layer data also has its own length; Even the data processing standards and codes adopted, as well as the format of the recorded data, are still being harmonized[5]. Therefore, the standardized construction method and the standardized construction process, as well as the advanced weight arrangement technology and the rigorous quality control method are all the prerequisites to ensure the construction of a reasonable and applicable petroleum information management system.

3. Design of main functions of database management based on improved wastewater treatment technology

Collect and integrate ecological environment and disaster prevention and mitigation data such as remote sensing information of Beibu Gulf, land and sea area use rights, status of natural resources utilization, functional zoning, online buoy temperature, salinity and dissolved oxygen, convert and relate data, establish core database of Beibu Gulf land-sea complex and formulate core database warehousing standards.

(1) Database design and preparation.Through the preparatory work of database design, according to the actual situation of the design of data resources in accordance with the requirements of Guangxi, the region's oil data survey, find out, the preliminary grasp of the status of oil data.

(2) Detailed database design.On the basis of following the database design specifications, the core database table structure and ER diagram are designed

according to the relevant national and oil industry standards, and the metadata database is defined.

(3) Data result management and maintenance design.On the basis of the database design results, through the definition of data quality control standard system, the data quality control; And realize metadata and petroleum data management and maintenance.

(4) Data collation design.Through cooperate with owner to establish reasonable oil information data collection, access mechanism and information channel, the existing owners' collecting, sorting 908-01.02 projects in guangxi coastal areas, all kinds of survey and evaluation of data, historical data and the oil business monitor monitoring data, in accordance with the unified national "digital oil" oil information standards, technical specifications, technical platform and quality management system, to integrate the data processing, form a standard data sets.

4. Principle and application of key technologies

4.1. Principle of wastewater treatment technology

Object Relation mapping is to solve the problem of mismatching between relational database and object-oriented, and it realizes the mutual transformation between relational data and object model.Wastewater treatment technology defines a corresponding description object in the code for each data table. By describing the mapping relationship between the object and the data table, the administrator can realize the structural design and management of the database without knowing any SQL statements[6].

4.2. Improved adaptive wastewater treatment framework

Although wastewater treatment framework provides us, through the figure 3, you can see that the traditional wastewater treatment framework still has some defects, such as: when the data table structure changes, we have to change the code management system to adapt to changes in the database structure and not only so users unable to modify the data structure, and will greatly increases the maintenance costs of the system.Therefore, to solve this problem,

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this system proposes an improved adaptive framework for wastewater treatment, as shown in Figure 4 below:
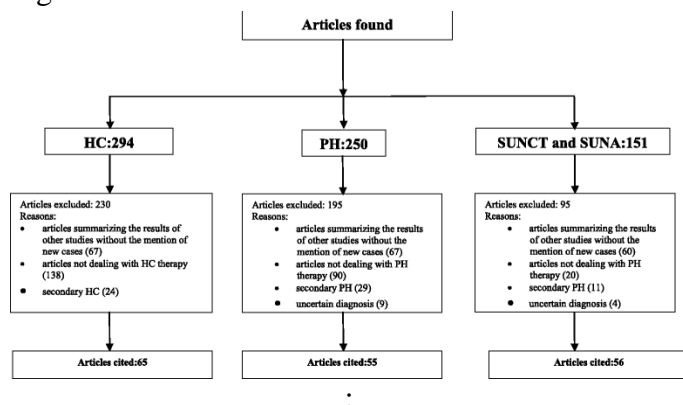

Figure 4. Improved adaptive framework for wastewater treatment.

As can be seen from figure 4 above, in the traditional wastewater treatment framework, an XML mapping layer was added in this paper to realize multiple mapping relations between XML configuration file -> database table and XML configuration file -> entity class, replacing the traditional binding between database table and entity class directly.When the database table structure is modified, the user only needs to modify the corresponding XML configuration file, and the system will automatically read the XML configuration and dynamically generate the corresponding entity class according to the configuration, so as to achieve the purpose of modifying the database structure without modifying the software code, making the system architecture more flexible and more reusable.

4.3. Integrated framework of petroleum database based on improved wastewater treatment technology
In order to realize the centralized management of petroleum comprehensive data, such as petroleum environment, Marine resources and petroleum economy, this system adopts the framework of wastewater treatment technology, designs the object description model of petroleum comprehensive database, and develops the front and back end separation technology.System score data service layer, application layer and browsing end. Browse

the end using AJAX technology to send data via HTTP request, the server application is received after browsing the data request, filtering permissions on the user's request, to filter through the permission request is submitted to the wastewater treatment (object relation mapping), from the analysis of wastewater treatment was carried out on the requested data, access to data in the database, and then generate the corresponding SQL requests to send data to the database request, the request result feedback to server applications, the server application to compile the data into a JSON format sent to the browser, to complete a data request service.

4.4. Standardized integration of multivariate oil data
4.4.1. Metadata database construction
Metadata contains spatial data and attribute data metadata, metadata spatial data (that is, the digital image map DOM, digital elevation model (DEM, line graph DLG) metadata have specific national standards, its mainly includes the related data source, data layering, achievement attribution, spatial reference frame, data quality (including data accuracy and data evaluation), data update, sheet edge information;So far, there is no national standard for attribute data metadata, which mainly refers to the design of national standard for spatial data metadata, which mainly contains information related to data source, data classification, achievement attribution, data quality, data update and other aspects. Metadata is the description of all kinds of data itself, including: data identification information, spatial data organization information, data source, nature, quality, formation time, coordinate system, data producer, data quality and other contents.

4.4.2. Design of data resource catalog
First of all, the classification of petroleum data resources should be solved.In order to facilitate the management and use, the with common business data attributes or characteristics of oil resources merge together, through the categories of properties

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or characteristics to data for oil resources for the difference, to establish a classification system of petroleum resource data directory, for oil resource data collection, management, query and sharing service, so that an orderly management and data resources development and utilization of oil.According to the actual situation of the petroleum system in the whole region, the petroleum data resource catalog is divided into business catalog, resource catalog and Shared demand catalog.

4.4.3. Design of core database management system

System for data collection, system management, data quality control, metadata management and maintenance, and other functions, to achieve the monitoring site data, Internet data, the north sea oil environmental monitoring center to share data, superior forecast data collection center allots in a platform, and support for metadata entry, modify, update, delete, edit operation, the metadata tree structure, reflects the internal architecture of metadata, through a simple and friendly interface to realize comprehensive database of professional management and maintenance for oil.

5. Integrated petroleum database management based on improved key wastewater treatment technologies

5.1. Spatial data sea-land integration technology

Adhering to the thought of sea and land as a whole, according to petroleum based multi-source heterogeneous spatial data, spatial data and separating the land spatial data, lack of unified space foundation to support overall decision-making problems such as the land and sea, the project with the aid of GIS, with electronic chart, electronic maps, high resolution remote sensing images and three-dimensional seabed terrain data source for the space, to the space coordinate system transformation, and based on the geometry of space point with the same registration as the means, the development of the sea and land integrated spatial data integration technology, realized the oil the unification of the spatial resources integration, and support the integration of data management,It lays a solid

foundation for the integrated space information of land and sea for petroleum integrated management, as shown in Figure 5 below:
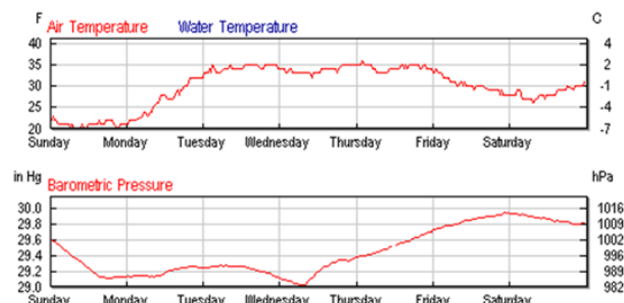

Figure 5. Spatial data sea-land integration data.

As shown in the above five using GPS/beidou navigation positioning system, all kinds of sensors that make up the oil stereoscopic observation vector position tracking, implement the real-time dynamic positioning of the observation data, observation data for oil and oil spatial data integration, and the integration with other non-spatial attribute data provides accurate spatial correlation information.

5.2. Spatial positioning technology of petroleum observation data

Using GPS/beidou navigation positioning system, the composition of oil carrier position tracking, three-dimensional network of each kind of sensor to realize real-time dynamic positioning of the observation data of oil for petroleum observation data and spatial data integration, and the integration with other non-spatial attribute data provides accurate spatial correlation information.Drift alarm mechanism is also designed in this project.
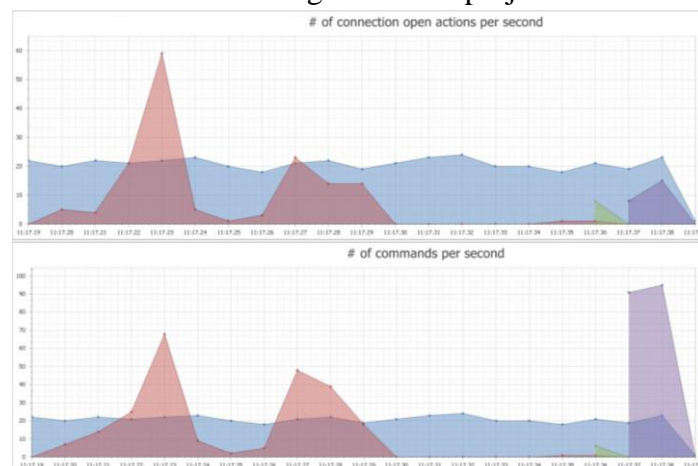

Figure 6. Oil observations in the information age.

As shown in Figure 6, on the premise of consolidating the spatial foundation, it is necessary to integrate all kinds of non-spatial attribute data, such as petroleum ecology, environment and economy, into a unified spatial foundation in order to truly realize the integrated management concept of mapping the sea.With the help of GIS, this project adopts a unified spatio-temporal reference coordinate system, realizes the spatio-temporal integration of multi-source heterogeneous petroleum data through the spatial target connection and time matching of various petroleum attribute data, preliminarily forms a petroleum management map, and opens a new management mode of mapping the sea.

5.3. Real-time update technology of oil observation data

Due to the lack of a shareable description model and scientific correlation method, petroleum sensors have various types, observation mechanisms and data storage formats, presenting a closed and isolated status.Without changing network existing oil storage management mode under the premise of the project using Web Services technology, research and development for oil observation data extract, transform, and load tools, data observed by oil with the same frequency frequency oil extract, transform, and load to integrated database of oil, with fixed frequency data leakage searching strategy, achieve stability and oil observation data update in time, the oil observation data level to achieve the unity and integration, are shown in figure 7 below:

Figure 7. The basic site for data observation in petrochemical industry.

Against oil base shown in figure 7 multi-source heterogeneous spatial data, spatial data of oil and separating the land spatial data, lack of unified space foundation to support the overall decision-making problems such as the land and sea, the project with the aid of GIS, with electronic chart, the electric map, high resolution remote sensing images and three-dimensional seabed terrain data source for the space, to the space coordinate system transformation and geometric registration based on spatial point with the same as the means, the development of the sea and land integrated spatial data integration technology, to achieve reunification of the oil space resources integration, supporting the integration of data management, comprehensive management for oil laid the integration of spatial information based on the land and sea.

5.4. Time-space collaborative observation technology for petroleum sensors

Based on the concept of video GIS, this project realizes the real-time linkage between the video system and the electronic map (chart) through the establishment of the corresponding relationship between the visual range of the video system and geographical space. Then, with the help of 3D visual analysis, the linkage query between visual range and sea projects and oil economic entities (such as sea-related units, sea units and wharfs) is realized.

In the same way, this project realizes the collaborative observation of the same petroleum element between the video system and other sensing systems.Such as when a user selects a buoy system, video monitoring system for oil can adaptive rotating camera monitoring, allowing users in the same working conditions, can also see the real-time video image (waves and tides) and buoy from the scene environment information parameters such as temperature and salinity (oil), the observation of the same sea.

6. Conclusion

Through the establishment of a set of complete and multi-source heterogeneous oil comprehensive database management platform, integrated oil real-time observation data, history data, basic

geographic information data, social and economic data, remote sensing image data and historical data, such as oil disasters to provide user management interface based on wastewater treatment framework, ordinary users can easily make the non-professional for database structure design and management, disaster warning analysis for oil, big wisdom oil providing the data such as data mining, has been greatly increased wisdom for oil in the department in charge of management ability,It provides reliable data support and technical means for rational utilization and scientific protection of petroleum.

Acknowledgments

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