

Exploration and Research of Basic Data of Chemical Enterprises

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Abstract: In this era of rapid industrial development, the chemical industry continues to develop, information technology continues to progress, and the informatization construction of chemical enterprises is in full swing. Based on the information construction of chemical enterprises, this paper analyzes the research status and significance of chemical basic data, studies the construction content, construction process and key points of chemical basic database, and clarifies the use of chemical basic data management system. It provides the prerequisite for realizing the effective application and efficient management of chemical industry and promoting the development of chemical industry.

1. Introduction

With the emergence of new chemical products and the increase of social demand for chemical products, the chemical industry develops rapidly. With the continuous improvement of the information capability of chemical enterprises, the number of information systems is increasing and the functions are becoming more and more powerful, followed by the continuous growth of data of chemical enterprises. In every process of chemical products from pre-research and development to molding to mass production, basic data are indispensable. Therefore, it is urgent to study the basic data of chemical industry.

2. Research Status and Significance of Basic Data

With the rapid development of information, different kinds of enterprises at home and abroad begin to attach importance to the construction and application of information system. The management form of chemical enterprises, manufacturing methods of chemical products and the unique characteristics of chemical products make the information construction of chemical enterprises have its own particularity. As the core data, basic data is the top priority of chemical enterprise informatization construction. However, the research on basic data of chemical enterprises is still lacking, which is also the purpose of this paper.

For basic data resources in the process of informatization construction of chemical enterprises, if there is no unified basic database, it is impossible to collect and organize complete data resources. This requires chemical enterprises to maintain a complete basic database to provide data resources for various processes from enterprise management to chemical product R&D and manufacturing. In the absence of scientific management of basic data, similar data will be maintained in different business systems, which will increase the workload of data maintenance. The establishment of a special basic data management platform for chemical enterprises can effectively reduce data redundancy, increase the availability of data and improve data quality. To sum up, the basic data of chemical industry is the most important thing in the information construction of chemical enterprises and even in the development of enterprises. In-depth research on the specification, database content, management and application of chemical basic data will provide more efficient

working environment for chemical enterprise managers and professionals, and contribute to the better development of chemical enterprises.

3. Chemical Basic Database

3.1 Basic Data Concepts of Chemical Industry

Generally speaking, the basic data is the data that describes and expresses the attributes [1], information and characteristics of the object itself, which is specific to the object, but has nothing to do with the business link and application system in which the object is located. Chemical enterprise data include chemical basic data and enterprise indicator data. We define the chemical basic data as the collection of master data and transactional data in chemical enterprise. Master data is static data, which has no change in the whole life cycle, and is the common data for enterprises to conduct business [2]. Master data consists of configuration master data, core master data and conditional master data. Transactional data is dynamic data, which is business behavior and result data generated around master data entities according to enterprise business needs.

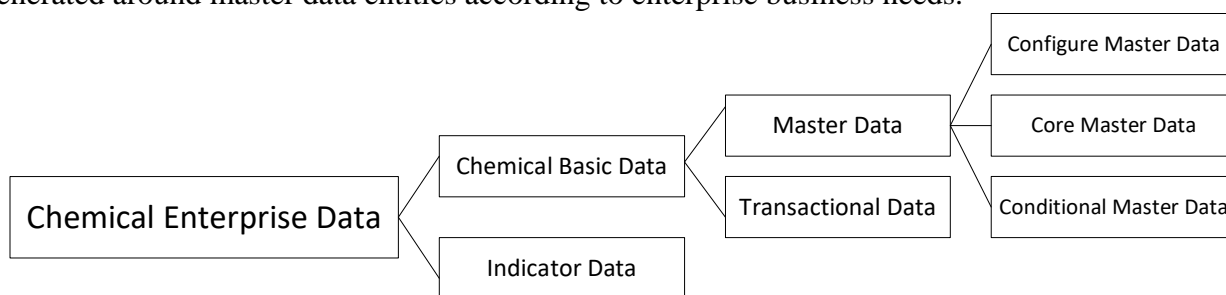


Figure 1. Chemical Data Structural & Relationship

3.2 Chemical Industry Basic Database Content

In chemical enterprises, there are both public management data and professional basic data of chemical product R&D and manufacturing. Therefore, the basic database of chemical industry is composed of basic data of management and engineering basic data.

3.2.1 Chemical Industry Management Basic Data

The chemical industry management basic data is mainly for the management affairs of chemical enterprise, which is shared by multiple business systems in the whole enterprise [3]. These data include staff, organization, projects, contracts, contacting units, and collection of information on chemical products research and manufacturing raw materials as well as equipment and assets, including goods, equipment, and facilities.

Based on the requirement of chemical industry management basic data, after classifying, summarizing and refining the data, a metadata table for management basic data can be formed, and we choose some important metadata can be selected as an example, as shown in table 1.

Table 1. Chemical Industry Management Basic Data

Personnel	Section	Project	Contract	Contacting Units		Supplies		Equipment		Facility	
				Supplier	Client & Investor	Office Materials	Chemical Raw Materials	Research/Manufacturing Equipment	Mould & Tooling	Office Equipment	Building
Name	Section Name	Project Name	Contract Name	Supplier Name	Company Name	Supplies Name		Equipment Name		Facility Name	
Work Number	Section Coding	Project Coding	Contract Coding	Supplier Coding	Company Coding	Supplies Coding		Equipment Coding		Facility Coding	
Sex	Section Type	Project Type	Contracting Party	Supplier Level	Company Type	Classification Code		Using Status		Facility Location	
Staff Position	Section Size	Project Cycle	Confidentiality Level	Supplier Type	Company Class	Supplier Information		Responsible Department		Facility Status	
Position Grade	Section Nature	Project Leader	Contracting Type	Account Information	Legal Person Information	Material Proprietary Information		Storage Location		Responsible Person	
...	

After the metadata and data structure of chemical management basic data are determined, the core content of management database is to improve the information on it.

3.2.2 Chemical Industry Engineering Basic Data

Generally speaking, the manufacturing mode of chemical enterprises is mainly process-based manufacturing, which has the following characteristics,

1. There are various product categories and a variety of product properties.
2. The product structure is not fixed, so the product preparation process is greatly affected by the environment.
3. There are many states of raw materials, including solid, liquid and gas states, with various performance.
4. Production equipment in chemical production industry has high investment and difficult maintenance.

Because of the above characteristics, the product development and production process of chemical enterprises has strong specialty and particularity. For chemical enterprises, different kinds of professional basic data need to be shared, no matter they are in different types of chemical products, or between various processes from product design and development to small trial and amplification to mass production. Starting from the above characteristics, we divided the chemical industry engineering basic data into four parts, the performance data of chemical products, the preparation process data of chemical products, the performance data of chemical raw materials and the professional manufacturing equipment data of chemical products [4]. According to the content requirements of relevant personnel for these four types of data, the metadata table of chemical industry engineering basic data is extracted and summarized, and some important metadata are selected as examples. The same, engineering basic database is to improve and perfect the information on this table.

Table 2. Chemical Industry Engineering Basic Data

Professional Data of Chemical Products		Performance Data of Chemical Raw Materials		Professional Data of Chemical Product Preparation			
Basic Information	Quality	Basic Information	Quality	Preparation Process Data		Professional Equipment Data	
Product Name	Density	Chemical Name	Density	Basic Information	Professional Information	Basic Information	Work Performance
Molecular Formula	Specific Volume	CAS Number	Specific Volume	Process Name	Required Temperature	Device Name	Operating Temperature
Molecular Structure	Toxicity	Molecular Formula	Toxicity	Process Category	Required Humidity	Equipment Coding	Operating Humidity
Character and Appearance	Thermal Stability	Character and Appearance	Thermal Stability	Process Equipment Requirements	Required Pressure	Special Type	Energy Consumption
Transfer and Storage	Mechanical Property	Transfer and Storage	Mechanical Property	Process Material Equipments	Operation Time	Professional Use	Environmental Protection Level
...

3.3 Construct Chemical Industry Database

About key points in construction, firstly, only when the main leaders attach great importance to and implement the work schedule can the basic data work be smoothly promoted. Secondly, the responsible units and persons, reward and punishment measures for the establishment and maintenance of basic database should be clarified. Set up work team and carry out reasonable division of labor [6]. Thirdly, following the "from small to large, from easy to difficult" principle. According to the implementation requirements of the system, the overall planning should be carried out, and then the work should be carried out step by step, cannot move at once.

As for the construction process, firstly, set up teams and make rules. The enterprise shall set up a working group of chemical basic data, formulate rules and regulations for basic data work, and define work plan and division of labor. Secondly, demand investigation and clear thinking. After the establishment of working group on basic data, sort out data requirements and data range of management and research department by researching. Thirdly, governance data and specification

formation. After determining requirements and data scope, start data governance and standard determining. Formulate data coding rules and form the coding system of basic data. Forth, making templates and collecting data. Making basic data structure template, collecting and organizing data. The collection template should be designed as detailed as possible but not redundant, so as to ensure the professionalism, standardization and integrity of chemical basic data information. Fifth, data warehousing and standard management. Import the collected and sorted data into the basic database. During the import process, the migration of original data should be handled carefully, and professional and technical personnel should be arranged for maintenance and management.

4. Function Design of Chemical Industry Basic Data System

In order to facilitate the unified management of chemical basic data, the special chemical basic data management system is a good choice. With this system, enterprise personnel can quickly collect and manage basic chemical data and assign different application approaches for data. A complete basic database of chemical enterprises will be gradually established which can provide good basic information conditions for the management and engineering of chemical enterprises. In addition, the basic data management system can make statistics on the whole enterprise's data, so that enterprise managers and engineering personnel can timely grasp the use of management data and engineering data, and reasonably use resources to carry out related work. Through analysis, we design three main functions for this special data management system, namely chemical master data management, chemical basic database management and data integration management.

The system can view and maintain the data content of each part of the database, according to the preset template, it can input common basic data include organization, personnel and so on, input professional basic data include chemical raw material data as well as chemical products and process data, and even build a new sub-database.

The system can manage master data, including metadata management and coding management. Manage data classification, different types of data can be organized and managed according to the classification model set by specialized personnel. Define data model, set dynamic and static properties of each data class. Manage the data dictionary, encode, name and set the status of the data dictionary. Manage data coding, preset frequently-used code segments such as feature codes, flowing codes, fixed codes and date codes, set coding rules for different types of data, and realize the unique identification of resource objects in enterprises.

And, this system can manage data integration with other systems. It can design special integration scheme for chemical enterprises, realize data integration with other information system through professional setting of interface, and realize flexible configuration of integration mode according to enterprise requirements. For example, as shown in figure 2, for enterprise which has a HRM System with comprehensive and stable data, after configuring the data interface, we can grasping human basic data from the HRMS to basic data management system, and then push the data to PDM, LIMS, MES and other information systems for chemical enterprises. This method can greatly reduce the enterprise information system based data redundancy and improve overall efficiency.

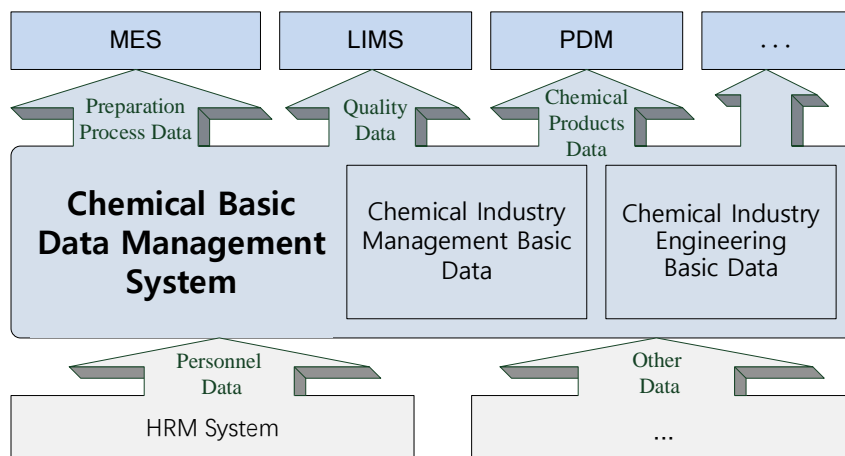


Figure 2. An Example of How Chemical Basic Data Management System Works

5. Conclusion

This paper aims at two aspects including management and scientific research business, it combed chemical enterprise basic data content, put forward some ideas of the chemical industry base of the construction of data repository, and designed basic data resource management platform. It facilitated the unified management and application of basic data in chemical enterprises.

Through the establishment and management of basic data in chemical industry, it can promote the resource sharing of chemical basic data, greatly reduce the workload of data collection during scientific research, promote the interconnection of data in the process of chemical products research and development, and improve the standardization of management data of chemical enterprise to make business management more efficient. In the next stage of work, we will further improve the professional data resources of chemical industry, and conduct more in-depth research on the basic data management methods of chemical industry enterprises.

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