

# Design and Implementation of the Comprehensive Information Platform for Smelting Enterprises

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**Abstract**—According to the development of information technology and the management of metallurgical enterprises, the paper puts forward the design scheme of the information platform for metallurgical enterprises, introduces the structure and function of the new type of metallurgical information platform. It realize loop online collection, hierarchical data computation, distributed database management and global WEB publishing capability. And improve the level of production automation, reduce energy consumption and improve the competitiveness of enterprises.

**Keywords**—metallurgical; enterprise information technology; networking; cloud services; big data

## I. THE MEANING OF THE METALLURGY ENTERPRISE INFORMATION SYSTEM

In the era of big data<sup>[1-4]</sup>, metallurgy enterprise information<sup>[5]</sup> is the development direction of the future. Metallurgy enterprise information is the future of information technology which can be applied to the whole process of the design of products, manufacture, managements and sales, as an object to development and utilization of information resources, as the main content to reform the enterprise production, management and marketing and other business process, as the goal of the dynamic development process in order to improve enterprise's economic benefit and competitiveness. Enterprise information is an event involving enterprise survival and the development and also is the enterprise management innovation accelerator; Information management and system innovation management, management innovation supplement each other, promote each other; information is the enterprise technological progress lifter; Information is also the multiplier of enterprise competitiveness; information is the safe valve of enterprise funds operation ; Information is the enterprise products to the world and the direct train of transnational management.

## II. THE DESIGN OF METALLURGY ENTERPRISE INFORMATION SYSTEM FRAMEWORK

A real enterprise information system [6-8] must be a comprehensive, integrated information management system and a complete enterprise information system should be composed of horizontal and vertical two aspects. The lateral

needs to cover supply productions, sales and finance, personnel, equipment maintenance, projects management and so on each link. The longitudinal should be from the bottom of the production equipment, production lines and materials control system to extend upward to the enterprise the highest level of [9-10].A real enterprise information system must be a comprehensive, integrated information management system.

For metallurgical enterprises, the application of a five-layer system architecture may be the best choice. The five systems are: level 1 system: the equipment control system; level 2 system: the process control system; level 3 system: workshop manufacturing execution system (MES);level 4 system: the enterprise resource planning system (ERP);level 5 systems: the enterprise management system and decision support system (DSS). The five layers of system are mutual integration and coordinate with each other, forming a complete enterprise information management system.

Among the three layers system of DCS and MES and ERP, business system regards production scheduling and production management as the core, and finally with enterprise ERP forms one of the multilevel network application system, which regards composition control and scheduling management and operation management as a whole. And the MES and ERP are the main system of the business application system .

MES built up the communication between DCS and ERP information with it around production process continuity of information collection, processing and handling and completed all kinds of production data and business plan transmission and so on by developing and producing various kinds of real-time database, DCS, PLC, instrument and meter, key equipment and the ERP system data interface. What MES levels mainly have are detailed scheduling, resource allocations and state managements, distribution of production units , processes managements, human resource managements, maintenance managements, quality management, document control, products tracking and inventory managements, performance analysis and data acquisitions etc.

ERP system achieves the enterprise resource planning that regards finance as the core and makes enterprise resources becoming a reasonable plan and allocation and management, makes the enterprise logistics, cash flow,

information flow be the integration of management, so as to guide the enterprise management, management, decision-making, specific function in business process management, sales and distribution, purchasing and inventory, financial management, customer relationship management, production management, human resource management, cost control and material management etc.

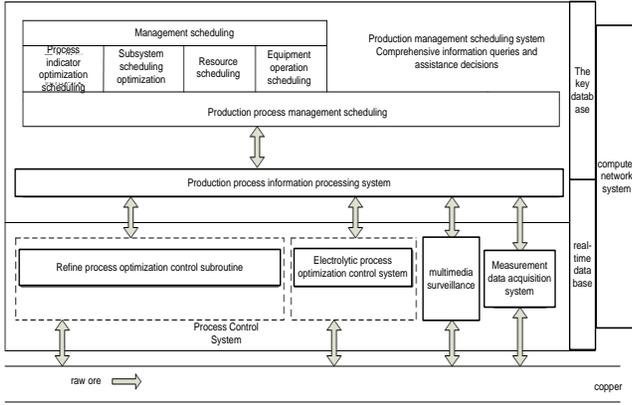


Figure 1. The integrated optimization scheduling system structure

Business systems first need timely data obtained from the production site information and guide the production scheduling, when necessary, it can according to a new technological process and process parameters optimization control strategy; secondly, it need to surround production scheduling and management to complete the relevant business operations and accept the production planning, production scheduling commands and controls instructions, and generates the necessary daily scheduling, production statistics etc. ERP system is the comprehensive information management system which is applied to all ranges , on the one hand, it accepts the production data from the MES level, on the other hand , it issued production plan to production department , according to the production and operation situation, you can adjust the plan and guide management decisions. As shown in figure 1 integrated optimization scheduling system structure.

At the management level, the manager leader needs to comprehend enterprise's production and management as a whole and production, supply and sale , people, goods of the process of production to correct and prevents the contents of abnormal timely. In the face of numerous business application systems, to facilitate the competent leadership, we need a comprehensive platform for the display, only need one account, a password to query and browse all information within the scope of his authority. Implementation through a comprehensive display platform based on ERP system to achieve and complete the comprehensive analysis of the production and management, by means of data mining, such as graphics, trends, dashboard intuitive form, we can provide it for management decision makers. Fig. 1 for integrated optimization scheduling system structure.

### III. CLOUD SERVICES AND THE INTERNET OF THINGS IN THE APPLICATION OF METALLURGICAL INFORMATION TECHNOLOGY

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Cloud services and the Internet of things are a hot field of information industry at home and abroad in recent years, our government thinks highly of it and we will vigorously support it. Both them will play a positive role in energy conservation and emissions reduction and enterprise innovation. Cloud service is not a new, specific IT technology, its characteristics is based on the Internet, especially high-speed Internet, which can be able to provide reliable, convenient and cheaper services for using. The users can choose the most suitable way for their own using according to their own needs , such as to pay on time, to pay according to the need, to pay according to times, to pay according to the users. And the system is flexible and scalable. For example, if users are less, system can be used fewer, if users are more, system can be used more. When you need more storage space, you can apply to the system. Cloud services can make users access to the standardized interface (Web browser or Console) you can use on-demand, self-service ways to visit cloud computing center and storage resources. By purchasing a cloud computing service, users can greatly reduce the investment in infrastructure, accelerate the system deployment, reduce management and operational costs. Cloud computing center offers a variety of data protection solutions, including online backup, offline backup and disaster in another place, and we can according to customer demands to set up the flexible backup and disaster plan in order to ensure the data availability.

Establish energy metering cloud computing service center in the whole country's industry. Energy metering cloud storage is the cloud computing system which regards data storage and management as the core. First, establish a computer cloud computing center. Cloud computing center includes monitoring system server and database system and a number of internal substation. Cloud computing can accept several enterprise database system data and have the cloud storage and release functions. The center also has the remote data list, remote diagnosis expert analysis evaluation, region or industry operation regulation and financial supervision even provides query interface of government and society, diagnosis and fault diagnosis of BBS and other functions. Fig. 2 is a cloud computing center network structure:

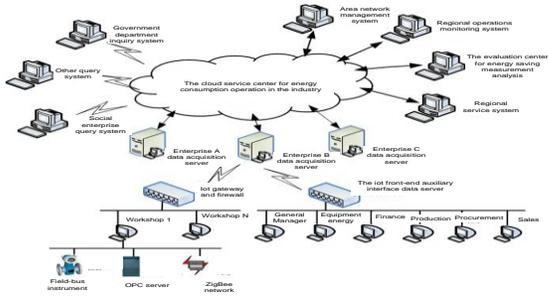


Figure 2. The cloud computing center network structure

Establish an intelligent integrated information networking platform, which has multiple levels and intelligent interface in the internal of the enterprise. And it uses the framework of wireless Internet of things and includes instrument bus data acquisition system, the database to form a system, data storage, computing analysis and networking WEB publishing and other functions. Through field bus and all kinds of Internet interface and wireless communication mode to realize the automatic equipment and instrument measurement and using the network security and redundant technology to form the independent stable and energy management network, people can achieve circulating online acquisition, hierarchical data computation, the distributed database management and the global WEB publishing function.

#### IV. METALLURGY ENTERPRISE INFORMATION DATA PROCESSING METHOD

Before you begin to format your paper, first write and save the content as a separate text file. Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.

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##### A. The raw data tracking

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

Because the information data of metallurgical enterprise is giant. In order to analysis the data and management effectively and clearly , we will make a raw data classification and start original information tracking analysis. We can track from five lines, which are from material into products, from energy consumption into products, from equipment into products, from releasing into the products, from human into products. And it is asked ensuring the energy management network and control network (DCS) and office automation (OA) three network to run and relate independently of each other. At the same time,

we must pay attention to network security problem and the key area to be strictly on guard and defend to the last. And we can use the instrument of OPC server and distributed database systems for information collection and storage. When using a satellite synchronous timing, we should check the time of information systems to make each unit be a time synchronization system, which can guarantee the circulation of online data acquisition systems to have a valid time tag. Information acquisition system block diagram is shown in fig. 3.

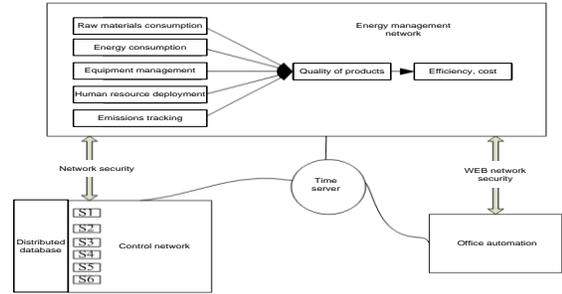


Figure 3. The information acquisition system diagram

##### B. Simple and flexible data entry interface

Information platform must have a flexible data access way. The current popular ways are OPC, FTP, ODBC, Matrix and other data acquisition ways; For Mobile devices, Mobile system design should be considered to use USB, infrared, Bluetooth, wireless access system.

##### C. The optimization of reliable distributed extensible database system

Almost every database product has a clustering solution. Oracle RAC is the most popular products in the industry. the biggest characteristic of its architecture is the Shared storage architecture (Shared-disk).The whole RAC cluster is built on a shared memory device, and the nodes are interconnected by high speed network. RAC Oracle provided very good high availability features. Oracle apparently aware of the problem, in the Oracle MAA (Maximum Availability Architecture) architecture, the ability of ASM to integrate multiple storage devices, ability makes the shared memory at the bottom of RAC have linear expansion of the processing ability of the cluster is no longer dependent on large storage and availability.

Using the Oracle database to define the data points (Data point) and common data points (Generic Data point)and Constant and the derivative data points (Derived Data point) and other data types. It can improve the utilization rate of database in that way to adopt flexible data storage method and through the substitution of value, data limitation and so on to ensure the data acquisition of continuous and reliable or through derived through Summarization concept.

##### D. The hierarchical data calculation

The basis of information system data calculation is divided into three layers: cycle (Loop), formula (MEVAS),

Excel. Loop (Loop) is to collect data in the field for online calculation. Including mathematical processing, logic operation, comparison operation, threshold processing, quantitative analysis, time data processing and a variety of standard functions and so on. At the same it can provide interfaces for users who write personalized processing function. And the calculated data can be used as the basis of formula data to be stored in the database.

The formula (MEVAS) is based on the database to store data. It offers a large number of rich data analysis (rich reporting system), information processing formula and so on. And it provides users with the results of the analysis as the basis of information reporting various performance value. This data can be generated according to needs rather than in advance for data storage and reduce the burden of the database system.

The analysis reports are showed in Excel format and are based on formula (Mevas) and data points (Datapoint) data and so on or software, which provides various query template. It is compatible with Excel charts and Macro computing model, which is convenient and flexible to generate reports to meet the needs of users. Such as energy prediction and energy cost analysis.

#### E. Global WEB data release function

The client can use IE browser to visit system such as real-time information, alarm information, historical data, a variety of graphical information, production statistics, energy performance reports, etc; Interface with real-time system man-machine conversation interface style is consistent; WEB browsing has permission limits, only the legitimate users can access and use the system.

The release function can classify each sampling point data statistics to produce all kinds of statements, including daily, monthly, annual reports etc. Reports can query and print something at any time. And it also can start history query of each sampling point data and analysis and so on.

The statistical analysis of Information analysis system refers to make use of historical data and real-time data, rely on the data mining technology, analysis the situation of the production and then control the production costs and formulate energy consumption quotas. System can flexible choose statistical time and set up the statistical conditions. System provides the fuzzy query of statistical results, provides function of historical data contrast and also provides printing etc. System can record directly and produces the following results: the price of energy and raw materials and quality, the input and output of energy and raw materials and products of quality and quantity. We can query directly what is sent from the energy management WEB site to the company.

## V. CONCLUSIONS

"Information technology to improve the industry development" is the guiding ideology of manufacturing enterprises development in our country. We can establish a comprehensive information platform in metallurgical enterprise and build five layer information management architecture. The cloud technology and internet technology is applied to the enterprise information management. Using advanced data storage, analysis and management technology is bound to improve the management level of metallurgical enterprises and production automation level. Saving energy improves the competitiveness of the enterprises. In the days of extending enterprise scale and competing intensely, by strengthening and perfecting the enterprise information construction and we can ensure that strengthening enterprise resources, planning, production and sales, efficiency, the development direction of decision-making management is correct.

## ACKNOWLEDGMENT

This paper is supported mostly by the Jilin Province department of education Science and Technology Plan Project (Grant NO.201656), partially by the Jilin Province department of education Science and Technology Plan Project (Grant NO.201632).

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