

Digitized Resources Management System Design for Unfolding of Sheet Metal

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Abstract. In order to realize automation and intelligent design of sheet metal design, an integrated design system is constructed and tools for unfolding of sheet metal are developed, the system is composed of raw materials management, design tools management and process management. This system contains related information about text, graphics, forms, formula and programming language of the sheet metal. The system describes the relationship of those types of resources by XML, eventually it forms the model of hierarchical relationship. This system can search keywords in text and database records to inquire digital resources.

Introduction

In the modern industrial production, the advantages of sheet metal structure and parts are always high production efficiency, low cost and simple process. The sheet metal structure occupies great proportion in many industries, such as the chemical machinery, the mechanical industry, the metallurgical industry and the light industry [1]. Digitized resources management system which is lead by people is the man-machine system, it can collect, transfer, process, storage, renew and maintain the information by using computer hardware and software, network communication equipment and other office equipment. It can support the top decision, the middle control and the integration of grassroots operation for enterprise [2]. The management system design for unfolding of sheet metal can realize the automatic and intelligent design of sheet metal design, so it can support the sheet metal independent research and development by integrated design environment and tools.

There are three kinds of digitized resources management system design for unfolding of sheet metal recently. The first kind is suitable for sheet metal production industry development. The second kind is the secondary development in the general CAD software platform. The third kind is the sheet metal CAD which is nested by the mainstream professional CAD software [3-5]. The management system for unfolding which is match with our country sheet metal industry is the professional sheet metal resources management system. The digitized resources management system is composed of raw materials management, design tools management and process management. Then people can convenient to inquire and browse information by using the platform.

The System Function

This function of resources management system for sheet metal is shown in Fig. 1. When we start the resources management system for sheet metal, according to their own needs different staff choose component types, raw material and technique of sheet metal parts which they need. It can search information in sheet metal resource. When we find the sheet metal raw material management, design tools management and process management which need to design and manufacture, we can understand the detailed information about each type of sheet metal parts. The detailed information can detail express by picture, document and tabular. The sheet metal material can be inquired, added, modified, deleted and back-upped and so on if the sheet metal design management personnel inquire information in the process of sheet metal. Then sheet metal resources management system is more fully complete and using convenient. After the completion of inquire and design, we exit the application and complete the design.

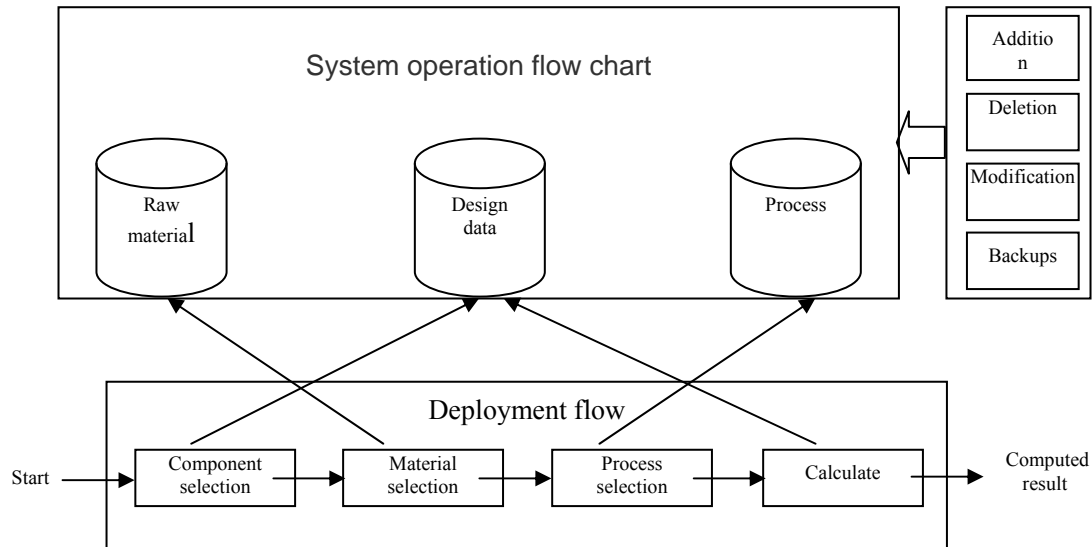


Fig. 1 Digitized resources management system for unfolding of sheet metal flow

The Managed Objects

There are many types of knowledge and structures of the sheet metal. According to the design and application of sheet metal, the sheet metal are divided into pipe (containing an elliptic tubes) type, changed diameter cone tube type, cone tube pipe type fellowship, cone tube crossing pipe type, square and round transitional type, square and rectangle cone tube type, rectangular crossing pipe type and spherical spiral type. The sheet metal resources management system divides the seven categories of sheet metal information into the raw material management (convenient the application of storage and transportation management personnel), the design tools management (convenient the inquiry design personnel) and the process management (convenient the using of manufacturing personnel). The specific classification of the three kinds of management information is shown in Table 1.

Table 1 The classification of management information

Information type	Meaning
Narrative memoranda	It preserves the HTML file format and put the HTML pages and the image and files joining pages to a single file.
Graph	It is a common image compression format or an IGES special file format. It can be open by some engineering interface software
The form and standard data	Access database files

The sheet metal raw material management mainly aims at the material properties analysis when the sheet metal component has designed. It includes plate type (non-ferrous metal or black metal), chemical properties (corrosion resistance, inoxidizability and chemical stability), mechanical properties (density, melting point, thermal conductivity, electrical conductivity, thermal expansion and magnetism), mechanical property (strength, plasticity, hardness, headstrong and fatigue) and corrosion resistance.

The sheet metal design material management is simple, convenience and easy to inquire. The general design personnel can understand. We can find the corresponding schematic diagram and the 3 d model for each type. According to the 3 d model we can input the corresponding number of the line to find the corresponding component figure. Then according to the specific calculation formula we can calculate the length of the line and some parameters in element component chart. So it has short the design cycle, reduced unnecessary repeat work and improved productivity.

The sheet metal process management is respectively contains stamping, separation, curve, drawing and forming process of the sheet metal parts. Each type contains classification, principle, condition, characteristics and application. So the processing personnel can directly query. It can improve the product production efficiency.

The digitized resources management system for sheet metal classification diagram is shown in Fig. 2.

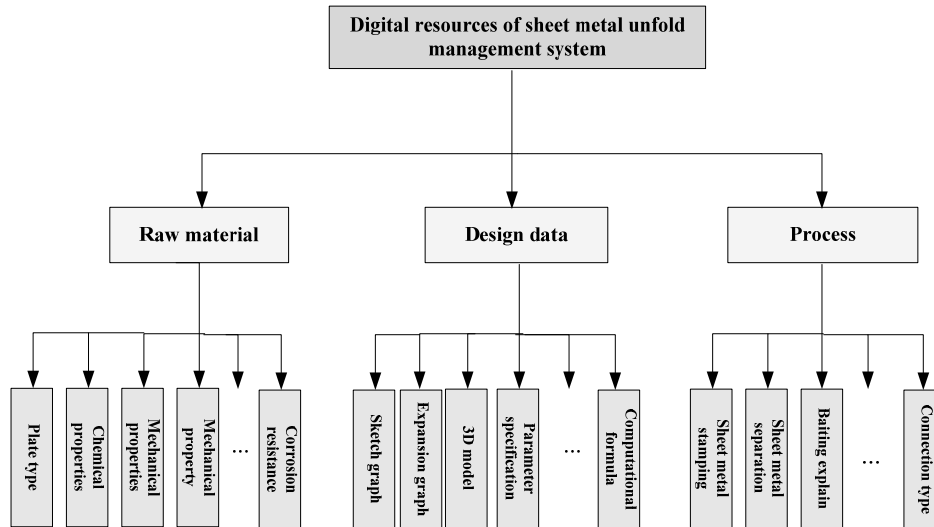


Fig. 2 Digitized resources for sheet metal content structure

The System Structure

We can design the structure, for an example is the sheet metal resources management system which is shown in Fig. 3.

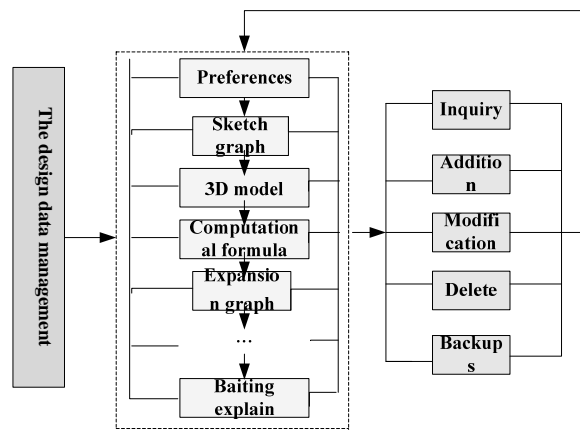


Fig. 3 Management system of sheet metal structure

The design data management includes sheet metal model scheme, sheet metal model launched figure, 3D model, preferences and calculation formula. The sheet metal model launched figure contains spread figure circumference $f(n)$, the number r from point to curve coordinates, auxiliary circle radius and pipe radius d , thickness δ , elbow axis angle a and auxiliary round horn parts an . The 3D model can be larger or smaller in any angle drag. When we input the parameters of the sheet metal components, we can get the parameter settings which contain this kind of sheet metal components all corresponding information. We also can find all corresponding formulas of sheet metal. All the information is packaging by ini. format. Then we can update the information and log out. Other management information system can be designed by the same method.

The Technique Route

The system uses the following development method to realize the digitized resources management system for unfolding of sheet metal.

Establish the digitized resources management library for unfolding of sheet metal by SQL Server. Storage the specific object by files resources, such as picture, model, drawings and charts.

Describes the relationship between the resources and the object by XML format, eventually form the hierarchical relationship.

Cooperate with XML text search and database records way to realize digitized resources inquiries. Implement the system by PowerBuilder software which is as a main development tools.

The sheet metal resources management system technology road map is shown in Fig. 4.

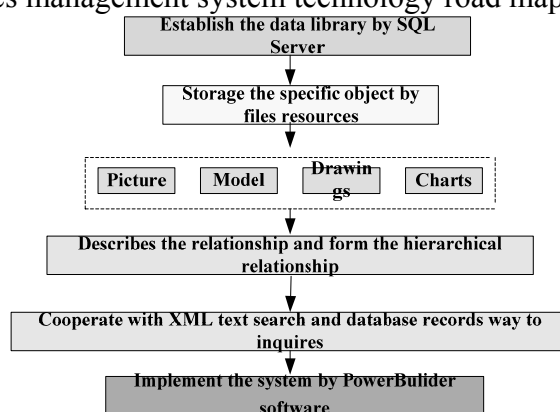


Fig. 4 Management system of sheet metal technical route

Conclusions

Digitized resources management system for unfolding of sheet metal which can provide powerful information management support services for sheet metal industry is as a knowledge information platform which contains knowledge query, knowledge application, learning, knowledge sharing and communication and information management. Because the system combines rich application knowledge, the technical personnel owns rapid, convenient and standard information resources. It is a tool which can promote the enterprise service ability and enhance knowledge management ability. It will quickly look related material and experience, so it can short working hours, avoid unnecessary duplication, improve working efficiency, facilitate learning and effective share the experience.

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References

- [1] The writing group of practical sheet metal technical manual: Practical sheet metal technical manual (China Machine Publications, China 2001).
- [2] Lianye Li: Computer information management system design and implementation (China financial and economic Publications, China 2011).
- [3] Junbiao Wang: Aircraft sheet metal digital manufacture system and key technology research (Northwestern Polytechnical University Publications, China 2004)..
- [4] Shuzi Yang and Bo Wu: Mater. The Journal of Mechanical Engineering. Vol. 73-78 (2003), p. 39
- [5] Chuang Liu: The knowledge which faces the plane sheet metal digital manufacture reuses method research and application (Northwestern Polytechnical University Publications, China 2006).