

STUDY ON CONCEPT OF WEB-BASED REACTOR PIPING DESIGN DATA PLATFORM

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ABSTRACT

For solving the piping design problems such as design data deficiency, designer communication inconvenience and design project inconsistency, Reactor Piping Design Database Platform, which is the main part of the Integrated Nuclear Project Research Platform, is proposed by analyzing the nuclear piping designs in detail. The functions and system structures of the platform are described in the paper for the sake of the realization of the Reactor Piping Design Database Platform. The platform is constituted by web-based management interface, AutoPlant selected as CAD software, and relation database management system (DBMS).

Keywords: Nuclear Piping Design; Database; Web-based management interface

1. INTRODUCTION

The research and establishment of the Integrated Nuclear Project Research Platform will play an important role in improving the ability of our country's autonomous research, development and design of the nuclear power, with the Reactor Piping Design Database Platform being a part of it. The establishment of the Reactor Piping Design Database Platform will solve some problems in piping system, such as deficiency of the systematic data management, inconvenience for the designers to communicate the design information, and lack of organic relationship among different parts of a design project. Further more, it will lighten the amount of work of relevant personnel, improve the working efficiency and reduce errors in the work.

On the basis of making much investigation into the existing CAD/CAE software, database management system and related development technique, aiming at overcoming the shortcomings of existing reactor piping design platform, this paper puts forward the web-based system model of the platform which may make the reactor piping design easier and more efficient. Besides, it can be the reference model for the whole Integrated Nuclear Project Research Platform.

2. ANALYSIS OF THE NUCLEAR PIPING DESIGN

Nuclear piping design is a process involving many people, so cooperating design must be fully considered. The

management and the auditing of the design drawing is very important, before the designing file and drawing are assigned, the level of auditing must be confirmed. The level is set off according to the important degree of the design file and drawing, which includes three levels: level III, level IV, and level V.

The main difference between the three levels rest with two steps: authorization and approve (see in Table 1).

Table 1 the level of auditing

Level	Approve	Authorize	Audit	Collate	Compile
III	No Need	No need	Need	Need	Need
IV	Need	No need	Need	Need	Need
V	Need	Need	Need	Need	Need

The table following list the file types that is applied often in the nuclear projects and their corresponding audit level.

Table 2 file levels in nuclear projects

	Files	Level
	Report of address choosing, report of the feasibility research, Assignment, Plan design, Report of security analysis	V
Primary analysis	Import design files such as: the General explain book, the general dispose book, the main technical flow, the overall budgetary estimate, the key devices and technique	V
	Common files, drawing, list of devices and materials	IV
Design of construction	Important files, general drawing including import devices, import calculation	IV
	The detail drawing, parts drawing, accessory drawing, common calculation	III
Others	Overall technical files	V
	Technical files of the project	IV

From the Table 2, we can see that, the common design and construction, including parts drawing and accessory drawing and common calculation, is on the level III. So, for the common piping design, level III is enough.

3. DESIGN OF THE DATABASE PLATFORM

3.1 Cooperation design

According to the position and the response mode of the two communicating sides, cooperation design can be divided into 4 sorts: synchronization, asynchronous, distributing synchronization and distributing asynchronousness (Wang, 1997, Dong, 2002).

Face to face communication usually is meeting, can be realized by shared database, distributing synchronization need network support, may be realized by file system, E-mail and distributing database etc, while

distributing asynchronousness is more difficult, it needs real-time cooperation support besides the tools which distributing synchronization needs.

Since abundant graph information is involved in the piping design, so the consistency of the graph information in the database in the process of the design must be considered to avoid the inconsistent of the graph data. Besides, management rights should be controlled so that designing person and management person may share information under control.

3.2 Structure of the server

The data file and documents will be saved as files for they are very large and other design information will be saved in the database. Meanwhile, the data file server, the web server and the database server may be departed, so that the safety of system is assured and also heavy burden of the machine is avoided.

3.3 Security of the system

Since there is large amount of design data and documents, the security of the system is very important.

1) Physical separate

Physical separate is one of the basically measure, the system can be created on a locate network which is separate from outside. The access to the system should also be limited through the limit of IP address, firewall maybe installed between the internal network and the outside network.

2) Rights control

The rights control is based on the role, so the management of the user information and the role information is very import. Since the system is based on web, the logon record of users should be saved and used to do rights check at every web page, the user whole has not logged on the system or doesn't have enough rights can't visit the corresponding pages.

3) Regular save and backup

Regular save and backup, includes file backup and database backup, in which file backup includes design drawing and documents, database backup includes fully backup incremental backup and cold backup

3.4 Structure of the system platform

At the server side of the system, the web server is at the center, connecting all other parts and the center database. The client user is connected to server via web browser, after the authentication of security model and rights control model, they can use the cooperation design model and information query model and version management model etc. The client database can send data to center database through the file transfer model.

4. CHOOSE OF THE SOFTWARE

4.1 Choose of the piping design software

Among varieties of piping design software such as AutoPlant, CADPIPE, PDSOFT etc, AutoPlant has many advantages, most important of which, it has good opening of database and it has interface to stress analysis software which is particularly fit for this system. So, AutoPlant can be chosen as piping design software in this system, and AutoPIPE may be a choice of stress analysis software which is closely combined to AutoPlant.

4.2 Choose of the database system

Databases in this system (Wu, 1996) include center db and client db. The center db is very large to save all kinds of design data and management information, while the client db is relatively smaller to save data of every designer only. So the center db should choose large DBMS while the client db may use small DBMS. The communication between the center db and the client db is also an important part of the system.

As to choose the client database, convenience and simpleness to connect with the piping design software and the center database is the key. The Access DBMS of Microsoft is a perfect relationship database, it's small and easy to use, and since it's integrated into the Microsoft office series software, it needn't additional installation. So, it may be chosen to be the client database.

4.3 Choose of the other softwares

The web application developing tools can use dynamic web page language ASP (Active Server Page); it's simple to develop, and can be extended with ActiveX component, and it has general database interface.

The tools visit database via web may use ADO (Active Data Object). It defines a group of programmable objects which can be used in all kinds' script language which support automation characters. It can reduce the network flow with optimized tech, and can process all kinds of data source with a group of simplified interface.

5. CONCLUSION

According to the nuclear piping design procedure, Reactor Piping Design Database Platform, which is the main part of the Integrated Nuclear Project Research Platform, is studied in detail. The platform is constituted by web-based management interface, AutoPlant selected as CAD software, and relation database management system (DBMS). Moreover, the platform supports the cooperation design among the piping designers and has good system security.

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