Digital Process Management Technology for Nuclear Power Plants

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1. Introduction

PHILOSOPHIA, Inc. and Seoul National University have utilized the cutting edge Digital Process Management (DPM) technology for the good of Nuclear Power Plant in recent days. This work represent the overall benefits and the use of this new flow of technology which come into the spotlight. Before realizing the three dimensional (3D) technologies and applying it to real mechnical manufactures and constructions, majority of planning and designing works need huge time and cost even if the process is before the real work. Especially, for a massive construction such as power plant and harbor, without computer-aided technology currently we cannot imagine the whole process can be established easily.

Computer-aided Design (CAD) is now main and common technology for manufacturing or construction. This technology lead the other virtual reality 3D technologies into the job site. As a member of these new technologies, DPM is utilized in high-tech and huge scale manufacturing and construction for the benefits of time and cost.

2. Methods and Results

It begins with CAD software such as CATIA (Dassault System's 3D Design tool) and ends with 4^{+}D Simulation Software. DPM technology can include these digitalized contents from Computer-Aided Design to virtual process simulation.

DPM technology is operated in virtual space with virtual 3D models. Before creating 3D models, classified two dimensional (2D) drawings must be prepared. For huge mechanical equipments and construction site like nuclear power plant, over 100,000 drawings may be required for proper design. In the aspect of the amount of data must be conducted, choosing a suitable CAD software and compatible simulation tool is also essential. Every model which can be a unit of the process simulation should be created after the assortment of drawings. Each part of a model should be grouped before they are assembled in the categorized shape.(See Fig. 1) All modeling information is connected to from its upper assembly file to the final assembly file. So if a shape of any part has changed, the changed data will be immediately transported to the total assembly and transformed. In the middle of modeling and assembling, design errors such as interference between parts or mismatch of assembly can be easily found, because virtual 3D design shows product's appearance right away and it let us assemble each parts while we watch the products directly and make us look in many different ways.

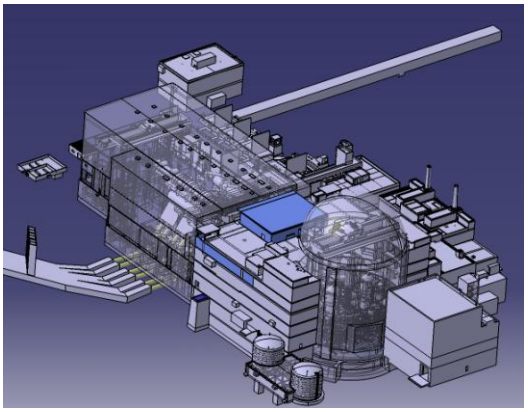

Fig. 1. Assembly of Ulchin Unit 5 Main Building

All design errors found are fed back to design team for modification. They should be applied to models and assembly. Virtual 3D tools used in DPM have advantages which let designers and engineers modify as freely as they want so as to change models and verify them immediately.

With DELMIA(Dassault System's 4D simulation tool) we chose, detailed construction simulation can be made.(See Fig. 2) Every movable unit of assembly is to be constructed according to its predefined process plan. Reviewing the whole process of construction through DPM leads us to find errors and improvements for a better process. And Comparing more than several test process simulation can make us find better solutions and it is directly connected to reducing the construction time and cost enormously.

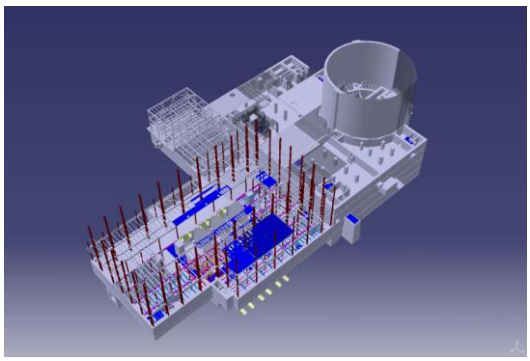

Fig. 2. Construction Process Simulation

This work is still underway deal with OPR1000 (Optimized Power Reactor 1000MW) Nuclear Power Plant in Ulchin of South Korea.

One of other try in DPM technology is Digital Information System in virtual reality as shown in Fig. 3. Anyone who engage in Nuclear Power Plant can find specific materials and data in this system easily and further more, this system software can be used as a training material and can be developed as a communication tool which is based on its information functions.

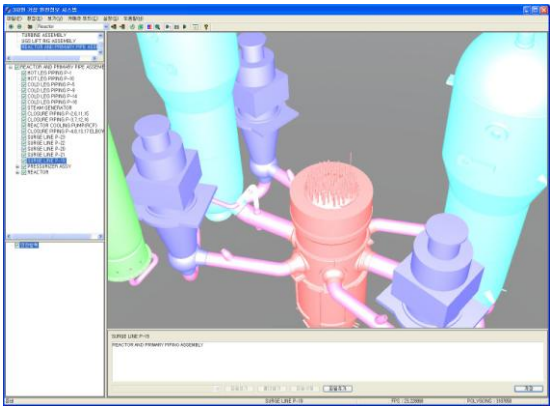

Fig. 3. Virtual Reality Digital Information System

3. Conclusions

By adopting DPM technology, many kinds of works which needs much time, manpower, cost such as construction, installation, and decommissioning of Nuclear power plant can be dealt with effectively. DPM will bring reduction of immense time and cost for the competitiveness of nuclear power plant.

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