Document Management System Development and Advanced Status of Nuclear Reactor Construction Project

Kook-Nam Park [a*], Yoon-Ho Shin [b], Sung-Kyu Lee [b], Young-Cheol Go [a], Youngse Kwon [a]
[a] *Korea Atomic Energy Research Institute,* [b] *Divi-vision Co.*
[*]Corresponding author: *knpark@kaeri.re.kr*

1. Introduction

The Korea Atomic Energy Research Institute built various nuclear facilities, such as self-designing and constructing Hanaro, exporting the entire system for research reactor to Jordan, which are considered successful construction projects for research and development. Systematic project management is essential to carry out large projects. This paper describes the development and advanced status of the document management system based on the experience of building a nuclear reactor.

2. Document Management System for Research Reactor Construction

At the time of the construction of Hanaro and the utilization facilities, design documents and drawings were mainly kept in hard copy form. In 2010, it was urgently needed to establish a document management system in order to export the entire nuclear reactor system to Jordan. After developing the document management system for the export of the Jordan research and training reactor, the document management system for the Kijangro and the document management system for the OYSTER project were established. In 2018, a new document management system was developed to perform scope management of small nuclear reactor project.

2.1. Scope Management Process

Scope management work process consists of plan scope management, collect requirements, define scope, create WBS (Work Breakdown Structure), validate scope, control scope, etc. [1].

In this process, the project charter, design criteria, design basis, and project plan are prepared. Next, the project procedure manual has been prepared. Among them, 'Project Number System' was created, and WBS was created in the field of document management. The WBS system varies for each project, but in the case of nuclear facilities, the method of describing the process WBS as project name + PBS + OBS + FBS + Serial No. is adopted.

Based on this, design documents such as design requirements and technical specifications and drawing numbers are assigned. In this project, the Documents Review and Approval Sheet was prepared by describing the document number, title, review area, and approval.

2.2. Research Reactor Document Management System

The Jordan Research & Training Reactor (JRTR) was implemented under a contract between KAERI and JAEC (Jordan Atomic Energy Commission) in January 2010. The PPM was first issued in April 2010 and has been revised three times until July 2014. At this time, the development of the JRTR document management system shown in Fig. 1 was completed in 2010, and the IOC, DDA, design document and communication document were prepared, reviewed and approved in the document management system.

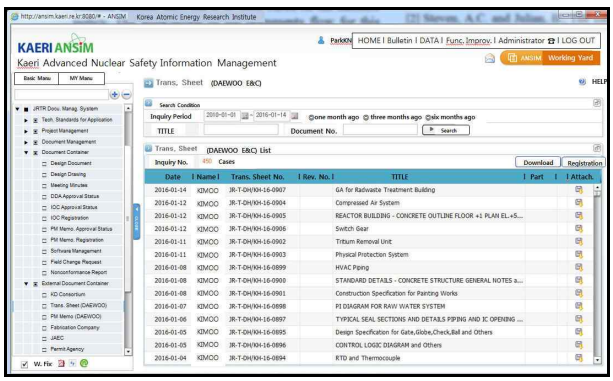

Fig. 1 JRTR Document Management System

The Kijang research reactor, which started in April 2012, was designed over 7 years and obtained a construction permission. The document management system created at the time of the development of The Kijang research reactor was developed after the Jordan research reactor document management system, so the project design period was long, and a higher level document management system was implemented.

Fig. 2 is the development status of the document management system in Kijangro. The performance and excellence of the Kijangro document management system is a stable document management system that is recognized by quality management departments and licensing agencies. [3].

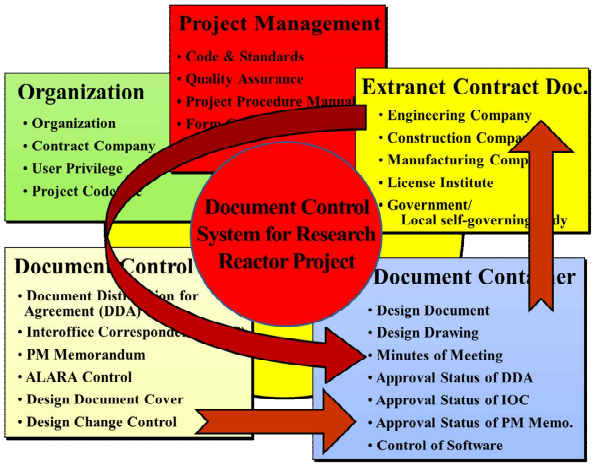

Fig. 2 Status of development of document management system for Kijang research reactor

3. Small Reactor document management system (PMIS) development

The document management system (PMIS) for small reactor consists of document management to create a document and a document storage box to store approved documents. Also, it has built design, production, construction and commissioning documents, other document storage boxes that manage licenses, quality assurance, purchase documents, etc., and system management to manage users, members of the organization, and contractors.

After establishing the ANSIM (Advanced Nuclear Safety Information Management system), the advantages and improvements of the document management system (PMIS) for small reactor are summarized as follows.

3.1. Understanding

Manpower with experience in developing similar systems for more than 10 years was put into the development of the document management system (PMIS) and nuclear quality requirements. It was based on accurate understanding of the work process while collecting user opinions. By designing the work process and Data Base with thorough needs analysis, user convenience and work efficiency have been increased.

3.2. Extensibility

As shown in Fig. 3, the development and maintenance productivity were maximized and a standard platform suitable for future expansion was applied (e-government framework). Compared to similar systems, equipment and solutions were selected as the latest ones, and the system processing speed, throughput, and response speed were significantly improved. By discovering new software to replace expensive software, the functions required for the document management system were completely implemented.

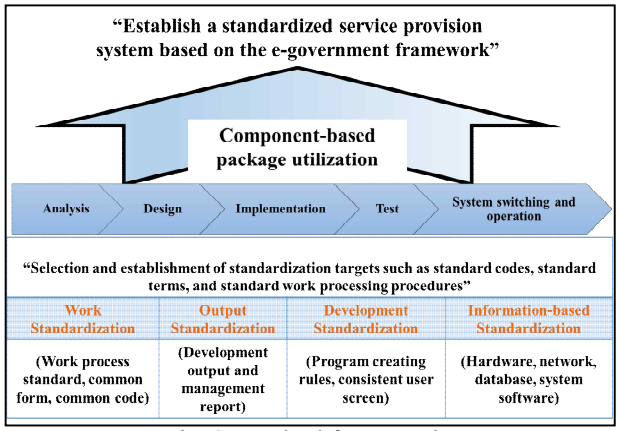

Fig. 3 standard framework

3.3. Document Security

Based on the establishment of a single server and installation of a document security solution (DRM), a strong countermeasure against document leakage was established. Access to unauthorized persons is fundamentally blocked through ID (identification), password, and IP (information provider) check.

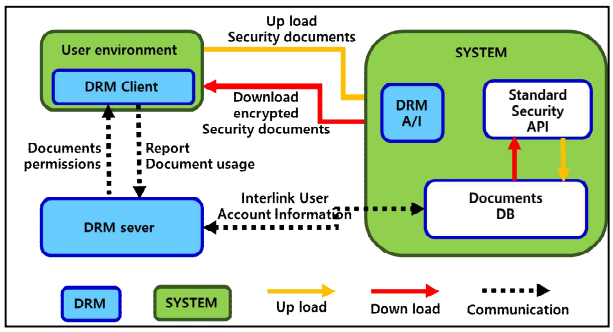

Fig. 4, the DRM document security solution

And as shown in Fig. 4, the DRM document security solution was used to manage the authorized person by granting access rights for each security level. In particular, through the system access log management, the tracking management function to identify responsible persons in case of a security incident has been strengthened.

3.4. Convenience

User-oriented interface and experience accumulation system are implemented to improve user convenience. Work efficiency was improved while reducing delayed

work by e-mail notification once a day for work to be processed.

4. Conclusions

Following the research reactor project, while developing document management system (PMIS) for a small reactor,

First, a work process and DB design based on accurate understanding through long-term collaboration were implemented.
Second, by using the standard platform, development and maintenance as well as scalability were secured, and processing speed, throughput, and response speed were greatly improved.
Third, the source of unauthorized persons was blocked through ID, password, and IP check. In addition, security measures were established through the establishment of a single server and a document security solution (DRM).
Lastly, the convenience of use was improved by implementing a user-oriented User Interface/User Experience system.

In addition, it is expected that overall project progress, budget management details, manpower resources, communication activities, risk management, and stakeholder management should be managed by the PMI (Project Management Institute).

Therefore, it is expected to be able to participate not only in the continuous development of nuclear reactor projects, but also in overseas nuclear reactor construction and decommissioning projects.

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