Development of Maintenance System for Supporting Structures & Facilities in NPP

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1. Introduction

Nuclear Power Plant(NPP) consists of structures, systems and components with varying functions. In order to keep safety and cost-benefit available, it requires an efficient control system to service life.

In case of the NPP which is now working, it should be noted that the periodic integrity assessment of safety-related structures including containment building have been performed. In addition, the establishment of maintenance D/B can be successfully accomplished through enhancement of SLMS(Structural Life Management System)[1] by the integrated control system.

Non-safety-related and outside power block structures play an important role to increase the function of the system, but have not any maintenance system available. This may cause both decrease in safety and increase in cost with damage of the structures.

Thus, this study aimed to develop an advanced management system to solve reasonably above problems.

2. Major features of the SUMS

2.1 System flow

Basically, supporting structures & facilities management system(SUMS) should be connected with SLMS. The basic system of NPP can work with access of the same D/B. Through this process,
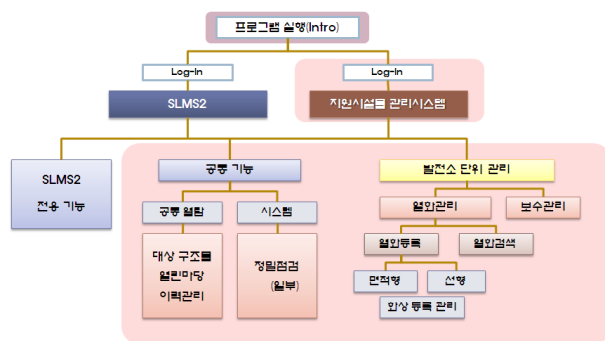
it can be developed as an unique management system. Additionally, the system can provide several functions such as history management, electronic bulletin board and close inspection.

SUMS control 2 unit at the same time. And, the structures can be functionally divided with safety-related structures, warehouses, tanks, outside power block, lines, etc.

The registration of degradation is originated from picture data.

2.2 Major management items with structures

Because the SLMS primarily controls main aging data causing the safety-related structures, this management system deals with window frame, waterproof, sump and siding. In particular, the management of warehouses contains both finishings and close inspection additionally.

In case of the tanks, the management should be done about foundation and breast wall. The component structures for outside powerblock consists of tower and foundation of swichyard, rock anchor in permeate slide and breast wall, side-hole, cover stone of breakwater and inner stone.

Besides, linear structures contain fence, road and drainpipe. These structures control concrete and wire-net for fence, pavement condition, curb stone and manhole for road, and drain facilities and concrete for drainpipe, respectively.

Other facilities contains barrier wall for transformer and foundation for crane.

2.3 System development

Fig. 1. System flow of SUMS

Fig. 2. Intro screen

Fig. 2 shows the Intro screen. Log-in requires the exact ID and Password.

Fig. 3. Main screen

When logged-in, the extent of management of structures depends on the used ID. Totally, main system manager can control both accessing right and limitation to system.

As shown in Fig. 3 indicating Main screen, the pulldown menu is used, and followed by the quick entry.

As mentioned above, SUMS manage 2 unit at the same screen as shown in Fig. 4. Appearance of the structures can be seen from the screen. Next, the registration of structures types should be done and followed by inputting picture data. This simple process can be made with basic management of structures. The registered structures & facilities can get individual code, location and type.

The acquired picture data are used for the control of degradation. However, in order to get more efficient D/B on damages obtained from inspection, the structures should basically be divided into 4 parts, as shown in Fig. 5. For linear structures such as pipe and road should be rearranged as a determined length unit.

Fig. 6 indicates that the inspection consists of a complete view and a degradation image. For a

Fig. 4. Screen for management and selection of structures

detailed inspection, the registration of picture data should be made simultaneously.

More specifically, the D/B contains date, item, division number, zone number, element type, degradation type, damage grade and determination of repair.

Comparing by normal image data, if the D/B is produced through this process, it can efficiently control amount, degree and type of damage.
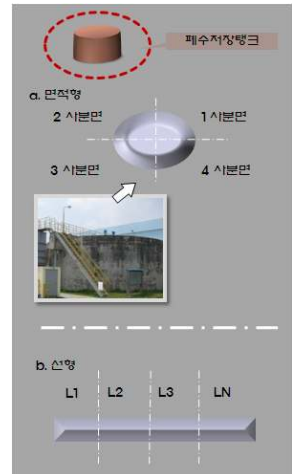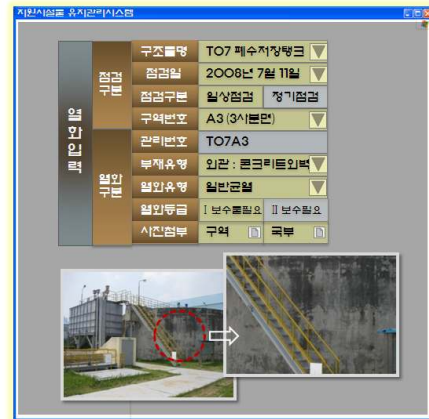

Fig. 5. Division of structures

Fig. 6. Aging management

3. Conclusions

In this study, an advanced and exclusive management system for supporting structures & facilities of NPP which had neither any systematic inspection nor functional management was developed. Alternatively, the system is characterized as an unique management system of power plants. Besides, it has an statistic D/B available, although based on the picture data. In other words, the control of damage of structures can be diversely made.

Conclusively, this system provides an efficient management control for supporting structures & facilities.

REFERENCES

1) M.S, Cho, Y.C. Song, J.S. Lee, J.H. Lee, "Development of the structural life management system II for the structures in nuclear power plant", Korean Society of Civil Engineers, 2008, pp787-790