A Prediction on the Unit Cost Estimation for Decommissioning Activities Using the Experienced Data from DECOMMIS

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1. Introduction

The information on the decommissioning activities of the nuclear facilities, in terms of the removal and recycling of that, is the importance of being a very highly. It contained the important point of the duration and budget on the management of decommissioning project. Because of this, other countries, the United States, UK, France, Germany, and Japan are established and be applied the database system for doing work in the decommissioning. The KAERI (Korea Atomic Energy Research Institute) has developed the DECOMMIS (Decommissioning Information Management System) and have been applied for the decommissioning project of the KRR (Korea Research Reactor)-1&2 and UCP (Uranium Conversion Plant), as the meaning of the first decommissioning project in Korea. All information and data which are from the decommissioning activities are input, saved, output and managed in the DECOMMIS. This system was consists of the web server and the database server. The users could be access through a web page, depending on the input, processing and output, and be modified the permissions to do such activities can after the decommissioning activities have created the initial system-wide data is stored. When it could be used the experienced data from DECOMMIS, the cost estimation on the new facilities for the decommissioning planning will be established with the basic frame of the WBS structures and its codes. In this paper, the prediction on the cost estimation through using the experienced data which were store in DECOMMIS was studied.

2. Methods and Results

2.1 DECOMMIS

The DECOMMIS (Fig. 1) was established with the purpose of the collection and managing the decommissioning activity information and data for the decommissioning project on KRR and UCP facilities in KAERI. About 12 G byte of data and information was input. After the completion the decommissioning project, all data in DECOMMIS was used in order to the application for the decommissioning planning and design as converted and modified factors for cost estimation. During the process, all data and factors was justified as codes for the basic technology development which will be applied for the cost estimation.
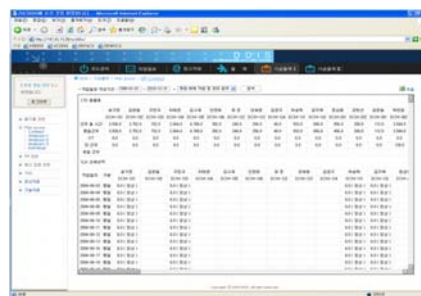

Fig. 1. DECOMMIS User Interface

These codes could be used for another engineering computer systems which were DEFACS (DEcommissioning FAcility Characterization System), DEWOCS (DEcommissioning WOrk-unit productivity Calculation System), DEMOS (DEcommissioning MOdeling System) and DEPES (DEcommissioning Procedure Establishment System).

2.2 Mapping with WBS Code and Costing

The WBS (Work Breakdown System) code was set up with working procedures according to the objected facilities or components and with working prediction according to the project management schedule on the decommissioning activities. And also this code was standardized with the unit-work productivity such as man power consumption or equipment used time etc., per unit weight, unit volume and unit area. At the DECOMMIS, the actual and real data and information was store as man power consumption or management factors. These data was produced with several ways from the DEWOCS system (Fig. 2).
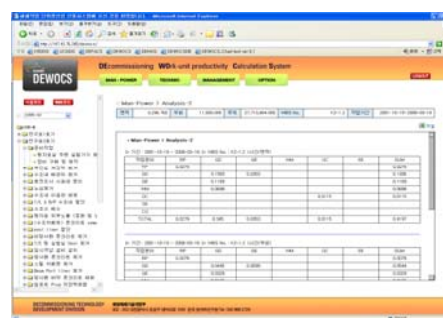

Fig. 2. DEWOCS User Interface

This system is used for producing an actual unit-work productivity factors per unit weight, area and volume from the decommissioning project on KRR and UCP. By using the DEMOS, Which was established for estimation the unit cost, it to be the addition the annual governmental labor unit working cost and equipment rental or used fee factors, total cost for total components were generated. The basic formulation of the man-power cost estimation is as bellows;

$$C\ its = \sum its\ (Q\ it \times PF\ it \times C\ l \times E\ r)$$

- C its = total cost of items
- Q it = quantities of item (m^2, m^3, kg)
- PF it = productivity factor of item (hr / m^2, m^3, kg)
- C l = labor cost (KRW/hr)
- E r = escalation ratio (%)
- it = item   - its = items

When the suitable description on the WBS items, it could be to confine the detail cost estimation with its application methodologies.

2.3 Simulations

Through this paper, it was established the simulation program for the processing the cost estimation with the raising the unit work factors.
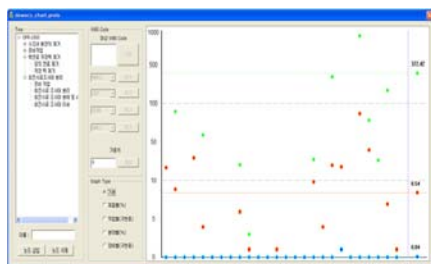

Fig. 3. Cost estimation prediction program

This program could be predicted the suitable cost when the control the management data for the facilities and the application of the scale factors with the scale, size, devices using and the description the WBS code. The simulator could be possible the storage to the WBS code for the object items and with functions of insert, delete and revision of the facilities for decommissioning. Each facility has a creation on the new WBS code on the information of the completion the decommissioning against the object from the DECOMMIS. This WBS code was input as the specialist on the decommissioning who was involved the actual decommissioning activities with who's experienced.

In the case of when there are many WBS code for one object component, it is selected by average values with confidence. Through this program (Fig. 3), the productivities on the new target for decommissioning unit costing could be implemented and compared.
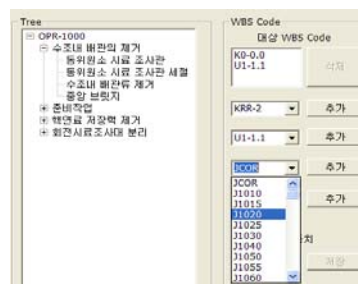

Fig. 4. Assign the WBS Code on the to target facility

3. Conclusions

For the new decommissioning project on the nuclear facilities in the future, through this paper, the cost estimation for the decommissioning using the experienced data which were WBS codes, unit-work productivity factors and annual governmental unit labor cost is proposed. These data were from the KRR and UCP decommissioning project. The result on the 3 items of the objected components for decommissioning is shown in Table 1.

Table 1. The cost estimation result on 3 items.

items	New WBS Code	WBS Code (DECOMMIS)	Man power cost (krw/kg)
Removal the pipes for RI trans	**KA-4.1**	**K2-3.1 K1-2.1**	**618,517.8**
Pipes in the reactor pool	**KB-3.8**	**K2-14.3 K2-14.7 U-8.7**	**40,760.4**
preparation	**KC-1.1**	**K1-1.1**	**111,171**

The differences on the WBS code sectors and facility characterization between new objected components and experienced dismantled components was reduces as scaling factors. The study on the establishment the scaling factors and cost prediction for the cost estimation is developing with the algorism from the productivity data, now.

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