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# The Study on the evaluation of the schedule for a research reactor

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## 1. Introduction

Recently the graphic simulation has been used to design and verify new equipment and also it has been expanded to virtual prototyping technology[1]. In the nuclear decommissioning field, this technology also has been used to investigate the validation for the design of dismantling machines and to check interferences and collisions in dismantling scenarios[2]. However, the graphic simulation just gives us visible results that mean they just provide us with illustrating and comprehensible information of the decommissioning process. They rarely can contribute to decommissioning planning. For this reason, in order to make a decommissioning plan efficiently we have been developing a method for scenario evaluation using the computer simulation technology.

In this paper the study about a method which is related with the calculation of the schedule among several modules of dismantling process evaluation is presented

## 2. Methods and Results

In this chapter, a method using weighting factors and a method using trends of data[3] for the dismantling schedules evaluation are described. The scenario of the thermal column among the dismantling items of KRR-2 was derived.

### *2.1 A method using weighing factors*

The values that can take a primary role to fix working time are weighing factors. The method using weighing factors likes this.

$$\mathrm{US} = Unit \times \sum_{i=1}^{n} Weighting\ factor \quad (1)$$

Where, unit is a number of workers and working hours needed to dismantling unit works. Dismantling unit works are classified into 4 main categories and then they are divided into 15 minor categories. And workers also are grouped as radiation management worker, common worker, Quality control and waste management worker, and decommissioning specialist and each of them are specialized jobs according to beginner, intermediate, and advanced.

The weighting factors affected to dismantling work are classified into as follows;

1. Work difficulty
2. Radiological difficulty
3. Work scale
4. Equipment specification

Among them work difficulty and radiological difficulty are determined as following the tables.

Table 1. The weighing factor of the work difficulty.

| Classification | Weighting factor | Criterion |
|---|---|---|
| Very simple | 0.5 | Using simple equipment |
| Common | 1.0 | Using normal equipment |
| Middle difficulty | 2.0 | Need special technology |
| Middle-high difficulty | 3.0 | Using remote equipment, Narrow location |
| High difficulty | 5.0 | In highly activated area, under water, |

Table 2. The weighing factor of the radiological difficulty.

| Classification | Weighting factor | Criterion(Surface dose) |
|---|---|---|
| Common | 1.0 | Non-activated material |
| Very low level | 1.5 | Using normal equipment |
| Low level | 3.0 | Need special technology |
| Middle level | 5.0 | Using remote equipment, Narrow location |

### *2.2 A method using trends of dismantling data*

Various information happen everyday in the KRR-1&2 decommissioning site. Especially work contents and working time are managed systematically. The method using trends of dismantling data likes this.

1. The items of dismantling work are classified into working items of manual dismantling, working items of remote dismantling, working items of decontamination, radiological measurement, and arrangement.
2. Above 3 items of dismantling work are assorted using the daily work data and waste data for KRR-2.
3. Derive elements which affect to dismantling work as analyzing classified data
4. Derive dot graphs about input man-powers vs. elements and derive trend lines and functions.
5. Apply functions to other dismantling objects.

These figures show the trend line graphs of hydraulic cutting method and the plasma arc cutting method.

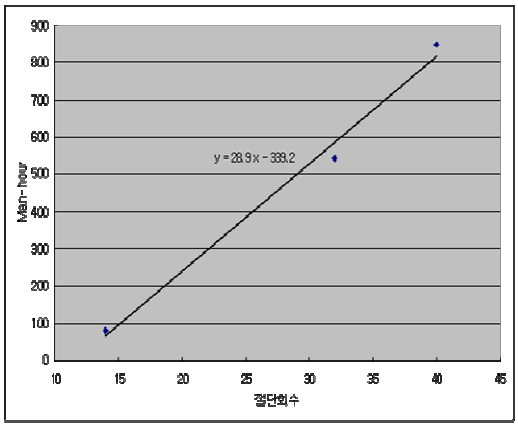


Figure 1. The graph and trend equation of hydraulic cutting method.

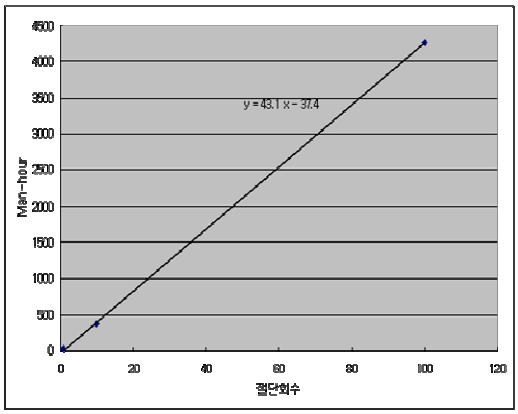


Figure 2. The graph and trend equation of plasma arc cutting method.

*2.3 Application using a method of trends of dismantling data*

Table 2. The result of the man-hours using a method of trends of dismantling data

| Work contents | Unit | Man-hours |
|---|---|---|
| Discharge pool water | Volume | 10.0 |
| Thermal column survey #1 | Area | 24.9 |
| Shield door open | Number of time | 2.0 |
| Removal of graphite | Number of time | 223.3 |
| Thermal column survey #2 | Area | 6.7 |
| Setup green house | Area | 65.6 |
| Equipment preparation | Weight | 97.7 |
| Setup equipment | Weight | 159.9 |
| Removal of horizontal graphite | Number of time | 169.5 |
| Disjoining a green house | Area | 15.4 |
| Preparation of plasma cutting | Cutting number | 79.2 |
| Dismantling beamport | Cutting number | 520.1 |
| Dismantling thermal column | Cutting number | 4251.5 |
| Final survey | Area | 24.9 |

Table 2 shows the man-hours of thermal column for KRR-2 using a method of trends of dismantling data. We can also estimate the expected cost as the obtained man-hours multiply by the personal expenses (146,000 won/man). Total cost is approximately estimated to reach eight million won.

## 3. Conclusion

In order to estimate dismantling schedule, a method using weighing factors and a method using trends of dismantling data were derived. And the schedule of thermal column was obtained using a method using trends of dismantling data. To increase the reliability it is important that many data have to be required. Therefore this method is necessary to have the dismantling DB.

## REFERENCES

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[3] K. Shiraishi, T. Sukegawa, and S. Yanagihara, Data analysis on Work Activities in Dismantling of JPDR, JPDR-Data/Code 98-010, 1998.