

TREND OF COLLECTIVE DOSE AND DOSE REDUCTION MEASURES OF MITSUBISHI ELECTRIC CORPORATION WORKERS IN NUCLEAR POWER PLANTS

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("MELCO" hereafter)

ABSTRACT

MELCO has supplied the reactor instrumentation control system, reactor coolant pump motors, turbine generator and central control system for the pressurized water type nuclear power plant. For the legal periodical inspection and repair work, MELCO has also received orders for the periodical inspection for 23 power plants (including 4 plants under construction) of 5 electric power companies, and executed the inspection work from the view point of preventive maintenance.

The annual dose for MELCO's workers is liable to be decreased in spite of increased number of plants. The dose for new plant in particular is 50% or less as compared with that for conventional plant. This is because the measures taken for the conventional plant against the dose reduction is reflected upon the new plant.

The dose reduction measures are taken for each system for which order was received. Such measures are mainly intended to improve the work procedures and equipment for reduction of work time in the radioactive area and to arrange the working process, so as to perform the work in such period when the dose level at the working environment is low.

To enhance the workers' consciousness for reduction of dose, MELCO provided the workers with dose predictive training, and let them aware of such items known at the tool box briefing(TBM), which could realize the dose reduction for workers. MELCO has been positively promoting the activity to arrange the desirable work environment for extermination of 3Ks (*Kiken, Kitsui, Kitanai*) or 3Ds(dangerous, difficult, dirty) including protection against radiation in corporation with electric power companies.

INTRODUCTION

The number of workers engaging in nuclear facilities for MELCO's nuclear work tallied to approx. 300 (net) annually, and the number of workers engaging in such work, including the employees of cooperative companies tallied to approx. 1,500 (net) annually.

The paper is intended to report the results of investigation/analysis on the annual dose(1983~1994) for employees of MELCO at time of periodical inspection from the view point of dose reduction, and to introduce the technical method for dose reduction and contents of education/training for workers.

TRENDS

1. The annual collective dose(PWR) for MELCO's workers(including workers of cooperative company) during period from 1983 to 1994 tends to be decreased inspite of increased number of power plants.
 - 1) The annual dose for MELCO's worker per each periodical inspection of PWR plant is liable to be decreased.
 - 2) The reason why the dose for MELCO's worker was increased in 1993 is that the

attached work (replacement of steam generator) was executed.
(dose for work concerned: 443 man.mSv)

2. The main exposure for MELCO's workers is that received during periodical inspection, or from the replacement work of reactor coolant pump motor. The transition of dose during latest 5 years is liable to be decreased.

METHODS

The basic principles for dose reduction measure are to secure the proper distance from the radiation source, to reduce the time required for work, to shield and remove the radiation source. The effect of dose reduction is depending on how these four principles are fulfilled by the electric power company, contractor(who plans the work) and workers in cooperation. As a result of such activities, the dose for MELCO's workers during periodical inspection of nuclear power plant is liable to be decreased.

1. The methods for those who plan the dose reduction measures will include the improvement of equipment/facility, adjustment of work implementation process, and improvement, education and training of work procedures, etc.
 - 1) The improvement of equipment/facility will include the modification of power cable connection from conventional type to plug-in type, installation of lube oil filling and drainage equipment for lube oil, installation of lifting device for motor terminal box, and is intended to shorten the time required for work.
 - 2) The adjustment of work implementation process, for instance, is so planned as to be performed when the water is filled in the secondary side of steam generator within the loop room as much as possible.
(When the water has already been filled in the secondary side of S/G, the water will serve as shielding substance, causing the environmental dose rate to be decreased by more than 50%.)

- 3) The education/training is an essential item from the view point of radiation protection, as it helps to enhance the worker's consciousness against dose reduction.

For the education/training, MELCO provides the basic education/practical education on the radiation for 7 hours, to learn the knowledge on radiation, influence of exposure, dose limit, etc.

For dose reduction, MELCO provides the dose prediction training(HYT), using the illustrations, to minimize unnecessary radiation exposure.

Such training was evaluated for effect in accordance with the result of questionnaire conducted on the workers, which proved that some effect was brought about, though it was difficult to evaluate it quantitatively.

For dose prediction training, MELCO gathered the workers in charge and selected the leader to make up a small-member group, to provide the dose prediction training, using the illustrations simulating the site for each group

In addition, MELCO provides a reading-out of instruction manuals prior to the work, or the TBM on the very day of work.

2. The measures to be taken by the electric power companies will include the purification of primary cooling material stained due to oxidation operation of

plant, removal of high dose rate piping, etc.

When the radiation source is removed, the dose rate for entire plant is decreased, causing the dose against the worker of contractor to be decreased.

Such measures are expected to provide the greatest dose reduction effect.

3. The education/training discussed above is intended to allow the workers to learn the knowledge on the basic principles for dose reduction, to be conscious of dose reduction,

and further to utilize such knowledge during the process of work.

Enhancing the consciousness of worker against the dose reduction will help to eliminate unnecessary radiation exposure of each worker, and repeated practice will reduce exposure.

The attitude of each worker concerned with the radiation protection will be an essential item to secure the radiation safety.

It is also essential for each worker to take the dose reduction activity as his own activity, and to let him have such consciousness as to be taking part in the activity.

Although it is difficult to calculate the dose reduction quantitatively for trial, the dose reduction of 30% is thought to be an effect of such activity.

CONCLUSION

The paper mainly discussed the dose reduction measures from the standing point of a contractor.

It is thought that the great effect will be assured for dose reduction by through the work by three parties of electric power company, contractor(who plans the work) and workers in cooperation.

It is also necessary to minimize the exposure risk of workers by reflecting the ALARA spirit(which ICRP recommends), upon the local equipment/facility design/layout and workers, to minimize exposure risk of workers.

It is important to enhance the consciousness of workers against the dose reduction as well as to study the technical dose reduction measures.

Each nuclear power plant takes the radiation as a main factor of countermeasure against 3Ks, and has been carrying on the dose reduction measures together with the electric power company.

The dose reduction will be an important problem to be settled, for those who are engaged in the radiation protection. The authors are intended to positively promoting the subject in the future.