

Report on improvement of work efficiency and reduction of exposure dose by improving the working environment and using mechanization

Taisei Corporation

This report concerns the effects of improving efficiency and reducing exposure dose in the coastal area on the south side of the reactor building, through work environment improvements and mechanization carried out in the on-site south-side maintenance work performed starting in December 2015.

1. Examples of reduction in exposure dose

(1) Improvement of method of access the work location

The work location is located at the edge of the site, on the south side of the reactor building, and movement is done by car and walking in the order: 1) Off-site parking lot, 2) Access management, etc., 3) Welfare building, 4) Specific work location. Movement time every day was 118 minutes, and this was shortened to 30 minutes by considering other routes. This reduced the time spent on the 1F site, improved work efficiency, and reduced the daily exposure dose over the entire work period by 17%.

(2) Providing rest facilities and a materials yard near the work location

In line with the change in access method, a site owned by Fukushima Prefecture and located a five-minute walk away from the work location was borrowed, and after decontamination a temporary shed and materials yard were set up. Also, a clean-room was set up on-site about 1 minute away from the work location, to make it possible for workers to remove their equipment and replenish liquids, etc.

(3) Mechanization of mowing work

Manual mowing work is a task with a possibility for high radiation exposure due to the high dose. The mowing area in this work is an extensive 10,000 m² and there are some obstructions; thus mechanical mowing was adopted by mounting a mower to the backhoe attachment. This made it possible to reduce the exposure dose in this work to 79%.

(4) Topographic surveying of inclined ground using drones

Aerial photography by drones was used for topographic surveying of inclined ground, one type of review work carried out prior to specific work. This reduced the exposure dose in topographic surveying work by 96% in comparison with the previous method of posting surveyors on dangerous slopes with a high dose (including tasks such as mowing and safety rope installation and removal).

(5) Backhoe equipped with robot

An unmanned backhoe was used to perform backfilling work for collapsed slopes. This equipment has a robot installed in the cabin, and the robot's arms are connected to the control sticks of the heavy equipment. The heavy equipment is operated by controlling the robot remotely. Since the heavy equipment can be used without modification, the system is inexpensive and highly versatile. Machinery used at locations with a high dose can be easily adapted for unmanned operation.

2. Conclusion

The most effective measures in this work were improving the access method, and accompanying that, providing rest facilities and a materials yard near the work location. Improvement of the working environment raised efficiency of all work over the entire work period, and had a major effect on exposure dose, safety and process steps (cost). It will also be important to specify high dose work at the planning stage, and consider mechanization or elimination of such work.