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ROBOT CHALLENGES FOR NUCLEAR DECOMMISSIONING OF FUKUSHIMA DAIICHI NUCLEAR POWER STATION

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We will present robot technologies for nuclear decommissioning developed by IRID (International Research Institute for Nuclear Decommissioning, JAPAN).

In the lead-up to retrieving fuel debris from Units 1-3 at Fukushima Daiichi, various tasks are planned to take place inside the reactor buildings. In order to perform these tasks smoothly, improving the working environment is essential. An overall reduction in radiation levels is sought through a combination of decontamination, shielding, and removal of radioactive sources.
As one of key challenges, we developed technologies for remotely operated decontamination inside reactor building. Three types (high pressure water jet, dry ice blast, and suction/blast) of decontamination technology were selected. Three types of decontamination systems for lower parts of the first floor, for higher parts of the first floor, and for upper floor of the reactor building (2nd and 3rd floors) were developed respectively.
A mockup test facilities were constructed and verification tests took place. The performance of decontamination, traveling, and operability and safety functions were evaluated during verification tests.

It is estimated that reactors cores in Units 1-3 have melted and fuel has partially fallen with reactor internals into the Reactor Pressure Vessel (RPV) and Primary Containment Vessel (PCV). In particular, it is possible that after fuel debris melted through the bottom of the PCV in Unit 1, they emerged from the inside og the pedestal (which supports the PCV) and spread out of the pedestal opening. However the actual condition has not been confirmed.
Before the fuel debris removal, it is important to know the condition of inside RPV and PCV. Because of severe environment of high radiation dose and high humidity, remotely controlled systems are indispensable.
As one of challenges, we developed two systems for investigation inside the PCV. The one is technology for accessing the pedestal exterior. A shape-changing robot to investigate the pedestal exterior inside the Unit 1 PCV (the grating outside of the pedestal) was developed. The other is technology for accessing inside the pedestal. A self-miniature robot will enter via the opening of the X-6 penetration (PCV penetrating part) and after traveling through a guide pipe inserted into the PCV traverse the CRD rail into the pedestal interior.

Finally we will conclude our achievements and discuss the lessons learned.

Country or International Organization

JAPAN

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