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Decontaminating road surfaces with ultra-high pressure water jet

Reduction of air dose rate from 20μSv/h to 5μSv/h

The technology for decontaminating road surfaces by blasting with water pressurized as high as 2000 atmospheres, then recovering, treating and reusing the water, is known as "ultrahigh-pressure water decontamination technology." Among various decontamination technologies, the decontamination using ultrahigh pressurized water has shown high decontamination performance; the technology is furthermore characterized by the fact that it produces minimal waste substances. The air dose rates have been successfully lowered from an average of 20μSv/h to 5μSv/h as a result of the decontamination tests which the Japan Atomic Energy Agency (JAEA) conducted using the technology in Okuma town, within the area which is designated as an area where it is difficult for residents to return for a long time (difficult to return area).

With ultrahigh-pressure water decontamination technology, road surfaces are sprayed with water compressed to approximately 2000 atmospheres and the water is recovered; it however fundamentally differs from the mechanism of decontamination by high-pressure washing whereby the surfaces are sprayed by water under tens of atmospheres of pressure and the water is then recovered. With high-pressure washing, the places sprayed by waster are washed and decontaminated by removing radioactive materials adhering to dirt, etc. that were on the surface of the roads. Ultrahigh-pressure water decontamination technology, on the other hand, is able to dislodge radioactive materials having penetrated into the road materials as well as the surface dirt, by thinly scraping away the asphalt, thereby offering more thorough decontamination.

With ultrahigh-pressure water decontamination technology, decontamination is influenced by three elements: water pressure, amount of water and suction power of water. Decontamination performance is enhanced by increasing pressure and amount of water, but it also proportionally increases damage to the road surface and amount of waste as it scrapes more. Decontamination performance is inversely affected by reducing these two factors.

The JAEA therefore worked toward optimizing parameters to offer more effective decontamination with minimal damage to road surfaces. As a result, it was found that effective decontamination is possible by using a certain level of impact force; even if the water pressure is lower, with the water volume that can produce such impact force, the same effect can be obtained.

Because optimizing parameters has produced some leeway concerning ultrahigh-pressure pump performance, the JAEA enhanced the work efficiency of the pump by 300% by increasing

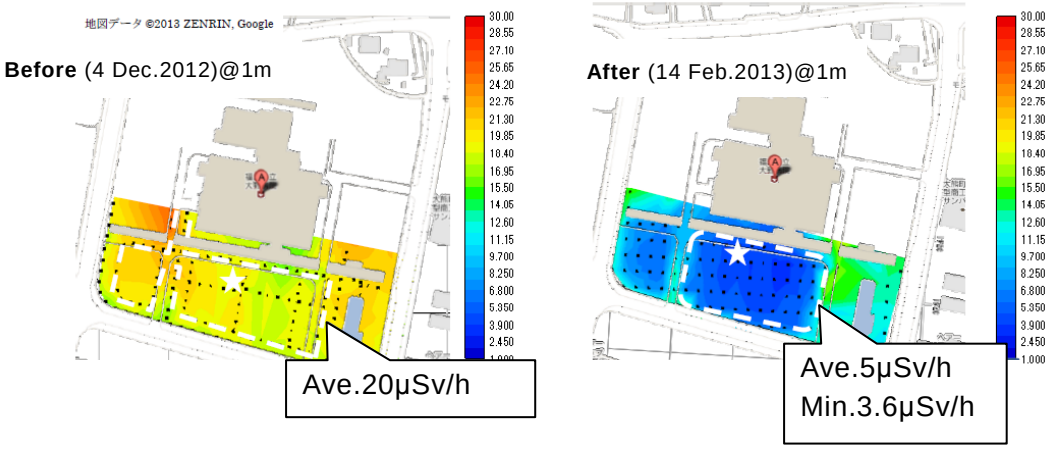
the number of decontamination heads mounted on its end.

The JAEA conducted a decontamination test in the approx. 1.3 ha permeable asphalt parking lot of the Fukushima Prefectural Ono Hospital using multiple decontamination heads (see photo on the right) in Okuma town. Permeable asphalt is easily penetrated by water and therefore tends not to yield favorable decontamination results. Surface contamination density of the road surfaces within the difficult to return area is high (30,000 to 50,000 cpm). The pavement is furthermore the water permeable type, whereby contamination extends to the interior of the aggregate, thus lowering the effectiveness of the conventional high-pressure water.

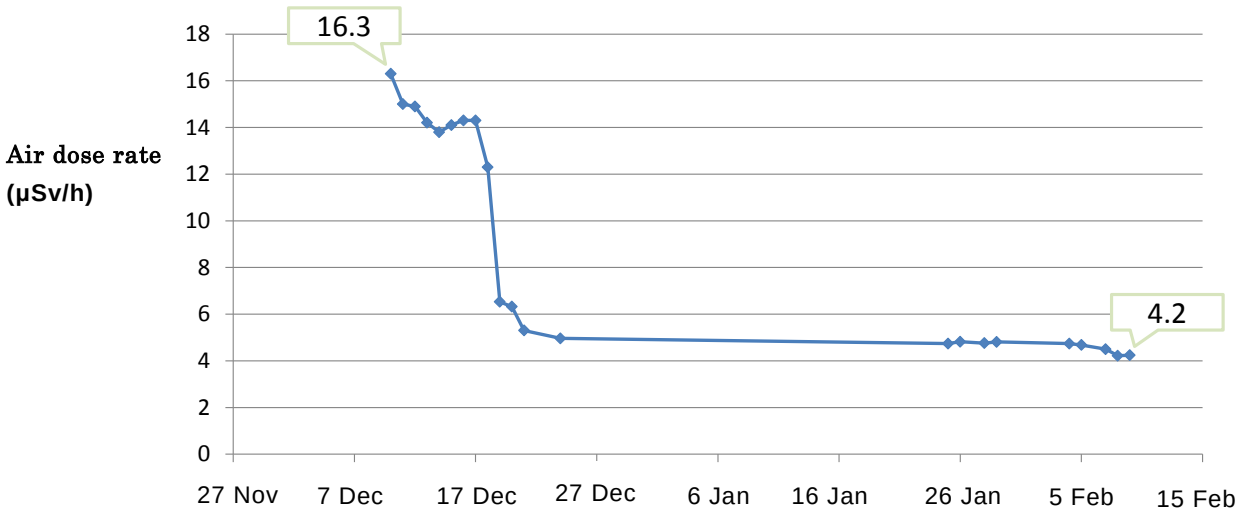
When two heads were used to wash off road surface contamination, it succeeded in reducing road surface contamination density by 70 to 90%. Air dose rates which had been an average of 20μSv/h dropped to an average of 5μSv/h (see photo on the top right corner of next page).

Also, when a commonly used coagulative precipitation agent was used in combination with a 0.01μm filter, radiation concentration of the recovered water was reduced to 2Bq/kg or lower. In addition to this, as suspended solids (SS) concentration was at 2mg/L or lower, it was confirmed that the water, which would not damage the ultrahigh spray nozzle with holes as small as human hairs, could be reused.

Ultrahigh-pressure water decontamination technology was noted as being effective in Revision 2 of Decontamination Guidelines put out by the Ministry of the Environment. The technology has been employed for thorough decontamination in Naraha town, and further cost reduction while maintaining high quality is expected through the efforts of private sector companies in the future.



Results of a decontamination test conducted in Okuma Town. The figure on the left corresponds to before decontamination and the one on the right to after decontamination. Air dose rates that had previously been an average of 20μSv/h were reduced to 5μSv/h.



The results of the measurements at the fixed point (the star in the figure of the previous page) that were conducted during decontamination work. It was discovered that air dose rates dropped radically by decontaminating the road surface directory below the measuring point. It was also confirmed that dose rates gradually decreased as the surrounding area was decontaminated. Although the surface could be further removed, the work was stopped considering the impact on the road surface, and was ultimately decontaminated to 4.2μSv/h.