

Simulating radioactivity in reactor components

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Popular science summary

During the operation of a nuclear power plant materials and components in close proximity to the reactor core may become radioactive. This will of course have consequences for the safety of personnel during handling and disposal of radioactive waste when components are exchanged, and in the long run when the facility is decommissioned and dismantled. To better be able to plan and manage these activities, greater knowledge of the degree of radioactivity is necessary.

Previous studies on the subject have been made for the reactor Oskarshamn 3 (O3) located in the municipality of Oskarshamn on the Swedish east coast, but the aim of this paper was to do so in greater detail, and to gain new insight. For that purpose, two components were chosen for the analysis which had previously not been studied in detail; the steam separator and the steam dryer, located inside the reactor of O3. The results from a previous study of the radiation around the reactor core, along with material data of the components in question, was then used to simulate the degree of radioactivity at the surface of the components, as well as at a 1 m distance. The results showed that the degree of radioactivity was in fact significant in some parts of the steam separator which was located closer to the reactor core. For the first year after the reactor had stopped its operation, a worker would not be able to spend more than a few hours close to the component before reaching their yearly radiation limit. The radioactivity was still significant after 30 years, though not nearly as bad. The steam dryer was however for the most part at a safe level.

These results could prove important when the decommissioning of O3 is being planned, as they show that certain measures should be taken regarding the steam separator.