



Contribution ID: 65

Type: Oral presentation

## #05-65 Iterative method in modelization of gamma radiotracer measurements on the Colentec loop in Cadarache for the quantified analysis of the clogging phenomena in Steam Generators

Wednesday, June 23, 2021 11:00 AM (20 minutes)

The Tube Support Plate blockage, also named clogging, is a complex phenomenon that can occur in the steam generator of Pressurized Water Reactors. This deposit mainly composed of iron oxides, may induce several consequences (thermohydraulic flows changes inside SGs, vibrational or oscillatory risks, mechanical resistance of SG tubes and internals, impact on water inventory ...). Since 2014, the representative dedicated equipment, named COLENTEC loop at Cadarache had already provide a large number of results on the physico-chemical properties of the deposit formed in specifics thermohydraulic and chemical stable conditions. A major improvement was the switch to an active configuration allowing the injection of a gamma radiotracer  $^{59}\text{Fe}$  inside the circuit. Thanks to three dedicated gamma-measuring stations specifically designed by our laboratory, a first test showed that it was possible to determine on line the influence on clogging of parameters such as the chemistry, the temperature, the pressure without waiting for the opening and the dismounting of the test section.

This paper presents the iterative method of modelling performed for the analysis of the results obtained during this first test on the three gamma detectors.

The analysis starts with the simplest low background gamma measuring station in place and allows quantification of the  $^{59}\text{Fe}$  measurements of the fluid inside the loop.

The modelling, with a Monte Carlo code MCNP, of the second on-line measuring station positioned on a section of the loop provides quantitative results on the residual  $^{59}\text{Fe}$  deposit along tubes.

Finally, the sophisticated modelling of the geometrical configuration of the main on line measuring station on the Tube Support Plate allows determining the extent of the clogging.

The presented method is then able to discriminate but also quantify primary and secondary phenomena taking place in the specific selected thermohydraulic and chemical conditions. It therefore improves the understanding of clogging and could lead to a better management of the maintenance of steam generators in power plants.

These works are carried out within the framework of a scientific and financial collaboration between CEA and EDF (France) that the authors gratefully thank.

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**Session Classification:** 05 Nuclear Power Reactors Monitoring and Control

**Track Classification:** 05 Nuclear Power Reactors Monitoring and Control