CONTROL-ROD GUIDE TUBES WEAR INSPECTION: IMPLEMENTATION OF THE SURVEILLANCE

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ABSTRACT

Control-rod guide tube (CRGT) wear has been part of EDF maintenance strategy concerns since the 90s. The CRGT wear inspection activity, supervised by EDF, is carried out by a Subcontractor. Surveillance of this activity falls to the CEIDRE, a unit of EDF. The subject of this internship refers to the implementation of the surveillance of the CRGT wear inspection. Indeed, the activity has never been implemented before: no proper inspection with non-destructive testing has been carried out for CRGT wear, and the inspection equipment has never been used.

First, research for this thesis aimed to analyze all data concerning the CRGT wear issue in order to respond to the questions linked to the inspection of this component and to the surveillance of this activity. Therefore, I carried out research on CRGT wear, a review of the existing procedures for CRGT wear inspection in other countries and an assessment of existing technologies available in France for CRGT wear inspection.

Then, the second phase was to list and select the most suitable surveillance method, in order to draw up the principles of the specific surveillance of the CRGT wear inspection activity described in this paper. Drawing it up was a long process because the CRGT specific doctrine works under the general doctrine, which underwent a reshaping at the same time of the degree project, and under the maintenance strategy, which was also in draft state given the newness of the activity.

The selected method relies mainly in the analysis of tests and real-time operations and also uses the sampling rates theory: integral surveillance has to be performed on a number of inspected CRGTs, given by sampling rates that have been calculated during the project. In addition, condition-based surveillance should prevail, according to parameters that have been determined. By doing so, the surveillance procedure provides the guarantee that the whole CRGT wear inspection has been carried out according to EDF requirements.

Finally, the last part of the thesis focuses on the actual implementation of the surveillance of the CRGT wear inspection, in preparation for the next inspection (August 2012). Unfortunately, the industrial environment prevents a linear implementation. While the surveillance principles are being built, first inspections are on-going. I had to anticipate the on-site surveillance. It required thinking the practical organization of the surveillance, by developing trainings and setting up meetings.

Planning, training and meetings were an important management part of my project. As the engineer of the activity, my task was to understand and be able to explain the latest versions of the analysis software programme, to plan the work of the monitors for the coming on-site inspections, and to determine the sampling rates for the surveillance. The surveillance of CRGT wear inspection activity is expected to change and to be adjusted, given the results of the inspections to come. Wear kinetics will be established, so that the maintenance strategy will be more efficient. This project degree is only the starting point of an activity that is meant to last when it comes to the NPPs maintenance operations. Effective results will thus be available only after the coming inspections, scheduled in late 2012.

My paper is the first of its kind, for it gathers all important data on CRGT wear: wear mechanisms, feedback from foreign countries, description of the inspection process, and explanation of the surveillance draw-up. I build the surveillance strategy given the existing strategies for other components inspection, but not only. With a fresh eye and a nuclear energy engineering profile, I gave to the CRGT wear inspection surveillance a new dimension: I aimed to make the surveillance the most efficient, in terms of quality insurance, keeping in mind that it is a time and resource consuming activity.