

Development of database for the in-service inspection of the concrete structures of the Finnish Nuclear Power Plants

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Summary

The in-service inspections are an essential part of aging management and condition monitoring of the nuclear power plants. The purpose of the in-service inspections is to prevent the damage of concrete structure from being increased to such a degree that they could risk the normal operation or safety of nuclear power plant structures. The in-service inspections are generally divided into three categories: visual inspections, special inspections, and monitoring and measurements.

The paper is about the development of a database for the in-service inspections data of the nuclear power plants concrete structures. The objectives of the database are to (i) collect the essential and up-to-date data of the condition and the performance of the NPP concrete structures, (ii) store and update these data effectively, (iii) allow sophisticated search strategies, (iv) produce detailed reports automatically for the condition and the performance of the NPP concrete structures and (v) enable data transfer to other software for further analysis.

The design process of the database includes the system analysis, the logical and physical design, and then the final system implementation and testing. The structure of the database includes the information about the concrete structural and the surrounding climate, electronic documents and digital photos, visual investigation and diagnosis reports and non-destructive and destructive test results. The structure of the database is established to reflect the time dependent structural and functional performance of the concrete structures. The implementation phase involves in-service inspection raw data collection, validation, and harmonization for general use in the NPP. The raw data will be provided by each plant from their files and records and testing laboratories.

Organization of the in-service inspection results in the database will be useful to define in-service inspection and monitoring programs and establish maintenance strategies. In addition, this database will allow access to the data needed for development of ageing trends which in turn will indicate when critical stage is expected or emphasize when remedial actions are needed. It will also enhance the decision-making process for preventing or mitigating ageing effects by providing information for continued service evaluations and remaining service life estimates.

Keywords: Nuclear Power Plants; database; in-service inspection; concrete structures; deterioration.