

Ageing Management Platform for Concrete Structures in Finnish NPPs (MANAGE)

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Background and goal

Finnish nuclear power plants (NPP) are reaching their designed service life of approximately 40 years. Based on international guidelines for ageing management systems, the physical ageing of structures, systems and components (SCC), and their obsolescence, needs to be managed by coordinating existing programmes, including maintenance.

The main objective of the MANAGE ageing management system is to assist in implementing the ageing management activities at different phases of the service life of a power plant. The platform provides access to the structural, material and environmental information and through the acquisition of essential, up-to-date and proactive data on the condition and performance of reinforced concrete structures (RCS), it assists the designers and engineers of a NPP in the planning, inspection, monitoring, condition assessment, maintenance and repair of structures.

The MANAGE ageing management platform

The development of the platform took into account the recommendation presented in the YVL Guides and in the IAEA Safety Guide NS-G-2.12. Based on these recommendations the conceptual structure of the platform was defined (Figure 1). Access to the platform is through the Graphic User Interface (GUI) which connects the user to the various applications and the central database. The platform consists of a harmonised central database and a group of analysing and planning tools which access the data from the database. The applications currently available are: ServiceMan (service life management system), a visualization tool, and the inspection database. Direct access to monitoring data was not implemented.

ServiceMan is a service life management tool for life cycle planning of concrete structures of Finnish NPPs. It is able to estimate the degradation of concrete structures and to evaluate the timing of necessary maintenance and repair actions over the remaining licensed life time of the plant or longer (extended life time).

The platform's **Inspection Database** is part of the central database which includes all the NPP condition survey data. New inspection data is transferred to an electronic form then stored in the inspection database. The data consists of observations during both periodical inspections and special inspections. The inspection home page functions as a dashboard for the inspection database. It offers access to the sub-level inspection webpages which are:

- Archived in-service inspection reports;
- Detailed inspection reports (See Figure 2);
- NPP structures, systems and components details;
- Building materials used in the NPP SCCs; and
- Information on the inspection teams involved in the condition assessment of the NPP structures.

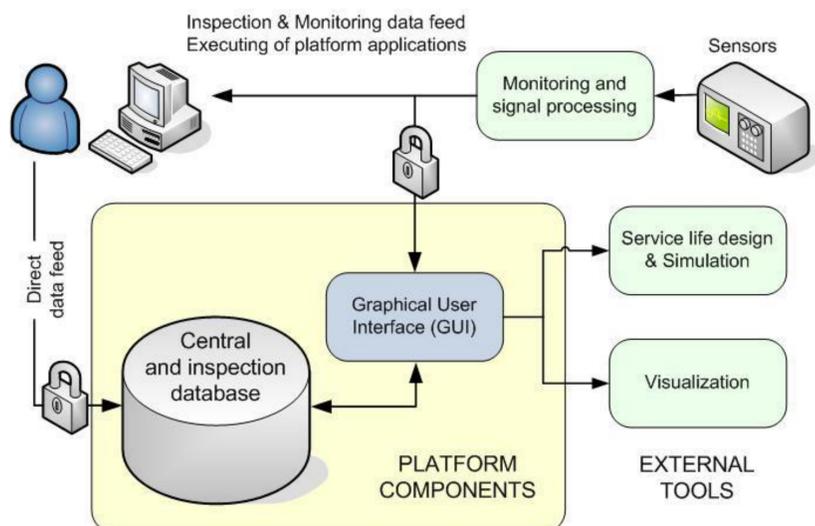


Figure 1. Schematic representation of the structure of the MANAGE platform and the user applications.

The **Central Database** is the core of the platform. The components of the database are organized into a series of sub-databases:

- User's management database (user data & authorized limits);
- Visualisation database;
- Service life management database (support ServiceMan);
- Structural database (SCC of NPP RCS);
- Monitoring database for monitoring and simulating the performance of the NPPs concrete structures; and
- Inspection database (investigation & diagnosis of NPP RCS).

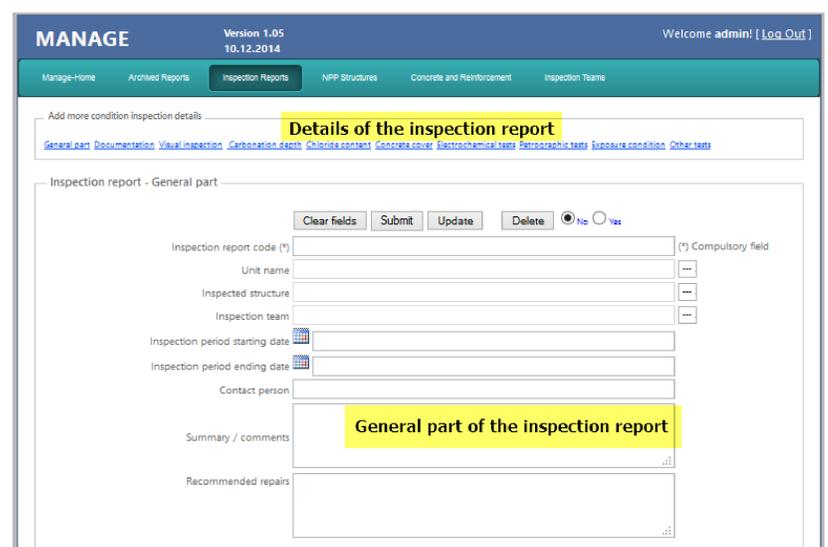


Figure 2. Print screen of the inspection report's general part.

The **Visualization Application** proposes an interactive system for visualization of data and documents related to NPP RCS. The visualization environment is able to provide visual representations of the database content. It is also able to provide direct access to all the digital content, both in terms of physical access to the structural data files as well as in terms of searching and retrieving information (See Figure 3).

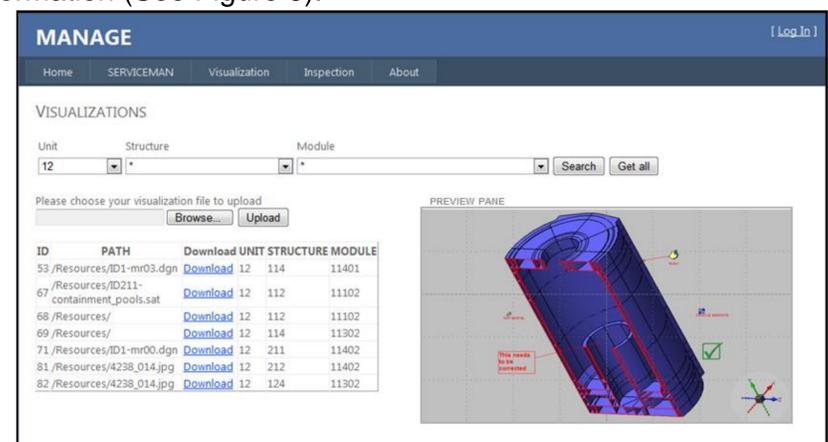


Figure 3. Screenshot of the GUI showing the Visualization interface.