

Optimising non-destructive testing frequency for integrity assessment

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This PhD project will examine the effect of inspection frequency when estimating the life of a safety critical component. NDE is currently used at intervals throughout the life of a component to detect if any cracks over a specified length have been formed. If a crack is found and its length measured, then the remaining useful life of the component can be estimated. The inspection frequency and RUL are based on a suitable crack growth model and operational loading. All aspects of the process (residual stress levels at manufacture, crack length measurement, material properties used in the crack growth model, the crack growth model itself, operational loading etc) involve assumptions and uncertainty.

The purpose of this PhD is to investigate (i) how uncertainties propagate through the process, (ii) how information obtained from NDE can be used to update crack growth model parameters to reduce uncertainty, (iii) the optimal inspection interval (which may not be constant) to achieve the most accurate outcome. The latter study will necessarily involve a cost-benefit analysis and will consider whether the added cost of permanent monitoring is worthwhile.