

THROUGH-LIFE STRUCTURAL INTEGRITY EVALUATION >

Managing the structural integrity of plant assets from design, through life to retirement requires the application of specialist knowledge, skills and experience. Through service, the condition of critical components evolves and the operating regime may change in response to business needs. In consequence, issues arise that can affect capital value, profit, performance, reliability and safety.

Are the design and materials appropriate?

Design and materials evaluation

Does the design meet its objective, that the component should perform its desired function at the best through-life cost-benefit ratio, with the required levels of safety and reliability?

Is the design correct in principle, in method, and in detail? Can this be demonstrated?

Are the materials appropriate, and are their properties known?

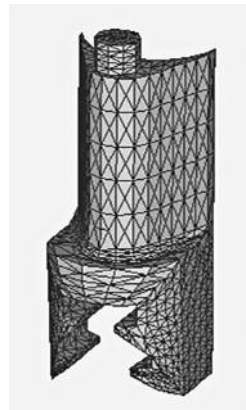


If so, for how long?

Remaining life prediction

For many components, time or cycle dependent degradation processes – such as corrosion, fatigue and creep – cause progressive deterioration that eventually renders the equipment unsuitable for continued service. An understanding of these mechanisms together with a knowledge of the operating conditions allows prediction of the life remaining. For efficiency and economy, a phased approach is adopted.

Through their collaboration, R-Tech Materials and John Brear – Plant Integrity have the capabilities and competencies to address these issues through a structured series of key questions, answers to which form the basis of an integrated approach to through-life structural integrity evaluation.

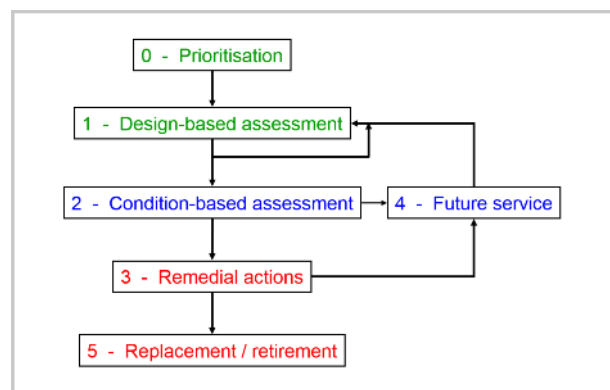


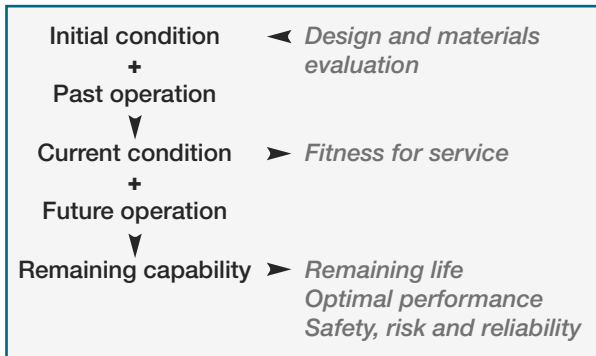
Can the equipment continue in operation?

Fitness for service

A fitness-for-service assessment demonstrates the structural integrity of an in-service component that contains a defect, damage or degradation, in order to:

- > ensure personnel and public safety
- > optimise maintenance, inspection and operation
- > maintain plant availability and economic viability





Can this capability be improved?

Life extension, performance optimisation

The initial state of a component is fixed by its design and fabrication. Adding the effect of operation to date determines its current condition.

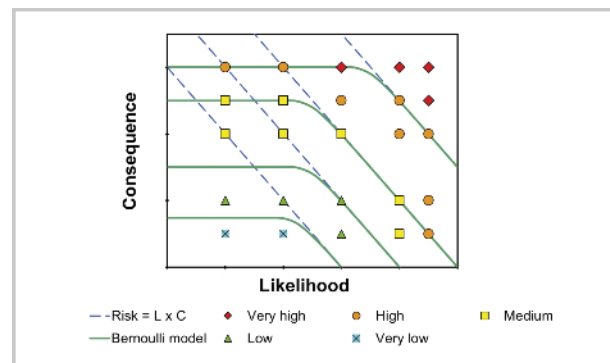
Future capability is then governed by the ongoing service envelope to which the component will be exposed. This leads to a balance between the life it will achieve and the performance it will deliver. This is optimised on a risk and reliability basis.

What if it fails or malfunctions?

Safety, risk and reliability management

Specific safety assessments may be required as part of the design process, or at any stage through life – particularly after any off-design incident.

Safety, environmental, business and engineering risks are addressed by the complementary disciplines of risk-based inspection and reliability-centred maintenance. These are fully integrated into the phased approach to remaining life assessment.



How and why did it fail or malfunction?

Failure analysis and problem solving

The root cause of any failure or malfunction can generally be attributed to one of the following:

- › Inadequate design or inappropriate materials
- › Errors in manufacture, construction or fabrication
- › Incorrect operation, inspection or maintenance
- › Previously unknown phenomena

Identifying the failure process allows the causes to be addressed.

The R-Tech Materials group includes two businesses specialising in engineering materials testing, analysis and consultancy: - R-Tech Services and Metamet Consultants. The consultancy side majors on laboratory-based and on-site materials investigations, particularly failure analysis of process and power generation plant.

John Brear – Plant Integrity brings to bear over forty-five years of consultancy and materials research in support of structural integrity assessment and life prediction for nuclear and fossil-fired power plant and for refining and petrochemical equipment.

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