
ASSET INTEGRITY MANAGEMENT

Facilities comprise various Assets that may be affected by ageing. They include:

- Static process equipment such as vessels, tanks, pipework and inline items providing primary containment
- Safety related EC&I equipment designed to prevent excursion, including loss of containment
- Civil structures including supports and bunding
- Tertiary containment systems which may incorporate kerbing, sumps, drains and valves designed to retain releases and contain firewater on site.

Plant ageing, leading to an increased risk of loss of containment, has been shown to be an important factor in incidents and accidents. Duty holders must ensure that ageing mechanisms are recognised, understood and managed. This includes building on lessons learned from all sources to implement corrective actions where similar ageing mechanisms could occur.

Ageing mechanisms such as corrosion, erosion, fatigue, embrittlement, obsolescence and calibration failure should be captured within the site's asset integrity management programme and addressed through appropriate inspection, testing, maintenance, calibration and repair.

The main controls for managing ageing plant risks are those relating to:

- Hazard identification and risk assessment
- Registration of safety-critical plant and equipment
- Assessment of degradation mechanisms and application of lessons learned where degradation could occur in multiple similar systems
- Inspection, testing and planned maintenance of safety-critical plant
- Testing and calibration of safety-related EC&I equipment
- Bund and tertiary containment civil engineering assessment
- Management of change

We can help you to identify safety-critical plant, equipment and structures, assess the potential for ageing, and develop strategies for on-going inspection, testing and preventive maintenance.

Risk Based Inspection Plans

An understanding of how plant condition is changing over time can be used to help plan inspection, maintenance and repair work to make best use of available resources and minimise impact on operations.

Most companies have programmes in place to cover equipment not captured by PSSR, but approaches can differ. Some are consequence focused, concentrating only on inspection of major vessels, tanks and other main plant items even though, for example, statistically speaking, pipework is a much more likely release source for hazardous substances.

If this is the case, our team of engineers can help you to build on what you have, to develop a comprehensive inspection programme based on all risks, not just those associated with releases of stored energy or loss of containment from bulk storage systems.

Asset Registration

We can help to develop a comprehensive inventory of assets covering primary containment systems and supporting structures, and the prevention, control and mitigation safeguards in place. The asset registration process will capture essential details relating to materials of construction, duties, design basis, safe operating limits, allowable tolerances, and so on.

Criticality Studies

An understanding of potential consequences for people, the environment and the business enables us to prioritise assets for further assessment.

Degradation Study

We can help to assess the potential for ageing in critical plant and equipment.

RR509 'Plant ageing: Management of equipment containing hazardous fluids or pressure' defines ageing and ageing plant as:

"Ageing is not about how old your equipment is; it is about its condition, and how that is changing over time. Ageing is the effect whereby a component suffers some form of material deterioration and damage (usually, but not necessarily, associated with time in service) with an increasing likelihood of failure over the lifetime.

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The significance of deterioration and damage relates to the potential effect on the equipment's functionality, availability, reliability and safety. Just because an item of equipment is old does not necessarily mean that it is significantly deteriorating and damaged. All types of equipment can be susceptible to ageing mechanisms".

Our degradation studies consider a range of issues including but not limited to:

- Operating temperatures and pressures
- Operating history in relation to design limits
- Materials or construction
- Aggressive chemicals (corrosive or abrasive)
- Environmental conditions
- Maintenance and inspection history
- EC&I equipment obsolescence
- Potential for corrosion under the insulation
- Hydrogen embrittlement

We can provide the results of the studies in workbook format, enabling them to be maintained as living documents.

Inspection Planning

We can provide a plant-specific risk assessment grounded in established damage rate data to aid inspection planning for mechanical, EC&I and Civils systems. This considers damage caused by ageing, allowing us to determine which areas are most at risk so that you can:

- Increase the probability of finding damage before failure
- Reduce the uncertainty and expense associated with low added-value inspections
- Target budget and resources at plant and machinery most likely to fail
- Interpret inspection findings to inform future inspections

We can help you to design and implement programmes to deliver tangible improvements in operational practices and performance to improve overall asset integrity and reliability.

Written Schemes of Examination and Legislation

The Pressure Systems and Safety Regulations (PSSR) require that written schemes of examination (WSE) must remain suitable over the lifetime of the plant, which means they should be reviewed and, when necessary, revised. RR509 'Plant ageing: Management of equipment containing hazardous fluids or pressure' also recommends that inspection plans are reviewed regularly.

It is the duty holder's responsibility under PSSR to ensure that the content of the written scheme is reviewed at appropriate intervals by a Competent Person. It is also worthwhile noting that the Regulations are concerned with risks arising from unintentional releases of stored energy and not those arising from toxic, flammable or other hazardous materials, which are covered under the Control of Major Accident Hazard (COMAH) Regulations and the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR). A risk-based approach would include a provision for all consequences not necessarily limited to those under PSSR.

The legislation leaves the duty holder, in conjunction with the Competent Person, with flexibility to decide a 'suitable' written scheme for examination to prevent danger on the basis of the available information about the system and good engineering practice.

A risk-based approach to inspection planning is detailed in CRR363/2001 'Best practice for risk-based inspection as a part of plant integrity management'.

SLR can help you to develop the scope of your inspection programme, based on all the hazards and risks, to ensure maximum value is obtained from any inspection effort.

Remnant Life Studies

An effective asset integrity management programme should provide valuable information on the changing condition of primary containment systems (e.g., pressure vessels, storage tanks, piping systems and inline items, relief and vent systems, pumps and controls) and protective devices. It

should also provide a similar level of information for other key assets and infrastructure items to allow the requirements for inspection, repair or replacement to be determined.

Our consulting engineers can help you to review current systems, procedures and documentation, and examine plant condition, as part of a technical life study to help establish the following:

- Health, safety, environment and business critical assets
- When future upgrades, repairs or replacement might be necessary, based on condition and known degradation mechanisms
- Critical assets for which there is insufficient information available to determine when future upgrades, repairs or replacement might be necessary
- Prioritised action plans for investment planning

Asset Management Audits

Our specialist process safety knowledge and experience of management systems and policy deployment has led to the development of a suite of inhouse auditing tools.

These are used to look at an organisation's ability to manage process safety, SHE issues and regulatory compliance from a SHE perspective. A targeted approach can be taken to examine specific Risk Control Systems (e.g., asset integrity management and maintenance) and plant areas.

Our database-driven auditing and assessment tools incorporate modular question sets based on recognised good practice guidance and cover inspection, testing and maintenance of chemical process plant. The findings are scored, weighted and processed to provide results in an easy-to-interpret format, highlighting strengths, weaknesses and actions for improvement.