Managing Ageing Assets

Ensure Safe & Reliable operation of Plant beyond its design life

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Jonathan Cook - Asset Integrity Consultant

- **30+ Years' Experience** of refining and petrochemical industries as Mechanical Engineer and Consultant
- A professional **Chartered Engineer** and a member of the Institution of Mechanical Engineers UK **(IMechE)**
- **Master in Mechanical Subjects** collected from working with the world class companies including:

Ageing Plant - Unforeseen Risks?

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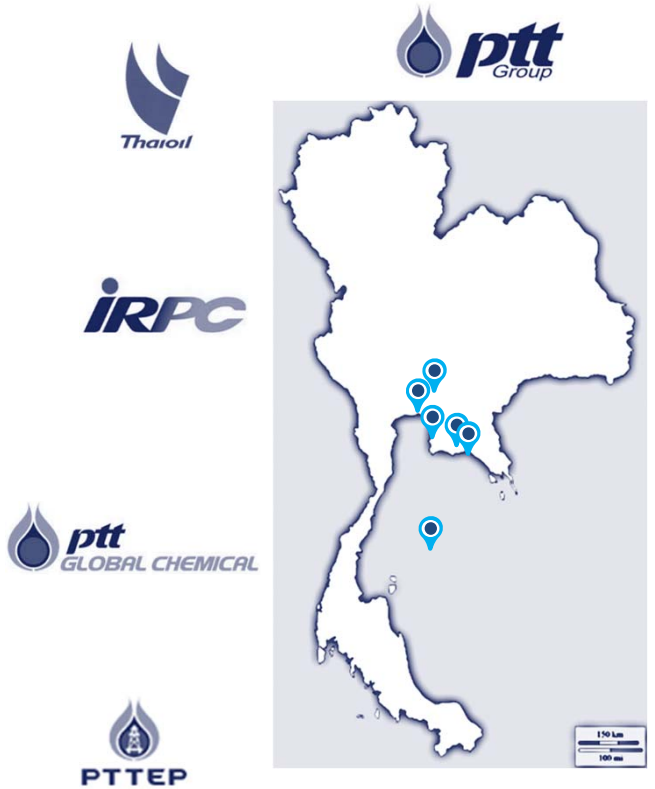
Is Ageing Plant an issue for Thailand ?!?

How can you justify operation beyond design life ?!?



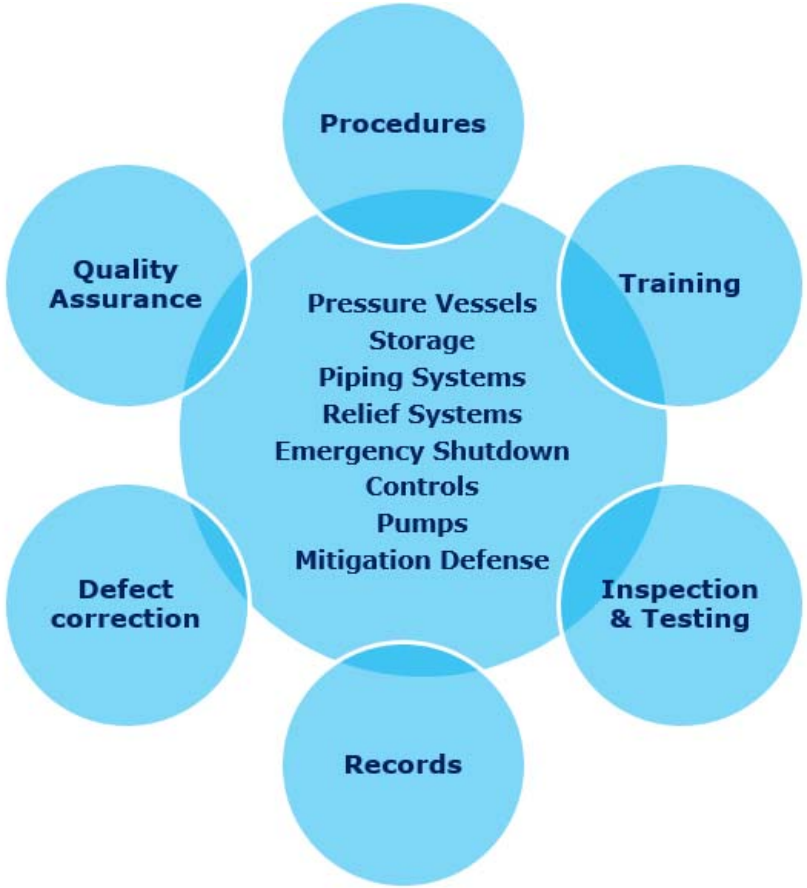
Ageing Plant – Some HSE Statistics

- Between 1980 and 2006, **96** **incidents** due to **ageing**
- **28 %** of all reported **'Major Accident' Loss of Containment** events
- **11** deaths, **183** injuries
- Over 6,400 MTHB loss – average **68** **MTHB per incident**

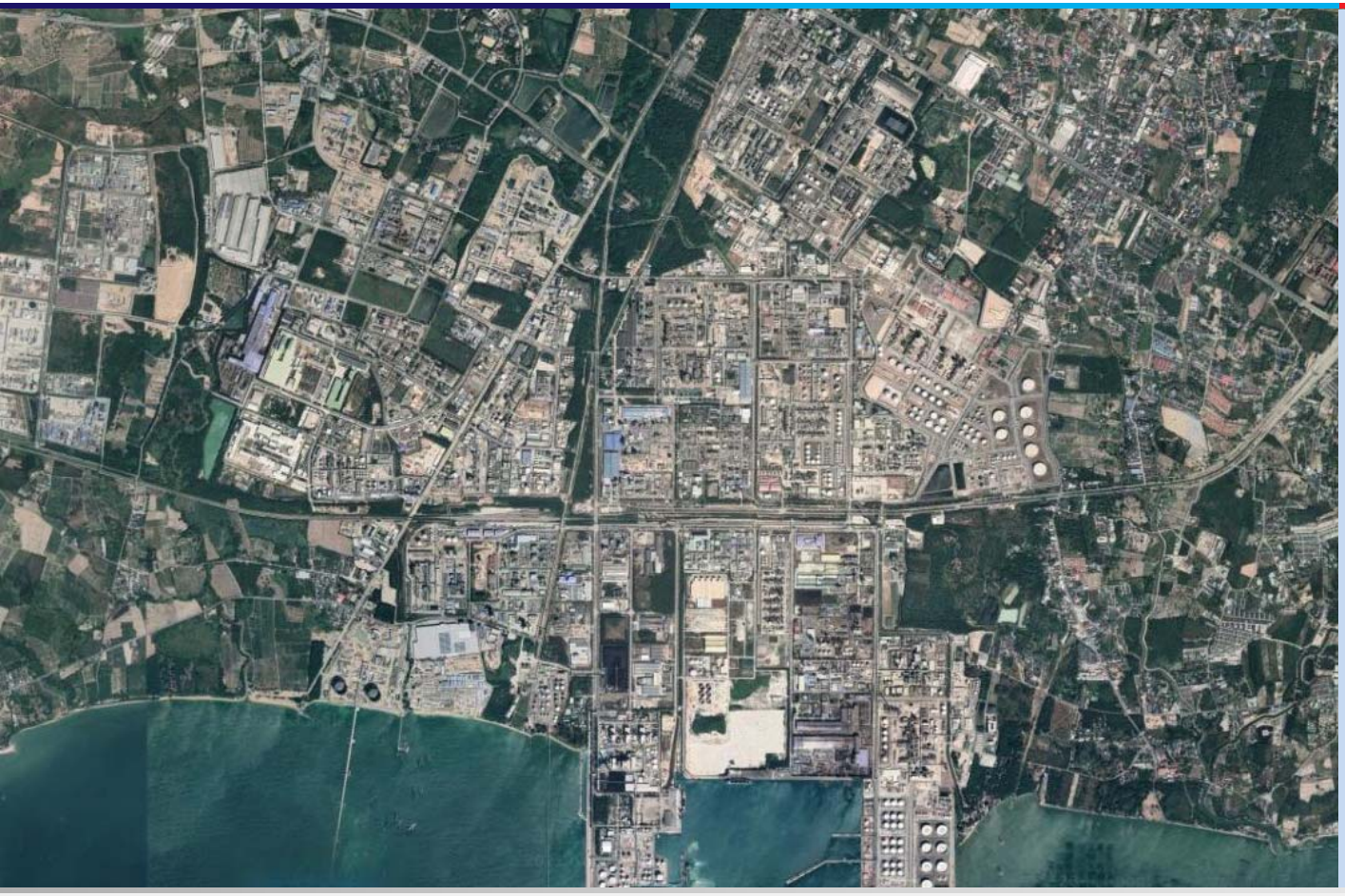
Ref : European Major Accident Database (MARS)

Industry Best Practice

IEAT Regulations

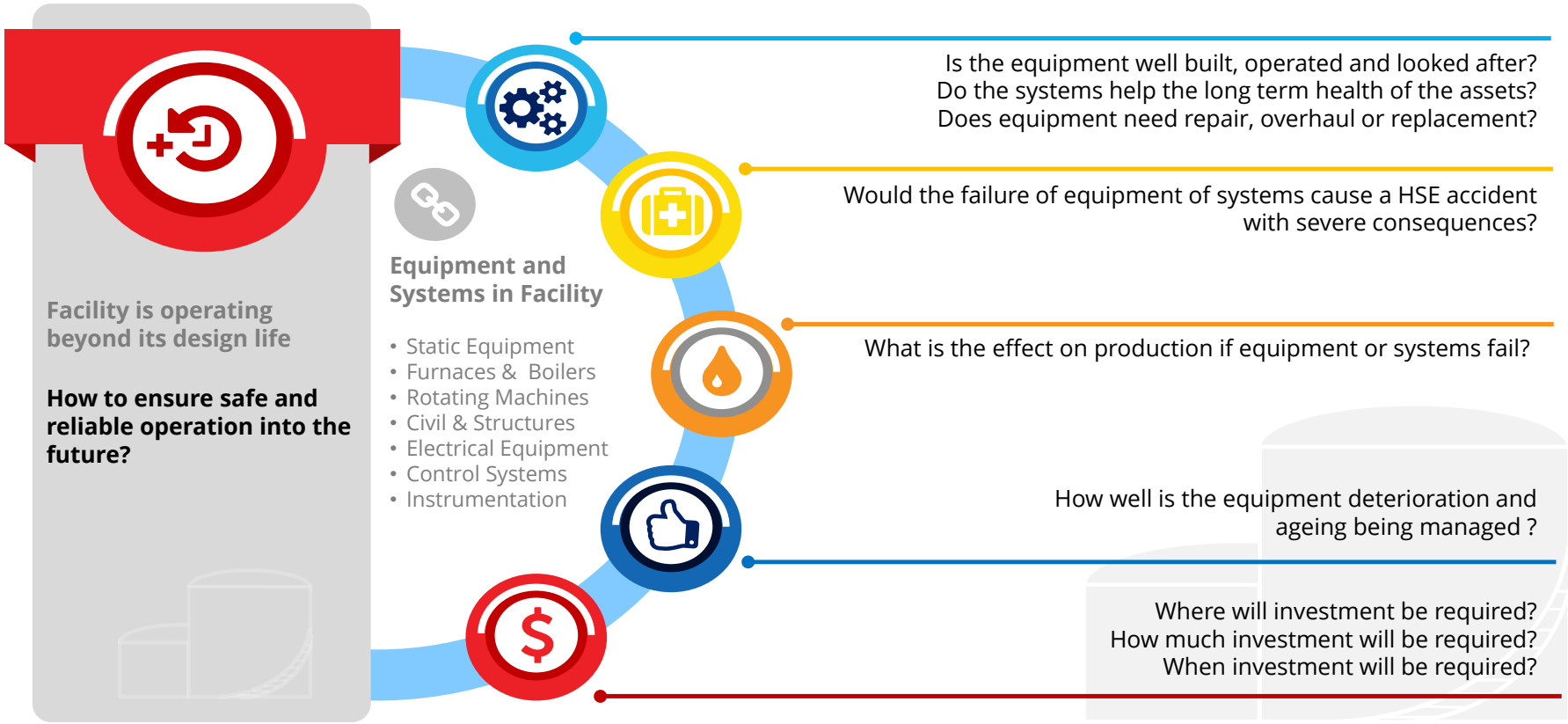


Case Study



1990 Petrochemical Facility

Plant Life Assessment (PLA)



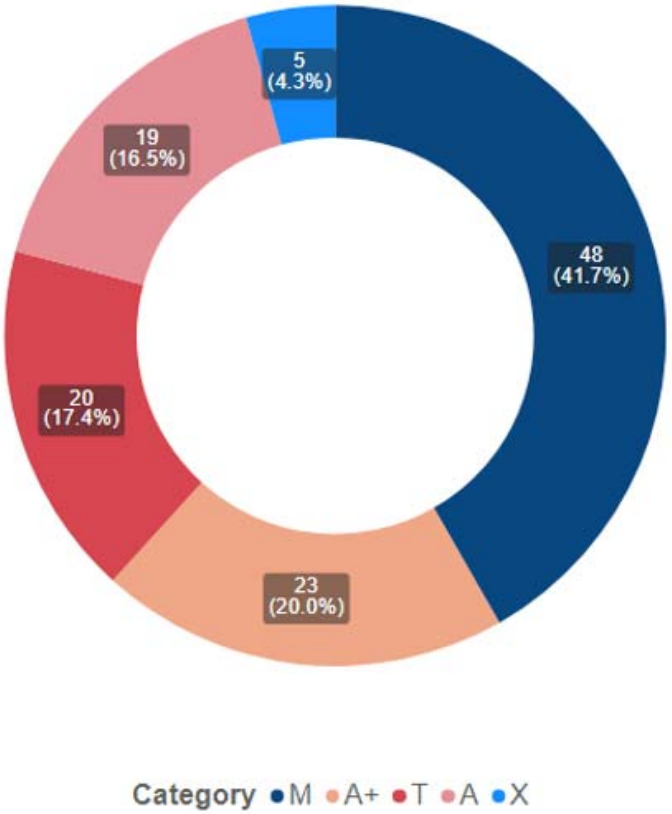
Study Outcomes

Facility Status	• Helicopter View for the entire facility • Management Summary across all functions
Equipment Distribution	• Detailed Functional Engineering Reports • Deterioration / Obsolescence Rating • Vulnerability Assessment
Expenditure Profile	• Long term view, typically 20 years, for future budget requirement • Cost breakdown per functional discipline per year
Improvement Roadmap	• Prioritized Action Plan • Best Practice Implementation • Recommendations for Systems/People development

Key Findings

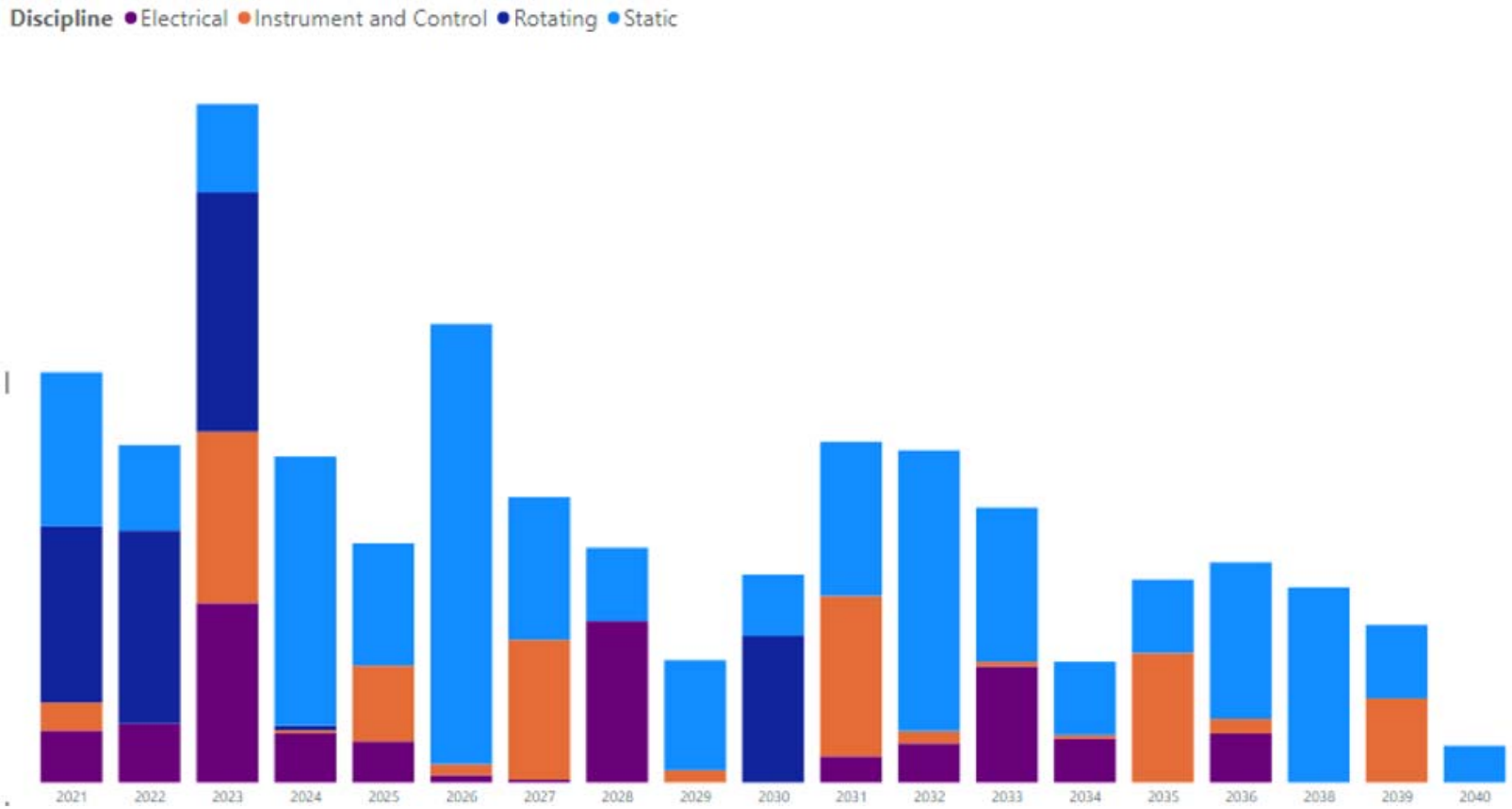
- Equipment projected as not fit for purpose
- Rotating equipment replacements/improvements with 5 years
- Replacement of obsolete equipment
- Furnace & Heater refurbishments required
- Newly emerging deterioration mechanisms
- Integrity of minor structures
- Integrity of utility systems
- Competencies as ageing workforce retires
- Leaner organisations with increased reliance on sub-contractors
- Lack of clarity for ownership of knowledge between operator and sub-contractors
- Loss of ‘Corporate Knowledge’ and ‘unfriendly’ documentation systems

Equipment Categorisation



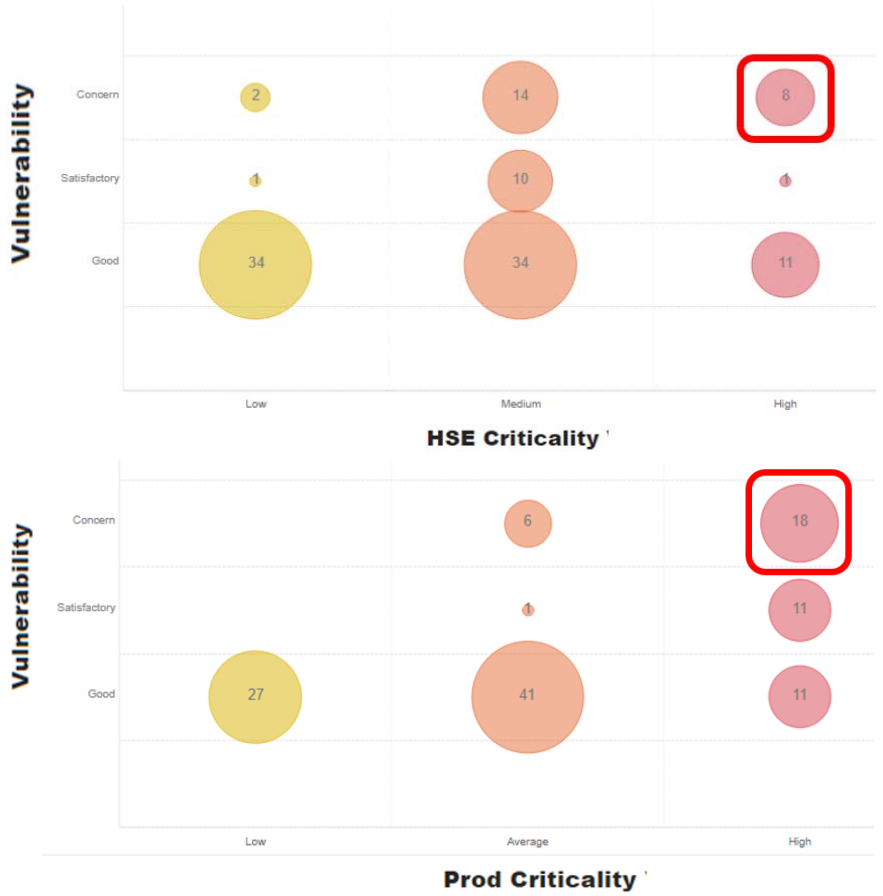
Categories
X : Extensive / specialist study required
M : Routine maintenance only required
A+ : Major work required
A : Minor (but significant) work required
T : Replacement needed

Discipline Expenditure



Prioritised Action Plan

- ✓ **375 Actions** across 5 disciplines
- ✓ **275 Actions** for continued operation
- ✓ **100 Actions** for improvement
- ✓ Prioritised with HSE/Production Criticality & Vulnerability



Benefits delivered throughout the Organisation

Board Level - Long term strategy and investment plan

Senior Management - Vulnerabilities of equipment, systems and people

Division & Functional Managers - Roadmaps for improvement & detailed reports for equipment

Project Engineers - Timelines and costing for replacement and refurbishment

Plant Life Assessment – Key Takeaways

- A site wide multi-functional assessment
- A balanced view of actions and costs required over the study period
- Reviews of predictive & preventative measures at the facility
- Demonstrates best practice management of ageing assets
- Findings backed up with supporting evidence from operations/inspection & maintenance

Questions High Hazard Operators need to ask

- What is the remaining life of critical assets?
- How was the risk of ageing issues determined?
- What are the consequences of failure?
- Which deficiencies carry to greatest risk?
- Do the human resources have the proper competency?
- What inspections are best performed by 3rd parties?
- What is the cost of maintaining/upgrading critical ageing assets?
- What timeframe is required for completing repairs/replacement?
- What is the BCM plan in the event of equipment failure?
- What is the equipment contingency plan to reduce downtime?

Ref: Dealing with Aging Process Facilities & Infrastructure – CCPS/Wiley ISBN 978-1-119-43083-4

Safe & Reliable - beyond design life

THANK YOU

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Your Excellent Solutions