



Introduction to Risk Assessment



What is Risk Based Inspection (RBI)

Process of carrying out risk analysis to determine an optimum inspection plan



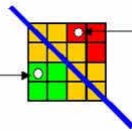
“A Rigorous Approach to Managing Pressure System Risk”





Definitions

- **Risk** is the consideration of potential hazards, simultaneously accounting for both the likelihood and consequences of an event.
- **Risk Based Inspection** (RBI) is a systematic tool that helps users make informed business decisions regarding inspection and maintenance spending.

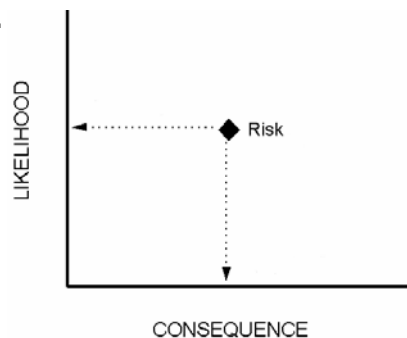


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Measuring Risk

- **Risk** may be defined as the combination of likelihood and consequence of a failure.
- A means of illustrating risk is to display the likelihood and consequence factors on an X-Y plot.

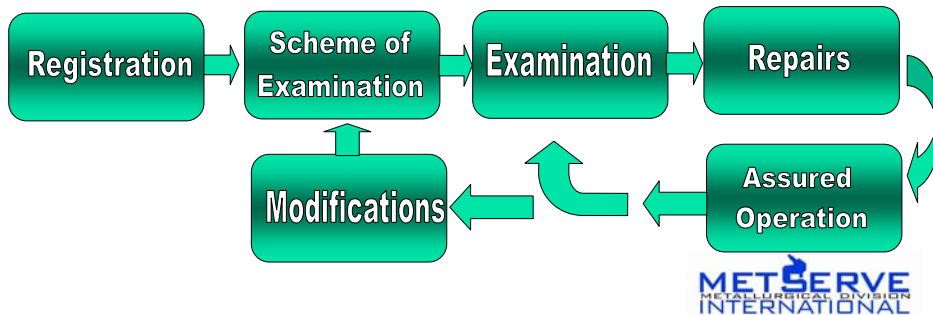


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Traditional Asset Integrity System

- Prescriptive Schemes of Examination with little operation input
- Consequence of potential failure mechanisms not assessed
- Unacceptable number of unforeseen failures.



Traditional Way

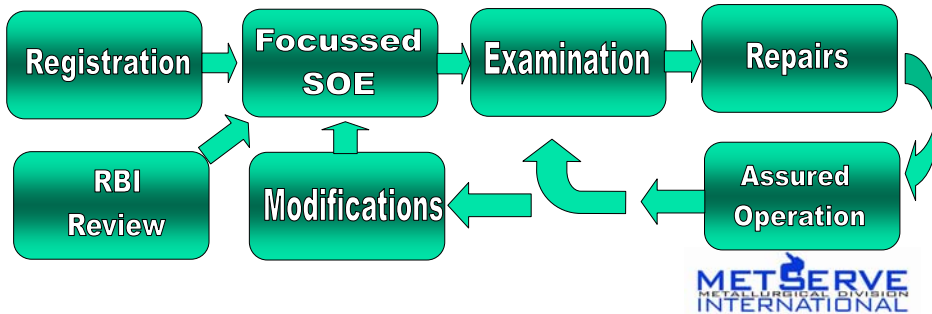


- The inspection results are generally reported to the plant engineers in raw form without an engineering / metallurgical evaluation .



Risk Based Asset Integrity System

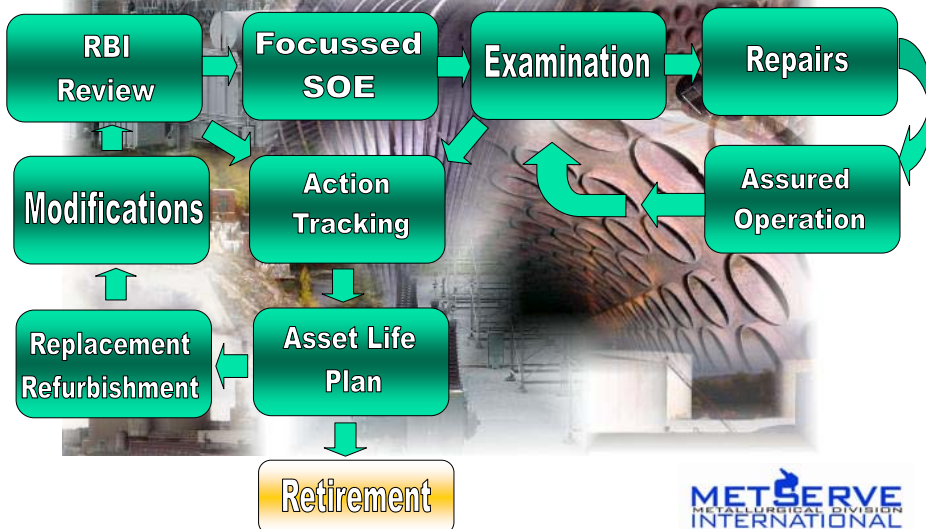
- Focused Schemes of Examination
- Increased use of non-invasive techniques
- Significant cost savings
- Control of long term action & review.



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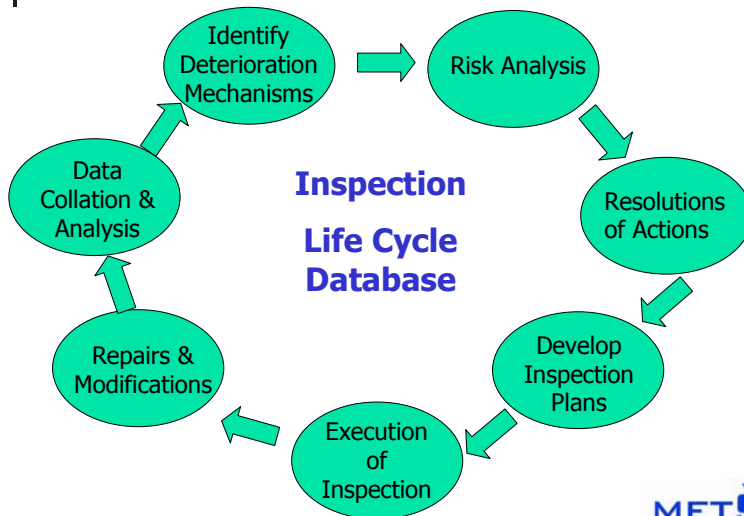
Intergrated Asset Management System



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Methodology



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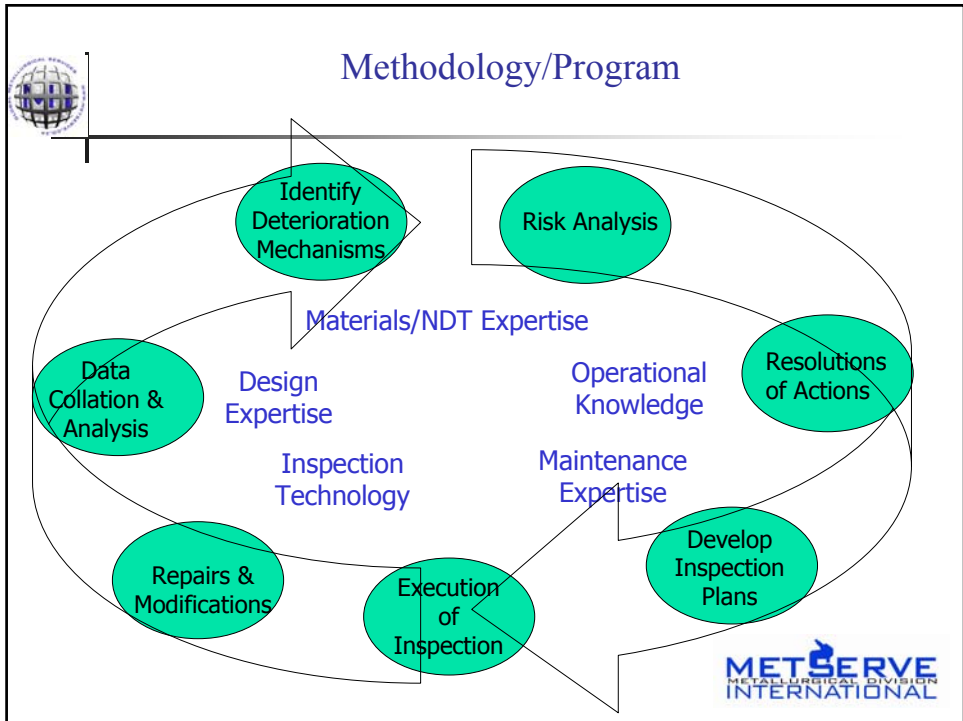


The RBI Process

- Appoint joint PB Power & Client review team with necessary skills and knowledge utilising MetRisk Database.
- Review and confirm all relevant data to ensure thorough understanding of all operational and engineering issues
- Identify all possible deterioration mechanisms
- Carry out Risk Analysis
- Identify Actions



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RiskMet Database

- Collect Data
- Review Data
- Identify Deterioration Mechanisms
- Identify Actions

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Necessary Skills and Knowledge

- Plant operating conditions
- Plant operating history
- Future operation
- Maintenance history/philosophy
- Inspection History
- Inspection techniques and practices
- Material and deterioration mechanisms
- Equipment design
- Statutory requirements
- RBI team leadership
- Consequence of failure



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Identify all possible deterioration mechanisms

- For each major component.
- Internal/external pressure deterioration
- Internal deterioration e.q.tubes
- Location of deterioration
- Rate of deterioration
- Likely failure mode
- Examining past inspection reports



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Risk Analysis

- For each location where possible deterioration has been identified.
- Estimate the probability of failure.
- Consequence of failure.
 - Safety (injuries)
 - Environment
 - Business Impact -Reputation (Media coverage)
 - Assets/Revenue - Equipment Repair Cost
utilisation - availability cost.

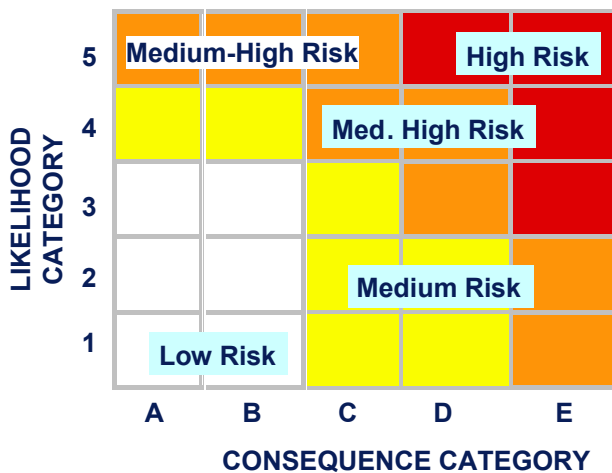


*Can you afford
a failure?*

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Semi-Quantitative Risk Matrix



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Identify Actions

■ Actions

- Mitigating Actions
- Install isolation valves
- Change material of construction
- Add a spare unit
- Design Change
- Install leak detection system
- Instigate routine inspection
- Set up monitoring systems
- More detailed assessment
- Evaluate Creep Life
- Critical defect size determination

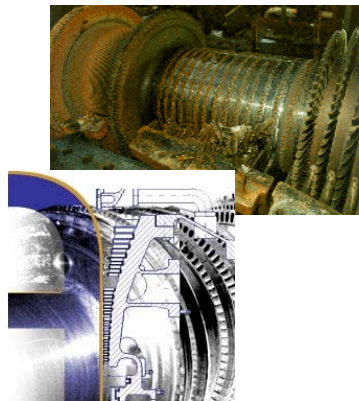


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Develop Focused Schemes of Examination

- Split scheme between statutory and reliable requirements
- Highlight areas of particular concern
- Choose appropriate inspection technique for each identified mechanism and location
- Develop preventative measures
- Interim inspection and intervals



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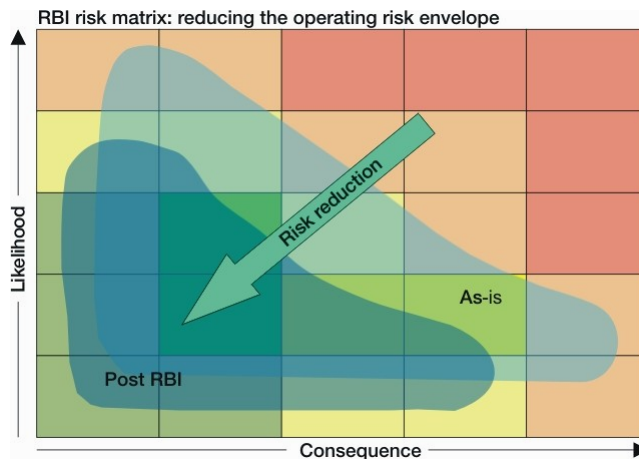


10% of the Equipment - 90% of Risk

- It is roughly estimated that 10% of the equipment in a plant contributes 90% of the risk. Consequently, if this 10% of the equipment is identified, testing and inspection activities can be focused meaningfully, rather than wasting effort on low-risk items.
- This results in improved safety, fewer forced outages, and reduced operational costs.



Semi-Quantitative Risk Matrix





Key Learning's

- Reduction in unplanned downtime-
higher confidence in detecting the onset of deterioration
- Cost of getting it wrong once outweighs the saving of one exercise.

