This Presentation

- What is asset integrity?
- Why should we invest in asset integrity?
- A modern interpretation of asset integrity
- Standardisation of asset integrity performance standards
Why Asset Integrity?
Physical Asset Integrity

Asset integrity refers to “the ability of an asset to perform its required function effectively and efficiently whilst protecting health, safety and the environment”

Today we will focus on physical asset integrity
Physical Asset Integrity

Asset integrity ensures systems, processes and resources are in place to maintain a safe, regulatory compliant and reliable asset.
Purpose of Asset Integrity

- Maintain barriers to prevent major accidents
- Provide assurance with respect to:
  - Plant performance
  - Personnel performance
  - Process performance
- Manage risk
  - Reduce risk to ALARP
Integrated Asset Integrity Model

- Reliability, maintenance and safety are managed as “silos” in most organizations

- Increased reliability and operating efficiency are achieved by integrating disciplines within an organization:
  - Physical asset integrity
  - Process safety
  - Supported on reliability foundations

- Physical asset management utilises risk management to reduce risks from major incident: “Asset Integrity Management House”.
Asset Integrity Management

The Plan-Do-Check-Act

- PAS 55 standard for optimized management of physical assets
- Structured physical asset management into a management system based on Plan-Do-Check-Act
- Established as essential attributes:
  - to be risk-based
  - to be integrated
- Introduced elements that can be overlapped with a PSM system
- Evolved into ISO 55001
- ISO 55001 refers to ISO 31000 for risk management
Managing Your Assets

Changes in the Market

Budget Constraints
Lack of Cross-Functional Collaboration
Poor Data Management
Optimisation (New with Old)
Managing your assets

The Opportunities

Improve decision making

Target the appropriate risks

Integrate business streams

Create Value
Risk-Based Decision Making

More complex or risky projects require more sophisticated tools

- Codes & standards
- Good practice & engineering judgement
- Risk assessment & cost-benefit analysis
- Peer review & benchmarking
- Stakeholder consultation

Increasing risk and complexity

Increasing detail / cost

The most suitable tool also depends on what information is available, form of output and what the output is going to be used for

- Nothing new or unusual
- Well understood risks
- Established practice
- Some risk trade-offs
- Some uncertainty
- Some deviation from standards
- Very novel or challenging
- Strong stakeholder views
- Large uncertainties
Integration- Optimisation (New with Old)

Process Safety and Asset Integrity Lifecycle

- PAS 55 focused on the management of physical assets (withdrawn in 2010)
- ISO 55000
- OGP 415
- ISO 31000
- Always comes back to clear direction and leadership
- Cross-functional Cooperation

Design | Fabricate | Commission | Operate | maintain | Modify & Repair | Decommission
The Different Approaches and Elements

Process Safety

- Used risk-based methodology to control hazards which may result in major incidents
- CCPS Risk Based Process Safety program groups 20 elements into four pillars:
  1. Commitment to process safety
  2. Understanding of hazards and risks
  3. Management of risk
  4. Learning from experience

- Can be complemented with the Energy Institute Process Safety Management program
Risk assessment should be an input into a decision making process **NOT** a justification for a decision already made.

The Different Approaches and Elements
Risk Management

- Based on the Plan-Do-Check-Act principle
- Based on risk assessment
- ISO 31000
The Different Approaches and Elements

Safety critical equipment, performance standards & reliability

- “Hardware barriers” are robust and reliable control measures used to prevent or mitigate an undesirable event (e.g. MAH)
- Hardware barriers comprise of “Safety Critical Equipment”
- Performance Standards developed for “Safety Critical Equipment”.
- Performance defined in terms of functionality, availability, reliability and survivability
- OGP 415
The Different Approaches and Elements
Mechanical Integrity and Reliability

- Reliability is at the core of SCE performance standards
- Maintaining equipment and systems free of failure
- Mechanical integrity has evolved to encompass other critical assets (process and equipment)
- Inspections, tests, preventive, predictive maintenance, repair, quality assurance
## Correlation between Approaches

<table>
<thead>
<tr>
<th>PAS 55</th>
<th>CCPS RBPS</th>
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<tbody>
<tr>
<td><strong>Element</strong></td>
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<tr>
<td>4.3.1. AM strategy</td>
<td>5. Stakeholder outreach</td>
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<td>4.1. General requirements</td>
<td>4.4.5. AM system documentation</td>
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<td>4.4.1. Structure, authority and responsibilities</td>
<td>4.5.1. Lifecycle activities (very loosely)</td>
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<td>4.2. AM policy</td>
<td>12. Operating procedures</td>
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<td>4.3.3. AM plans</td>
<td>9. Safe work practices</td>
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<td>4.3.2. AM objectives</td>
<td>14. Operational readiness</td>
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<td>4.4.7.1. Risk management process</td>
<td>15. Conduct of operations</td>
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<td>4.4.7.2. Risk management methodology</td>
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<td>4.4.7.3. Risk identification and assessment</td>
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<td>4.4.7.4. Use and maintainence of asset risk information</td>
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<td>4.3.4. Contingency planning</td>
<td>4.4.9. Management of change</td>
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<td>4.5.1. Lifecycle activities (very loosely)</td>
<td>13. Management of change</td>
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<td>4.5.2. Tools, facilites and equipment</td>
<td>11. Contractor management</td>
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<td>4.4.5. AM system documentation</td>
<td>4.6.1. Performance and condition monitoring</td>
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<td>4.4.3. Training, awareness and competence</td>
<td>18. Measurement and metrics</td>
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<td>4.4.8. Legal and other requirements</td>
<td>19. Auditing</td>
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<td>4.4.4. Communication, participation and consultation</td>
<td>7. Hazard identification and risk analysis</td>
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<td>4. Workforce involvement</td>
<td>10. Asset integrity and reliability</td>
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<td>4.6.3. Evaluation of compliance</td>
<td>20. Management review and continuous improvement</td>
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<td>4.4.8. Legal and other requirements</td>
<td>2. Compliance with standaradns</td>
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<td>4.6.2. Investigation of asset-related failures, incidents and nonconformities</td>
<td>17. Incident investigation</td>
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<td>4.6.3. Evaluation of compliance</td>
<td>1. Process safety culture</td>
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Asset Integrity House (Core Elements)

Integrated physical AIM system

Top Down- Bottom Up; Integrates inspection, testing with integrity, risk, security, process safety and management systems.

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<tr>
<th>Asset Integrity</th>
<th>Management system and software Selection</th>
<th>Data analysis and technical Assessment</th>
<th>Data collection (testing and inspection)</th>
<th>AIM training and independent reviews and verification</th>
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<tr>
<td></td>
<td>AIM &amp; Process Safety system, strategy development and implementation</td>
<td>Inspection planning and RBI consulting</td>
<td>Inspection of plants and components</td>
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<td>AIM software selection and implementation support</td>
<td>Maintenance optimisation and RCM</td>
<td>Condition monitoring (static and rotating)</td>
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<td>Integrity assessment and remaining lifetime extension</td>
<td>Material testing and Non Destructive Testing (NDT)</td>
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<td>Risk, process safety &amp; security assessment</td>
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<td>Auditing and certification</td>
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Core Elements

Top Level - Integrated physical AIM system

- AIM/PS system and strategy development and implementation
- Top down - connective management systems building framework and elements.
- Looks to establish, Policy, procedures and resources needed to be in place to deliver integrity over the whole life cycle of an asset.
Core Elements

Top Level - Integrated physical AIM system

- Software Selection and Implementation support
- Auditing and Certification
Core Elements
Middle Level-Integrity, Reliability & Process Safety Assessment

- Inspection Planning and RBI
- Integrity assessment and remaining lifetime extension
  - Fitness for Service (FFS)
  - Corrosion Prevention and Control (CPC)
  - Failure Analysis (FA)
  - Lifetime Extension (LTE)
Core Elements

Middle Level - Integrity, Reliability & Process Safety Assessment

- Maintenance Optimisation and RCM
- Risk Process Safety & Security Assessment
Core Elements

Lower Level - Performance assurance

- Inspection of plants and components
- Condition monitoring (static and rotating)
- Material testing and Non Destructive Testing (NDT)
Core Elements
All floors- Competence

- Spanning all floors is the competence of personnel in performing their tasks to the required standards.
The opportunities
Make more informed choices….How?

- Learn from the Industry- there is an opportunity to embed the learnings in day-to-day

- Establish external context- Recognise the balance between applicable legislation, codes and standards

- Establish what risks are acceptable to your organization ; categorize your options - elimination, prevention, control, mitigation and recovery
The opportunities
Make more informed choices…

- Outline process and tools that explicitly address the highest risk
- Work to your strengths and understand Internal capabilities. Complicated uses a wide range of skills departments adds to the challenges.
- Use the most optimal resources to minimise the residual risk
Conclusion

- The Asset Integrity Management House model brings together under one roof:
  - Physical asset integrity management
  - Process safety
  - Reliability

- Asset integrity is focused on risk management
- Towards reduction of major incidents risk