



# Asset Integrity Management The House of Integrity Integrating Process Safety

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# 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

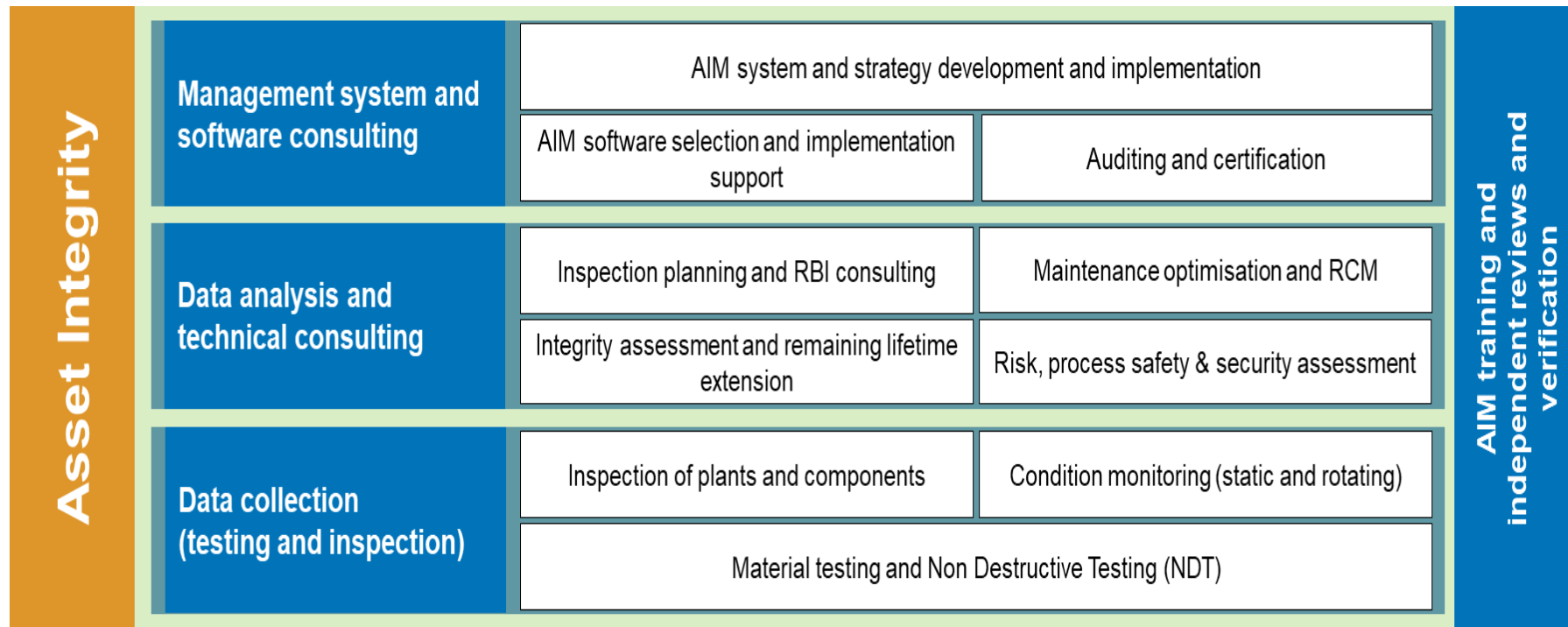
Asset integrity refers to “the ability of an asset to perform its required function effectively and efficiently whilst protecting health, safety and the environment”

Today we will focus on physical asset integrity



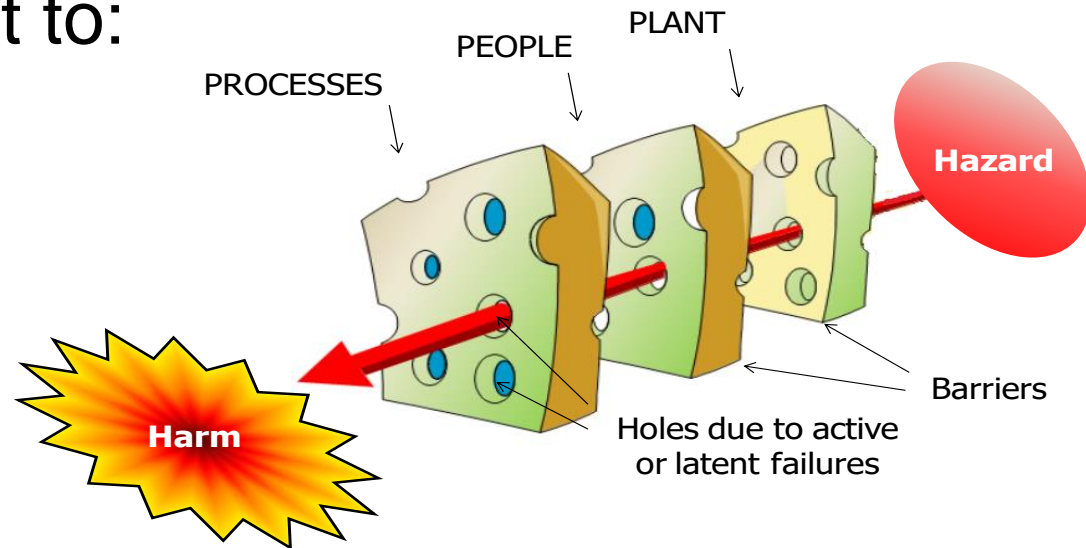
# Physical Asset Integrity

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

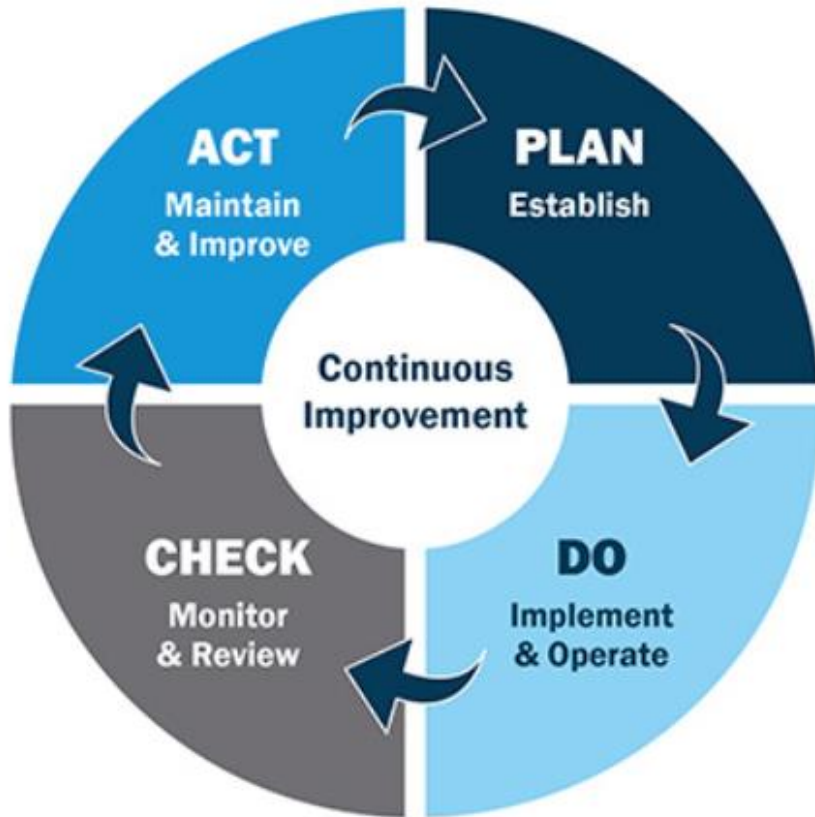


# Integrated Asset Integrity Model

- Reliability, maintenance and safety are managed as “silos” in most organizations
- Increased reliability and operating efficiency are achieved by integrating disciplines within an organisation:
  - 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 3100 for risk management



# Managing Your Assets

## Changes in the Market



Budget  
Constraints



Lack of **C**ross-  
**F**unctional  
**C**ollaboration



Poor Data  
Management



Optimisation  
(New with  
Old)

# Managing your assets

## The Opportunities



Improve  
decision  
making



Target the  
appropriate  
risks



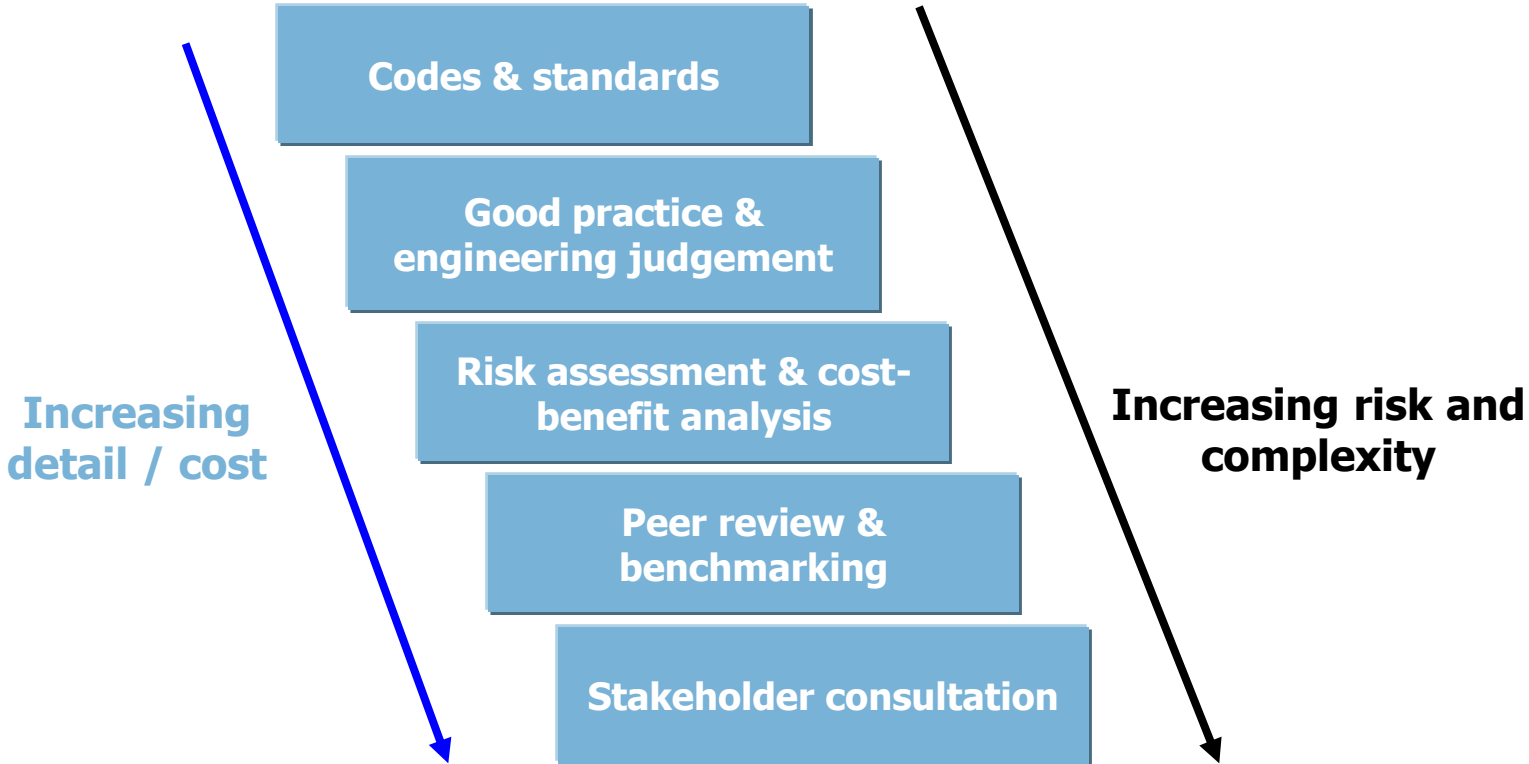
Integrate  
business  
streams



Create  
Value

# Risk-Based Decision Making

More complex or risky projects require more sophisticated tools



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



# The Different Approaches and Elements

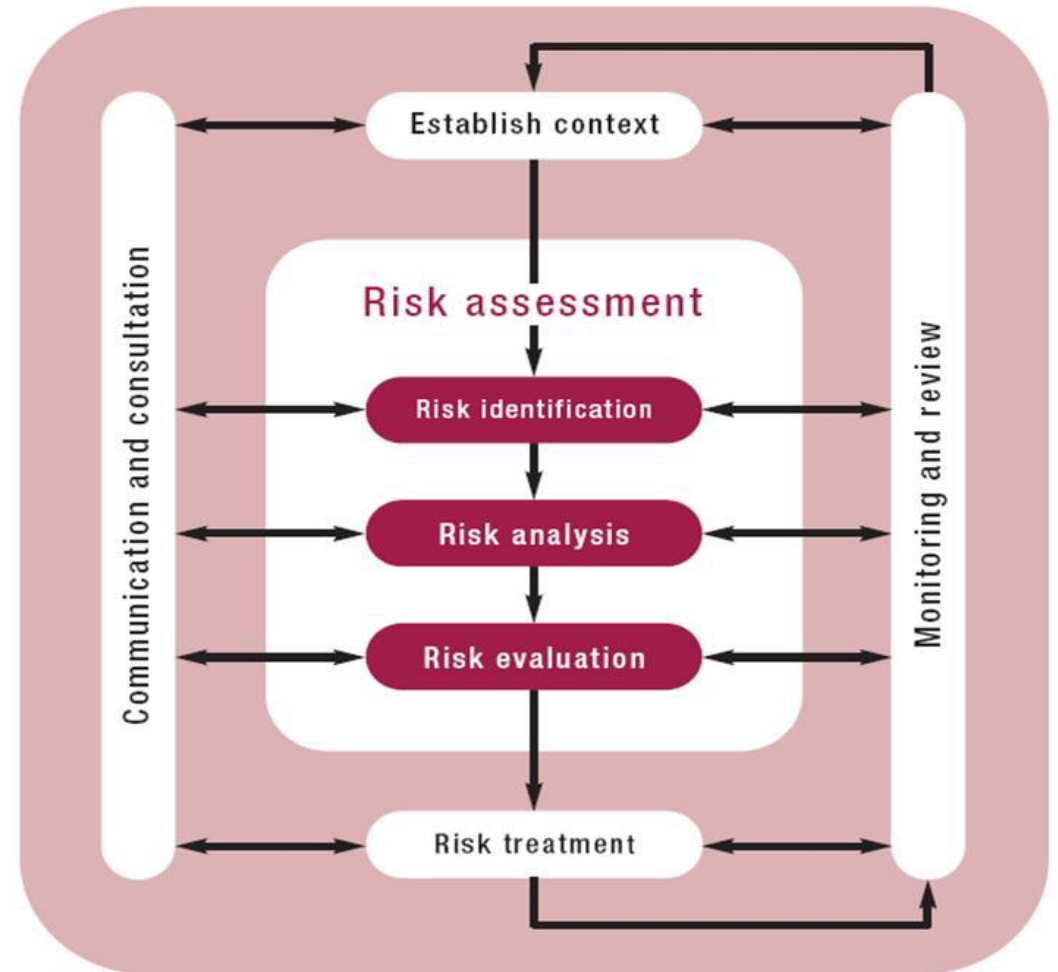
## Process Safety

- 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



# The Different Approaches and Elements Risk Management

- Based on the Plan-Do-Check-Act principle
- Based on risk assessment
- ISO 31000



Risk assessment should be an input into a decision making process **NOT** a justification for a decision already made

# 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

PAS 55	CCPS RBPS
Element	Element
4.3.1. AM strategy	
	5. Stakeholder outreach
4.1. General requirements	
4.1. General requirements	
4.4.1. Structure, authority and responsibilities	
4.2. AM policy	
4.4.1. Structure, authority and responsibilities	
4.3.3. AM plans	
4.3.2. AM objectives	
4.3.3. AM plans	
4.4.7.1. Risk management process	
4.4.7.2. Risk management methodology	
4.4.7.3. Risk identification and assessment	7. Hazard identification and risk analysis
4.4.7.4. Use and maintenance of asset risk information	
4.3.4. Contingency planning	16. Emergency management
4.5.2. Tools, facilities and equipment	
4.4.3. Training, awareness and competence	
4.4.3. Training, awareness and competence	3. Process safety competency
	12. Training and performance assurance
4.4.3. Training, awareness and competence	
4.4.4. Communication, participation and consultation	4. Workforce involvement
	5. Stakeholder outreach

PAS 55	CCPS RBPS
Element	Element
4.4.5. AM system documentation	6. Process knowledge management
4.4.5. AM system documentation	
4.4.5. AM system documentation	
4.5.1. Lifecycle activities (very loosely)	8. Operating procedures
	9. Safe work practices
	14. Operational readiness
	15. Conduct of operations
4.4.9. Management of change	13. Management of change
4.4.2. Outsourcing of AM activities	11. Contractor management
4.6.1. Performance and condition monitoring	18. Measurement and metrics
4.6.4. Audit	19. Auditing
4.7. Management review	20. Management review and continuous improvement
4.6.5.1. Corrective and preventative action	10. Asset integrity and reliability
4.6.5.1. Corrective and preventative action	10. Asset integrity and reliability
4.6.5.2. Continual improvement	20. Management review and continuous improvement
4.4.8. Legal and other requirements	2. Compliance with standards
4.6.2. Investigation of asset-related failures, incidents and nonconformities	17. Incident investigation
4.6.3. Evaluation of compliance	
4.6.6. Records	
	1. Process safety culture

# 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.

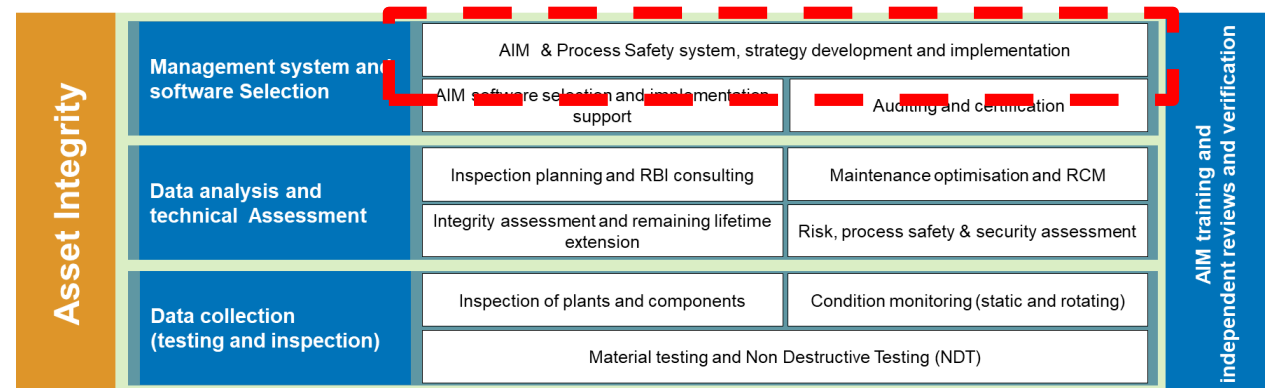
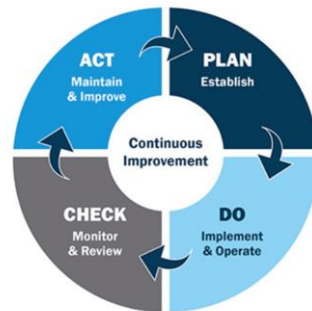
<b>Asset Integrity</b>	<b>Management system and software Selection</b>	AIM & Process Safety system, strategy development and implementation	
		AIM software selection and implementation support	Auditing and certification
	<b>Data analysis and technical Assessment</b>	Inspection planning and RBI consulting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



# Core Elements

## Top Level- Integrated physical AIM system

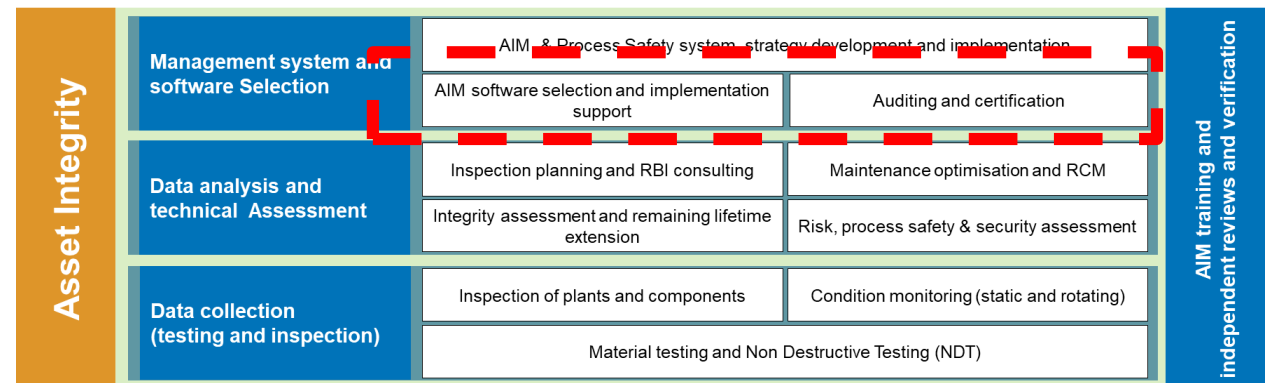
- AIM/PS system and strategy development and implementation
- Top down - connective management systems building framework and elements.
- Looks to establish, Policy, procedures and resources needed to be in place to deliver integrity over the whole life cycle of an asset.



# Core Elements

## Top Level- Integrated physical AIM system

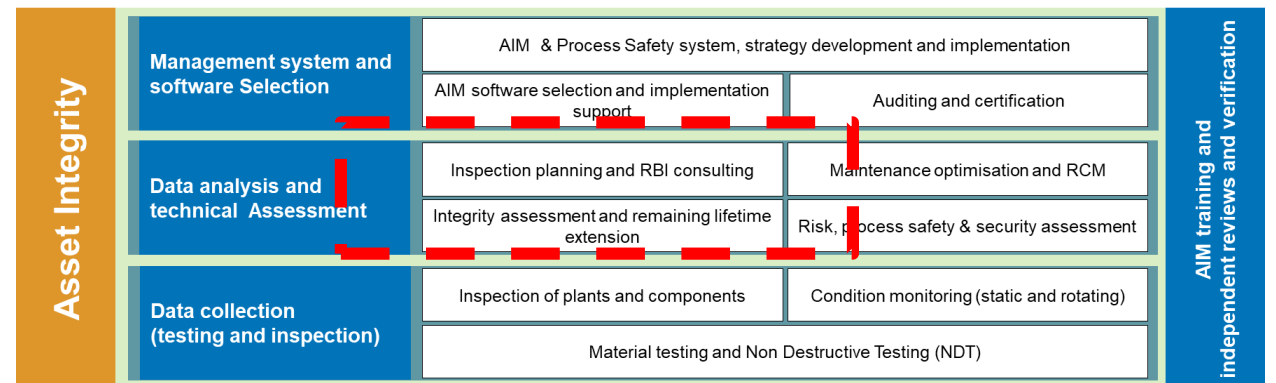
- Software Selection and Implementation support
- Auditing and Certification



# Core Elements

## Middle Level-Integrity, Reliability & Process Safety Assessment

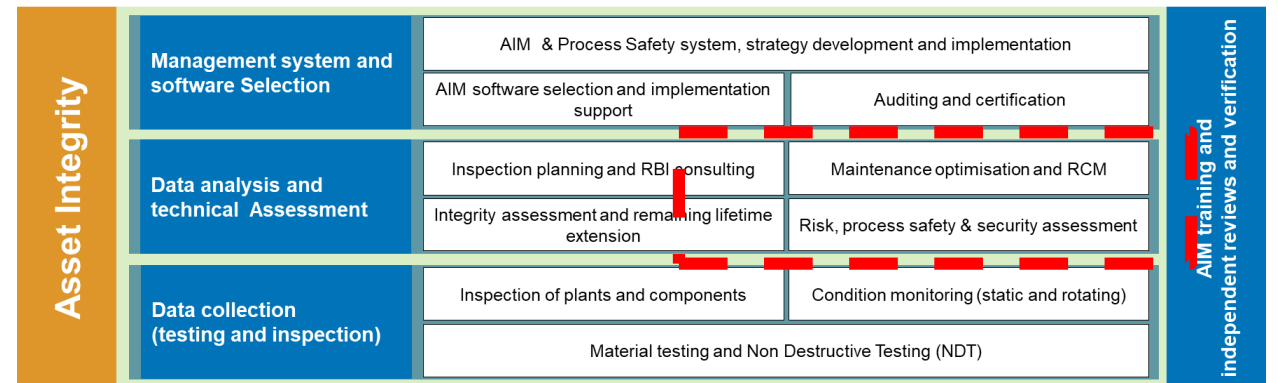
- Inspection Planning and RBI
- Integrity assessment and remaining lifetime extension
  - Fitness for Service (FFS)
  - Corrosion Prevention and Control (CPC)
  - Failure Analysis (FA)
  - Lifetime Extension (LTE)



# Core Elements

## Middle Level-Integrity, Reliability & Process Safety Assessment

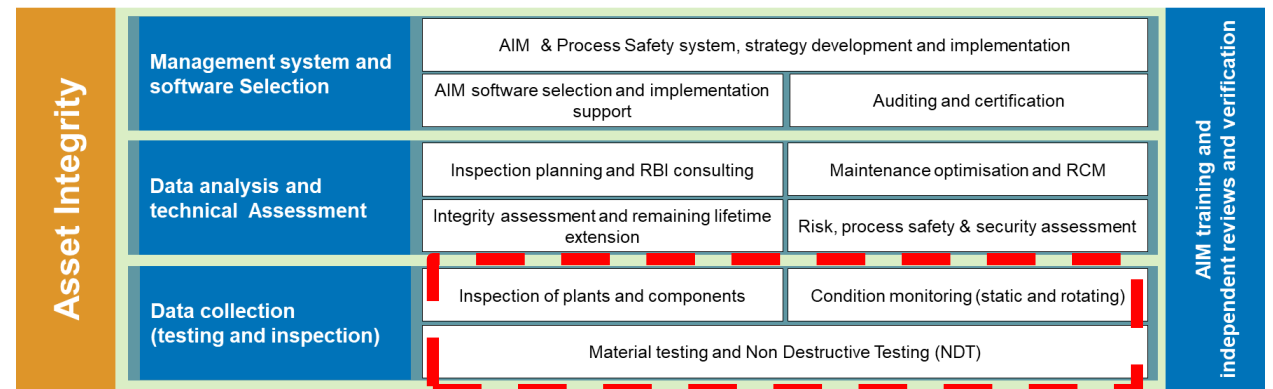
- Maintenance Optimisation and RCM
- Risk Process Safety & Security Assessment



# Core Elements

## Lower Level- Performance assurance

- Inspection of plants and components
- Condition monitoring (static and rotating)
- Material testing and Non Destructive Testing (NDT)

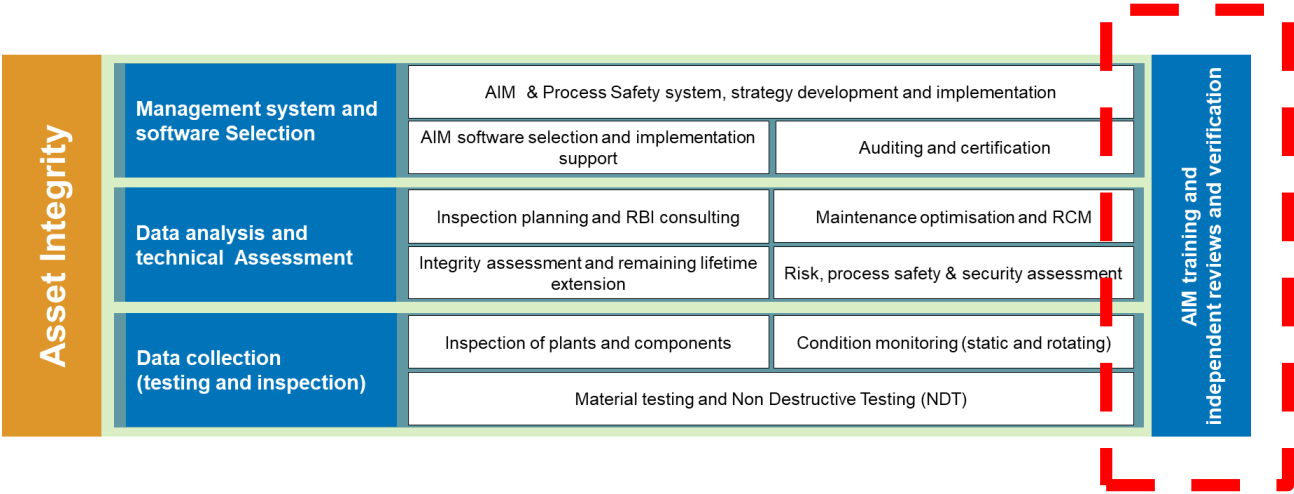




# Core Elements

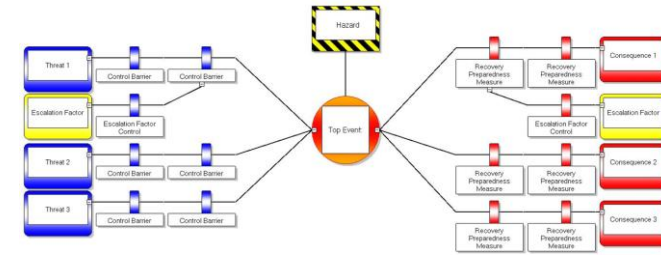
## All floors- Competence

- Spanning all floors is the competence of personnel in performing their tasks to the required standards.



# The opportunities

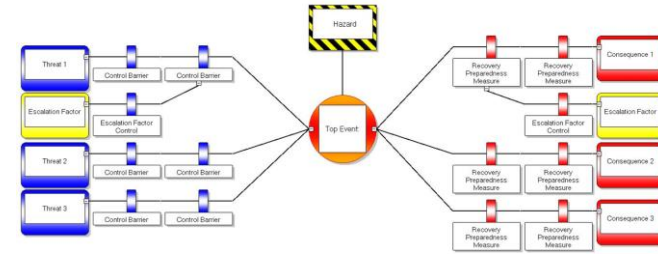
Make more informed choices....How?



- 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