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Integrity Management

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15th March 2011
Introduction

- Integrity Management – A definition
- Objectives & applicability of Integrity Management
- Outline the Integrity Management process
- Describe the elements of Integrity Management
Integrity Management - Definition

- **Integrity Management** is a system for ensuring defined asset availability in a safe and cost effective manner.
- Process for delivering ALL of the activities required to manage the integrity of a facility
  - Closely linked with Maintenance Management
- “Integrity Management” - often talked about, but rarely a common understanding
  - Also known as Asset Integrity Management, Technical Integrity Assurance
  - Used to be known as Terotechnology, Life Cycle Management
- IM is an operator / duty holder responsibility
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Integrity Management - Objectives

- Reduction in safety and environmental hazard from leaks and structural failures
- Compliance with statutory and corporate safety & HSE requirements
- Defined availability (Production & income optimisation)
- Reduction in unplanned maintenance & deferment costs
- Optimisation of mitigation, monitoring & inspection costs

Above courtesy of: Energy institute / HSE - Guidance for Corrosion Management in O&G Production and Processing

- Provide auditable processes
Integrity Management - Applicability

Applicable to any asset based process industry: -
- Oil and Gas – Upstream (platforms, receiving / processing plants)
- Oil and Gas – Downstream (refineries, petrochemical)
- Chemicals and fertiliser
- Power generation (coal, gas, nuclear)
- Pharmaceuticals
- Paper and pulp
Integrity Management - Process

Integrity Management: A closed loop process

- Review of Systems and Influencing Factors
- Risk Assessment
- Define Control and Monitoring Requirements
- Implement Control and Monitoring Activities
- Collate Information
- Review and Analyse
- Integrity Statement
- Decide Actions
- Enact and Assure Change
- Legislation, Regulations, Corporate Requirements, Industry Best practice
- Review of Systems and Influencing Factors
Integrity Management - Process

- Clear Policies & Objectives
- Organisational Structure & Responsibilities
- Corrosion Risk Assessment & Planning
- Implementation & Analysis
- Monitoring and Measuring Performance
- Review System Performance

EI / HSE - Guidance for Corrosion Management in O&G Production and Processing

The system as a “management process”
Integrity Management - Process

BP Corrosion Management Framework (Slightly Modified)
The system as an “activity process”
Integrity Management - The Elements
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Integrity Management - Overview

- We assess the **hazards** & the **consequences**, i.e. the **risks**

- We develop:
  - Corrosion control plans
  - Inspection plans
  - Maintenance plans

&… put them into action

- We monitor their effectiveness and modify accordingly

**Plan - Do - Review**
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Integrity Management - Review

“Let’s look at each element in turn..”

Review systems and influencing factors

“What do we do..?”

- Review all relevant documentation
- Understand the systems and processes
- Determine status of components
- Determine baseline requirements
- Establish regulatory or corporate requirements
- Influence design decisions
- Influence operations plans
Integrity Management - Failure Risk Assessment

Risk Assessment

The basis for integrity management and inspection (RBI)

Risk = f(Probability) * f(Consequences)

External threat
- Type of material
- Process conditions
- Environment

Internal threat
- Type of material
- Process conditions
- History

Hazard
- To personnel
- To environment

Operability
- Time to repair
- Extent of shutdown

Probability - of a failure, e.g.
- Corrosion, erosion, cracking

Consequences - of a failure, i.e.: 
- On personnel & environment
- For production
Integrity Management - Planning

**PLAN corrosion control and monitoring, inspection & FM management programmes**

- Corrosion mitigation programme
  - Activities to be implemented
  - Parameters to be measured

- Inspection programme
  - Inspection plans - What / Where / How
  - Work packs - Drawings / Datasheets / Procedures / Access constraints / Safety requirements / Reporting routes

- Fabric maintenance
  - Planning / Implementation / Monitoring

- Information management
  - Inspection / Integrity Management Database
  - Anomaly management
  - Reporting
Integrity Management - Implementation

\textit{Just ******** Do It.....!}

- Implement Corrosion Control Activities
  - Plant operation / Fabric maintenance / Chemical management, e.g. Corrosion inhibition

- Implement Chemical & Corrosion Monitoring Activities
  - On-line corrosion monitoring / Chemical analysis, e.g. BS&W, WI system monitoring

- Implement Inspection Activities
  - Work planning / Resource planning / Methods and procedures / Mobilisation / Coordination / Execution

- Implement Fabric Maintenance Activities
  - Planning / Implementation / Monitoring
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Integrity Management - Collate Information

- Collate and verify information
  - Inspection and monitoring activities
  - Incidents and failures
  - Process monitoring information
  - Environmental changes
  - Legislative changes
  - Modifications
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Integrity Management - Performance Assessment

- Review and Analyse Data / Reports
  - Corrosion control (Key performance indicators - Pro-active and re-active)
  - Inspection & corrosion monitoring data (Assessment & Trending)
  - Anomaly reporting and analysis
Integrity Management - Outcomes & Actions

- **Decide Actions**
  - Risk implications and time-frame
  - Cost effective and practical recovery actions
  - Extent of repair
  - Process modifications
  - Facility modifications
  - Operational changes

- **Make & Assure Changes**
  - Usually by others
  - Prepare procedures
  - Operational changes
  - Prepare procedures
  - Ensure implemented and documented
  - Update strategy
Integrity Management - Reporting / Feedback

- **Tactical Review**
  - Inspection Results / Corrosion Monitoring Results & Anomalies
    - Continuous
    - Periodic (e.g. monthly)
- **Integrity Management Team Meetings**
  - Involve all stakeholders
- **Strategic Review (Integrity Statement)**
  - Up to date asset condition statements
    - Annually
    - After campaigns
    - Major changes
    - Inspection findings, accident or incident
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Integrity Management - Review and Audit

"Quality assurance and continuous improvement"

- Review and Audit of Processes
  - Audits (Internal / Client / Accreditation)
  - Reviews of best practice
  - Compliance - Verification / Classification
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Integrity Management - Strategy

All defined in an overall “Strategy”

- Defined policies and objectives
- Listing of systems & scope
- Definition of integrity parameters
- Risk based ranking of components
- Optimum requirements for in-service corrosion control, inspection and monitoring
- Frequencies and methods
- Roles and responsibilities / Competences
- Reporting requirements
- Management of change process
- Review and audit of processes – QA and continuous improvement
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Integrity Management - Common Pitfalls

- Having good procedures is not enough - most problems result from not following agreed practice (Constraints in budgets / personnel availability / SW tools)
- Failure in the basics (many problems have been recognised and understood decades ago)
- Lack of competence / experience
- Inadequate or compromised design, e.g. Inadequate materials selection
- Not operating to specification
- Inadequate external corrosion control
  - Poor management of corrosion under insulation
  - Poor implementation of fabric maintenance (Constraints in budgets / personnel availability)
- Inadequate communication, e.g. poor interaction between technical disciplines and between technical and managerial disciplines
- Inadequate performance monitoring, especially w.r.t. corrosion control activities
Integrity Management - Summary

Integrity Management

Definition
A system for ensuring defined asset availability in a safe and cost effective manner

Objectives
Safety / regulatory compliance / cost

Applicability
Any asset based process industry

Overall Process
Assess / Plan / Do / Review

Elements

A closed loop & continuous process
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