Engineering Changes and Lifecycle Information Management Challenges in Process Plants

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Outline

• Asset Lifecycle
• Plant Changes Conundrum
• Management of Change and Process Safety Management
• P&ID As-Built Documentation
• Culture Mapping and Force-field Analysis
• Case Study
• Conclusions
Events

- The William Olefins Plant Explosion
  - 2 fatalities with 167 injured
  - Weak safety culture and poor management of change

Source: CSB
Events

- The Tesoro Refinery Explosion
  - 7 fatalities
  - Outdated start-up procedure
  - Weak safety culture

Source: CSB
• Design
  - Conceptual
  - FEED
  - DED

• Construction

• Commissioning

• Operation & Maintenance

• Decommissioning
Plant Changes Conundrum

- What constitutes a change?
  - In kind versus not in kind changes
  - Complicated versus complex changes
  - Critical versus non-critical changes

- Examples of changes include
  - Modifications to piping and equipment
  - Changes to instrumentation and process control
  - Adjustment of safety systems (interlocks, Isolation, etc.)
Management of Change and Process Safety Management

- OSHA 1910 111 says

“The employer shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process.”
Plant Documentation

• As-built is the king
  – The need to update documents is a vital part of MOC and it is critical to PSM

• Main documents include
  – Design Basis
  – Process Description
  – Piping and Instrumentation Diagrams
  – Operating Procedures
  – Plot Plan, etc.
The Criticality of P&IDs

- P&IDs are the blueprints of every Process Plant
- P&IDs must be complete, accurate, and up to date
- OSHA considers errors in P&IDs as wilful violation
- Use of outdated or misleading P&IDs can result in catastrophe
The Criticality of P&IDs
Reasons for Poor As-built Records

- Difficulty in recognizing change
- Temporary changes
- Emergency works
- Lengthy route of approval
- Lack of standardization
- Inadequate audit
- Complex document linkage
- Poor asset registry and tag management
- Poor collaboration
Proposed Solution Approach

• Technology
  – Aveva Engineering
  – Bentley Assetwise ALIM
  – Industry 4.0 for Process Plant

• Human Element
  – Training
  – Collaboration
  – Culture Mapping
  – Force-field Analysis
• Royal Dutch Shell: Global Asset Management Excellence for Gas Plants

• Optimizing facility operations with ABB Ability™ Asset Suite eSOMS

• L&T Hydrocarbon Engineering: Integrated EPC Project Execution through AVEVA NET
Conclusions

• Every engineering change needs to be assessed for its impact
• Accurate plant documentation is paramount to robust asset lifecycle management
• Technologies are being utilized to converge plant lifecycle activities
• Quality techniques are potent tools for continual safety improvement in Process Plant
• Humans lie at the heart of safe asset integrity
THANK YOU FOR YOUR TIME