Leveraging Risk and Cost Analytics for Better Reliability and Holistic Enterprise-wide Asset Strategies
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Presentation Focus

• How are companies ...

- leveraging data (real-time & historical) to quantify risks and cost in development of their equipment reliability strategies
- managing strategy and changes to the strategy over time for assets.
• Key Takeaways

- Recommendations from all asset strategies can be managed as a whole and driven to completion.
- Knowledge capture and Management is a major issue facing all manufacturing.
- Key capabilities of this holistic, enterprise-wide approach
• Asset Strategies
• A risk based approach
• Cost vs. Risk - What if analysis
• Holistic approach
• Knowledge Capture / Knowledge Mgmt.
• Case Studies
• Summary
### Overview

**Identified Bad Actors and Business Risks**

**Discovered Failure Modes and Criticality**

**Reviewed Existing Maintenance Plans & Strategies**

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#### Table

<table>
<thead>
<tr>
<th>AssetActionLink</th>
<th>Action ID</th>
<th>Action Basis</th>
<th>Headline</th>
<th>Description</th>
<th>Action Type</th>
<th>Condition Monitoring Type</th>
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</thead>
<tbody>
<tr>
<td>G0008-100</td>
<td>G0008-100-ACN01</td>
<td>Existing Plan: MFG Recommendation</td>
<td>Change Lubricant</td>
<td>Perform changeout of lubricant</td>
<td>PM</td>
<td></td>
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<tr>
<td>G0008-100-ACN02</td>
<td>G0008-100-ACN03</td>
<td>Existing Plan: MFG Recommendation</td>
<td>Overhaul</td>
<td>Perform overhaul of components</td>
<td>PM</td>
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<tr>
<td>G0008-100-ACN04</td>
<td>G0008-100-ACN05</td>
<td>Existing PdM</td>
<td>Vibration Analysis</td>
<td>Perform full spectrum vibration monitoring. Establish baseline and action levels. Trend results.</td>
<td>CM</td>
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<td>G0008-100-ACN05</td>
<td>G0008-100-ACN06</td>
<td>Lube Oil Analysis</td>
<td>Performance Test</td>
<td>Perform lube oil analysis. Establish action levels. Sampling and analysis of lube oil to include water, sediment, viscosity.</td>
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<tr>
<td>G0008-100-ACN07</td>
<td>G0008-100-ACN08</td>
<td>Existing Ops Plan</td>
<td>Operational Check</td>
<td>Verify proper operation. Qualitative observation of condition and performance.</td>
<td>CM</td>
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<tr>
<td>G0008-100-ACN08</td>
<td>G0008-100-ACN09</td>
<td>Existing PM</td>
<td>Performance Test</td>
<td>Perform component performance test over full range of operation. Establish baseline and action levels. Trend results. Test includes pressures, temperatures, flows, etc...</td>
<td>CM</td>
<td></td>
</tr>
</tbody>
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Overview

Understanding risk and developing a plan for actions is key to keeping equipment reliable, available, safe, and productive.

Define, communicate, implement, and then re-evaluate an overall strategy in terms of actions around an asset and the specific risks that are mitigated.

Package asset strategies into work items for execution.
Benefits of a risk based approach

• Visibility and accessibility to an asset’s complete strategy plan (all actions performed on an asset)

• Risk-based justification for the cost associated with the strategy plan

• Risk analysis to optimize strategy plans

• Documentation of all changes made to optimize the strategy plan

• Implementation of the strategy plan in work management systems

• Standard Integration with SAP-EAM
Risk Assessment

View the suggested actions and the risks that they mitigate.

- View the **mitigated** risk rank for each risk.
- View the **unmitigated** risk rank for each risk.

Define new risks that could be mitigated by an existing action.
Define existing risks that could be mitigated by an existing action.

View the unmitigated risk rank for each risk.
Risk Analysis

View the impact of proposed changes to a strategy on the overall risk and cost.

- Assess the current strategy in terms of risk, cost, and benefit.
- View the financial impact.
- View the cost impact.
- Accept or undo the changes.
Combine asset strategies into an implementation package, where you can use actions to build additional items in Meridium or in SAP.

Implement package and view data in SAP.
Strategy Templates for KM

Capture best practices for asset classes in asset strategy templates, and apply those templates en masse to similar assets.

View new asset strategy.
System and Unit Strategy

Roll up asset strategies to provide business analysts with a way to measure action costs rolled up for a system or unit and the overall impact on risk mitigation.

View the total projected cost for all actions across all underlying strategies.

View the sum of financial risks across underlying strategies.

Roll changes up to the unit level.

View the total projected cost for all actions across all underlying strategies.
Case Study #1 - Global Utility Company

Risk and Cost Summary

Financial Risk Exposure

- UNMITIGATED
- CURRENT STRATEGY
- OPTIMIZED STRATEGY

Reduced financial risk $720,000

Risk Profile | Financial Risk

- Unmitigated
- Active
- Proposed

- Seals / Packing Failure
- Coupling Failure
- Internal Coupling Rod Failure
- Main Rotor Failure
- Ball Bearings Failure
- Pump Case Failure
- Idler Rotors Failure

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Meridium Asset Strategy Manager

- ASM – Asset Strategy Manager
  - Tool that allows a team to quickly document risks
    - Safety, Environmental, and Economic
  - View Risks Graphically
  - Define Actions to Mitigate the Risks
  - Optimize the Actions
    - Eliminate Actions that are expensive and do not significantly reduce risks
    - Evaluate Cost benefit of Actions

- ASM Packaging and Implementation
  - Link Actions to Existing or New Tasks

- ASM Advanced Analysis
  - Optimize Task Intervals based on inspection & failure
Ramp-Up Experience

- **Results:**
  - Validated existing plan of actions for equipment
  - Identified an existing risk that was not fully mitigated
  - Recommended an adjustment to the current strategy to further mitigate risk
  - Determined ASM is a viable analysis method for PPG
Case Study #3 - US Chemical Company

- Multi site operator

- Not ready for rigorous analysis techniques (RCM/FMEA, Risk Based Inspection)
  - Good at task execution but not at task evaluation
  - Not sure if doing too much or too little

- Applied ASM Strategy Analysis method on Compressor System
  - Unplanned failure event results in lost production, repair cost, and evaluated risk exposure over $2,000,000
  - Team identified Bearing Failures as highest risk failure mode
    - Existing strategy called for oil analyses - 3 month interval @ $100
    - Asset can run up to 1 month maximum after detection of contaminant
    - Updated Oil Analysis task to monthly execution
  - $800 increase in annual PM costs - significant reduction in risk
Alberta Envirofuels

2009 Asset Management Project

Using Meridium Packaged Solutions
Alberta Envirofuels

- Isooctane Producer, Edmonton, Alberta Canada
- JV, Chevron & Nest Oil Finland
- Convert Isobutane into Isooctane, similar equipment to a refinery

- ~15,000 bpd
- 108 employees
Progress on The Perfect Run:

- Longest run in current history is 488 days
- Currently at 102 days with 72 days until the next planned shutdown

Four Years Between Unplanned Lost Production Days

THE PERFECT RUN
Case Study #3

Gavin Linderman
Global Reliability Leader
SABIC Innovative Plastics
Asset Reliability is about managing risks of:

- not being able to produce product
- hurting the environment
- hurting our reputation
- a fellow employee getting hurt

The Asset Reliability Work Process helps us understand and develop strategies to effectively manage these risks so we can continue to meet our goals in a safe and predictable way.
SABIC’S ASSET RELIABILITY WORK PROCESS

- Review Business Goals & Unit Technology Plans
- Understand Systems/ Assets Structure
- Perform Criticality Assessment & Rank Opportunities
- Analyze Risk & Develop Mitigation Strategy
- Implement Strategy & Execute
- Monitor Asset Health & Identify Improvements
- Perform Root Cause Analysis & Implement Recommendations

The successful execution, enablement, and sustainment of the Asset Reliability Work Process requires a proper balance of:

- People
- Process
- Technology
**Key Objective of Proactive Maintenance:**

Identify Potential Failures with Sufficient Lead-Time to Plan and Schedule the Corrective Work **Before** Actual Failure Occurs

- Each Task in the PPM Should Link to a Specific Failure Mode.
- Defined Strategy for Every Asset in the Plant (even if it is run to failure).
CURRENT STATE...IT’S UGLY.

Asset Strategies

- Reliability Rec’s
- Operator Care
- CMMS Work Order Feedback
- RCA Analysis
- SIS Mgmt
- EHS/Compliance Requirements
- RCM / FMEA Analysis
- RBI Analysis
- Inspection Mgmt. Findings
- Work Order Feedback
- Reliability Rec’s
- Operator Care
- CMMS Work Order Feedback
- RCA Analysis
- SIS Mgmt
- EHS/Compliance Requirements
- RCM / FMEA Analysis
- RBI Analysis
- Inspection Mgmt. Findings
- Work Order Feedback
CURRENT STATE ISSUES

• Inability to integrate various work management tools

• Inability to understand and manage risk

• Inability to efficiently implement recommendations

• Inability to manage asset strategy changes and revisions effectively

• Lack of data & process integration
FUTURE STATE WITH SOFTWARE ENABLER

- Operator Care
- CMMS Work Order Feedback
- Reliability Rec's
- SIS Mgmt
- RCA Analysis
- RBI Analysis
- EHS/Compliance Requirements
- Inspection Mgmt. Findings
- RCM / FMEA Analysis
Summary

• Leverage Risk and Cost Analytics across the enterprise
• Manage risk and cost associated with physical asset strategy plans
• Evaluate and optimize strategy plans based on risk mitigation
• Review history of all changes made to strategy plans
• Organize and aggregate into system and unit strategies
• Implement strategy plans for execution
• Knowledge Capture and Knowledge Management that can be shared across the enterprise