Asset Performance Management Workshop

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Prescriptive Guidebooks for Manufacturers
The following Strategic Initiatives of MESA International are associated with this presentation:

- Lean Manufacturing
- Quality & Regulatory Compliance
- Product Lifecycle Management (PLM)
- Real-Time Enterprise
- Asset Performance Management (APM)
Agenda

- Introduction to APM
- Cost Justification
- ROI
- Implementation Best Practices
- Dependencies & Risk
- Value
- Questions
History of APM

Introduced in 1993 as an enterprise class software - Asset Performance Management is based on the following assumptions:

- ERP systems would become standardized and own the business transaction
  - They would focus on efficiency
- Physical Assets were becoming more complex and their cost of failure and cost to repair would increase
- Eliminating failure was the best way to protect:
  - Assets: People and Equipment
  - Profits
  - Environment
- APM would focus on effectiveness not efficiency
“All worlds come together at the asset. However, assets are viewed as depreciable sunk costs, but they're not — they're competitive differentiators, and contribute to profit margin.”

Alison Smith

AMR Research
Manufacturing Software Segments

Enterprise asset management landscape applications market segmentation, 2006

Source: AMR Research, 2007
Different Views of Plant Data

- Enterprise Asset Management (EAM/ERP)
- Asset Performance Management (APM)
- Condition Monitoring & Process Historians
- Control Systems
- Engineering and Design

Transaction View
Strategy View
Trend View
Control View
Picture View
APM in the Asset Management Landscape

Enterprise Asset Management (EAM)
- Work management
- Materials Management
- Purchasing and Stores

Asset Performance Management (APM)
- Strategy Development / RCM / FMEA / RBI
- Strategy Management / Implementation
- Condition Assessment / Operator Rounds
- Reliability Analytics / Root Cause Analysis / Metrics

- Condition Monitoring
  - Asset Diagnostics
  - Online Monitoring
  - Anomaly Detection

- Control System/Process Historian
  - Process Control/Alarm & Events
  - Operating Envelope Definition
  - Online Monitoring

- Engineering and Design
  - Tag Master
  - Engineering Data
  - Regulatory Documents
  - Management of Change

Maintenance Strategy
Maintenance History
Conditional Alerts
Monitoring Strategy
Conditional Alerts
Engineering Characteristics
Re-design Recommendations
Efficiency versus Effectiveness

- Strategy Development
- Analysis/Assessment
- Work Planning
- Work Scheduling
- Work History
- Work Execution

The Right Tasks
- Performed Well

Effectiveness
- Continuous Improvement Cycle

Efficiency
- Sustaining Maintenance Management Cycle
Case Study: Marathon Petroleum

- Corporate
  - Early focus - regulatory compliance
  - $14+ million in documented savings
  - IRR >50%
- Single plant
  - $1,117,800 in maintenance cost savings
  - Reduced LPO cost of in-service heat exchanger failures by $3 million
  - Equipment life increased 12%

“Marathon estimates the savings at $3M to $5M per plant per year depending on size, and current reliability situation”.

Lance Holmer
Marathon Petroleum

source: Meridium Conference 2002
Customer Practice at Xcel Energy

**Xcellence in Reliability**

- A **tactical** capability supporting the daily management process in the plants, such as identifying, prioritizing and planning maintenance activities.

- A **strategic** capability supporting fleet-wide asset management decisions, production planning, process improvements and justification for project requests.

*Operational excellence is dependent upon being able to collect performance and condition data and analyze it consistently across the fleet.*
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**Case Study - Lockheed Martin**

**Project:** Streamline Logistics and Property Management for the Consolidated Space Operations Contract

<table>
<thead>
<tr>
<th>Goals:</th>
<th>Results:</th>
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<tbody>
<tr>
<td>Eliminate redundant work control systems</td>
<td>Reduced work control systems from 26 to one</td>
</tr>
<tr>
<td>Achieve compliance with JFMIP property management requirements</td>
<td>The implementation of Maximo® made CSOC compliant with JFMIP property management requirements</td>
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<tr>
<td>Streamline the 1018 reporting process</td>
<td>Maximo enabled one person to put together the 1018 report in a few days, a job that used to involve 10-15 people over two months</td>
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<tr>
<td>Increase asset visibility across the enterprise</td>
<td>Achieved total enterprise visibility of parts, material, work status, resources and property information for CSOC</td>
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“NASA can’t delay a mission because we were unable to supply the parts necessary for the mission to get off the ground. . . . With Maximo, we have every possible logistical detail mapped out and available at a moment’s notice. To have that data at our fingertips is absolutely critical to our entire operation.”

Rid Horner, Project Manager for the CSOC Logistics Project
Lockheed Martin
Case Study – Rolls Royce

The Company:

- Rolls Royce / UK: sales revenue of more than $11 billion, of which 55% are services revenues supporting an installed base of 54,000 gas turbines and more than 4,500 customers.

- Component Care Division of **RR Civil Aerospace** manages Total Care Agreements for Line Replacement Units (LRUs) for 12 Airlines. These are units, normally from 3rd party vendors, that can be replaced “on wing” to ensure the availability of the engine/aircraft.

The Project:

- Maximo is used in RR for Facilities Management, Machine Tool Maintenance, Service Data Management (SDM) and Component Care.

- The **Component Care Division of RR Civil Aerospace** use Maximo to manage the Work Orders for LRUs in the repair cycle with logistics vendors to/from Aircraft Overhaul & Repair (AORs) centres.

Maximo capabilities for the SDM project (Service Data Management):

- Unique capabilities of Maximo Configuration Manager to calculate, track and manage asset life:
- Define complex asset configuration models/variances and associated configuration rules
- Create physical assets based on legacy data utilizing specific data loader utilities
- Validate physical asset configurations (“as maintained”) against approved configurations (“could build”) and display any discrepancies with color coded statuses (dashboard)
- Record in-service events (e.g. in-flight shut downs) and track, monitor & control any associated symptoms, reactions, actions and findings in order to execute detailed analysis and reporting.
- Manage complex design change processes associated with Service Bulletins and Airworthiness Directives and managing the effectivity of these changes across the fleet.
Success Factors

- Aligning with overall Business Goals and Objectives
  - Measure meaningful metrics to link operational performance with business performance

- APM Projects are only successful if fully supported by LOB Executives and Leadership teams

- Adaptability and Flexibility to quickly response to business process changes
  - agile organization,
  - skilled and involved people
  - cross functional continuous improvement teams

- Invest in information (real-time) integration of APM capabilities, combined with EAM, MES and ERP

- Adoption of open, industry standards, event-based and Services-Oriented APM Architecture for Data and Process integration
  - ISA-88, ISA-95, ISO 15926, Mimosa, OPC, etc
  - sophisticated IT Platform
“The Reliability & Maintenance Management System is a comprehensive program designed by ExxonMobil to safely achieve higher plant reliability and availability at low, world-class costs. The program requires development of specific maintenance strategies for every significant piece of equipment at every refinery. The system focuses on continuous improvement and uses detailed equipment fault analyses, tracking over 400 thousand types of equipment. Since its introduction in 1994, the system has reduced maintenance costs by about 30 percent while improving mechanical availability by about 2 percent.”

Source: ExxonMobil Corporation Downstream 2001 Annual Report, Page 67
The value of an integrated APM approach will achieve added value in the following areas:

<table>
<thead>
<tr>
<th>Manual Operations</th>
<th>Automated Operations</th>
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<tr>
<td>Reactive Maintenance</td>
<td>Predictive and Preventive</td>
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<td>Cost Intensive</td>
<td>Cost Controlled</td>
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<td>Stand Alone System</td>
<td>Integrated Solution</td>
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<td>Autonomous Sites</td>
<td>Corporate Standards</td>
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<tr>
<td>Business as usual</td>
<td>Continuous Improvement</td>
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**Potential Benefits for Cost and ROI:**
- Improved Labor utilization
- Increased Asset utilization
- Improved asset availability and reliability
- Increased planned/preventive maintenance
- New equipment purchases down
- Improved support for compliance
- Lost warranty recoveries up
- On-hand inventory needs down
- Inventory carrying costs down
- Material costs reduced by
- Purchasing Labor reduced
- Better interaction between different teams (e.g. engineering, production, maintenance)
- Better and sophisticated metrics for decision-making
- Better visibility on (financial) cost
**Questions...**

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