Enterprise Asset Performance Management

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The following Strategic Initiatives of MESA International are associated with this presentation:

Asset Performance Management (APM)
Real-Time Enterprise (RTE)
Agenda

- Enterprise Asset Performance Management (EAPM) – basics
- Asset Lifecycle Management
- Architecture & Solutions
- Drivers & Strategy
- Execution Methodology
- Expected Benefits & ROI
- Summary
EAPM Mission

EAPM provides means to share information regarding the right time to do maintenance based on the health of equipment, coupled with the best time to bring an asset down given operational demands.

“APM goes beyond maintenance: It cuts across many boundaries. The bottom line is return-on-assets [ROA]” *ARC Advisory Group*
Basics on EAPM

- Operations and maintenance drive plant performance. Operations is measured on maximum asset utilization while maintenance is measured on availability.

- Enterprise Asset Performance Management is about striking an optimal balance between asset utilization and availability and sustainability.

Since the bottom line in the hydrocarbon industries is Return on Assets (ROA), improving the bottom line is a function of how much utilization is achieved from assets and how well assets are utilized when on line.
Machinery, Equipment, People and Information - with the purpose of providing an economic and/or social benefit
Asset Performance
The degree to which an asset performs its intended function measured against agreed targets and standards. These measurements include:

- Uptime – Total Effective Equipment Performance (TEEP)
- Overall Equipment Effectiveness (OEE)
- Delivery Performance
Asset Management
The actions required to ensure that the asset is:
• Safe for operators, user and public
• Environmentally safe and sustainable
• Operating at Maximum level of service efficiently
• Achieving all the above with lowest asset lifecycle cost

Asset Effectiveness
• The degree to which an asset fulfils its purpose
• Sustaining economic value
• Financial terms measurement – e.g. Net Present Value (NPV), Return on Capital Employed (ROCE)
EAPM maximizes Asset Effectiveness

EAPM Ensures that the asset safely performs its planned function over defined time horizon in terms of:

- The operational performance of plant assets is assured
- The risk involved in operating those assets are controlled
- Energy, Emissions, and other Sustainable Manufacturing targets are achieved
Strategies for Operation

- Outside operator detects an abnormal situation (e.g. visual inspection, noise, etc.)
- Field data readings are wirelessly transmitted and combined with real time process sensor data and suggest impending failure

  maintenance wants to ____?
  operations wants to _____?

- How is the work process handled?
- Should we deal with this in a logical - consistent way?
Asset Management Landscape

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

Maintenance Strategy

Enterprise Asset Performance Management (EAPM)
- Strategy Development (RCM, RBI, etc.)
- Strategy Management (Asset)
- Condition Assessment (Calibration, Inspection, etc.)
- Performance Management (KPIs, RCA, Analysis, etc.)

Maintenance History

Conditional Alerts

Monitoring Strategy

Engineering Characteristics

Re-Design Recommendations

Process Historians/Condition Monitoring
- Predictive Technologies
- Online Monitoring
- Anomaly Detection

Engineering and Design
- Tag Master
- Engineering Data
- Regulatory Documents
- Management of Change
Asset Lifecycle – Traditional Model

Project Management
- Plan
- FEED
- Detailed Design
- Source & Build
- Commission & Handover
- Operate & Maintain
- Retire

Asset Management

Capital Costs (CAPEX)

Revenue

OPEX

Net Income

ROA

Capital Costs (CAPEX) ÷ Net Income = ROA
Plant Assets Lifecycle

ARC Advisory Group.
EAPM Measures (KPIs)

\[ \text{OEE} = \text{Utilization}\% \times \text{Rate}\% \times \text{Yield}\% \]

Where:
\begin{align*}
\text{UTIL}\% &= \frac{\text{Utilization(Actual)}}{\text{Utilization(Planned)}} \\
\text{RATE}\% &= \frac{\text{Production Rate(Actual)}}{\text{Production Rate(Planned)}} \\
\text{Yield}\% &= \frac{\text{Prime Yield(Actual)}}{\text{Prime Yield(Planned)}}
\end{align*}

\[ \text{ROCE}\% = \text{PROFIT}\% \times \text{CAPEX}\% \times \text{DESIGN}\% \times \text{OEE}\% \]

Where:
\begin{align*}
\text{ROCE}\% &= \frac{\text{ROCE(actual)}}{\text{ROCE(Planned)}} \\
\text{PROFIT}\% &= \frac{\text{Per Unit Profit(Actual)}}{\text{Per Unit Profit(Planned)}} \\
\text{CAPEX}\% &= \frac{\text{Invested Capital(Planned)}}{\text{Invested Capital(Actual)}} \\
\text{DESIGN}\% &= \frac{\text{Availability(Actual)}}{\text{Availability(Planned)}}
\end{align*}

Operators and Maintenance personnel can focus their joint efforts toward major problems.
Business Processes Focus

WO/EAPM

With EAPM

Operational Silos

Focus on Business Process
Operational Drivers

- Normally 5-7% Cost Avoidance is achieved when Asset Performance Management System is used effectively.

- It has been shown that typically equipment reliability problems accounts for about 38 percent of all unplanned slowdowns or shutdowns.

Problems with Data Quality, Data Entry Completion, End users are not reliability oriented, No Standardization.
Production Losses Provide Basis for EAPM

Total Effective Equipment Performance (TEEP)

- The ratio of the good product produced to maximum possible production over a given calendar time period

Overall Equipment Effectiveness (OEE)

- The ratio of the good product produced to planned production over a given calendar time period

\[
\text{TEEP} = \frac{A}{C}
\]

\[
\text{OEE} = \frac{A}{B}
\]

Planned Losses

(B) Planned Production

Operational Losses

(C) Maximum Production

Quality Losses

Good Production
EAPM Added Value

- EAPM provides asset owners with a single point of access to a collaborative transactional workspace to manager their assets throughout their productive lifecycle.

- Enterprise Asset performance management is the backbone to culture of reliability.

EAPM enables organizations to identify, contain, analyze and remove production losses and thus improve production performance.
Requirements For a Successful Deployment

• Visible corporate leadership
  – Baseline reliability performance expectations

• The establishment of clear, attainable goals

• The selection of metrics
  – Measure reliability performance and a path to improvement

• Establishing a partnership with IT Services to develop and implement change

• Clearly defined roles and responsibilities
  – Impacted Maintenance, Operations – the entire organization
Prerequisites for a Successful Implementation

• Ensure Good Reliability and Maintenance Data Entry
• Establish Business KPI’s and provide consistent methods of calculations
• Conduct risk-based criticality assessment of plant equipment (ABC indicator)
• Establish Root Cause Analysis
• Establish RCM, PMO, Reliability Engineering, Statistics, Six Sigma
• Work flow roles and responsibilities
• Inspection Module and Management Empowerment
Effective EAPM Implementation

The following actions must be emphasized and accomplished:

- Management of Change (MOC): Support / Participation
- Culture Change: Change Toward APM
- Software / Tool: Cost of Suitable Integration
- Readiness: Measure / Gap Analysis
- APM Effective Implementation: Action Plan
- Training: APM Focused Training and Awareness Sessions
- Changing Agent: Empower & Support Implementation Team
- Implementation Method: Selective Sites at a time, Business Vertical, Corporate Business
EAPM Culture Requirements

• Companies are Facing a Challenge
  - Shift from Reactive to Pro-active culture

• Why moving to reliability culture
  - To ensure business success
  - To provide a safe working environment
  - To meet changing regulations

• The requirements to achieve cultural change
  - Management commitment
  - Reliability is everyone’s responsibility (Operations, Maintenance, Engineering)
As large investments in assets and ongoing cost are made, owners are eager to see higher rates of return on their capital employed – maximized lifecycle value.

This gets fulfilled when:

- The operational performance of plant assets is assured
- The risk involved in operating those assets are controlled
Clearly and consistently communicate the value of EAPM to the higher management.

Establish awareness program of the value of EAPM for the organization.
EAPM Direct Savings

- Reduction of unplanned downtime
- Reduction of planned downtime (TA frequency can be extended)
- Reduction of maintenance inventory
- Avoidance of major maintenance work
- Reduced production losses
- Reduced safety and environmental losses
- Reduced Capital Costs (better life cycle costs management can be achieved leading to significant savings in total material costs)
- Improved quality performance (product quality can be improved and rework of produced parts can be decreased)
- Improved Energy Utilization (this improvement is achieved through early detection and resolutions of performance deficiencies)
- Maximize the effectiveness of your assets
- Optimize the productivity and reliability of your plant assets
Prevent Disasters
Deploying EAPM provides:

- Integrated solution for reliability and maintenance
- Obtaining a satisfactory ‘transformation change’ (cultural, data quality, and management)

*ARC Advisory Group.*
Q&A
Thank You