Asset Management vs. Equipment Maintenance Plan

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Asset Management

• You just paid $10M for a new capital asset, how do you assure full value for your investment?
  – Install correctly?
  – Proper startup?
  – How do you operate?
  – How do you maintain?
  – When do you retire asset?

• What will it really cost?
Total Cost of Ownership

- **Research and Development (C_R)**
  - Program Management (C_RM)
  - Advanced R&D (C_RR)
  - Engineering Design (C_RE)
  - Equipment Development and Test (C_RT)
  - Engineering Data (C_RD)

- **Investment (C_I)**
  - Manufacturing (C_MI)
  - Construction (C_IC)
  - Manufacturing Facilities (C_ICF)
  - Test Facilities (C_ICT)
  - Operational Facilities (CICODE)
  - Maintenance Facilities (C_ICM)
  - Initial Logistics Support (C_IL)

- **Operations and Maintenance (C_O)**
  - Operations Cost (C_OO)
  - Maintenance Cost (C_OM)
  - System/Equipment Modification (C_ON)
  - Asset Phase-out and Disposal (C_OF)
Reliability Starts With Design

• Inherent design deficiencies will determine reliability
• 95% of the total cost determined in the design stage
  – Proper design and selection will assure reliable, long-term useful life
  – Improper design or selection will assure chronic reliability problems, high cost and short useful life
Asset Management Plan

• A fundamental requirement of *Life Cycle Asset Management (LCAM)*
• An effective means to assure maximum return on capital investment (RoNA)
• Defines and provides *Standardized Work Practices (SWP)* for all aspects of the asset’s utilization from commissioning through decommissioning, e.g. its *life cycle*
• For new assets, development of the AMP begins during the detailed design phase and is finalized before commissioning
LCAM Model

<table>
<thead>
<tr>
<th>Project Management/Leadership</th>
<th>Authorize Conceptual Design</th>
<th>Authorize Functional Design</th>
<th>Authorize Detailed Design</th>
<th>Authorize Purchase</th>
<th>Authorize Construct</th>
<th>Authorize Installation</th>
<th>Approve Installation</th>
<th>Approve Commission</th>
<th>Approve Operation</th>
<th>Verify Proper Operation</th>
<th>Verify Proper Maintenance</th>
<th>Authorize Capital Replace</th>
<th>Approve Disposal</th>
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<tbody>
<tr>
<td>Engineering and Design</td>
<td>Conceptual Design Document</td>
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<tr>
<td>Procurement</td>
<td>Vendor Qualification &amp; Selection</td>
<td>Develop RFP Package</td>
<td>Final Selection and Contract Award</td>
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<tr>
<td>Finance/Accounting</td>
<td>Strategic Business Plan Input</td>
<td>Determine Compliance with Strategic Plan</td>
<td>Evaluate Capital Expenditures</td>
<td>Establish Chart of Accounts</td>
<td>Establish Capital Asset Accounts</td>
<td>Oversee Construction</td>
<td>Release Initial Payment</td>
<td>Release Final Payment &amp; Track Actual Costs</td>
<td>Track &amp; Evaluate Actual Cost</td>
<td>Analyze ILC and TCO</td>
<td>Close Asset Records &amp; COA</td>
<td>Archive Asset Data for Future Use</td>
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<tr>
<td>Quality Assurance</td>
<td>Impact on Product Quality</td>
<td>Define QA Requirements</td>
<td>Develop QA Specifications</td>
<td>Input Final QA Requirements</td>
<td>Evaluate QA Impact</td>
<td>Modify/Develop QA Program</td>
<td>Implement QA Processes</td>
<td>Validate QA Compliance</td>
<td>Evaluate QA Compliance</td>
<td>Evaluate QA Compliance</td>
<td>Evaluate QA Trends</td>
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<tr>
<td>Maintenance</td>
<td>Input Maintenance Comments</td>
<td>Evaluate for Maintenance Impact</td>
<td>Comments</td>
<td>Oversee Construction</td>
<td>Modify MRO Plans</td>
<td>Adjust MRO Inventory</td>
<td>Evaluate MRO Planning</td>
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<tr>
<td>Materials Management</td>
<td>Input Concerns/Comments</td>
<td>Evaluate Materials Requirements</td>
<td>Evaluate Vendor Specifications</td>
<td>Oversee Construction</td>
<td>Adjust MRO Inventory</td>
<td>Evaluate MRO Planning</td>
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Asset Management Goals

- Identify, develop or enhance business processes that cut across all business units.
- Identify the critical business areas that will create value and illustrate the probability of success.
Asset Management Goals

• Provide effective monitoring capabilities which allow decision makers to manage identified opportunities

• Prevent value destruction by stabilizing and positioning the organization for integration and implementation
Asset Management Plan

- **Risk Management**: includes reliability, environmental and business risks as well as specific actions to mitigate an event or action that would increase the probability that a risk event will occur
  - Business or financial
  - Occupational health and safety
  - Environmental and regulatory compliance
Asset Management Plan (AMP)

AMP governs all aspects of operations and maintenance
- Starts with commissioning
- Ends with disposal

Standard Work Procedures (SWP) define all processes step-by-step
Asset Management Plan

• **Operating Plan**: a comprehensive plan that defines and governs how the asset will be used and operated over its entire life cycle
  – Campaign cycles
  – Products produced
  – Continuous operating hours
  – Changeovers and
  – All other aspects of operations, including staffing, budgets and infrastructure requirements
Asset Operating Plan

Defines Operating Envelope of asset or process

- Boundary conditions, e.g. input-output
- Startup and shutdown procedures
- Permissible operating ranges and methods
- Operating campaigns
- Specific procedures for abnormal operating modes
Operating Plan

• Standardized Work Procedures (SWPs) for:
  – Setup and changeovers
  – Startup and shutdowns
  – Ramp and deceleration
  – Cleaning and autonomous maintenance
  – Calibration and adjustments
  – Materials handling
  – Performance monitoring
Asset Management Plan

• Maintenance Plan (MP): is the counterpart of the Operating Plan and provides governance of all aspect of the maintenance function required to sustain the asset over its life cycle

• It is much more than a simple listing of preventive or predictive maintenance tasks
Maintenance Plan

• All required maintenance tasks:
  – Preventive
  – Predictive
  – Rebuilds
  – Overhauls

• Maintenance intervals
• Durations
• Skills and manning
• Tools and materials
Maintenance Plan

• Defines maintenance organization
  – Structure
  – Crafts, skills and staffing
  – Support personnel
  – Materials and tools
  – Infrastructure

• The Maintenance Budget
Asset Management Plan

Strategy - **Develop a robust program within strategic framework.**

Business Review - **Implement with respect to critical business needs and without impact to scheduled operations.**

Technology Review - **Implement technology that can support processes at the business unit level but that can also be supported at the enterprise level.**

Implementation Planning - **Identify an implementation schedule based on the program and corresponding costs.**
Asset Management Plan Content

Background and Objectives

– Interaction with other goals, procedures and plans
– Planning period adopted
– Stakeholder interest
– Accountability and responsibilities for asset management
– Details of asset management systems and processes
Asset Management Plan Content

Assets covered

– Description of asset configuration
– Identification of assets by category
– Justification for assets
– Age and condition of assets
Asset Management Plan Content

Proposed levels of service

– Customer oriented performance targets
  • Operating cycles
  • Changeovers

– Other asset performance targets
  • Asset utilization
  • Overall equipment effectiveness

– Justification for target levels of service
Asset Management Plan Content

Development and Life Cycle Plans
– Description of planning criteria and assumptions
– Details of demand forecast
  • Nature of anticipated growth or decline
  • Issues to be considered in forecasting demand change
  • Existing demand and distribution of asset allocation
  • Load growth/decline projection
  • Infrastructure constraints
Development and Life Cycle Plans (con’t)

– Key processes
  • Non-asset solutions
  • Distributed generation/production
  • Acquisition of new assets
  • Adoption of new technology
  • Disposal of asset

– Analysis of options for meeting target service levels

– Description of maintenance strategies

– Description of development program
Risk Policies, Assessment and Mitigation
  – Methods, details and conclusions of risk assessment
  – Details of emergency response and contingency plans

Performance Measurement, Evaluation and Improvement
  – Review of progress against plan
  – Evaluation and comparison of actual performance against targets
  – Improvement initiatives
Asset Management Plan Content

Appendix

- Asset age and condition
- Detailed infrastructure performance measures
- Example of decision process
- Maintenance spend plan
- Development spend plan
- Risk management processes
- Asset maintenance plan
- Glossary of terms
AMP Creation

- **Asset Criticality**
  - All assets measured against same criteria
  - Sufficient stratification to be effective
    - Minimum of square root of number of assets

- **Identify Failure Modes and Inherent Weaknesses**
  - Operations and maintenance-related
  - **Tools**
    - O&M manuals
    - SFMEA
    - Historical data
    - Native knowledge
AMP Is Means To An End

- Capabilities
- Functions
- Priorities
- Reliability
- Maintainability
- Supportability
- Predictability
- System Availability
- Operation
- Maintenance
- Logistics
- Total Ownership Cost (TOC)
- Cost as an Independent Variable (CAIV)

System Performance
Technical Effectiveness
System Effectiveness
Process Efficiency
System Operational Effectiveness
Return On Net Assets (RoNA)

- For that $10M capital investment
  - 15 – 20 years of useful life
  - Minimum *Total Cost of Ownership* (TCO)
  - Best *Cost of Goods Sold* (COGS)
- Minimum $100M (10:1) *Return on Investment* (ROI)
- Effective AMP provides the roadmap to these goals