BENCHMARKING WORLD-CLASS MAINTENANCE

Coby Frampton, CMC
Charles Brooks Associates, Inc.
Benchmarking

- **Benchmarking** is the process of comparing one's business processes and performance metrics to industry bests and/or best practices from other industries.
- Dimensions typically measured are quality, time, and cost.
- Improvements from learning mean doing things better, faster, and cheaper.

* Wikipedia
WHAT IS WORLD-CLASS MAINTENANCE?

1. The best “simply do the basics very well.”*

2. The best also take a proactive approach to the management of maintenance.*

* Engineer’s Digest February 2001
THE ASSET MANAGEMENT PYRAMID*

Continuous Improvement

TPM

Predictive Maintenance

Operations Improvement

Financial Optimization

RCM

Stores and Procurement

Work-flow System

CMMS

IP - Technical Training

Preventive Maintenance

* Engineer’s Digest February 2001

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World-Class Maintenance Best Practices

- Planned Maintenance Work > 90%
- Breakdown/Crisis Work < 3%
- Maintenance Schedule Compliance > 90%
- Craftsmen per Planner = 15 to 20
- Maintenance Overtime < 5%
- Maintenance Direct Work > 65%
- MRO Inventory Turns > 3 per year
- Accurate CMMS Data
- Annual Maintenance Cost < 2.5% of ERC (Estimated Replacement Cost)
Characteristics of World-Class Maintenance Performance

- Clear Vision and Mission for Maintenance
- Proactive not Reactive
- Managed Costs
- Total Facility Understanding of & Participation in Maintenance
- Top Management Support
World-Class Performance Work Management

- Planned Maintenance Work > 90%
- Breakdown/Crisis Work < 3%
- Maintenance Schedule Compliance > 90%
- Craftsmen per Planner = 15 to 20
World-Class Performance Personnel Management

- Man-hours Charged to Work Orders = 100%
- Maintenance Call-in’s per month < 2
- Maintenance Overtime < 5%
- Training Days per Employee Year > 15
- Maintenance Direct Work > 65%
Maintenance Labor Productivity
U.S. Average Distribution of Maintenance Time

Best Practices for Direct Work = 65%

- Direct Work: 24%
- Waiting: 7%
- Unnecessary Breaks: 6%
- Personal Breaks: 5%
- Redo Work: 4%
- Poor Communication: 12%
- Late Starts/Early Quits: 12%

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Published studies show that in a *reactive* or emergency type of maintenance organization, craftworkers usually are *25-35 percent productive*. In organizations where good planning and scheduling disciplines are in use, however, productivity is much higher; it can often achieve levels of *60 percent or greater*—Terry Wireman, *Engineers Digest*

Case studies indicate *37 to 70% gain in efficiency* in one to five (1 to 5) years after implementing *maintenance planning and scheduling*—Amoco Chemicals, *Total Productive Manufacturing Manual*
World-Class Performance
Material Management

- MRO Service Level > 95%
- Inventory Turns per Year > 3
- Value of MRO % of ERV < 1%
World-Class Performance
Cost Management

- Annual Maintenance Cost to Original Investment in Equipment < 3%
- Annual Maintenance Cost to Estimated Replacement Cost < 2.5%
Direct Maintenance Costs

- Maintenance Labor
- Maintenance Materials
- Maintenance Overhead
DIRECT MAINTENANCE COST

Minimum approximately 50%

% Planned Maintenance

Breakdown
Planned
Indirect Maintenance Costs

- Equipment Availability
- Lost Capacity
- Equipment Life Cycle Cost
- Production Overtime
- Idle Production Personnel
- Scrap and Rework
- Expedited Shipments
- Late Deliveries
- Lost Customers
TOTAL MAINTENANCE COST

Minimum approximately 70%
The Hidden Cost of Poor Maintenance

- Equipment Availability
- Lost Capacity
- Equipment Life Cycle Cost
- Production Overtime
- Idle Production Personnel
- Scrap and Rework
- Late Deliveries
- Lost Customers
Levels of Maintenance

- Reactive
- Preventive
- Predictive
- Proactive
PERCEIVED WORLD-CLASS

Preventive: 47%
Predictive: 35%
Reactive: 18%

Survey conducted by K. Blache 1991
REACTIVE MAINTENANCE

Survey conducted by K. Blache 1991

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North American Maintenance Excellence Award

- Won by Few Companies
  (Alcoa, Baldor Marion Dodge, Aera Energy LLC, A. K. Steel Corp.)
- Peer Evaluation
- 1000-Point Evaluation of Maintenance
- Primary Focus on Work Process
  (540 of 1000 points in this area)
North American Maintenance Excellence Award Focus Areas

- **Materials Management**: 180
- **Organization**: 280
- **Work Processes**: 540

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North American Maintenance Excellence Award

Work Process

- Reliability-based **Preventive & Predictive Maintenance**
- Outstanding Environment, Health & Safety Record
- Disciplined **Planning & Scheduling Process**
- Total Quality/Continuous Improvement Process
- Effective **Performance Measurement & Reporting**
- Fixed Asset/Project Management Process
- Facilities Maintenance Process
Reduce Costs Through

**Maintenance Benchmarking**

To determine your opportunity for improvement you need to know where you are today. Maintenance Benchmarking addresses the following areas:

- Organization
- Procedures
- Planning and Scheduling
- Planned Maintenance and Lubrication
- Equipment Records and CMMS
- MRO Inventory
- Training
- Maintenance Costs
- Maintenance Performance Measurement (KPI’s)
Planning & Scheduling Benchmarking Topics

- Are maintenance activities planned?
- What percentage of maintenance time has been planned at least 24 hours in advance?
- Who plans and coordinates for labor, material, and equipment availability?
- Are estimates made for maintenance actions?
- What is the current backlog of work waiting to be done? (labor-hours)
- How are major upgrade/overhaul schedules determined?
- Is a flow chart of the planning and scheduling process available?
- Are operations and maintenance schedules coordinated?
Company X

Maintenance Benchmarking - Planning & Scheduling

A-G are other companies that have been benchmarked
Maintenance Cost Controls

Benchmarking Topics

- Does the organization have a long-range (3-5 years) spending plan?
- Does the department have an annual budget?
- Are sub-accounts maintained for different types of maintenance activity?
- How are indirect maintenance costs accounted for?
- Are cost comparisons made of repetitive jobs?
- Does the organization have a maintenance cost reduction program?
- Is maintenance cost performance data shared with hourly employees?
- Are maintenance costs charged back to the requesting departments?
- Is there a capital equipment acquisition plan?
A-G are other companies that have been benchmarked.
Sample Opportunity Graph

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## Maintenance Management Functional Analysis

<table>
<thead>
<tr>
<th>Function</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Identification</td>
<td>PM work identified. Work lists, hot lists on Excel/DB common</td>
</tr>
<tr>
<td>Work Prioritization</td>
<td>Informal. Production needs are first. Work lists</td>
</tr>
<tr>
<td>Documentation</td>
<td>Some PM work. Lacks detail. Heavy use of checklists. No audits</td>
</tr>
<tr>
<td>Scheduling</td>
<td>Informal. Supervisor and technicians. No measures of compliance. Due dates.</td>
</tr>
</tbody>
</table>
Peer Comparison

• Yard A maintained 29 overhead cranes for $2,091 per crane
• Yard B maintained 38 cranes for the same period for $1,539 per crane

Differential between yards is 26%
“Six Big Losses” In Equipment Effectiveness

**Down Time:**
1. Equipment failure - from breakdowns
2. Setup and adjustment - style change, etc.

**Speed Losses:**
3. Idling and minor stoppages - due to abnormal operation of line components
4. Reduced speed - due to discrepancies between design and actual speed of equipment

**Defect:**
5. Process defects - due to waste/quality defects
6. Reduced yield - from machine start-up to stable production
Your Current Operation

- Do you have a mission and a strategy or do you respond to crises?
- Do you track performance indicators or measure success by *keeping it running*?
- Do you understand the economics of what you are doing or do you leave it to the *bean counters*?
- Are you a manager or a supplier of people?
- Do you feel responsible for individual development through innovative training?
Your Current Operation

- Are you providing a “Technology” or a “Service”?
- Do you pro-actively manage by prevention or react to problems?
- Do you manage assets or repair equipment?
- Do you manage life cycle costing or accept the lowest cost solution?
- Do you do long-range planning or react to the squeaky wheel?
- Is there a maintenance strategy for every asset?
World Class Maintenance Requirements

- Clear Vision and Mission for Maintenance
- Well Defined Equipment Strategies
- Top Management Support
- A Proactive NOT Reactive Approach
- Accurately Managed Costs
- Total Facility Participation
- Effective Maintenance Planning
- Strict Cost Control
Elements Needed for Effective Maintenance

- Supervisory Control Routines
- Operator and Trades Training
- Management Training
- Methodology for Sharing Information
Elements Needed for Effective Maintenance

- Agreement on Maintenance Structure, Procedures, & Formats (DES, PM, PdM, SOP, Planning, Staffing, etc.)

- Consistent and Accurate Equipment Histories

- Consistent MRO Procedures

- Implementation of Effective Maintenance Planning and Scheduling
Elements Needed for Effective Maintenance

- Consistent Metrics to Evaluate Progress
- Consistent Application of Proven Techniques
- Commitment to *Make It Work*
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- Maintenance Benchmarking (MB)
- Controlled Maintenance (CM)
- Computerized Maintenance Managements Systems
- The Analytical Method of Training (AMT)
- Performance Excellence Process (PEP)
- High Performance Work Team Development
- New Technology Start-Up
- TEAM (Training, Engineering and Motivation)
- Supervisory Skills Development (SSD)