

# Maintenance and Reliability Best Practices

plus SMRP Body of Knowledge

2 Days Workshop

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Maintenance and Reliability Best Practices will provide any organization proven methods and concepts to help their organization obtain a highly level of Maintainability and Reliability.

This is an interactive training course covering Maintenance and Reliability Best Practices as proven by the best Maintenance organizations in the world. The objective of this program is to equip participants with Known Maintenance and Reliability best practices (World Class Maintenance) and provide them with knowledge which will better prepare them to transition any Maintenance Organization to a highly level of effectiveness and efficiency.

Known Best Maintenance Practices will be defined and demonstrated, along with numerous “hands on exercises) to enhance learning, and attendees will work in groups on real-world issues in each functional area in maintenance and reliability allowing learning from the instructor

## What “you” should expect to take away from this training:

1. Better understanding of Maintenance and Reliability Best Practices and how to apply in any organization.
  2. Recognition of the gaps in your Maintenance Organization and how to close those gaps.
  3. A simple plan one can implement when they return.
  4. Feel pride in your Maintenance Work through the knowledge one has gained.
  5. Less stress through new knowledge and skills gained.
  6. Over 12 “Hands on” Exercises
- ... and so much more

## What should “your leadership” expect to see when you return?



- A more confident professional based on knowledge gained in the training.
- A simple plan with “quick wins” and long-term sustainment
- A simple but effective Maintenance Dashboard which can be implemented.
- Procedure Templates and other items which can be used upon return.

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## WORKSHOP OBJECTIVES

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- ❖ Learn what are Known Maintenance and Reliability Best Practices and how to apply in any organization.
- ❖ Review what is “World Class Maintenance” (based on the Alcoa Mt Holly Model, workflow, attributes, benchmarks and how to achieve this level of performance)
- ❖ Assess the current state of your Maintenance Organization and create a plan to Optimize through application of the “Crawl, Walk, Run Methodology”
- ❖ Learn how to:
  - Develop Maintenance Leading and Lagging KPI Scorecard for your Organization
  - Define Roles and Responsibilities for all Maintenance Functions using RACI
  - Perform a PM Optimization in your plant/facility on assets which are not meeting expectations
  - Increase “Maintenance Wrench-Time” through optimizing Maintenance Planning and Scheduling
  - Create Maintenance Process Maps and why are so critical to optimization of your Maintenance Function
  - Optimize use of Maintenance Technician through “Best Maintenance Technician Practices”
  - Reduce Maintenance Rework and Optimize Mean Time Between Failures through proven concepts and principles
  - Define what is Preventive and Predictive Maintenance and how they impact proactive maintenance.
  - Implement a “Change a Management Process” which transitions your current maintenance culture to a more proactive culture
  - Optimize a Maintenance Storeroom resulting reduced stockouts
- ❖ Become more confident as a Proactive Maintenance Professional because of knowledge provided along with over 12 “Hands On” Exercises
- ❖ How to move from the Current State to an Increased reliability of production assets
- ❖ ... and so much more

### Maintenance and Reliability Initiative Objective:

Increase reliability of production assets on a specified production line by 8% with a financial value of \$8 million the first year.” Developing the initiative’s objective and assigning value to it is important in order to receive management’s approval.

The preceding objective could be broken down further into more defined measurements, to include:

- Increase number of units produced in year 1, year 2, year 3, and so on.
- Reduce cost per unit in year 1, year 2, and so on.
- Increase in quality yield by X% in year 1, year 2, and so on.
- Reduce maintenance cost by 10% in year 2, 20% in year 3, and 30% in year 3 based on current maintenance material, labor, and contractor costs.

# Day 1: Maintenance and Reliability

## Day 1: Maintenance and Reliability Overview

- ❖ Instructor and Attendee Introductions
- ❖ Expectations from training
- ❖ Expectations from each attendee
- ❖ Expectations from instructor
- ❖ Daily Training Schedule
  - Pre-Test
- ❖ Definition of Maintenance
- ❖ Definition of Reliability
- ❖ What does “World Class Maintenance” look like and where was it created?
- ❖ World Class Maintenance Benchmarks
- ❖ Maintenance Leading and Lagging KPIs
- ❖ Work Identification
- ❖ Definition and expectations from PM and PdM
- ❖ The PF Curve and How does it Work.
- ❖ Repeatable Procedures
  - Repeatable Procedure Exercise
- ❖ The RACI Model to define Roles and Responsibilities.
  - RACI Exercise

Task	Position	Identify	Plan	Do	Check	Act	Review	Improve
Create / Manage Asset Criticality		C	R	C	I	I	C	A
Identify all Components		A	R	C	R	C	R	I
Identify each Component's Fail Mode		A	R	C	R	R	C	I
Write Repeatable PM Procedures		A	R	C	R	C	C	I
Monitor / Monitor PM Effectiveness		A	R	C	C	R	C	I
Modify PMs		A	R	R	R	C	C	I
Manage Maintenance Dashboard (Leading / Lagging KPIs)		A	R	R	I	C	I	I

Responsibility Legend:  
 C: Create / Develop  
 R: Review / Approve  
 I: Implement / Execute  
 A: Approve / Authorize  
 M: Monitor / Measure  
 S: Sustain / Support  
 U: Update / Improve

## Preventive Maintenance

- ❖ Failure Modes and how to manage and mitigate them
- ❖ Developing and Managing a PM Program/Process
- ❖ Steps required to develop an Effective PM Program
- ❖ Writing a Repeatable/Effective PM Procedure
- ❖ Preventive Maintenance Roles and Responsibilities (RACI)
- ❖ Managing a PM Program
- ❖ Preventive Maintenance Leading and Lagging KPIs
- ❖ 14 Steps of a PM Optimization Process
- ❖ How to Manage a PdM Program
  - Preventive Maintenance Exercise

## Predictive Maintenance (PdM) / Condition Monitoring (CBM)

- ❖ Definition of PdM and CBM)
- ❖ The Objective of PdM / CBM
- ❖ Vibration analysis
- ❖ Ultrasonic analysis
- ❖ Infrared analysis
- ❖ Oil analysis
- ❖ Laser-shaft alignment
- ❖ Motor circuit analysis
- ❖ Non-Destructive Testing
- ❖

# Workflow Processes

- ❖
- ❖ World Class Maintenance (Alcoa Mt Holly)

## Maintenance Planning

- ❖ Maintenance Planning Definition
- ❖ Maintenance Planning Workflow
- ❖ Maintenance Planning Leading and Lagging KPIs
- ❖ Maintenance Planning Roles and Responsibilities

## Maintenance Scheduling

- ❖ Maintenance Scheduling Definition
- ❖ Maintenance Scheduling Workflow
- ❖ Maintenance Scheduling Roles and Responsibilities (RACI)
  - Maintenance Planning and Scheduling Exercise

## Work Execution

- ❖ Work Execution Definition
- ❖ Work Execution Leading and Lagging KPIs
- ❖ Work Execution Roles and Responsibilities (RACI)

## Work Order Closeout

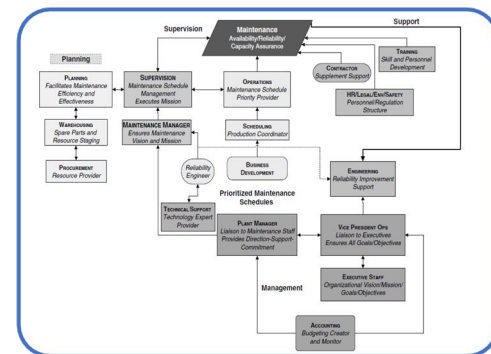
- ❖ Work Order Close Out Definition
- ❖ Work Order Close Out Leading and Lagging KPIs
- ❖ Work Order Close Out Roles and Responsibilities (RACI)

## Maintenance Dashboards

- ❖ Objective of Maintenance Dashboards
- ❖ Maintenance Dashboard Fundamentals
- ❖ Steps to Creating a Maintenance Dashboard

## Reliability Best Practices

- ❖ GFMAM Asset Management Landscape
- ❖ IAM Competency Framework
- ❖ ENGINEERING RELIABILITY FAULT TREES AND RELIABILITY BLOCK DIAGRAMS by Harry G. Kwatny
- ❖ ADKAR (Book) A Model for Change
- ❖ SMRP Definitions and how they can help your organization align everyone's definitions in Maintenance.
- ❖ Maintenance Best Practices Questions
- ❖ Failure Reporting, Analysis, and Corrective Action System (FRACAS)
- ❖ Best Maintenance Repair Practices
- ❖ How to Maintain Mechanical Components
- ❖ How to Maintain Electrical Components
- ❖ 2 Things one learned from today.



# Day 2: Transitioning from Current State to a Proactive State

## Business & Management

- ❖ Create a strategic direction and plan for Maintenance and Reliability Operations
- ❖ Vision, Mission, and Strategic Plan to achieve business goals.
- ❖ Maintenance and Reliability Leaders utilize knowledge of industry benchmarks to establish goals.
- ❖ The Value of Effective Metrics
- ❖ Managing with Leading and Lagging KPIs which measure the direction and success of Maintenance and Operations.
- ❖ Safety and Environmental issues are Critical to Success.

## Manufacturing Process Reliability

- ❖ Maintenance is critical to ensuring success of Manufacturing Processes.
- ❖ Manufacturing Process Reliability Principles
- ❖ Process Flows are defined.
- ❖ Continuous Improvement through Lean Six Sigma
- ❖ KPIs - Operation Driven Reliability (ODR), OEE and TEEP
- ❖ Management of Change and Change Management Protocols

## Equipment Reliability

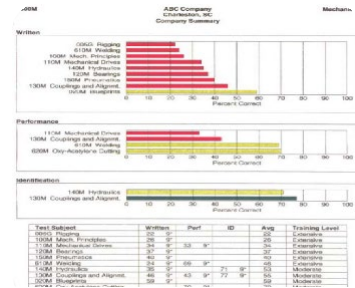
- ❖ Activities that apply to equipment and processes for which maintenance is accountable.
- ❖ Access current capabilities of equipment and processes in terms of reliability, maintainability, availability, and criticality
- ❖ Activities selected to apply the most appropriate maintenance practices, so they deliver capabilities in the safest and most cost-effective manner.
- ❖ Equipment performance expectations analyzed through methods such as Root Cause Analysis, Weibull Analysis, etc.
- ❖ Nominal design parameters and best demonstrated performance are evaluated and compared to inherent design.
- ❖ Defining Predictive and Condition Based Maintenance
- ❖ Understanding the application of Predictive (PdM) and Condition Based Maintenance Technologies to include
  - Vibration Analysis
  - Infrared Thermography
  - Ultrasonic Testing
  - Lubrication and Wear Particle Analysis
  - Electrical Condition Monitoring
  - Non-Destructive Testing
- ❖ What is Design for Reliability, Availability, and Maintainability?
  - Key Terms and Definition
  - Reliability Block Diagram
  - The Failure Curves
  - Reliability Distribution
  - Asset Life Cycle Cost

The six conditional failure probability patterns

		UAL 1978	Broberg 1973	MSDP Studies 1983	SSMD 1993
Age Related / Wearout	A.	4%	3%	3%	6%
	B.	2%	1%	17%	0%
	C.	5%	4%	3%	0%
Evidence of wearout		11%	8%	23%	6%
Random / No wearout	D.	7%	11%	6%	0%
	E.	14%	15%	42%	60%
	F.	68%	66%	29%	33%
No evidence of wearout		88%	92%	77%	93%

## Organization and Leadership

- Organizational structure and alignment to the strategic plan
- Skills, Competency and Performance analysis
- Job Task Analysis, Skills Assessments
- Training



## Work Management

- Maintenance Workflow
- Work Requests and Work Request Flow
- Identifying work
- Equipment numbering
- Maintenance Backlog
- Priority Systems
- Approval Systems

## Maintenance Technician

- Maintenance Skills
- How to Change Maintenance Technicians way of thinking
- Engaging Technicians
- Roles and Responsibilities

**Final Exercise: Creating a Master Plan to transition your organization to a higher level of reliability and maintainability along with a Maintenance Dashboard**

**If you would like to attend or need more information, send an email to [rsmith@worldclassmaintenance.org](mailto:rsmith@worldclassmaintenance.org)**