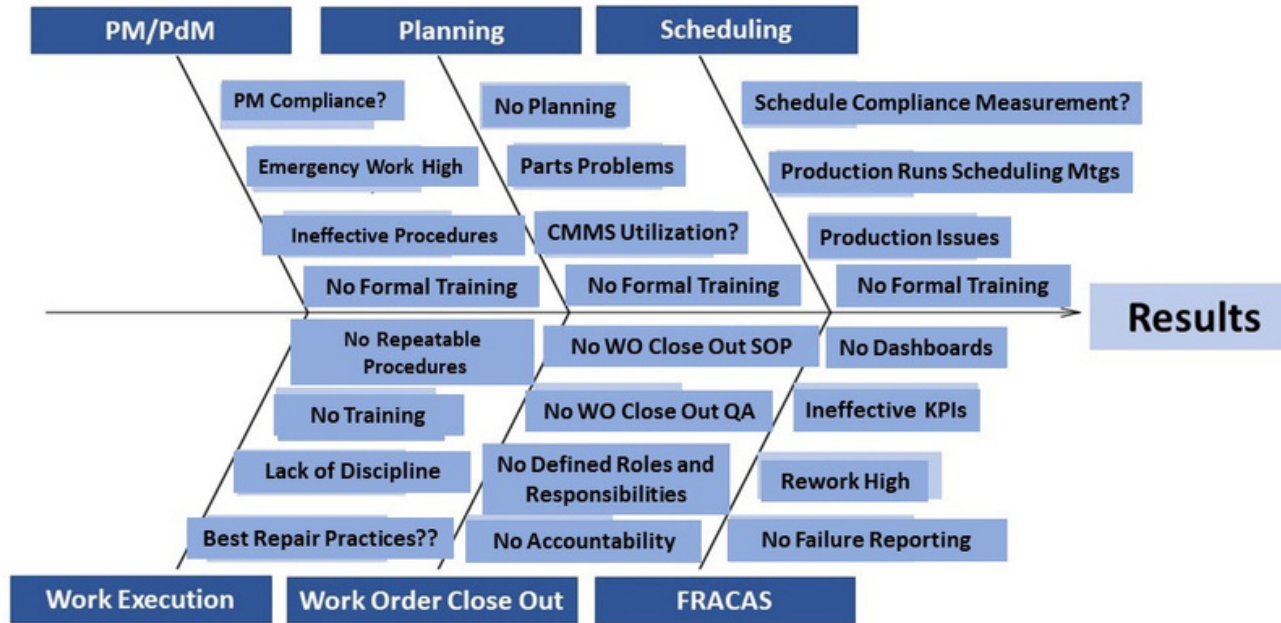


# HOW TO MOVE FROM REACTIVE MAINTENANCE TO PROACTIVE MAINTENANCE, STEP BY STEP

BY: **RICKY SMITH, CMRP,  
CMRT, CRL**



## Contributing Factors to Maintenance Problems/Issues "Ishikawa Diagram"



# Who am I?

•Over 30 years' experience working as a Maintenance and Reliability Professional for companies/organizations such as US Army, Exxon Company USA, Alcoa Mt Holly, Kendall Company, and Life Cycle Engineering. In addition, Ricky worked as a Maintenance Consultant/Educator with hundreds of companies in over 30 countries world-wide.

-Maintenance Technician (Exxon, Alcoa Mt Holly)

-Maintenance Supervisor

-Maintenance Manager

-Maintenance Engineer

-President / Owner –Technical Training Corporation

-Vice President (Life Cycle Engineering and World Class Maintenance)  
Maintenance Consultant / Educator

-Maintenance Company Commander (US Army Reserves)

•Certified Maintenance and Reliability Professional (CMRP), a Certified Maintenance and Reliability Technician (CMRT) and a Certified Reliability Leader (CRL)



# Why this Webinar at this Time?

**In the past 6 months I have seen...**

- 1. Organizations cut budgets and staff because sales were going down as a result of the coronavirus which increases reactivity**
- 2. A number of plants which have been reactive for a long time now need to satisfy the owners of their company because sales are down**
- 3. Maintenance cost is increasing because plants have reduced staff to ensure the stockholders/owners receive their expected Return on Investment**
- 4. Everyone is looking for silver bullet, but they were sold out a long time ago**
- 5. Bottom line, companies need to increase shareholder value**



# Pre-Test

## 1. What is Maintenance Planning?

a. Scheduling of Maintenance Activities

b. To identify who does what, when and where

c. To identify parts, labor, skill, required for scheduled work in the future ←

d. None of the above

## 2. What is Maintenance Scheduling?

a. To schedule maintenance activities by day, by hour ←

b. To plan maintenance activities for the week

c. To schedule maintenance activities by person, by day, by hour

d. None of the above

## 3. What is Wrench-Time?

a. The amount of time a maintenance person is working

b. Is a measure of crafts personnel at work, using tools, in front of jobs ←

c. Schedule work completed

d. None of the above

## 4. When to use a Repeatable Procedure?

a. On all Critical jobs

b. When working on critical assets

c. Do not know what a Repeatable Procedure looks like

d. Maintenance Work which requires repeatability in execution ←



What is your score? Text it in



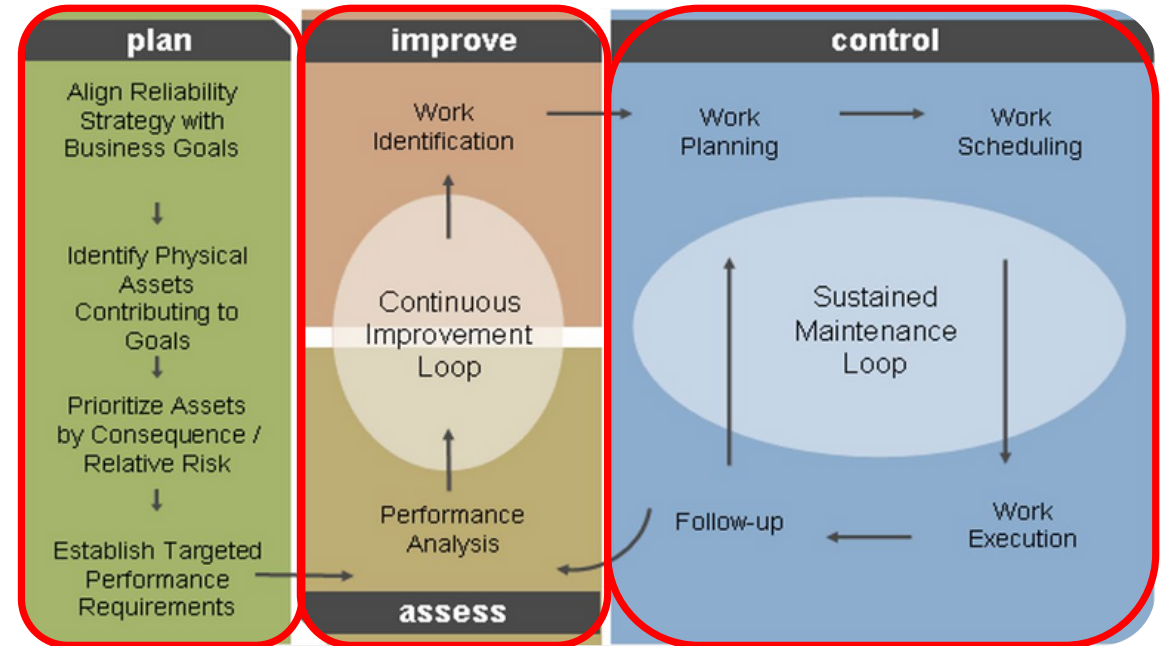


## “Proactive Maintenance is a Journey and Not a Destination, the View Improves as we focus on the right things”

- Maintenance’s Alignment with Production to Optimize Process Reliability –Increase Profit
- Managing with the right Leading and Lagging Metrics/KPIs with Dashboards
- Optimization of the PM Program (eliminate waste)
- Optimization of Planning and Scheduling thus increasing wrench-time
- Engagement of Maintenance Technicians and Operators to make the right decisions
- Training is built into the culture to align everyone with the “Best Practices” knowledge and focus

# What does Proactive Maintenance Look Like?

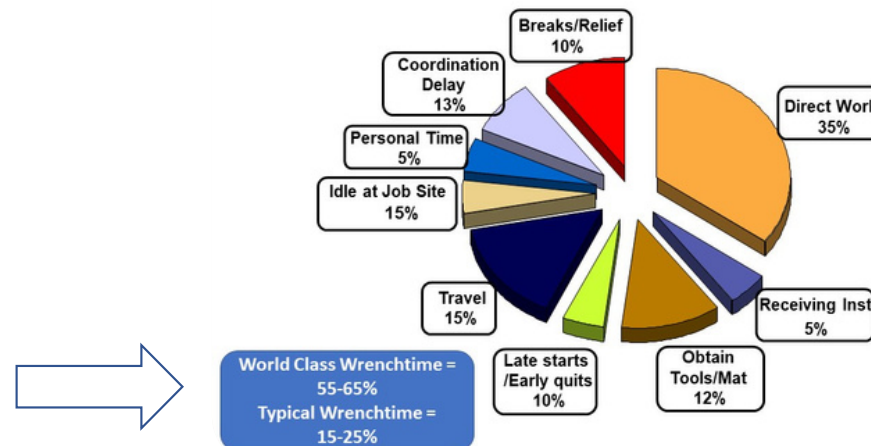
QUARTILE	MAINT \$ % RAV	STORES \$ % RAV	% VIBE	% IR MECH	% IR ELEC	% OIL ANALYSIS	% TRAD NDT	% ON PM	% ON BOM
Top 1st	1.4%	0.3%	88.5%	71.0%	100.0%	38.1%	51.0%	20.0%	71.0%
Middle 1st	3.1%	0.6%	78.0%	60.9%	91.0%	35.7%	42.0%	23.0%	65.0%
Top 2nd	4.1%	0.8%	60.0%	51.7%	85.6%	29.8%	36.1%	24.0%	59.0%
Middle 2nd	5.7%	1.7%	51.2%	41.2%	83.0%	24.3%	29.8%	27.0%	55.0%
Top 3rd	7.1%	2.9%	44.4%	34.6%	79.8%	19.8%	22.9%	28.0%	50.0%
Middle 3rd	8.9%	4.1%	29.3%	21.2%	69.8%	15.4%	18.7%	31.0%	45.0%
Top 4th	10.8%	5.4%	19.8%	15.0%	63.8%	10.8%	13.7%	35.0%	41.0%
Middle 4th	13.7%	7.4%	9.3%	3.6%	56.7%	5.1%	8.9%	37.0%	36.0%
Bottom 4th	17.3%	12.2%	2.9%	0.0%	48.7%	1.0%	4.1%	39.0%	28.0%



# What does “PROACTIVE MAINTENANCE” look like? cont.

1. Maintenance Process Maps align everyone’s thinking and provides the road map to success
2. Preventive Maintenance is conducted as a controlled experiment, “Equipment is put into a controlled state (fully functional) and tasks are performed to mitigate specific failure modes”
3. Maintenance Planning and Scheduling is critical to plan and schedule ALL Proactive Work to increase “WRENCHTIME”
  - 90% plus of all Maintenance Work is Planned and Scheduled (2 functions which are dependent on each other)

Current Labor Utilization (Wrenchtime) in “good or typical” Maintenance Organizations





# Maintenance Process Map Examples

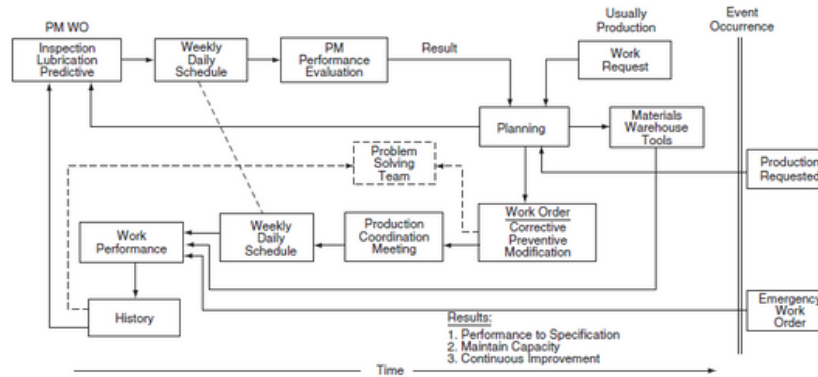
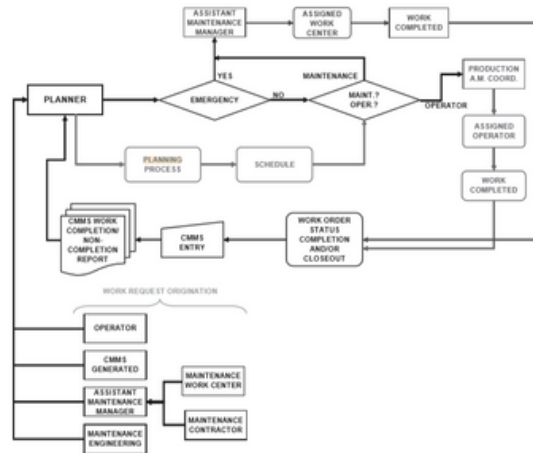
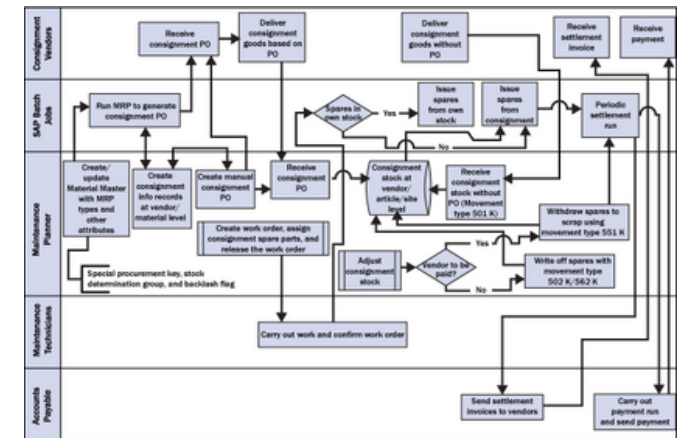
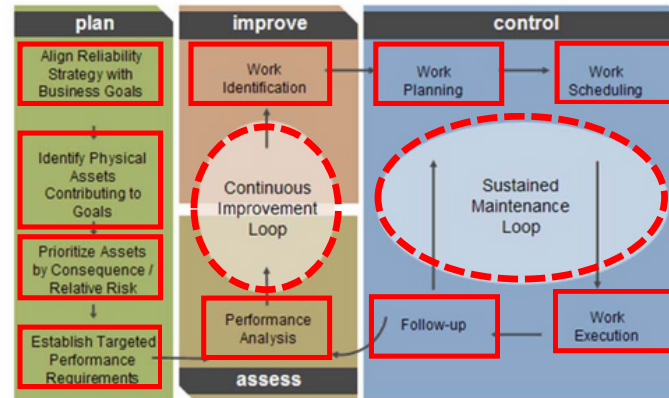


FIGURE 1.2. Mt. Holly's proactive maintenance model.



2005  
Lean Maintenance

## Alumax Mt Holly 1978



Process Map with Swim Lanes

## Rules of Thumb for Maintenance and Reliability Engineers



# World Class Maintenance vs Typical Attributes

Category		
Maintenance Cost as a % RAV	5.6 – 11%	2.0-3.5%
Budget Compliance	?	100%
Planners per Craftsperson	No Planner or No Proactive Planning Process	1 - 20
Absenteeism	10% plus	+/- 5.0 %
Ready Backlog in Weeks	Unknown	2-4 weeks
% Planned Work	15% or less	90%
Schedule Compliance	50%	90-100%
PM Compliance	60%	95-100%
Inventory Accuracy	Unknown	95% plus
Maintenance Training Cost	No Budget	6% of Budget
Maintenance Rework	High	Low
Accurate Maintenance Dashboard	Not Available	100%



# PLANT RELIABILITY AS A RESULT OF PROACTIVE MAINTENANCE

**Alcoa Mt Holly –The 1st Maintenance Organization in the World Certified as “World Class”  
Created by John Day, PE –Retired Engineering and Maintenance Manager**



# **MAINTENANCE Vision**

**The Maintenance Vision will be achieved through a  
Total Proactive approach to  
Maintenance based on  
CENTRALIZED,  
PROACTIVE MAINTENANCE PLANNING  
and  
DECENTRALIZED EXECUTION  
of the work.**



# MAINTENANCE Mission

**The Maintenance Mission for any Plant/Facility is to provide an efficient operating facility at all time through minimizing unscheduled / scheduled downtime and by approaching maintenance as an investment with a goal of minimizing the cost over the long run.**





An organization is either...

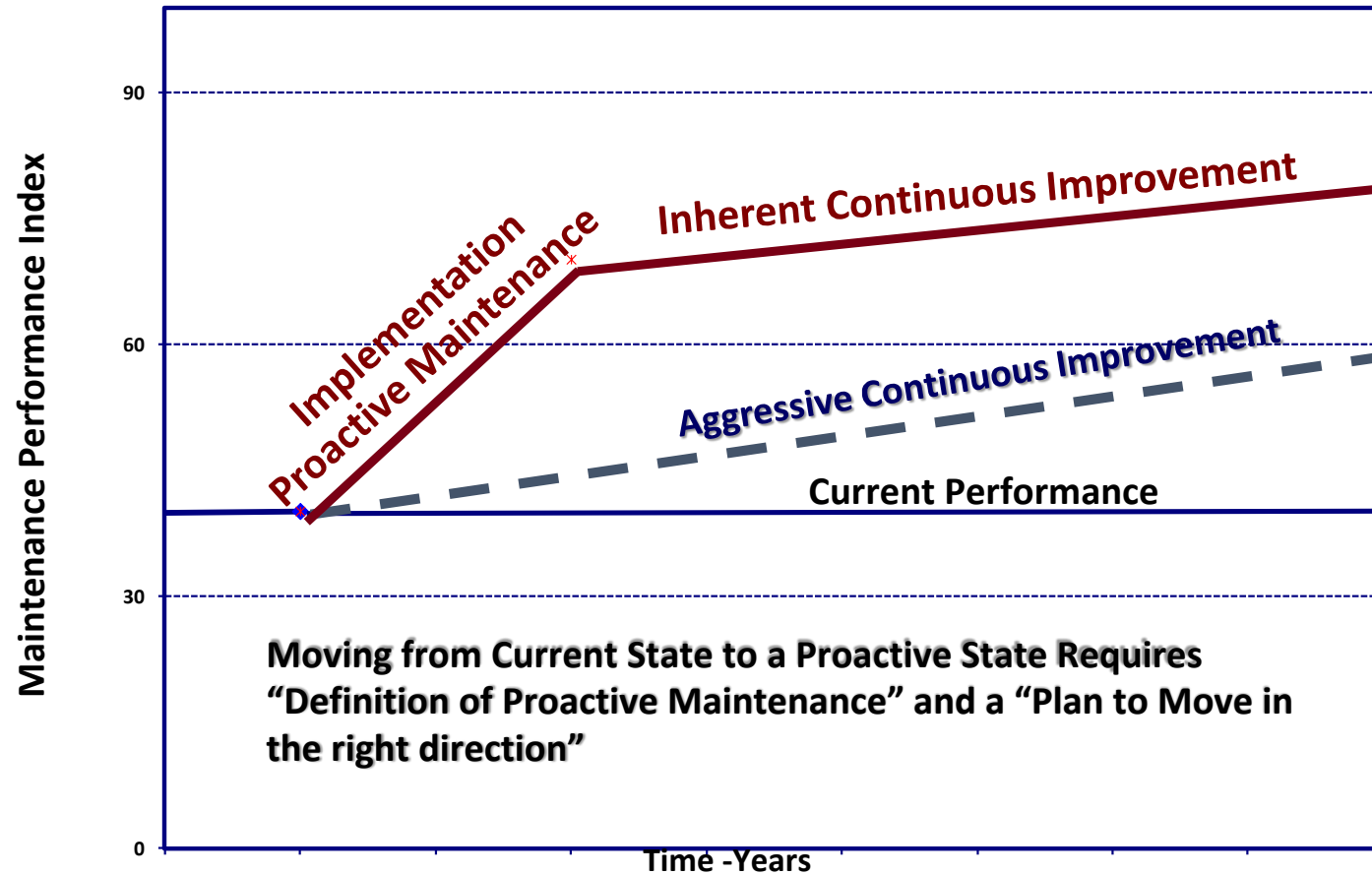
REACTIVE

VS

PROACTIVE



# Proactive Maintenance VS. Continuous Improvement



# MAINTENANCE PHILOSOPHY

- **Focus on Optimizing Wrench-Time**
- **Maintenance Cost is seen as an Investment vs. a Burden**
- **Maintenance is Managed through Process Maps**
- **Decisions / Actions Made at Lowest Level**
- **Preventive Maintenance and Planning and Scheduling are highly Effective**

# MAINTENANCE FUNCTION

- The Maintenance Function has well defined Roles and Responsibilities through RACI
- Single Point Accountability for Costs, Uptime, Budget
- Frequency and Level of Maintenance
- Reporting Level for Maintenance
- Credibility
- Equal Partner

Maintenance "Roles and Responsibilities"								
Task Position	Plant Mgr.	Prod Mgr.	Maint Mgr.	Stores Mgr.	Maint Tech	Maint Super	Maint Planner	CMMS Admin
CMMS Management	I	I	C	C	I	C	R	A
Lean Leading and Lagging KPI Management	I	I	A	C	I	C	R	R
Preventive Maintenance	I	I	A	I	R	C	C	C
PM Evaluation/Optimization	I	C	A	C	R	R	R	R
Maint. Planning/Scheduling	I	R	A	I	I	R	R	I
Work Execution	I	I	A	I	R	C		I
Maintenance Rework	I	I	A	C	R	C	C	C
Production Rework	I	A	I					
Failure Reporting, Analysis, Corrective Action Process	A	R	R	C	I	C	C	C

<b>R</b> esponsibility	<b>"the Doer"</b> (could be more than one)
<b>A</b> ccountable	<b>"the Buck stops here"</b> (One person only)
<b>C</b> onsulted	<b>"two-way communication"</b> (in the Loop)
<b>I</b> nformed	<b>"one-way communication"</b> (kept in the picture)

# MAINTENANCE INDUCED FAILURE

**70%**

**Lack of SKILLS**

**Lack of MEMORY**

**Lack of SPECIFICATIONS**

**Lack of an effective PLAN**



# MAINTENANCE

The act of **MAINTAINING**.

TO MAINTAIN

**KEEP** in an existing state.  
**PRESERVE** from failure or decline.

Keep

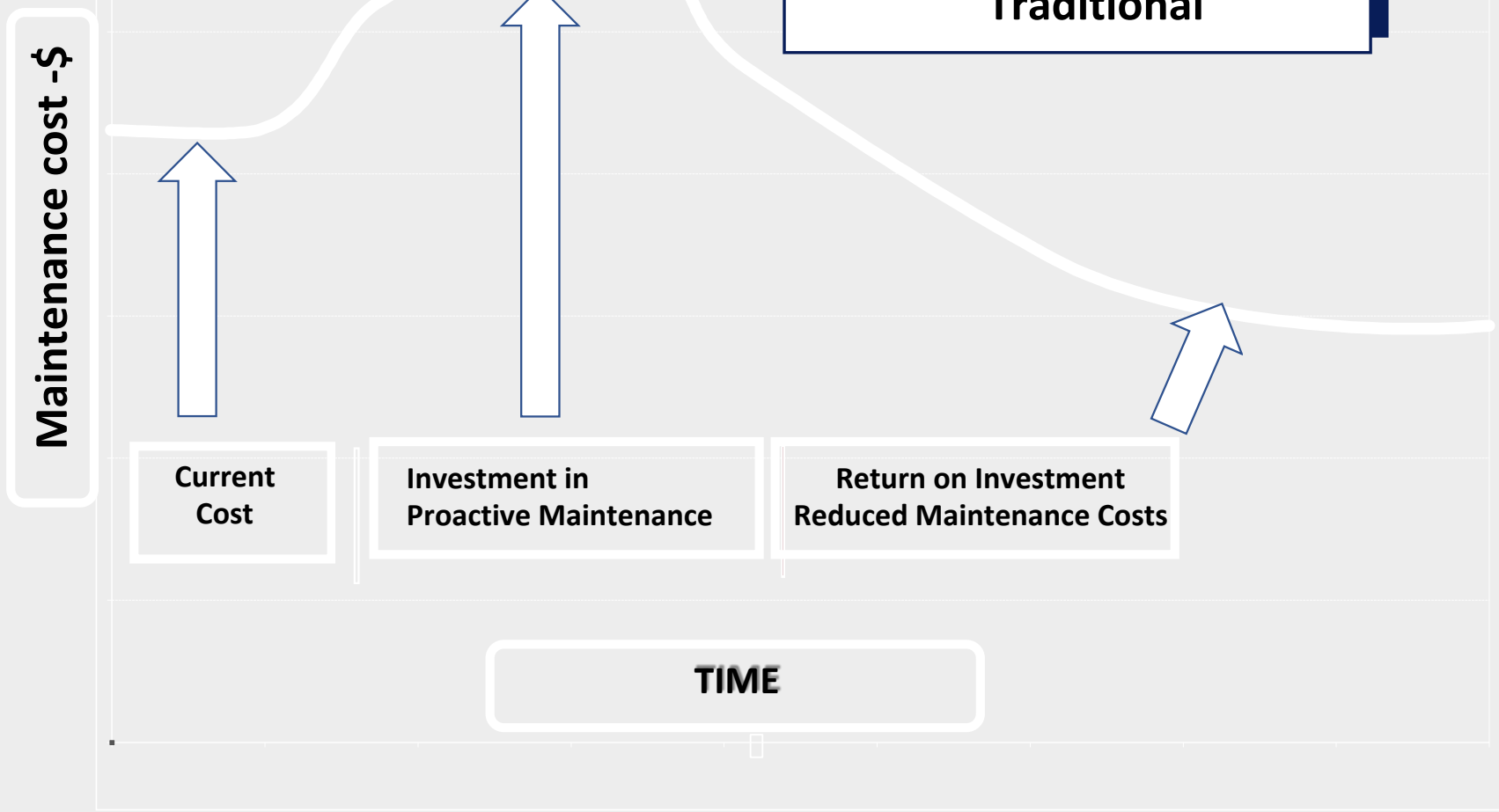
Preserve

Protect



# Cost of Maintenance

Proactive  
vs.  
Traditional



# MAINTENANCE

IS A

# PROCESS



THE  
MAINTENANCE  
PROCESS  
PRODUCES  
CAPACITY



# CMMS Requirement

- All Maintenance Work is captured through a Work Order, charged to an asset resulting in maintenance data used to Optimize Equipment Reliability and make the right decisions at the right time

**CMMS is Fully Implemented and Utilized 100% to manage asset reliability**

**Maintenance is seen as an Investment**

- Training
- Acceptable Facility
- Fully Functional Storeroom
- Maintenance Planning and Scheduling
- Failure Reporting used to mitigate “Bad Actors”
- RCA is applied to mitigate chronic failures and problems
- Manage Cost through a Proactive Approach to Maintenance
- Management Support



## CMMS – A HIDDEN TREASURE

- Investing in a CMMS is very similar to any other capital investment.
- One significant difference between the CMMS investment and other capital investments is that, over time, your return on investment for a CMMS will increase.
- This is because the CMMS system is doing something hardware doesn't. It is collecting information that can then be used to further improve the efficiency of your processes.
- Maintenance must be managed with a fully functional CMMS in order to repeat benefits expected



# Without a Fully Integrated CMMS you cannot improve Cost and Asset Reliability

## CMMS Optimization Plan

Task / Positions → ↓	Maint. Mgr.	Prod. Mgr.	Maint. Planner	Reliability Engineer	Stores Manager	CMMS Administrator	Plant Mgr.
Define Expected Outcome from CMMS	A	R	C	C	C	R	I
Verify Asset Hierarchy Source: ISO 14224	A	R	R	R	I	R	I
Walk down equipment / verify equipment data	A	C	C	R		R	I
Restructure Data if needed – Vertically/Horizontally	A	I	R	R	C	R	I
Verify Maintenance Process Maps are Optimized	A	R	R	R	R	R	I
Establish Leading/Lagging KPIs for all Maintenance Processes	A	I	R	R	R	R	I

**THE  
MAINTENANCE  
PROCESS  
IS  
AN  
INFORMATION  
DRIVEN  
PROCESS**

Which Requires a “Fully Functional CMMS” which is Fully Utilized

Responsibility  
Accountable  
Consulted  
Informed

“the Doer” (multiple people)  
“the Buck stops here” (one person)  
“in the Loop” (2 way Communication)  
“kept in the picture” (1 way Communications)

# RESULTS of PROACTIVE VS TYPICAL MAINTENANCE

	<b><u>PROACTIVE</u></b>	<b><u>TYPICAL</u></b>
Planned / Scheduled	<b>91.5%</b>	<b>30-50%</b>
Breakdowns	<b>1.8%</b>	<b>15-50%</b>
Overtime	<b>0.9%</b>	<b>10-25%</b>
Inventory Level	<b>1/2 Normal</b>	<b>Normal</b>
Call-Ins	<b>1/Month</b>	<b>Routine</b>
Off-Shift Work	<b>5 People</b>	<b>Full Crew</b>
Backlog	<b>5.5 Weeks</b>	<b>Unknown</b>
Budget Performance	<b>Var.1-3%</b>	<b>High Var.</b>
Capital Replacement	<b>Low</b>	<b>High</b>
Stock outs	<b>Minor</b>	<b>Routine</b>

# **CAPACITY ASSURANCE (MAINTENANCE)**



# Work Management –Core Beliefs

- 1.Planners remain focused on FUTURE WORK only.**
- 2.Planners do not chase parts for jobs in progress.**
- 3.Supervisors and crew leads handle the current day’s work and problems.**
- 4.Faced with the choice, a line supervisor must concentrate on today’s problems rather than work on future (even tomorrow’s) activities.**
- 5.There is no such thing as a perfectly planned job –continuous improvement is a must.**
- 6.All stakeholders must share the same priorities –active communication on priorities is an absolute requirement.**



# Reactive vs Proactive Maintenance Cost

The difference between reactive and proactive maintenance cost is high

**REMEMBER THIS: IT IS ALL ABOUT THE MONEY**

## Maintenance Cost as % Replacement of Asset Value (Source: SMRP Glossary)

Replacement Asset Value (RAV) Definition. The monetary value that would be required to replace the production capability of the present assets in the plant. It includes the replacement value of the buildings and the grounds if these assets are maintained by the maintenance expenditures.

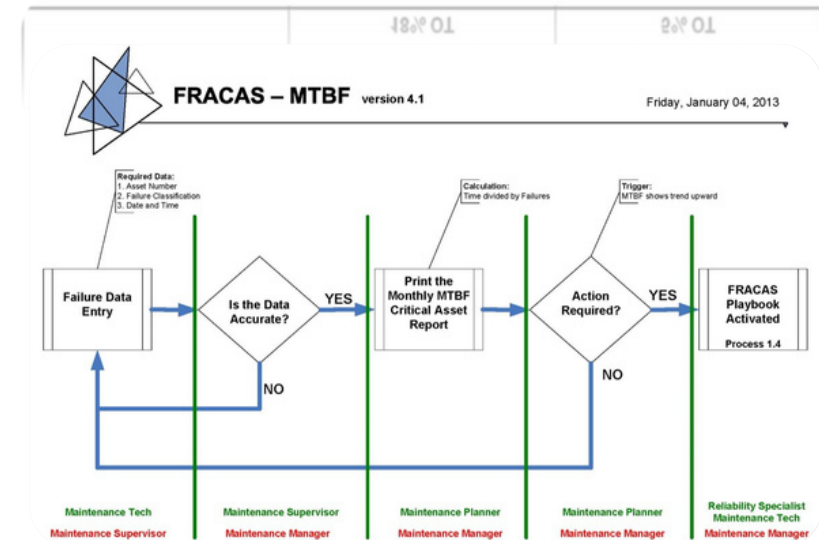
World Class Maintenance Cost as a % of Replacement of Asset Value = 2.0 – 3.4%

Typical Maintenance Cost as a % of Replacement of Asset Value = 4.5 – 11.2%

# What is Required to Move Reactive to Proactive?

1. Senior Leadership Commitment
2. Knowledge of Maintenance and Reliability Best Practices
3. Admitting you are Reactive
4. Identifying the attributes of Reactive Maintenance
  - If you are performing Preventive Maintenance and Equipment Continues to break down or not meeting expectations
  - If you do not have a fully functional CMMS
  - How do you know if your CMMS is not “Fully Functional”?
    - if “ALL” maintenance work is not charge to an asset via a “Work Order” your CMMS is not meeting requirements and maintenance failures are NOT Tracked effectively
    - No “Formal planning and scheduling function” resulting in low wrench-time
5. Focusing on Wrench-time resulting in increased asset reliability through “MAINTENANCE PLANNING AND SCHEDULING”
6. Manage with Maintenance Best Practices Process Maps
7. Manage Losses through a Failure Analysis Process

FTE Positions	Before	After
PM Techs	43	17
PdM Techs	0	11
Planners	0	8
Reliability Engineers	0	2
RE Techs	0	5
Balance of Crew	57*	57*
* Notes	Wrench time @ 28% 35 contractors 18% OT	Wrench time @ 50% 12 contractors 5% OT



# Focus on “Known Maintenance Best Practices”

Metrics	Typical Maintenance	World Class Maintenance	
Maintenance Cost as a % RAV	5.6 – 11%	2.0-2.5%	5.6 – 11%
Budget Compliance	Less than 60%	100%	than 60%
Planners per Craftsperson	No Planner or No Proactive Planning Process	1 - 20	
Absenteeism	10% plus	+/- 5.0 %	10% plus
Ready Backlog in Weeks	Unknown	2-4 weeks	Unknown
% Planned Work	15% or less	90%	15% or less
Schedule Compliance	50%	90-100%	50%
PM Compliance	60%	95-100%	60%
Inventory Accuracy	Unknown	95% plus	Unknown
Maintenance Training Cost	No Budget	6% of Budget	No Budget
Maintenance Rework	High	Low	High
Accurate Maintenance Dashboard	Not Available	100%	Not Available





# Steps to Move from Reactive Maintenance to Proactive Maintenance

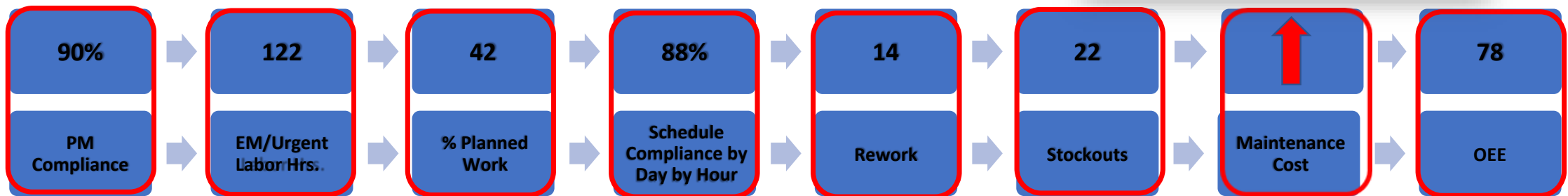
- 1 Admit you are in Reactive Maintenance
  - Educate you and your team leadership in Proactive Maintenance (attend FORMAL TRAINING)
- 2 Establish a baselinewhere your organization is currently with the following metrics...
  - Production Cost per Unit Produced
- 3
  - Identify current Maintenance Cost
  - Identify current Maintenance Labor Cost
  - Identify current Maintenance Material Cost
  - Identify Stores Stockouts
  - Maintenance Overtime
4. Create a Maintenance Dashboard to keep your plan on track

Maintenance and Reliability Best Practices Workshop  
May 18-20

Facts concerning the training:

1. The training is held Virtual via Zoom (internet) and Live at (Southern Wesleyan University, 4 miles from Clemson, SC)
2. Training includes multiple hands-on exercises to enhance learning
3. Best Practices documents and templates will be provided so you can take back to your organization to assist in change
4. Each attendee will create a simple plan they will be able to implement when they return
5. Each attendee will create a Maintenance Dashboard which can be applied to their organization when they return ... and so much more

For more information email Ricky at:  
[rsmith@worldclassmaintenance.org](mailto:rsmith@worldclassmaintenance.org)



# Steps to Move from Reactive Maintenance to Proactive Maintenance, Cont.

5. Establish a Baseline of your current Maintenance Organization's Maintenance Cost as a % of asset value against World Class

TABLE 7.2. Maintenance Costs in Typical and World-Class Companies

Metric	Typical	World Class
Maintenance cost/replacement asset value Maintenance cost must include labor (including overtime), materials, contract maintenance, and capital replacements, and maintenance (replacing worn-out assets because they were never properly maintained)	3.5–9%	2.0–3.0%
Maintenance materials cost/replacement asset value Maintenance materials cost must include material in storeroom stock plus material in other locations (maintenance shop, plant floor, etc.)	1.0–3.5%	0.25–0.75%

6. Create a 3-5 year Master Plan using the crawl –walk –run methodology with targets and goals.
7. Identify one person who will be the leader of this process (prefer someone who will keep the process on track with the right KPIs)
8. Challenge all your Maintenance Leadership from Planners to the Maintenance Manager to take the CMRP Exam (Certified Maintenance and Reliability Professional)
9. Challenge all your Maintenance Technicians to take the CMRT Exam (Certified Maintenance and Reliability Technician Exam)
10. #8 and #9 will align everyone's thinking in Proactive Maintenance



# Steps to Move from Reactive Maintenance to Proactive Maintenance, Cont.

11. Assign someone to track and manager this PROJECT (need a person who has a great attitude and ability to keep everyone on track in regard to a master plan once Roles and Responsibilities are defined for all processes)

12. Define Roles and Responsibilities using RACI

Proactive Maintenance "Roles and Responsibilities"							
Task Position → ↓	Prod Mgt.	Maint Mgr.	Maint Super	Stores	Maint Tech	Maint Planner	Oper.
Write a Work Request	I	A	R		R	R	R
Convert to Work Order	I	A	R	C	I	R	I
WO Charged to an Asset		A	R		C	R	C
Maintenance Planning	C	A	C		C	R	
Maintenance Scheduling	C	A	C	C		R	
Work Execution	I	A	R		R		
Work Order Data Input		A	C		R	R	
Work Order Close Out	C	A	C	I	C	R	I
Maintenance KPIs	I	A	C			R	

Responsibility "the Doer" (could be more than one)  
 Accountable "the Buck stops here" (One person only)  
 Consulted "two-way communication" (in the Loop)  
 Informed "one-way communication" (kept in the picture)

## Steps

1. Assemble a team of people involved in PM Success (ex: planner, supervisor, technician, reliability engineer, production)
2. Define the processes / tasks required for success of Preventive Maintenance
3. Educate the team in what an effective PMs looks like
4. Prepare key people before you assemble the team
5. Facilitate the team through the RACI Process
6. Post the RACI Chart along PM KPIs Dashboard for all to see
7. Perform RCA when PMs do not meet expectations

# Questions or Comments?

## **Maintenance and Reliability Best Practices Workshop** **May 18-20**

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  - 4.Each attendee will create a simple plan they will be able to implement when they return**
  - 5.Each attendee will create a Maintenance Dashboard which can be applied to their organization when they return**
- ... and so much more**



# #1 Software for Maintenance & Reliability Teams

UpKeep is a service-first company that builds software designed to make maintenance easier for technicians and managers everywhere. Reduce downtime up to 18% by switching over to a preventative maintenance solution!

[www.upkeep.com](http://www.upkeep.com)

## Our Products



### Mobile-first maintenance management and collaboration across all location, assets, and teams

"With nearly 340 different machines in our work environment, it's an impossible task to manually assign and track PM's. *With UpKeep we can schedule regular maintenance without overlapping tasks with other critical jobs.*"

★★★★★ Paul D, Health and Safety Coordinator



### An end-to-end solution for remote condition-based monitoring

Connected and secure IoT sensors for real-time remote condition asset monitoring



**DATAHUB**  
UpKeep

### Integrated & Centralized Data Ecosystem for World Class Asset Operations

The only purpose built Asset Data Platform. Asset Focused ELT Solution for advanced analytics and integrated, real-time asset data.



### The Maintenance Community Coalition was founded on the belief that working together will benefit everyone within our community

Committed to helping each other thrive in our individual professional journeys by sharing resources and expertise, granting scholarships, hosting events, and unlocking knowledge – always at no cost.

