ROOT CAUSE ANALYSIS FOR MAINTENANCE LEADERSHIP AND TECHNICIANS

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What types of Failures do you see often?
“Text your Answer”

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Types of Root Cause Analysis Techniques

- **Ishikawa diagrams are causal diagrams created by Kaoru Ishikawa that show the potential causes of a specific event.**
- **Maintenance's Common use of the Ishikawa diagram is maintenance process or chronic equipment defect prevention through identification potential factors causing an overall effect on asset and process reliability**
- **Five whys(or5 whys) isaniterativeinterrogativetechniqueused to explore thecause-and-effectrelationships underlying a particular problem.[1]**
- **The primary goal of this technique is to determine theroot causeof adefector problem by repeating the question "Why?".**
- ParetoChart

•Pareto Chart.
•The 5 Whys.
•Fishbone Diagram.
•Scatter Diagram.
•Failure Mode and Effects Analysis(FMEA

Why should all Maintenance Organizations embed “Root Cause Analysis” into their culture?

1. **To reduce “Human Induced Failures”**
2. **To reduced stress**
3. **To reduce Maintenance and Total**
4. **Cost To reduce employee turnover**
5. **To ensure equipment “meets expectations of the owners”**

Human Error Rate

Description	Probability
General rate for errors involving very high stress levels	**30%**
Complicated non-routine task, with stress	30%
Supervisor does not recognize the operator's error	10%
Non-routine operation, with other duties at the same time	10%
Operator fails to act correctly in the first 30 minutes of stressful emergency situations	10%
Errors in simple arithmetic with self-checking	3%
General error rate for oral communication	3%
Failure to return the manually operated test valve to the correct configuration after maintenance	1%
Operator fails to act correctly after the first few hours in a high stress scenario	1%
General error of omission	1%
General error rate for an act performed incorrectly	0.3%
Error in simple routine operation	0.1%
Selection of the wrong switch (dissimilar in shape)	0.1%
Selection of a key-operated switch rather that a non-key-operated switch (EOC)	0.01%
Human performance limit: single operator	0.01%
Human performance limit: team of operators performing a well-designed task	**0.001%**

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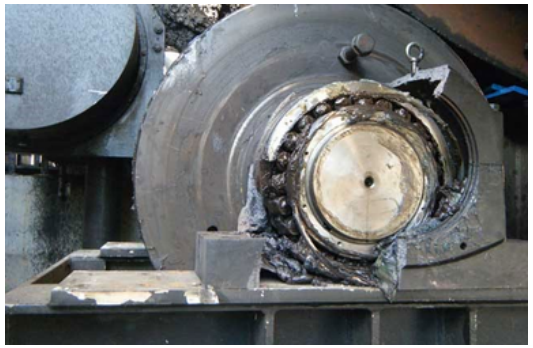
What is Root Cause Analysis?

- A root cause is defined as a factor that caused a nonconformance and should be permanently eliminated through process improvement.
- The root cause is the core issue—the highest-level cause—that sets in motion the entire cause-and-effect reactionthat ultimately leads to the problem(s).
- Root cause analysis (RCA) is defined as a collective term that describes a wide range ofapproaches, tools, and techniquesused to uncover causes of problems.
- Some RCA approaches are geared more toward identifying true root causes than others, some are more general problem-solving techniques, and others simply offer support for the core activity of root cause analysis.



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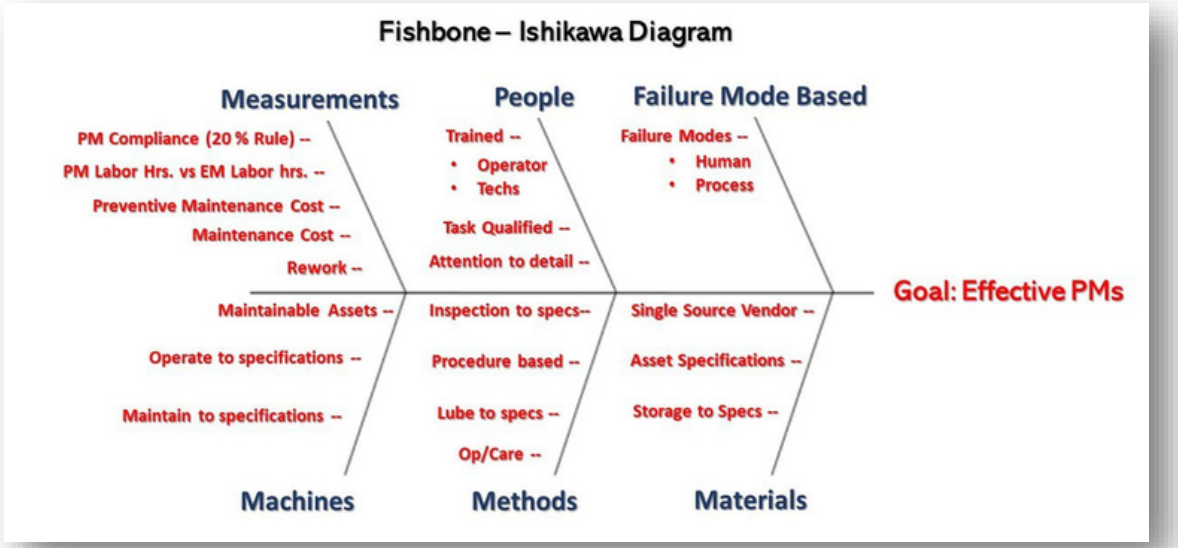
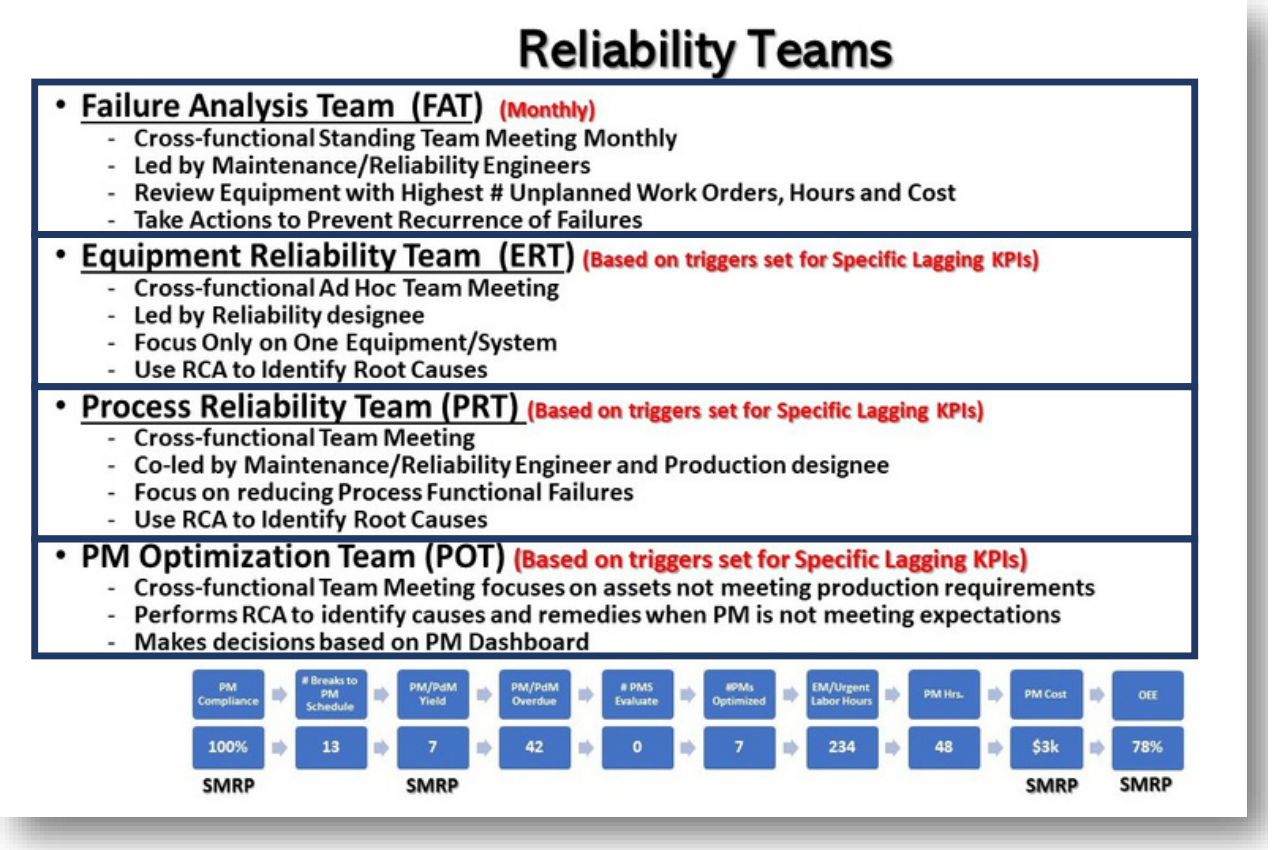
How to Reduce or Mitigate Failures in Maintenance

1. **Create cross-functional teams to resolve repeat and major loss failures**
2. **Define what Constitutes a Failure**
3. **Educate your staff in Root Cause Analysis Techniques**
4. **Create Triggers to initiate specific Root Causes Analysis Events**
5. **Measure the Outcomes of Root Cause Analysis Events**



1. Create a Plant Cross-functional team to resolve repeat and major loss failures

- **IDwhoare the stakeholders on theteam**
  - **ProductionManager**
  - **Maintenance Manager**
  - **Safety Manager**
  - **Stores Manager**
  - **Finance**
  - **Maintenance Supervisor**
  - **Senior Maintenance Technician**



Step 2: Define what constitutes a Failure

- **Partial Functional Failure**
- **Total Functional Failure**

3.Educate your staff in Root Cause Analysis Techniques

As an Example -5 Whys

Five whys(or5 whys) isaniterativeinterrogativetechniqueused to explore thecause-and-effectrelationships underlying a particular problem.[1]

The primary goal of the technique is to determine theroot causeof adefector problem by repeating the question "Why?".

Each answer forms the basis of the next question. The "five" in the name derives from an anecdotal observation on the number of iterations needed to resolve the problem.

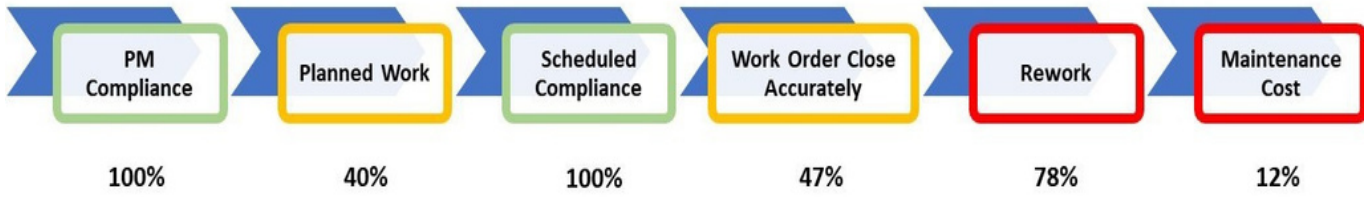
1. *Why?*–ProductionLinestopped. (First why)
2. *Why?*–V-Belt Failure on Blower (Second why)
3. *Why?*–V-Belt problem reported by production, however no action taken(Third why)
4. *Why?*–No one wrote a Work Order to replace the V-Belt (Fourth why)
5. *Why?*–"What do you think was the Root Cause, Text in your answer (Fifth why, a root cause)

5 Why Example

Five whys isan iterative interrogative technique used to explore the cause-and-effect relationships underlying a particular problem.

- **The primary goal of the technique is to determine the root cause of a defect or problem by repeating the question "Why?".**

- **Each answer forms the basis of the next question.**



Problem
Production not Meeting Rate

Why
Breakdowns high

Why
No Planning/Scheduling

Why
Tried it, did not work

Why
Lack of Discipline

Why
No KPI Scoreboard

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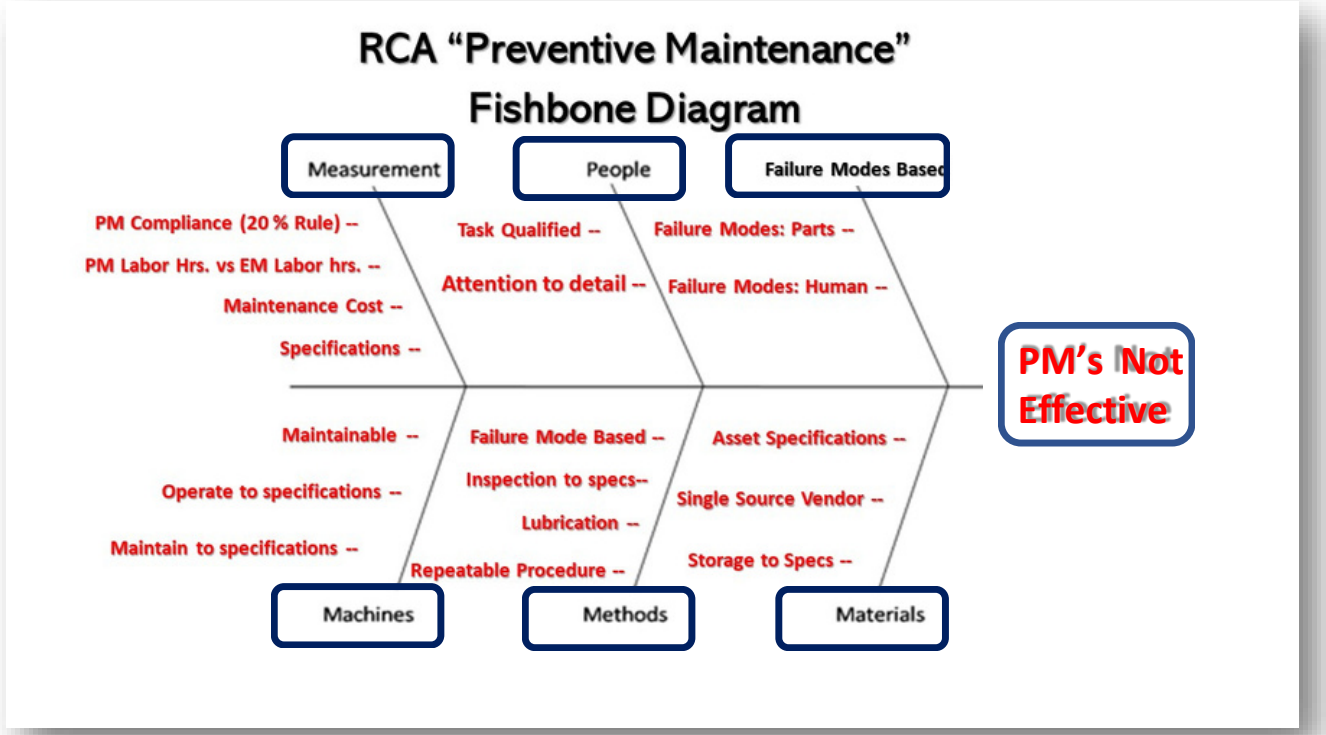
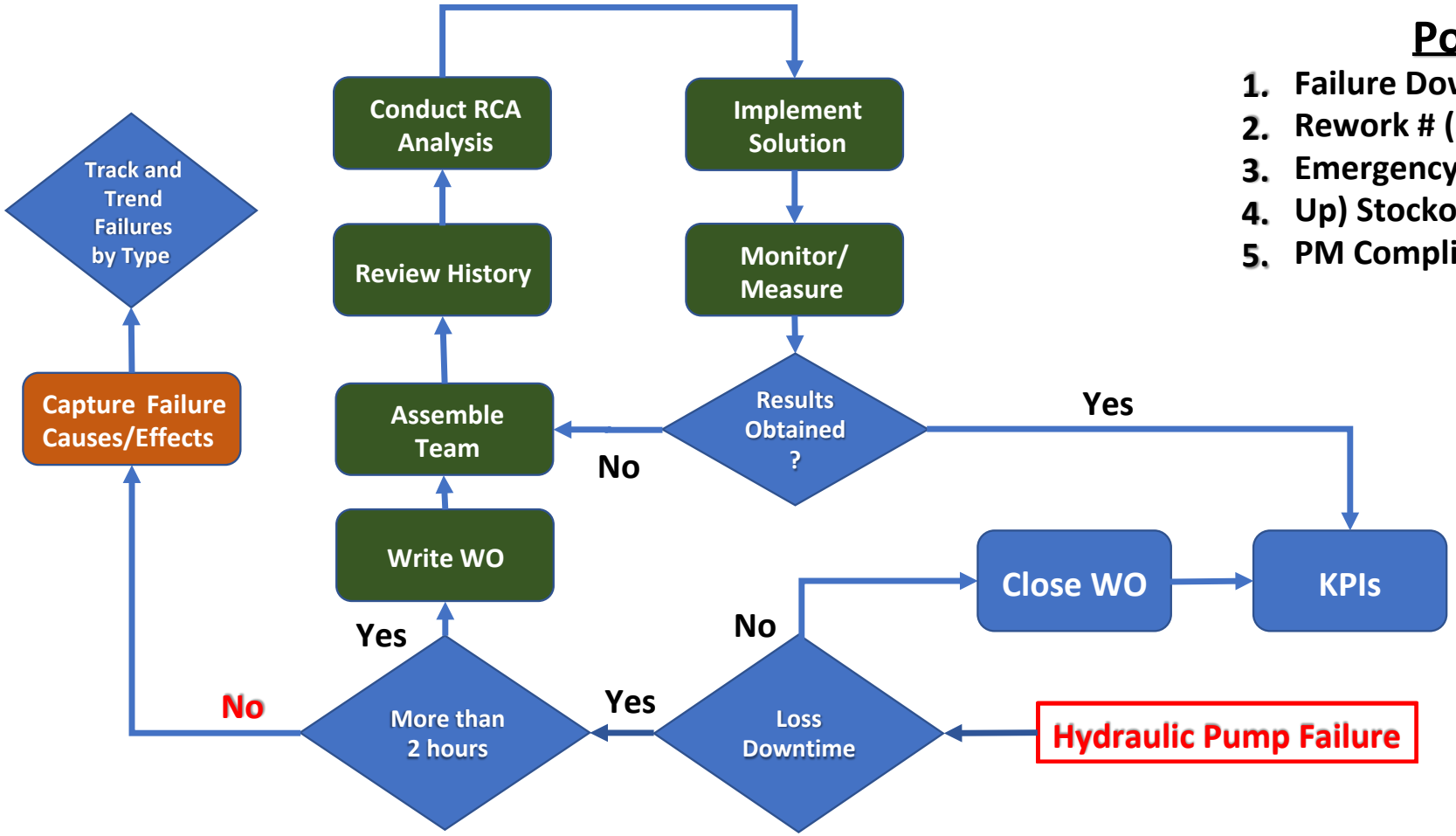
3.(cont.) Educate your staff in Root Cause Analysis Techniques, Cont.

- **Ishikawa (Fishbone) diagrams are causal diagrams created by Kaoru Ishikawa that show the potential causes of a specific event.**

- **Common uses of the Ishikawa diagram are Maintenance Process design and quality defect prevention to identify potential factors causing an overall effect.**



Step 4: Create Triggers to initiate specific Root Causes Analysis Events

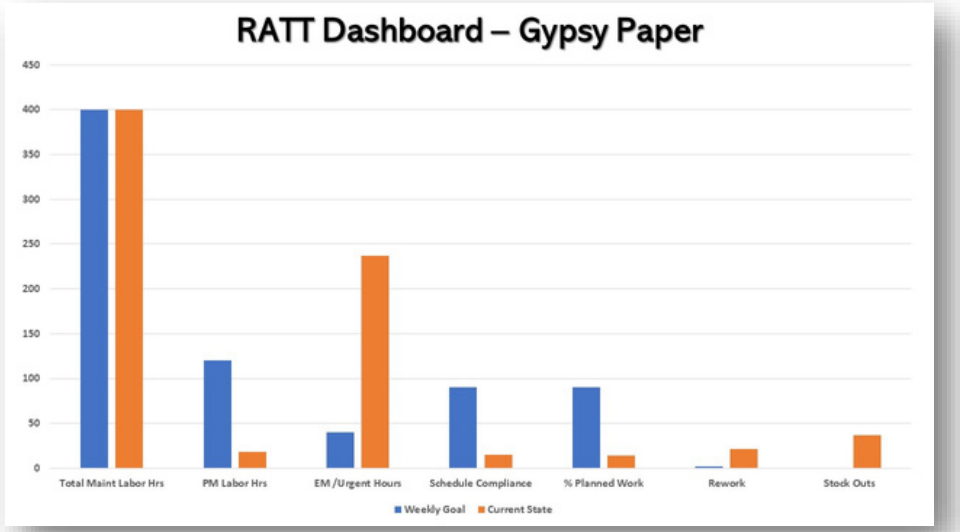


Possible Triggers

1. Failure Downtime (14 hrs.)
2. Rework # (3)
3. Emergency Labor Hours (Trending
4. Up) Stockouts # (4)
5. PM Compliance

5.Measure the Outcomes of Root Cause Analysis Events

- **Begin with current metrics**
  - **PMLaborHours**
  - **Emergency/Urgent Labor Hours**
  - **ScheduleCompliance**
  - **Rework**
  - **OEE**
- **Display aKPI Dashboard for everyone to know how effective this process is working**



Line Assets	# of Failures	Production Losses	EM/Urgent Labor Hrs.	PM Compliance
Board Infeed	127	1123	346	100%
Conveyor	21	489	469	100%
Press Unit	2	2312	18	98%
Hydraulics	47	324	110	95%
PLC / DCS	8	978	943	100%
DocArm Lift	64	1934	86	98%
Total	269	7160	1,999	

Where to begin?

1. **Educate your team in;**
   - **Root Cause Analysis Techniques**
   - **Best MaintenanceRepairPractices**
2. **Create Triggers which determine the resources required to resolve a problem or issue**
3. **EnsureaMaintenanceDashboardisinplace, so everyone knows their score**
4. **Define Roles and Responsibilities for Root Cause Analysis using the RACI Model**

Reliability Dashboard by Asset – Gypsy Paper
Board Line
2019

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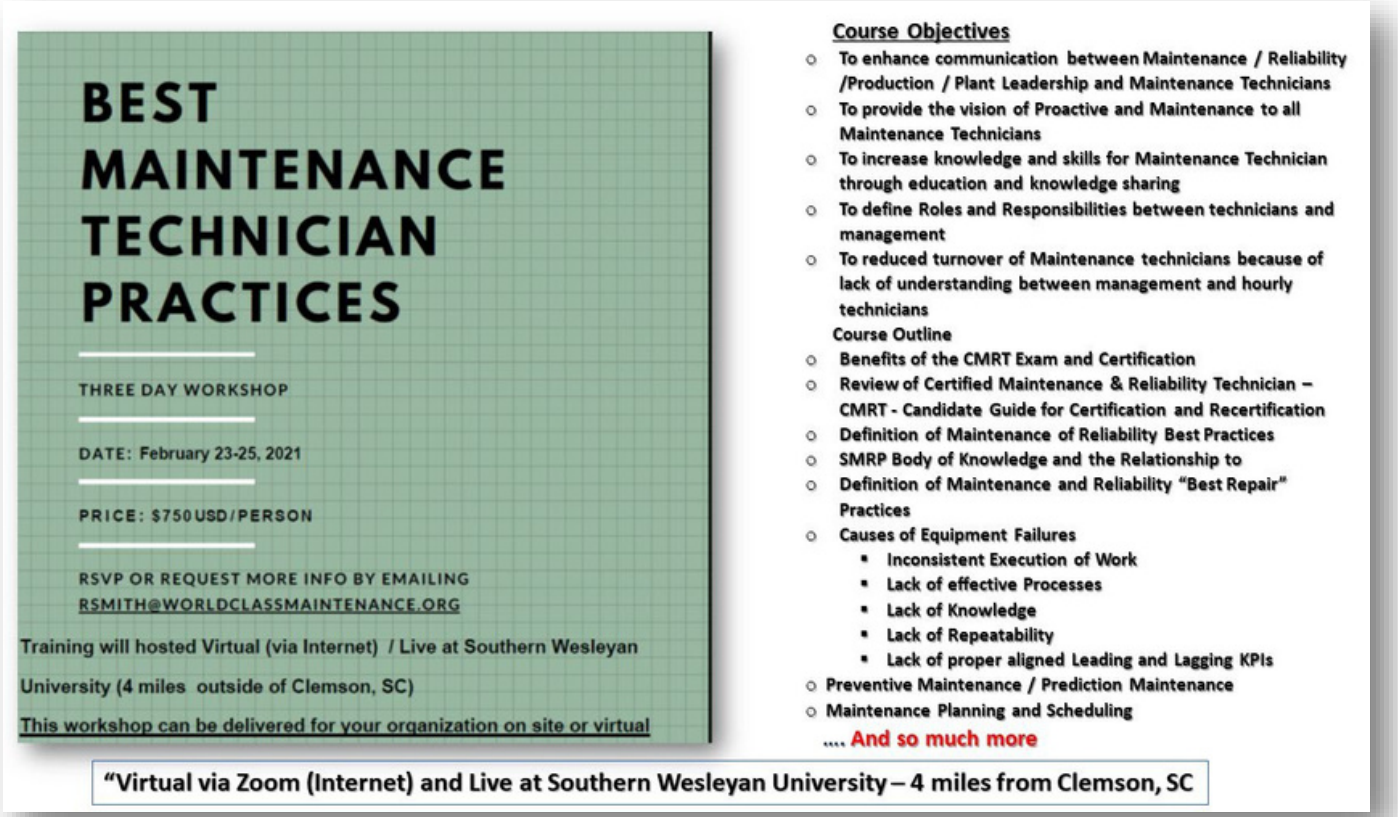
Total	269	7160	1,999	99.8%

Root Cause Analysis RACI Exercise
Problem: Production Not Meeting Goal

Task	Plant Mgr.	Prod Mgr.	Maint. Mgr.	Rel. Engr.	Planner	Maint. Supervisor
ID Current Data	A	R	R	C	C	C
Define Production Req.	A/R	R	I	I		
ID Production Losses by Category	A	R		C		
ID PM Labor Hrs. vs EM Labor hrs.	I	I	A	C	R	R
Define high turning parts			A	R	C	R
Perform RCA	A	R	R	R	C	R
Verify Production Procedures Effectiveness		A				
Verify Maintenance Procedures Effectiveness			A	R	R	R
Production Scoreboard	A	R		C	C	
Maintenance Scoreboard	A		R	R	R	C

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

Questions?



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#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!

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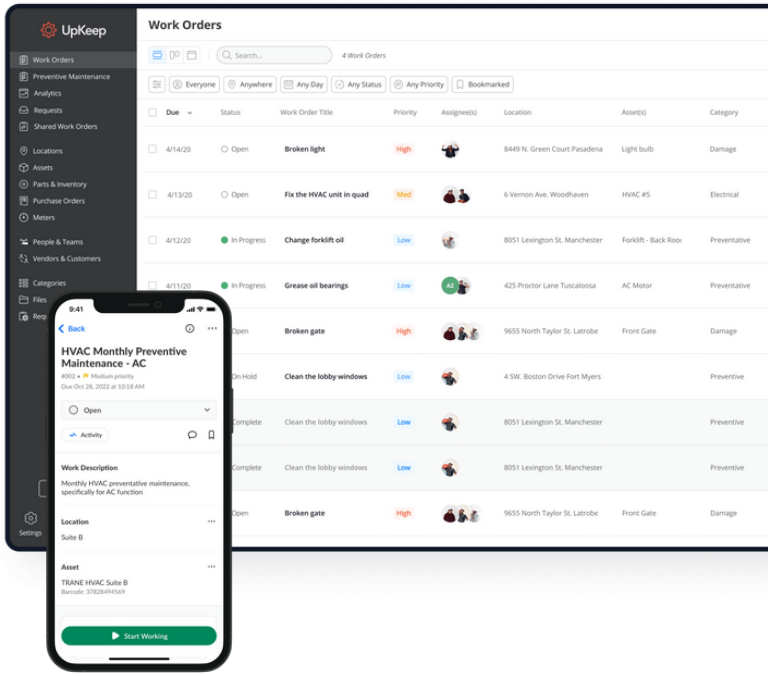

Our Products

UpKeep

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**

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TMCC THE MAINTENANCE COMMUNITY COALITION

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.