

The webcast will begin at 12:00 pm Central Standard Time

Merging TPM and RCM for Optimum Performance

Presenter: Richard Word

President, Catalyst Consulting & Reliability

The 5th webcast in a 5-part series:

The Real TPM: Beyond Autonomous & Preventative Maintenance

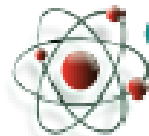
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RCM & TPM = Increased Reliability

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Catalyst Consulting & Reliability

Getting Results by Activating Reliable Changes with People and Systems

Reliability Centered Maintenance, TPM, Problem Solving, Failure Prevention,

Condition Monitoring Techniques, Team Building, Root Cause Analysis

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“Our Systems are perfectly designed to give us exactly what we are getting today”

W. Edwards Deming

**REGARDLESS OF
INCREASING AUTOMATION,
OUR *EMPLOYEES*
PRODUCE THE PRODUCT,
NOT OUR EQUIPMENT.**

**OTHER COMPANIES CAN BUY
THE SAME EQUIPMENT WE CAN**

**OUR COMPETITIVE ADVANTAGE
IS WHAT WE DO WITH OUR
PEOPLE!**

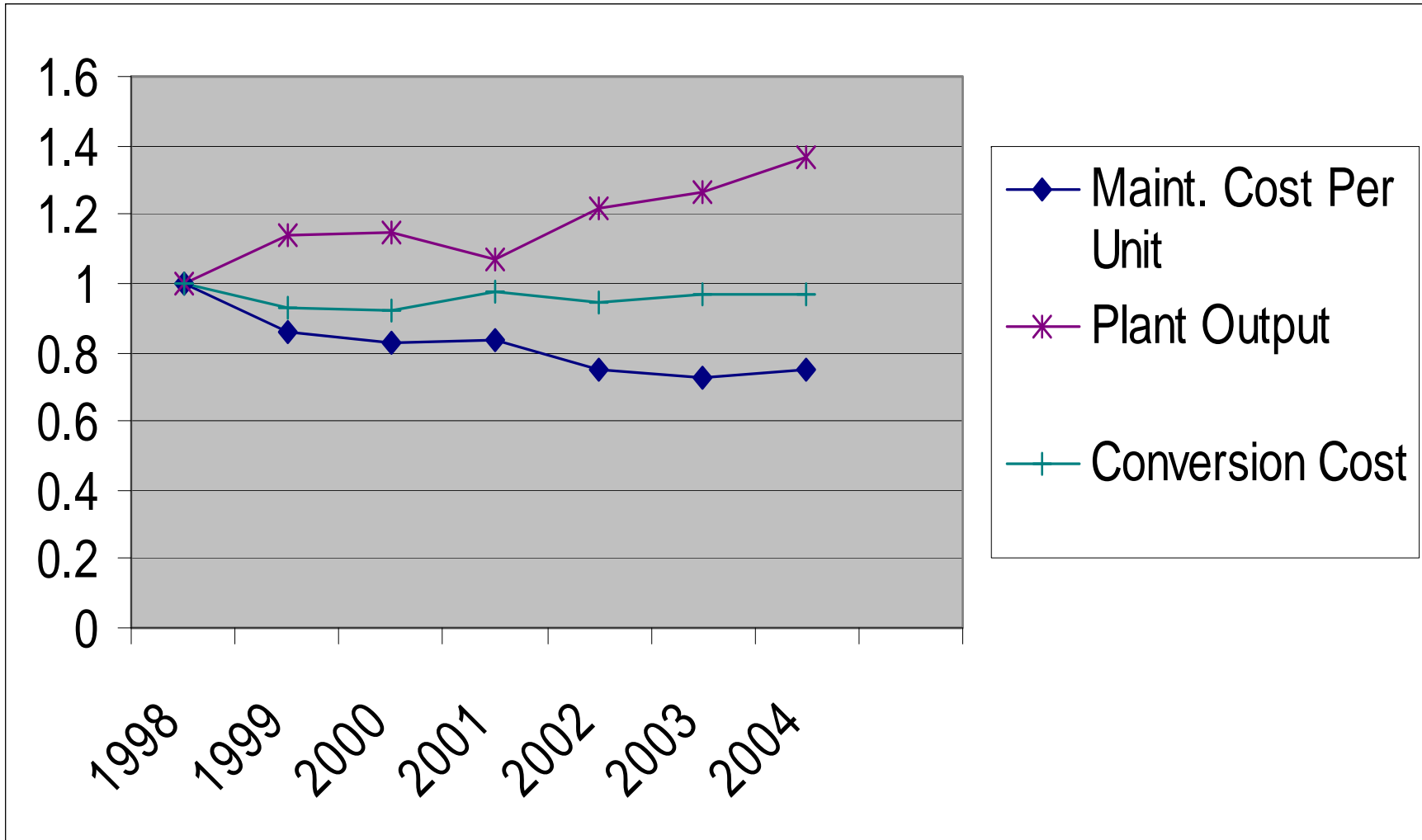
Essential Basic Care

Operations

- Detailed Cleaning
- Proper Operations
- Adjustments
- Lubrication
- Filtration
- Alignment
- Balancing

Maintenance

Trends 1998-2004



TIME Line Information

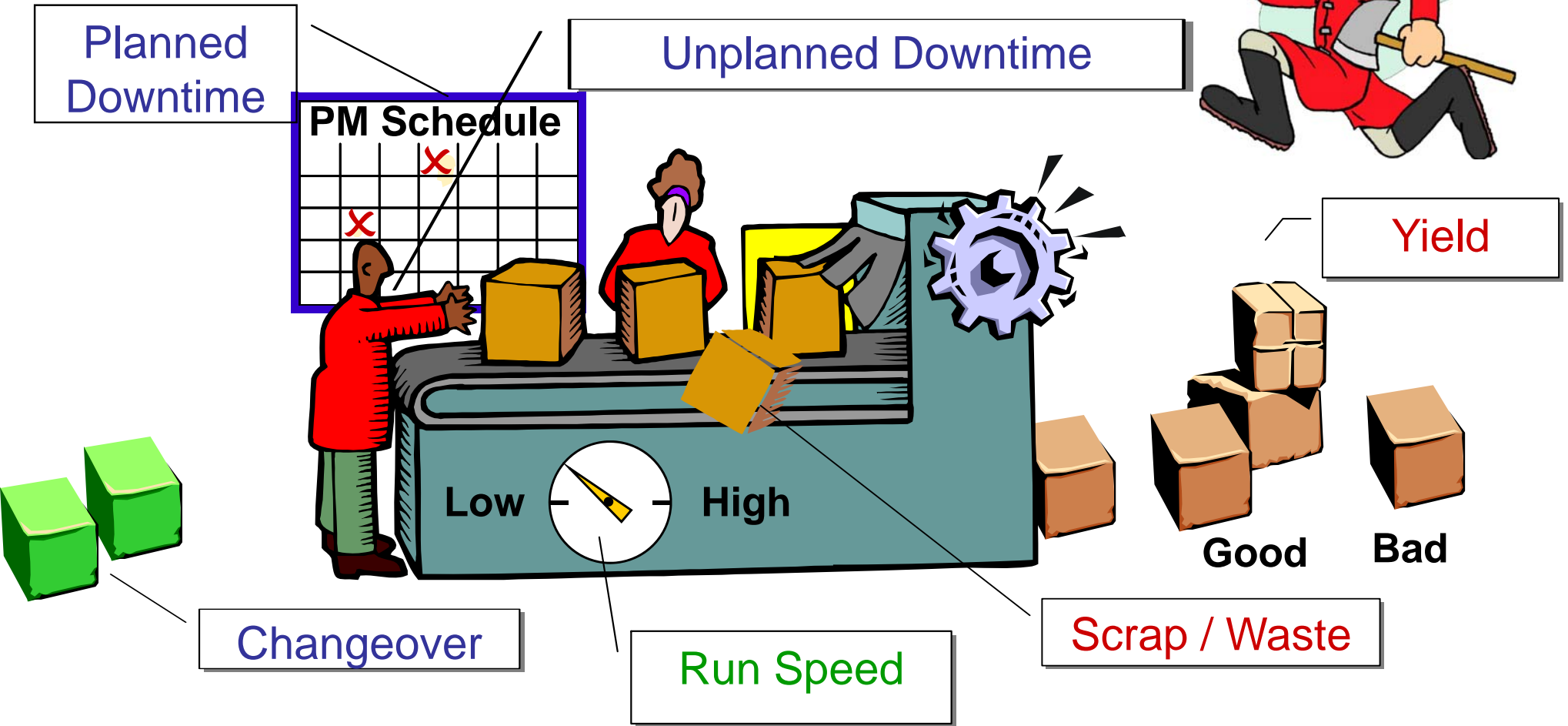
- TPM was reintroduced in 1998.
- RCA Training to all Maintenance & Engineers 1999
- RCM (Reliability Centered Maintenance) was introduced in 2000.
- Manufacturing Game 2001
- Maint. Master Plan 2002.
- Current Best Practices 2002
- PMO 2002
- Results Oriented Maintenance 2003
- Condition Monitoring Standards 2003
- Visual PM Matrix 2004
- Problem Solving Champion & Staff support 2006

TPM & RCM Introduction

- JIT initiative drove the need for equipment reliability.
- Maintenance Manager was tired of being the “Excuse” for all production problems.
- Conflicting Goals and “Silo” mentality was hurting Equipment Reliability and Productivity.
- Initial TPM effort very successful, but quickly regressed.
- RCM provided a very focused approach to create awareness and reliability principles.
- Resistance to change was substantial in all levels of the organization.

Finding the Opportunity

We measure Overall Equipment Effectiveness (OEE)
Performance x **Availability** x **Quality**



Tips to Help the Process

- Maintenance and Production must work together to obtain “Zero Unplanned Downtime”
- Maintaining Equipment and Continuous Improvement must be viewed as important as meeting production schedules
- Maintenance Planners, working with Production Personnel, smoothes the implementation process
- Ownership, by everyone associated with the process, is critical
 - 1) Involvement
 - 2) Empowerment
 - 3) Accountability

RCM at Findlay

(Reliability Centered Maintenance)

- RCM is one portion of a larger Strategy to Maximize Manufacturing Dishwashers at our Division.
- RCM is a Complementary tool, used in concert with several other methods to enhance our competitiveness.

RCM analysis Especially Complements

- Total Productive Maintenance
- Root Cause Analysis
- RCM fosters an environment for operators to communicate Chronic problems that otherwise become hidden.
- RCM provides operators with the knowledge to identify and perform proactive activities.

Foundation for RCM

- Progressive Management focused on investment and Growth; not blinded by only cost cutting.
- TPM Teams & measurement System in place (OEE).
- Reliability Lab populated with full time personal to use condition monitoring technologies and a willingness to teach others condition monitoring techniques.
- Tribology (Lubrication) Technician
- Functional PM program to support the execution of the tasks identified from the RCM analysis.

Our Goal for RCM

- Simply put the RCM process for us is to apply a structured thought process to the expertise of a cross-functional team.
- Performing the right maintenance task, at the right time, by the right group and having the right part available.

Criteria for choosing a system

- A Critical piece of equipment in need of an improved maintenance strategy.
- A system that immediately impacts production and/or has immediate negative economic consequences from poor reliability.
- A critical system that may be totally automated with no operator and is therefore not a good candidate for a TPM team.

Criteria for choosing a system

- A system that has become a constraint for product flow.
- Equipment that has recently encountered reliability problems.
- A system that will become much more reliable from ownership or operator awareness of the functions.
- Has a TPM team needing revitalization or several new members.

Choosing an Implementation Leader

- The Implementation Leader is responsible to see the results from the analysis are implemented with assistance from the RCM Facilitator to overcome any hurdles.
- Usually the Process Engineer for the system

Choosing the RCM Participants

- Consist persons with cross functional skill sets.
- RCM Facilitator, Co-Facilitator, Process Eng., Maintenance Supervisor, Control Engineer, Production Supervisor, Electrician, Millwright, Grade 4, operator and others.

Starting The Analysis

- A week is planned for most analyses
- A week is adequate for most of our systems.
- If a week is not enough time we may break up a system into sections.
- The first 4 hours are to train the participants about RCM and Condition Monitoring.

Steps of the analysis

- Review the operational history of the equipment
- Parameters for the probability of failure
- Parameters for the Consequence of failure
- List the main Function
- List the subfunctions
- List the failure modes

Steps of the analysis continued

- List the failure effects
- List the Downtime
- List the consequence
- Navigate the Decision Tree
- Determine the proper maintenance task(s)
- Assign the person responsible for implementation of the task(s).

Final steps of the Analysis

- Determine the need for stocking a spare part
- Review the completeness of the analysis for the time scheduled (1 week)
- Do a Reality Check

Implementation Step

- Most of the tasks will be transferred to the PM system(s).

The Implementation Process

- The Implementation Leader is to track and report progress to the TPM steering committee monthly & OEE improvements.
- Truthfully it is near impossible to complete all of the tasks from the analyses.
- It is important to only discard tasks that have a minimum Impact not because they are difficult to implement.

Implementation Aids

- PM sheets should reflect When, Where and What.
- Condition Monitoring Standards explain HOW the task should be done.
- Referencing the How and not attempting to include the how in the PM Sheet has made the process more manageable.

In the RCM Analysis we use the Standard PM Format to guide the crossfunctional group to produce a task that is ready to be transferred into the PM system with little or no editing required.

General Format for a Task

- Equipment Status: Running; Anytime or Down
- Action Verb: Check, measure, inspect, look, feel, Scan etc.
- Specific Component: Main Motor
- “FOR” a specific condition; Quantifiable whenever possible, Subjective if not Quantifiable.
- Reference a Condition monitoring Standard if available or required.
- Example Task: Running, IR Scan, The Main Motor, “FOR”, Heat (>160 degrees F), CMS100R

The Lines of Defense to avoid unplanned downtime.

- First line of defense is the operator.
- Second Line of defense is the Semi-skilled operator.
- Third Line of defense is the Area Maintenance Technician.
- Forth Line of Defense is the Reliability Lab Technician.
- Fifth Line of Defense is an outside Expert.

Reality of RCM

- It's simple, but not easy
- Requires a lot of work
- Requires Persistence
- Changes how we look at the Maintenance Function.
- RCM will highlight areas in need of improvement for a Reliability Culture.

RCM Reality

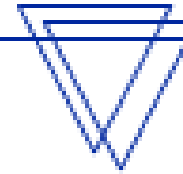
- Creates Paradigm Shifts
- It is uncomfortable at times
- Not a walk in the park
- Can be fun at times
- It is a complimentary tool for TPM
- Fosters employee involvement
- Generally Improves OEE ~ 10%

RCM Reality

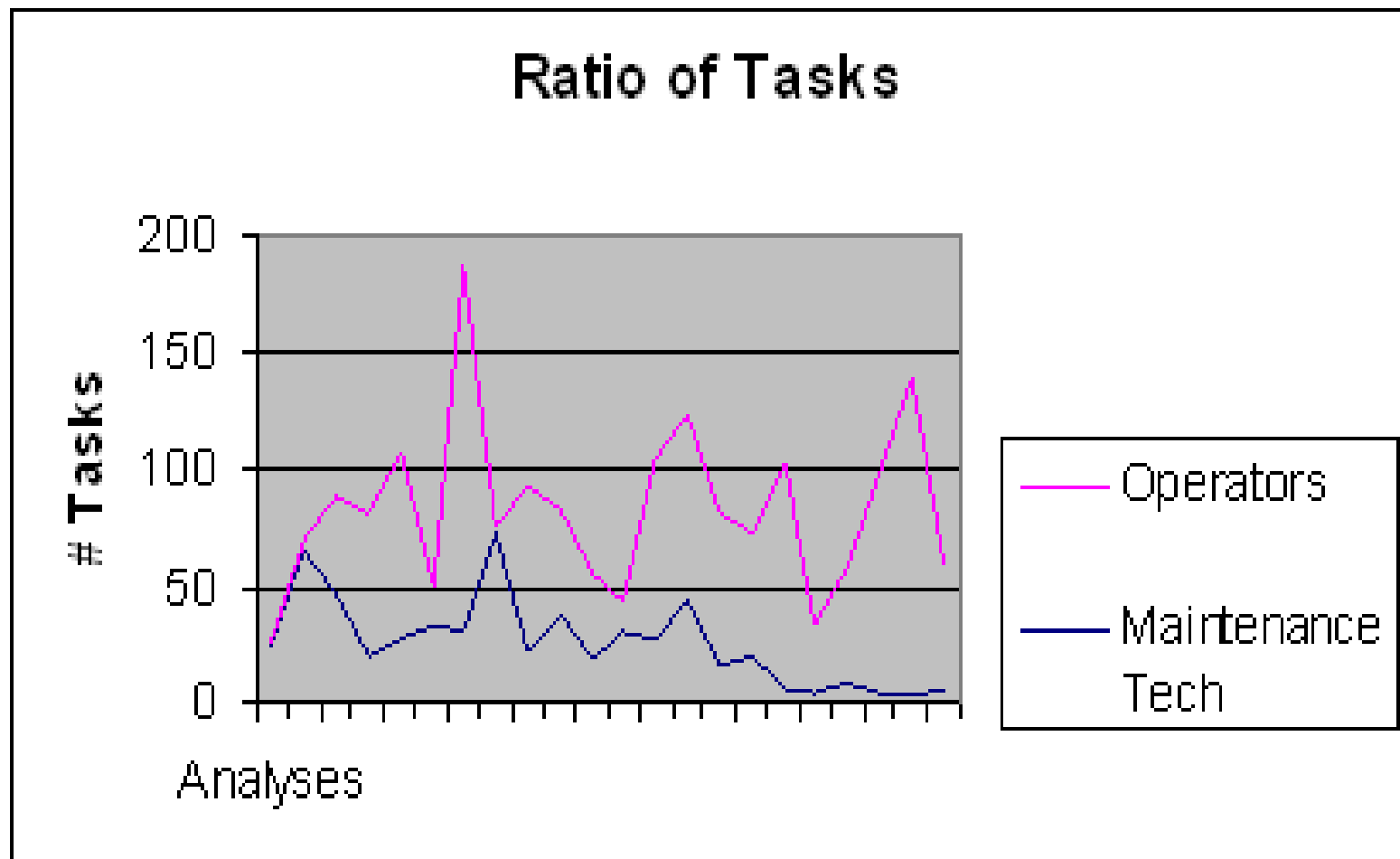
- Operators relish the opportunity to talk about and better understand their systems.
- The engineers must not take some of the findings personal.
- The failure effects generate an excellent troubleshooting guide.
- You can not be afraid of the Facts.

Some Statistics from our RCM's

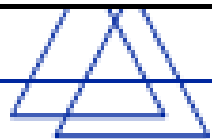
- 49 RCM Analyses completed
- 46 Analyses Implemented
- 4337 Failure Modes identified
- 3496 Tasks identified
- 1154 Maintenance Technician tasks
- 1975 Operator tasks
- 468 Redesigns identified
- 376 Consequence Reductions identified
- 189 Parking Lot Issues (several are redundant)



Operator & Maintenance Tasks



AT THE WORLD!



The Largest Dishwasher Manufacturing Facility

TPM means Total Productive Maintenance (or Total Productive Manufacturing)

Definition: A common sense team approach to maintaining the condition of equipment, managing it's life cycle and improving the reliability of the process. It relies heavily upon operator ownership of equipment, continuous improvement, and planned maintenance. TPM is a team approach that involves operators, supervisors, skilled trades, engineering and anyone else who has a stake in the equipment

Total Productive Maintenance

Shared Roles and Shared Tasks

TPM & RCM

Are now mature embedded Methodologies

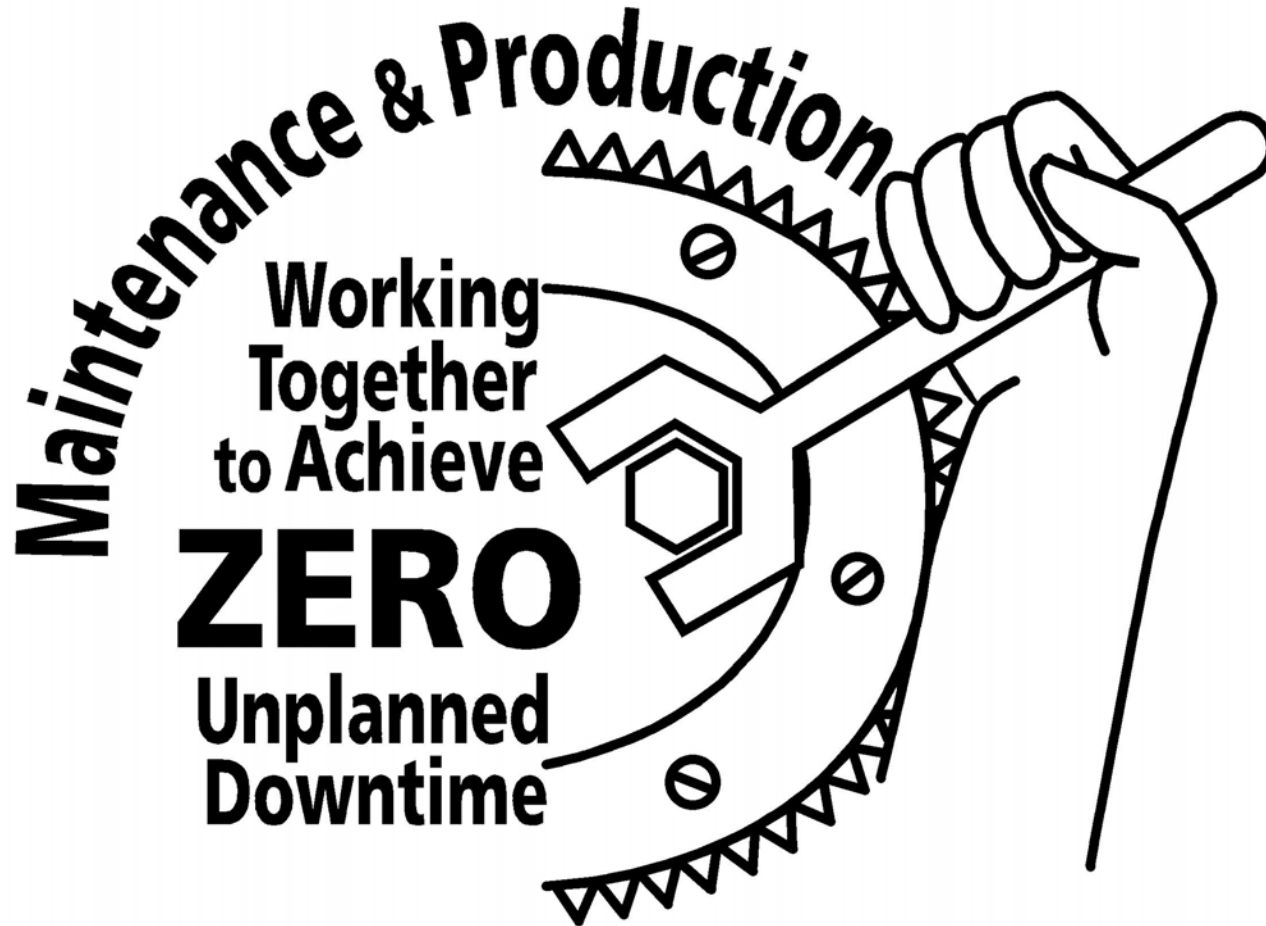
The need to reinforce and improve
on the basic's in Maintenance
Management is recognized.

Maintenance Master Plan(s)

Cross functional Group to evaluate and Lead improvements in Maintenance Management and Service.

The Maintenance Master plan created and aided in several improvements and awareness of needs.

Vision

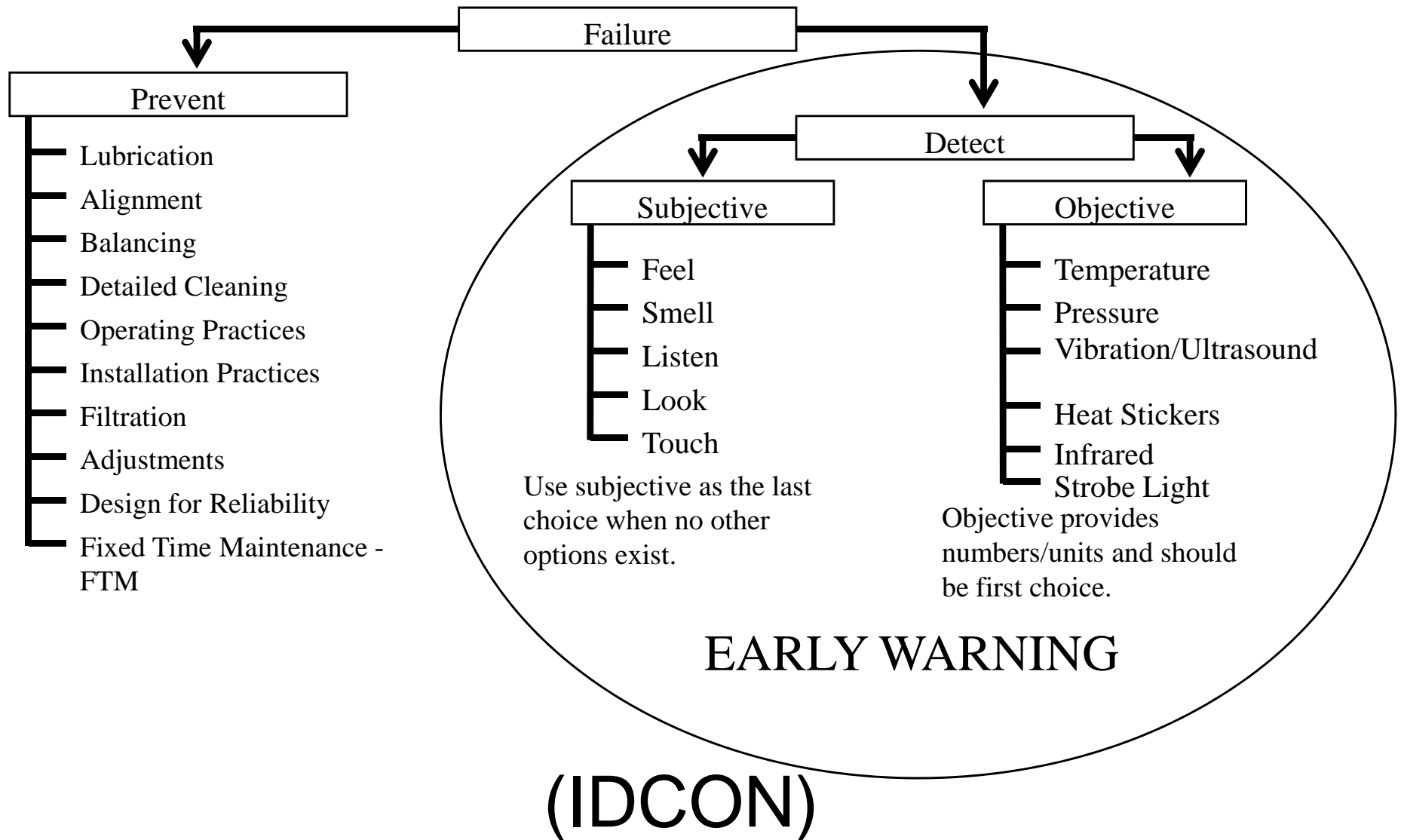


Mission

It is the mission of the Maintenance organization to be proactive and reliability-focused by...

- Maintaining a safe work environment
- Providing continuous education and training
- Implementing an effective planning strategy
- Improving communications
- Using condition monitoring, preventative, and essential care techniques
- Incorporating systems that measure key performance data

The Road Map for Reliability



Results Oriented Maintenance

- In 2003 the Maintenance Master Plan Leaders contacted IDCON to help drive Focus to the Maintenance Master Plan Process
- The Leaders Actively reviewed IDCON's Current Best Practices survey for Improvement Gap analysis. This was tough and beneficial for the group to do a self evaluation.

Results Oriented Maintenance

- The Leaders of the Maintenance Master plan upon completing the CBP survey made the decision to train key process partners in ROM I, ROM II and ROM III
- ROM I (WHY)
- ROM II (HOW)
- ROM III (Planning & Scheduling)

ROM I

- **Common Sense approach to cost reduction by improving Reliability with Maintenance & Production working together as partners.**
- **Overview designed for team members responsible for implementing improved reliability as well as their managers.**
- **Explore the working relationships of operations, engineering and maintenance.**
- **Changing our culture to support better reliability and enable cost reduction.**
- **How to make maintenance LEAN by increasing effectiveness of tasks.**
- **Learn about maintenance prevention vs. preventive maintenance.**

ROM II

- **The greatest challenge of improving existing PM performance is deciding WHAT to do and WHERE to start.**
- **Learn the How-to's of PM and basic inspection techniques, tools, instruments, and documentation.**
- **Overview of ROM improvement circle. How to get out of the fire fighting culture.**
- **Effects of PM activities on equipment reliability. Preparing for the next mission.**
- **Selecting the most cost-effective maintenance procedure.**
- **Documenting the inspection method to explain the why and how of inspection.**

ROM III

- Best Practices In Planning & Scheduling
- When the ROM III training was completed the group identified Fifty-Seven areas that needed either improvement or implementation.

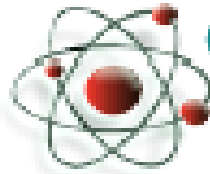
PM Optimization

- Identify which piece of equipment or system will benefit from an improved maintenance strategy.
- Choose a small cross-functional team to bring together.
- List the most likely failures large and/or frequent.
- Take the list of likely failures and list the components involved at the level that maintenance is performed.
- Use this component list to determine the likely failure modes for those components.
- Determine WHAT maintenance method to use by running the failure modes through the RCM decision tree.
- Determine the task(s) that can be performed to preserve the function.
- Determine which group should perform the task using the WHO decision tree.
- Determine how often the task should be performed using the WHEN decision tree.
- Should the part be stocked in the crib? Use the SPARE PARTS decision tree.
- Do a reality check and implement the findings!

THEY

WE

Thank You!



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COMMENTS / SUGGESTIONS

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Thank you for participating!