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Morphing RCM into an Effective Preventive
Maintenance Setup Tool

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Preparing for the RCM Analysis

The criteria for choosing a system to have RCM applied may have been one or more of the following attributes.

- A Critical piece 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 good candidates for a TPM team.
- 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.

Classically the Implementation leader has been the Process Engineer assigned to the system. Whatever the title of the Implementation Leader, the person chosen must have a vested interest in the improving the reliability to the system. Be willing to direct others to see that the tasks identified in the analysis are documented in the PM system and executed.

Choosing the individuals for the Analysis Team.

The exact make up of the RCM Analysis Team varies depending upon the type of positions needed for the daily running and care of the equipment. Most cross functional teams are a group that have been comprised of a RCM Facilitator, Co-facilitator, Process Engineer, Implementation Leader, Control (Elec.) Engineer, Maintenance Supervisor, Production Supervisor, Electrician, Millwright, Operator, Grade 4 and others.

Starting the Analysis

A week is planned for most analyses. Usually a week maybe more than enough time for some groups and systems. While it maybe required to dissect some systems into sections. One week has been found to be adequate for most of our systems.

The first four hours of Monday morning is reserved for RCM Participant training. This training is comprised of an Overview of the RCM Methodology, Condition Monitoring Technologies and Cause & Effect philosophies. This training is mandatory for anyone that has not previously participated in an RCM analysis. Beginning the second half of the first day the whole team is brought together to start the analysis.

Steps of the analysis

1. Review the operational history of the equipment.
2. Parameters for Probability of Failure
3. Parameters for Consequence of Failure
4. List the Main Function
5. List the Sub-Functions
6. List the Failure-Modes
7. List the Failure Effects
8. List the Downtime
9. List the Consequence
10. Navigate the Decision Tree
11. Determine the proper maintenance task
12. Determine the need for stocking a spare part
13. Assign the person responsible for implementing the Task or action item.
14. Review the completeness of the analysis for the time scheduled. (One week).
15. Do a reality Check

At this time the Analysis has been completed. The team will be advised that the next time we are to meet will be after a copy of the Analysis Report can be compiled for each of the team members. The team should review this report within two weeks.

The Analysis Report Review Meeting

Review all the sections of the RCM Analysis Report. The tasks may be as simple as a single point lesson or as involved as a redesign. Set achievable dates for each task to be implemented. Most of the implementation will involve reviewing and transferring a maintenance task into the PM system.

The Implementation Process

The Implementation Leader is to report any progress toward completion to the TPM Steering Committee periodically. The RCM Facilitator needs to be a resource to remove hurdles and assist in finding help until completion.

Running a report of the PM activity, history and OEE for the systems that have had an analysis performed is a good check and balance for completion.

Truthfully it is near impossible to complete all of the tasks for all the analyses, but it is important to make sure that reevaluating and dropping a task is for the right reason.

The RCM Facilitator needs to solicit the Leaders periodically to help identify hurdles to the implementation of the process.

When we first started it took up to a year to get the First RCM analyses implemented. Currently we have Implemented Analyses in weeks. (With a motivated Leader)

This decrease in implementation time is due to several factors, mainly a PM task format & assigning responsibilities in the analysis meeting.

The RCM methodology will highlight deficiencies in the support functions related to improving reliability.

We continue to review and remove as many barriers as possible to optimize the implementation process.

The most important factor has been finding Implementation Leaders that truly grasp the value in implementing a good Maintenance Strategy. A maintenance strategy that fully utilizes the skill of the operators is the usual result of the analysis.

Setting up a standard format for PM tasks that would fit most situations.

Recognizing that for our environment using the PM sheet to define the What, When and Where was a practical approach.

Utilizing Standards for Machine Condition Monitoring. These standards can be referenced from the PM sheet. That eliminated a lot of redundant HOW text from the sheet. In the past we attempted to include the HOW in the PM sheet which added to confusion that was not needed for the seasoned operators and technicians. IDCON Inc. has an excellent set of Condition Monitoring Standards. WWW. Idcon.com

In the RCM Analysis we use the Standard PM Format to guide the cross functional 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 (The RCM software has been set up to guide this format when possible).

- 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

Paradigm shift for doing PM inspections

“The best time to determine how well a piece of equipment is running is when it is running”.

“Prevention tasks are almost always performed when the equipment is down and most detection tasks are performed when the equipment is running”.

In the past most of our PM tasks required the machine to be down. Now the machine being down or running is a good time for inspection and prevention. This helps reduce the scheduling dilemmas. Prevention is the first focus and detection the second focus.

Current goal of the RCM Analysis is to have as many tasks completed at the operator level as possible. If operator can do a task or easily be empowered to perform the task. The operator will complete that task. The RCM Methodology highlights why this is the best approach to enhance Reliability of a system.

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.

These Lines of Defense are not mutually exclusive. There may be a combination of levels or the entire above if needed.

Discoveries

During the RCM Analysis the education about Condition Monitoring Technologies for the Team Members is an overwhelming benefit.

It is not uncommon to identify Chronic Issues from the team during the analysis, especially from the operators. If these issues can not be resolved by a short discussion in the analysis. They are put on list to be scheduled for a Root Cause Analysis at a later Date.

The process of going through an RCM Analysis tends to inculcate the team to a Reliability Culture verses a Reliability Department.

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.
- It is uncomfortable at times
- Creates Paradigm shifts
- Not a walk in the park
- Can Be Fun at Times
- Operators generally relish the opportunity to talk about and better understand their systems.
- Is a very complimentary tool for TPM.
- Fosters employee involvement
- The failure effects generate an excellent troubleshooting guide.
- The engineers must not take some of the findings personal.
- You can not be afraid of the facts.