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A Brief Introduction to Maintenance Task Analysis (MTA)

Introduction

Any large organization employing a large number of physical assets will always try to ensure that these assets can always perform their intended function as per their user's requirements in the present operating context. In other words, they will always try to get their physical assets to be most reliable. Almost all organizations have understood that in order to ensure the reliability of their assets performance, they must have effective maintenance programs. Many have also realized, that to derive the most effective maintenance program would requires the organization to conduct a Work Identification analysis using a proven approach. Preferably, using reliability centered approach. In a hugely complex plant which comprises of many different assets or systems, this process may be costly and if not managed properly, may also consume too many resources. Hence, for some maintenance organizations undergoing resources constraint condition in a prolonged fire fighting maintenance environment, it is sometimes difficult to conduct the full and proper work identification program for all of its assets.

Combating the situation above, our network has been assisting clients around the world by utilizing two complementary work identification methods that are based on the proven RCM principles. These methods are known as: Reliability Centered Maintenance 2 (RCM2) and Maintenance Task Analysis (MTA) method. For more information on RCM2, please refer to the white paper entitled "Introduction to RCM II" by John Moubray. We highly recommend the reader to read through John's paper first before reading this one. The rest of this paper will try to illustrate very briefly on Maintenance Task Analysis (MTA).

The Differences between MTA & RCM methods

MTA is an alternative Work Identification method, which uses fewer resources and takes less time to complete. It is not and should not be called an RCM process. The main differences are as follow; In RCM, the analysis to develop maintenance program is conducted from scratch where as in MTA, the analyses starts from the current maintenance program already existed or suggested maintenance program from OEM. Where RCM goes back to deriving the function and functional failure of the asset from the system / subsystem point of views, MTA only looks at component failures. As such, while RCM can produce the most comprehensive asset maintenance strategy under any condition (old or new assets), MTA is most appropriately done only to rationalize or optimize existing maintenance program. Although effective for some type of equipment the resulting MTA analysis is not and will not be as comprehensive as the result of RCM analysis.

The table below highlights major differences between RCM & MTA.

	RCM2	MTA
Approach	Structured analysis by a group of subject matter experts led by a facilitator	An analysis with participants and a facilitator in a one-on-one or group forum (preferred)
Application	Typically applied to assets with significant consequences of failure and opportunity for reliability improvement, regardless of the current state of the maintenance program (if it exists)	For validating an existing maintenance program or creating basic program for a poorly performing asset. Not desired when asset failure can lead to serious injury, death, or breach of environmental standards, or if very little is known about the asset.
Typical participants	RCM2 facilitator, Operators, Maintainers, Internal and External specialists (e.g. vendor)	MTA facilitator, Operators, Maintainers
Facilitator Preparation	RCM2 Introductory Course, RCM2 Facilitator Course + coaching	RCM2 Introductory Course, RCM2 Facilitator Course, MTA Facilitator Course + coaching
Task/Recommended action evaluation	Thorough evaluation of technical feasibility and economic worthiness, including risk considerations and formal failure finding-interval calculations.	Evaluation of technical feasibility and basic consideration for economic worthiness. No formal failure-finding interval calculations.
Scoping guidelines	Typically set for 5 to 15 sessions with the group, accommodating 100 to 250 failure modes.	Very flexible. Sessions can be scheduled as required.
Typical outcomes	Written report containing detailed operating context, equipment alarms and settings, performance expectations, operating environment descriptions, back up/standby/protective system and functionality, references to drawing/part lists, labeled photographs and drawings, comprehensive FMEA, detail task descriptions, summary of redesigns and modifications to equipment/procedures/training, other issues to be resolved (e.g. drawing errors, parts error, etc.)	Within EXP, asset hierarchy for the system, MTA recommended action templates (if possible), MTA recommended actions for the asset, summary of redesign and modifications to equipment/procedures/training.
Relation to standards	SAE JA-1011 and SAE JA-1012	No applicable standards but uses typical FMEA Work Identification principle

Source: The Aladon Network

Given the above differences, MTA is most often used to confirm and update existing maintenance program for less critical equipments which have not been reviewed for quite some time. Used in this context, the purposes of MTA are:

- To confirm the validity of current maintenance tasks. This means:
    - The tasks are based on technically feasible reasons. Or in other words the process tries to ensure that all maintenance tasks area there to address specific failure modes.
    - The tasks are based on "worth doing" reasons. In other words, the cost of doing the tasks are smaller than the costs of failure it is meant to prevent.
- To identify any new cause of failure (Failure Modes) and update existing maintenance program with tasks to avoid the possible consequences of the identified failure.
- MTA is also used to review current/existing maintenance programs to ensure that the determinations of maintenance tasks intervals (tasks frequencies) are based on valid and sound judgment.

The MTA Process

The MTA process has fewer steps as compared to the RCM-2 Process. Some of the steps are combined into one step. The process utilizes fewer resources as it is conducted in an interview mode which can be in a form of group interview or a one-on-one interview with people who are knowledgeable about the asset. The MTA process can be divided into three phase which is the following:

Phase-1 MTA Preparation

- Collect the necessary documents such maintenance & operational manuals, PID diagrams and failure information.
- Develop the operating state of the assets and it includes describing why the asset exists (the primary function) and the major components and their usage (other functions) for the asset or system.

Phase-2 Maintenance Task Analysis

- Review of existing maintenance program the tasks and intervals
- Identify the failure modes in relation to each task from the existing maintenance program and describes the failure effect for each failure modes.
- Define and recommend tasks for each failure modes considering the consequences of each failure modes and the technical feasibility of the tasks
- Identify any new failure modes, describe its effects and define the right task for the failure mode.
- The tasks (or action) recommended includes Condition Based Maintenance, Scheduled Restoration/Discard, Failure Finding, Modification/Redesign and Run to failure (No Scheduled Maintenance)

Phase-3 MTA Completion

- Complete the analysis to ensure all existing tasks have been reviewed and all new failure modes have been properly documented
- Review the analysis by the people who will sign off for implementation. The review is to make certain that the analysis have covered all about the asset and that assumptions are correctly made.

Although MTA can be used as an alternative Work identification method to RCM2, it is important for an organization to understand that the decision to apply MTA must go through a proper decision process. A Reliability Strategy Selection process can be utilized to assist organization in deciding which methodology to use. The Reliability Strategy Selection process rely on a number of criteria in helping organization decide which Work Identification method to use. These criteria include the criticality ranking of the asset based on its consequences priority number, the level of risks the asset has on the organization business goals should it fails, the current performance of the asset, the operational and maintenance knowledge about the asset and the level of documentation pertaining to the asset knowledge.

The benefits of using MTA are:

1. Increased proactive maintenance activities, particularly on condition maintenance where potential failures are captured hence maintenance repair work can be plan in advanced
2. Knowledge and important information about the asset from the best maintenance & operation people are captured and as a result the right decision can be made with regards to repair or maintenance action for an asset or system
3. Improved understanding of the maintenance tasks and the tasks intervals, which enables easy monitoring and update for future task effectiveness improvement.
4. Eliminate routine tasks which are non-value added.

Conclusion

Maintenance Task Analysis (MTA) is an asset maintenance strategy optimization method which utilizes the same principle as RCM2. In the hands of properly trained individuals, MTA is a very cost-effective method to produce sound and defensible maintenance program within a very short time frame. Although developed from the principle of RCM, it is not RCM and should not be called RCM. As it does not comprehensively address all failure risks in assets, it should not be applied to critical equipments. We do not recommend deploying MTA blindly for all of your assets in the absence of a proper RCM program. An appropriate selection process with sound logic should be used to determine which method to use for a selected asset.