Reliability Management

The Operational Sustainability, LLC® (OS) OESuite™ offers a powerful Reliability Management Module that includes a criticality analysis, Failure Mode and Effects Analysis (FMEA), and Reliability Centered Maintenance (RCM) analysis. The resulting analyses gives maintenance managers the ability to identify high-risk consequences and focus lean resources to obtain maximum financial impact. At the core, RCM is tied to our work management solution for creation of scheduled maintenance plans to improve the effectiveness of your asset management program. Equipment can be selected to be analyzed on the fly. Criticality ratings can be applied to the selected equipment covering numerous factors. Functional failures are documented for each function along with a list of failure modes for each functional failure, and failure effects for each failure mode. Tasks can be packaged based on factors such as time (scheduled interval), task type, and areas in the system where tasks are performed. Some advanced RCM analysis functions that are supported include numerical life (MTBF, P-F Interval), links to documents and drawings, recommendations, and Management of Change (MOC).

RCM is a philosophy and a process by which the maintenance requirements are determined for any physical asset in its operating context.

RCM enables companies to target and eliminate potential detectable failures before they occur. The result of effective application of RCM is greater asset life, higher plant availability, higher quality and reduced environmental and safety implications. The goal of the philosophy is to provide the stated function of the facility, with the required reliability and availability at the lowest cost. OS offers world-class RCM software.

RCM substantially reduces routine (cyclic) workloads when applied to existing preventive maintenance programs, and also enables maintenance programs to be developed for new equipment with remarkable speed, confidence and precision. It employs Preventive Maintenance (PM), Predictive Maintenance (PdM), Real-Time Monitoring (RTM), Run-to-Failure (RTF, also called reactive maintenance), and Proactive Maintenance techniques in an integrated manner.
Rigorous RCM analysis is based on a detailed Failure Mode and Effects Analysis (FMEA) and includes probabilities of failure and system reliability calculations. The analysis is used to determine appropriate maintenance tasks to address each of the identified failure modes and their consequences.

While OS is knowledgeable of many methodologies (i.e., RCM2™), we typically opt for less rigorous approaches. The most economical and efficient approach is to use a combination of rigorous (formal) and intuitive analysis depending on system criticality and failure impact. Failure modes that result in high costs or personnel injury, or where the resultant reliability is still unacceptable in terms of safety or operational impact still receive the rigorous approach, but all other failure modes will use intuitive analysis.

**Figure 2 – OESuite™ RCM Workflow**

**RCM is a Living System**

RCM gathers data from the results achieved and feeds this data back to improve design and future maintenance. This feedback is an important part of the proactive maintenance element of the RCM program.

RCM acknowledges the importance of new maintenance techniques — especially condition monitoring, and predictive technologies — while still acknowledging that traditional preventive maintenance initiatives have a role to play. It seeks to answer the following questions:

- What are the functions and associated performance standards of the asset in its present operating context?
- In what ways does it fail to fulfill its functions?
- What causes each functional failure?
- What happens when each failure occurs?
- In what way does each failure matter?
- What can be done to predict or prevent each failure?
- What should be done if a suitable proactive task cannot be found?
The purpose of RCM, as stated by Nowlan and Heap, is:

- To ensure realization of the inherent safety and reliability levels of the equipment
- To restore the equipment to these inherent levels when deterioration occurs
- To obtain the information necessary for design improvement of those items whose inherent reliability proves to be inadequate
- To accomplish these goals at a minimum total cost, including maintenance costs, support costs, and economic consequences of operational failures

RCM acknowledges five types of maintenance tasks as a result of an analysis:

- Time-directed (PM) – Scheduled when appropriate
- Condition-based Maintenance (PdM and real-time monitoring) – Performed when conditions indicate they are needed
- Failure finding (one of several aspects of proactive maintenance) – For protective devices and redundant systems that fail in a way that nobody knows it is in a failed state
- Equipment is run-to-failure – acceptable for some situations and some types of equipment
- Redesign - when failure of a system or piece of equipment is an unacceptable risk and none of the above tasks can help mitigate the failure; redesign may include training, changing procedures, and physical modifications to equipment such as adding a protective device

What is RCM2?

RCM2™ is a leading RCM methodology used to determine the maintenance requirements of any physical asset in its operating context. It is used to decide what must be done to ensure that any physical asset, system, or process continues to do whatever its users want it to do.

What users expect from their assets is defined in terms of primary performance parameters such as output, throughput, speed, range and carrying capacity. Where relevant, the RCM2 process defines what users want in terms of risk (e.g., safety and environmental integrity), quality (e.g., precision, accuracy, consistency, and stability), control, comfort, containment, economy, customer service, and so on.

The RCM2 process identifies the ways in which the system can fail to live up to these expectations (failed states), followed by a Failure Mode and Effects Analysis (FMEA), to identify all the events which are reasonably likely to cause each failed state.

Finally, the RCM2 process seeks to identify a suitable failure management policy for dealing with each failure mode in the light of its consequences and technical characteristics.

Failure management policy options include:

- Predictive maintenance
- Preventive maintenance
- Failure-finding
- Change the design or configuration of the system
- Change the way the system is operated
- Run-to-failure
The RCM2 process provides powerful rules for deciding whether any failure management policy is technically appropriate. It also provides precise criteria for deciding how often routine tasks should be done.

The OESuite™ Reliability Management Module helps organizations navigate the choices available and successfully implement a reliability program.

**Extended OESuite™ Modules**

- Management of Change
- Work Management / CMMS
- Document Management / Redlining
- Asset Strategy Management
- Inspection Management / Mechanical Integrity
- Safety Instrumented Systems / IPL Lifecycle

For more information email us at info@os-orm.com or call (713) 355-2900.