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To cite this article: Zulaikha Sajaradj *et al* 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **505** 012058

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# **The Application of Reliability Centered Maintenance (RCM) Methods to Design Maintenance System in Manufacturing (Journal Review)**

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**Abstract.** This paper introduces basic concepts of Reliability Centered Maintenance (RCM) in manufacturing that constitutes the process of selected the foremost effective maintenance approach. Reliability Centered Maintenance is an established methodology for identifying maintenance tasks. This method is used primarily in the fields of airline maintenance industries. Take advantage of Reliability Centered Maintenance it is an approach that structured to determine the type maintenance stages as well as optimal. This thing is done through a detailed analysis of FMEA. Although the main objective of Reliability Centered Maintenance is to determine the cost of maintenance, the results from the analysis can also be used in relation to the priorities raised in the observance of which was repairing, the project because they think an automobile spare parts , the considerations being the fact natural logistical limit and also has an important role in management systems.

## **1. Introduction**

The development of the technology is getting trigger competition in industry. To compete companies should can provide products and the quality of services best for consumers .Each company industry especially manufacturing must have machine of production as one of the main factors to perform the process of production. A machine consisting of the various components the vital support smooth operation , when the components damaged so will bring huge losses for the company. Therefore, we need a planning maintenance activities for each machine production to maximize available resources. A method of Reliability Centered Maintenance ( RCM ) II is a process that used for determining the maintenance corresponding in the context of operation and consequences its failure to each assets, because each components on a need a kind of maintenance of different suits to the context its operation. A method of RCM II blends the qualitative analysis which includes FMEA and RCM II decision



worksheet which will subsequently be used to determine and intervals care activities in accordance with its function and the system from the engine , while FMEA used to identify causes failure and effect caused by that collapse.

Maintenance is routine recurring work, which is necessary to retain equipment in a state in which it can perform its intended function. Maintenance is performed to ensure equipment availability in industry so as to compete in global market. Maintenance has changed more than any other management discipline during the past twenty years. In early ages, the maintenance strategy was breakdown maintenance, as there was no awareness of downtime. But with passage of time, increased complexity of machines led to the prevention maintenance in second generation, and then maintenance strategies and objectives have rapidly changed from preventive maintenance to condition monitoring. In this era, the importance of effectiveness of operational equipment raised, which is dependent on plant capacity. So, the concluded strategy must have a balance between maintenance cost and plant reliability [13].

One factor that consideration should be given on support for the implementation of the activity of treatment is spare parts. When a system experienced shut down because damaged components , the value of downtime can be reduced significantly if all spare parts needed to replace a faulty component are provided. The determination of the needs of spare parts supplies used during this is based on genuine demand the operators in the field , is not based on the analysis of a certain quantity. If spare parts is not available in times of need , to cause the cost the lost production will be tall. But , if too long accumulate spare parts in a warehouse , the cost of spare parts storage also be higher [1].

The Reliability Centered Maintenance ( RCM ) is a systematic process to do to secure all physical facilities to operate well in accordance with the design and functions .Along with the impact on caused so in 1990 started in launch RCM II that is the result of the process of development RCM previously by adding safety and environment in a consequence decision [14].

RCM is a cornerstone of physical and for the maintenance of a technique that is used to develop preventive maintenance, that on a regular schedule. A method of RCM expected to specify schedule maintenance and can know for sure the activities proper maintenance task to be carried on every other component machine [6].

## 2. RCM Background

Moubray defined RCM as “*a process used to determine what must be done to ensure that any physical asset continues to function in order to fulfill its intended functions in its present operating context.*” From this definition it is obvious that Reliability Centered Maintenance focused, not only the system hardware it self rather, but also the system function.

The develop of the Reliability Centered Maintenance methods can be traced to the aviation industry where the Maintenance Steering Groups that called (MSG) formed within the industry developed a maintenance process which was published in the 70's and 80's. This RCM methods developed into classical Reliability Centered Maintenance that has been professed by starting so as long as the manufacturing industry for sectors of the sea and to be successful in all industries in the world.

Basic steps for the implementation of the reliability had been centered the cost of maintenance the base of a method of who ask for the seven faced with the answers about in the

methodology for the pleasant and precious things that is intended to be implemented in this seven question is as follows [14]:

- (1) What are the intended functions and performance standards of the asset?
- (2) How does it fail to fulfil these intended functions?
- (3) The causes of each failure?
- (4) The appropriate consequences?
- (5) In what way does each failure ?
- (6) What task should be performed in order to avoid each failure?
- (7) What should be done if no preventive task founded to be came into effect?

Reliability Centered Maintenance is a framework structured and a process logical of optimizing maintenance resources for physical asset in its operating context. Reliability Centered Maintenance is focused on preserving system functions, rather than preserving physical asset. Reliability Centered Maintenance analyzes the functions, potential failures of spareparts and it is a seven-review step asking to evaluate “reliability”, with risk management. Reliability Centered Maintenance is possibly with the selection of an effective maintenance strategy that will offer “reliability” of spareparts [17].

### *2.1. The Purposed or RCM Method*

- a) To determine maintenance program optimal with lower the risk of and the impact due to the failure of
- b) To efforts maintenance optimal by means of focus on the critical function equipment in the system and avoid efforts maintenance action are unnecessary or no longer effective
- c) Increase maintenance task that refers to failure or repair histories [2]

### *2.2. Step of RCM Method*

- a) The selection of the system and the collection of information. In one of these phases would the election of towards the system there are so that the system which under review is not too wide.
- b) Explain the system. Explaining the system is intended to maintain overlap between one system with another system
- c) Explanation system and block diagram function. The system of the study outlined in detail than described in block diagram function. In this stage will also be developed system work breakdown structure of a system of the study.
- d) FMEA analysis. The early stages of the preparation of analysis fmea only supplement matrix equipment and failure of the function. This matrix made with combined list SWBS with information to a failure of the functions. In fmea will be conducted calculation of the value of risk priority number (RPN) based on severity value, occurrence, and detection
- e) LTA. The preparation of the LTA has objective to should be accorded priority in each mode its complete destruction and review its implementation and functions of until the status of reports of damage or injuries are not the same mode
- f) The selection of the act. The selection of the act of constituting the last stage in the process of RCM. This process will specify an action which is proper for types of damage on certain. To show off on doing the selection of the act of can be guided by questions a schoolmaster a ( selection guide ) [3]

### 3. Implementation

The most important things of the Reliability Centered Maintenance process is implementing the results of the analysis.

- (1) Need a capable Reliability Centered Maintenance leader who can socialize the results of the RCM analysis with maintenance.
- (2) The RCM Lead should work with the maintenance to request available funding to meet program needs based on the Reliability Centered Maintenance results

Basic required for the implementation of us reliability is very worrying due to centered maintenance analysis is that organizations and technical aspects of maintenance supportive function is available. The main problem is because to ensure the availability of maintenance supportive function .pemeliharaan the act of categorized into package maintenance, And every package explain what we have to do it.

The most accidents that happened in plant system are related to maintenance process. When the RCM methods applied it is a very important to consider risks associated with the execution of maintenance processes. This questions to identify potential risks associated with maintenance processes:

- (1) Can be maintenance operator injured during maintenance processes?
- (2) was a chore needed to execution maintenance processes?
- (3) how taken to avoid problems with re-routing etc??
- (4) can failure commenced during the maintenance?

Task analysis, may be used to uncover the risk involved with each maintenance job for a further discussion on implementing the Reliability Centered Maintenance analysis results [11]

### 4. Conclusion

RCM is the process of determining the most effective maintenance approach. Based on Engineering Maintenance by Dhillon, RCM has alot of positive ways, including improvement in safety and environmental system, developed product quality, improvement in the useful life of funding, improvement in team work and save cost, the best motivation for individuals, and higher plant availability and reliability.

The Reliability Centered Maintenance not only developed the responsibility of system but also reduce the needed maintenance in today competitive world, and also reduce concerned cost, saved. It also focused the safety system by set criticality point to the various sub systems and further selected maintenance activities based on the risk of failure. Therefore, Reliability Centered Maintenance introduces a maintenance plan designed for maximum safety in economical manner and make the system more reliable.

The Application of RCM can more effectiveness if we do a few things as follows:

- (1) Make sure that the operator who know the systems, participate in the analysis of RCM Methods: Process can be more effective and every people who takes it will learn more and experienced operator will also gain an amount of information when they participate but only if the knowledge operator participate.
- (2) Trained facilitator must lead the process
- (3) The Reliability Centered Maintenance process is only as effective as what each individual contributes. The more effort put in RCM, the better results we take.
- (4) The Reliability Centered Maintenance process is a living methodology that must be implementing periodically for the best result in maintenance ways [5]

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