

Business Management of Reliability and Maintainability

An Essay by

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The rift between Reliability and Maintenance (R&M) and senior management is one of philosophy. Executive management has the direction and purpose of developing market share and profitability of the corporation. R&M has the direction and purpose of maintaining the overall capacity to produce product in a cost-effective manner. In effect, management sets the course and steers the ship while R&M ensures that the ability to propel and steer is maintained.

Through a study of business books, manuals and training, the availability of equipment is often assumed to be a constant. Instead, the executive focuses energy and resources into producing a saleable product and then selling it. Everything else is secondary.

A common maintenance philosophy approach, which has worked its way into many management practices since 1984, is the Theory of Constraints. There are five basic steps within the Theory designed to improve the capacity and profitability (goal) of a company:

1. Identify the system's constraints
2. Decide how to exploit the system's constraints
3. Subordinate everything else to the above decision
4. Elevate the system's constraints
5. If a constraint is broken, go back to Step 1, but do not allow inertia to become a system constraint.

Within the Theory of Constraints, an action is considered effective when it positively impacts:

- An improvement to throughput
- A reduction of inventory
- A reduction of operating expense

Unfortunately, there are several areas of weakness in the Theory, as it is presented. As it provides a method of improving these three impacts, it overlooks some opportunities and makes a few assumptions that can be considered short-sighted. For instance, in The Goal, one of the examples of success outlines how the Theory allowed the US Army to reduce the amount of time it takes to completely tear-down a helicopter, replace parts and reassemble, periodically. The application of the Theory did not identify any reason as to why the helicopters required a periodic complete teardown instead of unintrusive

inspections and testing. It is of note that the successful example identified the existence of a percentage of failures following the periodic PM's. The second erroneous citation is the assumed measurement of a reduction of operating expense is directly related, by the author, to a reduction of personnel.

Within the R&M community, Condition-Based Maintenance (CBM) utilizing the rules of Reliability-Centered Maintenance (RCM). RCM utilizes a logical process, as follow:

1. Identify the functions required of the system
2. Understand what constitutes a functional failure
3. Understand the failure modes
4. Understand the failure effects
5. Understand the failure consequence and risk
6. What proactive tasks and intervals can detect or prevent failure
7. What can be done should a task not be identified

CBM also consists of other tactical processes, including Root-Cause Analysis (RCA), Planned Maintenance Optimization (PMO), etc. The focus of these processes place critical importance on equipment based upon the following criteria:

- Personnel Safety
- Law and Regulations
- Impact Production
- Impact Expense

When viewing these two concepts, several differences become apparent. The management level Theory of Constraints strategy is applied at the '30,000 foot' level while CBM is a 'floor' level strategy. At the corporate level, management is looking for any edge in deliverables and profitability over competitors, as such, appropriate resources are allotted to those areas that provide the greatest advantage. Such considerations involve substantial sums of money. At the floor level, such numbers as 'cost avoidance' are discussed with each finding. These numbers, and even 'availability,' often pale in comparison to the values that most executives deal with on a frequent basis, when presented individually. As a result, R&M efforts are given a back seat.

The opportunity to address R&M issues is to blend these two different philosophies. This can be done in several ways, for example:

1. Identify the corporate R&M constraints, and prioritize
2. Set potential goals in terms of (Setting Criticality – All goals should have a measurable impact on the profit margin):
 - a. Safety and Regulatory issues;
 - b. Production/Throughput;
 - c. Impact Expense (repair, replace and/or business); and,
 - d. Reduce Inventory
3. Perform RCM process on identified systems

4. Incorporate a continuous improvement process (Maintenance Effectiveness Review)

Using the example from The Goal on army helicopters, it was determined that there was a significant amount of time required to tear down and rebuild each helicopter. By following the Theory of Constraints process, there was an improvement in throughput only. There were also reliability issues following the periodic PM. If, instead, the RCM process had been applied to these helicopters, there would have been a measurable improvement in throughput, reliability issues, inventory levels, safety and costs.

Finally, it is absolutely important that upfront goals are presented in terms of profitability through such measurements as cost per unit of production. By combining the two strategies and focusing on such areas of constraint within the company, the impact of the R&M process will be significantly higher by allowing for the elevation of each constraint. This approach will also increase the importance of the R&M process within the company both focusing the efforts of R&M and presenting a business case to senior management.

Goldratt, Eliyahu M, The Goal, North River Press

Goldratt, Eliyahu M, Theory of Constraints, North River Press