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Asset Optimization as a Technique to Reduce Production Cost

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Abstract

Today manufacturing is more than an industry. It is a global engine of productivity and growth. Yet, like almost every other industry in today's struggling economy, manufacturers are under a great deal of pressure from customers and competitors, as well as partners and suppliers, to increase their capabilities in terms of faster speed to market, customization and addressing emerging business opportunities. That's on top of continually searching for new ways of cutting costs in every aspect of their business operations. For today's manufacturing companies what matters more is that how efficiently their company can compete globally with others as an organization followed by meeting the day today requirements of the customer and exchange of hassle free information while not focusing only on sales of the company [1].The prospect of having to somehow "do more with less"

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can be discouraging, but this need not be the case. In this paper the implementation of asset optimization technique in manufacturing is discussed

Index Terms—Productivity, Asset management, optimization, production

I. Introduction

Asset Optimization is the process of improving the deployment of assets to achieve improved performance and lower costs of operations with a system based approach. It makes all the equipment as perfect, as operational and as effective as possible. Asset Optimization is a system of organizing and applying assets from personnel to machinery, bringing knowledge and technology together to achieve the greatest return on investment [2].

II. Asset Utilization

Most manufacturing facilities today are employing a large quantity of assets. A process for quantifying opportunities for improvement is asset utilization (AU). This process quantifies the improvement opportunities through root cause analysis of time and material of equipment across an operation [4]. The different asset utilization parameters are described as under:

1. $\% \, Availability \, (A) = \frac{Calander \;\; Time - Down \; Time}{Calender \;\; Time}$
2. $\% \, Run \, Time \, Efficiency \, (RTE) = \frac{Available \;\; Time - Setup \; Time}{Available \;\; Time}$
3. $\% \, Run \, Speed \, Efficiency \, (RSE) = \frac{Total \;\; Production}{Runtime \; * Standard \;\; Rate}$
4. $\% \, Yield \, (Y) = \frac{Total \; Acceptable \;\; Products}{Total \;\; Production}$
5. AU= A * RTE * RSE * Y

Availability determines the percentage of time the asset is available to run whereas down time represents the time spent on the scheduled and unscheduled maintenance, no operation and idle times due to unavailability of the orders. No operation category includes the situation raised due to problems beyond its control like material flow, lack of supply, substandard material for operation etc. Run time efficiency examines the percentage of cycle time that is spent actually running product versus setting up for other products. Here the time spent in changeovers and transitioning is taken into account. Run speed efficiency is determined by comparing the actual production to the ideal production that could have been achieved at

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maximum speed or standard rate. While assessing yield, the quantity of quality product and the quantity of substandard product are taken into consideration [5]. The fig. 1 shows the AU parameters and their representation to calendar time.

AU process is applied to individual equipment across a manufacturing operation. This process helps in identifying the areas where in improvements can be made to reduce the cost of production [4]. Today in manufacturing Sector Companies generally thrive for supplying products at competitive prices which reflect their overall cost of production. In order to remain competitive or to have larger market share the cost of production should be as lower as possible. Minimum cost of production can be achieved by utilizing the fixed assets to the maximum and reduce wastage or improper use to the minimum level. Thus the asset optimization is gaining popularity in the manufacturing industry

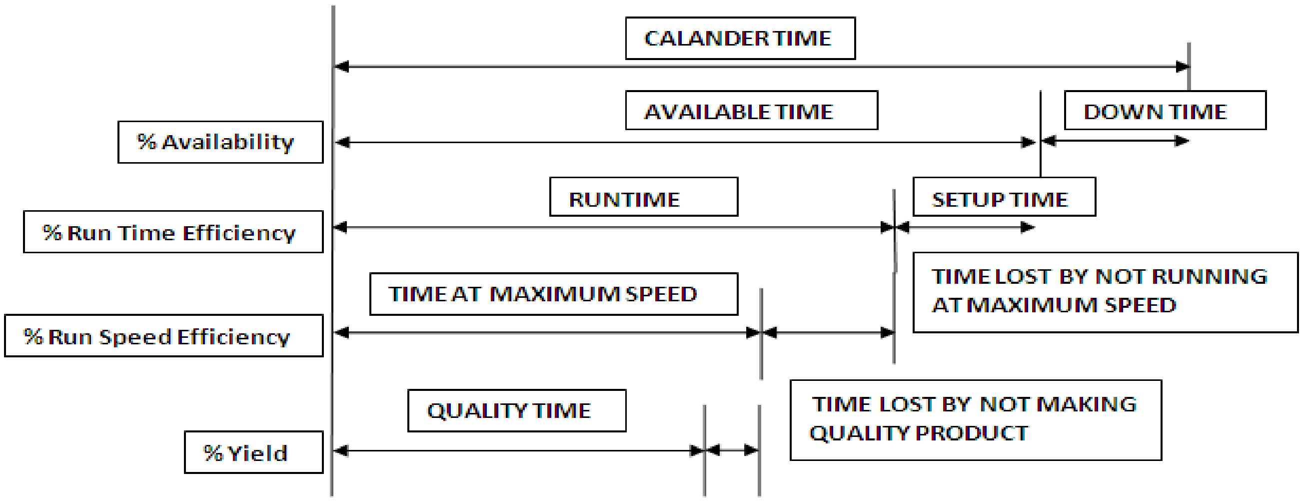


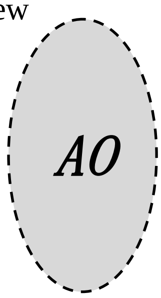
Figure 1. Representation of AU parameters on calendar time.

III. Asset Optimization benefits

A well-executed asset optimization strategy can reduce unnecessary maintenance and downtime, track causes of failures, identify “repeat” offenders, provide root cause data and fault diagnosis and recommend actions. It also detects failure conditions in advance, eliminates manual actions, handoffs, and paperwork and reduces latent time between problem identification and resolution. The primary benefits of an asset optimization strategy are that it increases asset availability and performance, and that it maximizes operations and maintenance effectiveness.

Many think increasing productivity means building more factories. But capitalizing on

Overall Equipment Efficiency (OEE) may be equivalent to setting up of a new factory [2]. To maximize OEE it becomes necessary to shift from traditional maintenance activity to a proactive process. The figure below demonstrates the different maintenance practices. While implementing AO the goal, of course, is to shift from traditional reactive activities to a proactive approach. A business supported dynamic blend will generate the best result.



IV. A 5-phase approach for achieving AO

For achieving asset optimization there may be numerous was. A step by step 5-phase approach is described here. This approach support high reliability, reduced maintenance costs, and continuous improvement in a sustainable program. This approach is applicable to optimizing of the existing programs and developing new programs, whether at existing or new facilities [3].

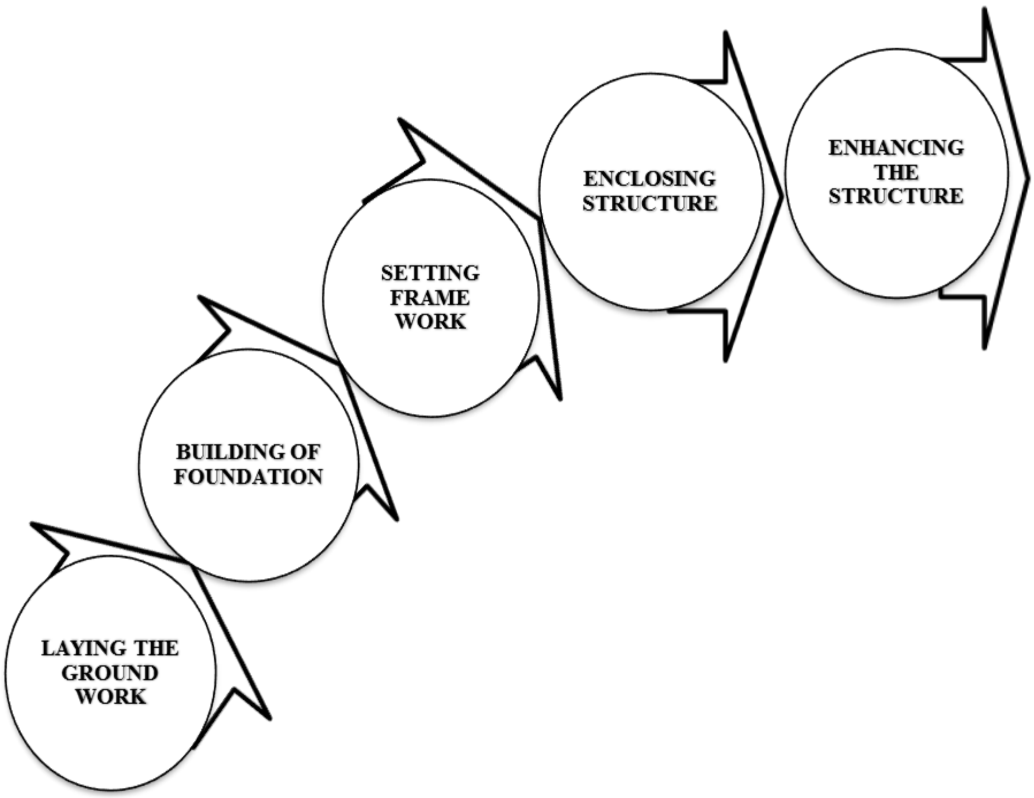


Figure 2: A5-phase approach to achieve Asset Optimization.

Phase I: Laying the Ground Work:

This phase of the process lays the groundwork for improvements by preparing the plan for "smart" improvements. It begins with a site assessment to identify the current situation versus desired performance, and then the strategy to mitigate the gaps. It is at this stage that all components of the plant asset optimization program are evaluated and obstacles toward program improvement are identified. The gap analysis results in a detailed process improvement plan that lays out the necessary actions for progress of the program. Phase I activities also deal with strategy development and the identification and control of programmatic and cultural issues. Effecting positive culture change is one of the most important ingredients required for success and this is generally overlooked. A comprehensive action plan so developed must be clearly communicated throughout the organization. Ensuring the entire plant staff understands project intent and the role each individual will play is extremely vital to project success and sustained performance.

Phase II: Building of Foundation:

In this phase based on the quality of the data, the practice fundamentals are established. Here begins the transition to a more controlled process, fortifying CMMS and technical information, incorporating training on program policies and work management procedures, and setting the table with tools for Phase III activities. Phase II includes systematic screening of all assets to determine relative criticality to safety, environment, operations, product quality, and maintenance costs these criticality rankings will be used in Phase III to direct development of optimum PM, PdM, and spare parts strategies. Asset optimization program performance reporting is also set up in Phase II. This involves the roll out of actions to meet the performance reporting requirements set out in the policies developed in Phase I.

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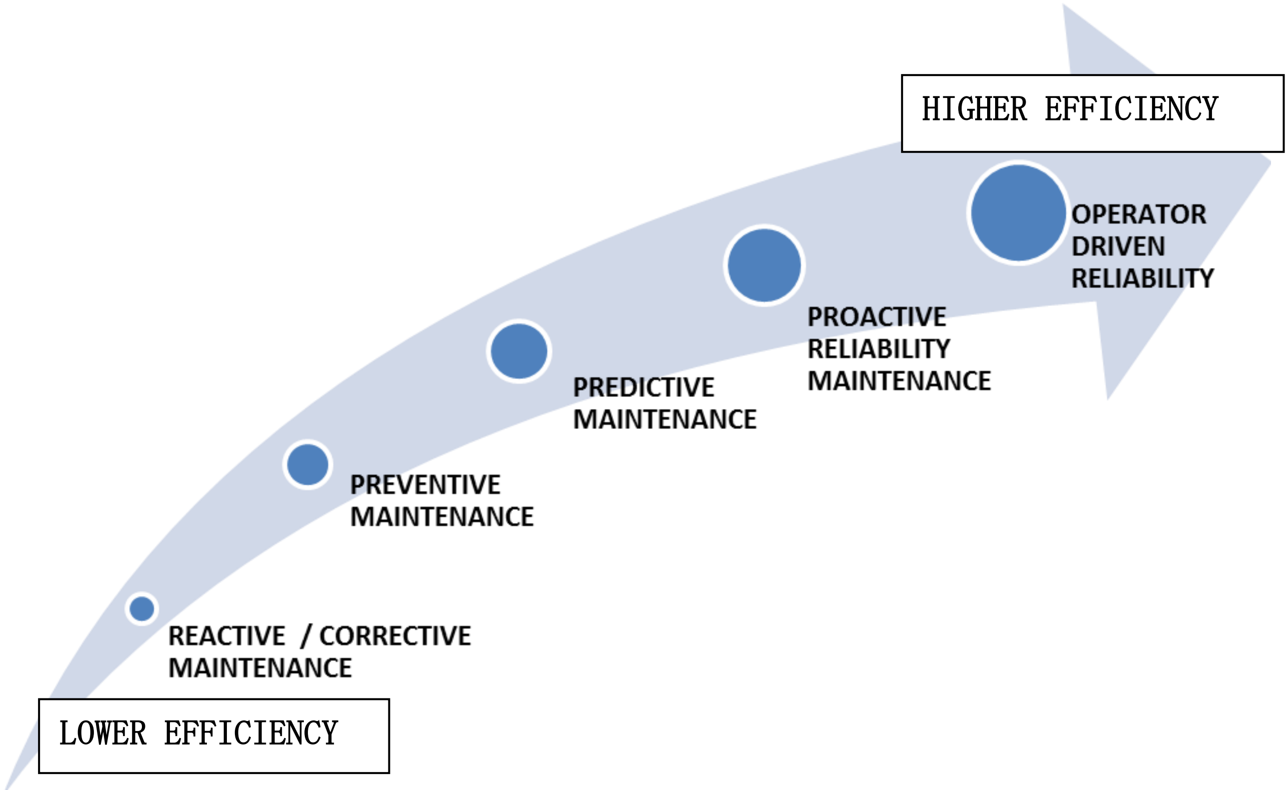

Figure 3. Transition from reactive maintenance to pro-active maintenance.

Phase III: Setting Frame Work:

In this phase the execution of the core program begins and changes in daily work routines are carried out. PM and PdM routines are developed and implemented in the CMMS. Critical issues that are often root cause of failures are identified, and the requirements to address them are thoroughly documented and utilized during this process. It is also at this point that the maintenance program will begin transition from reactive maintenance towards proactive maintenance in a controlled manner as shown by the steps in fig. 3. Here the “Fix It Now” or FIN team strategy is implemented to assist with this difficult transition. Initially a large portion of the maintenance team deals with daily work requests or “Fix It Now” items, allowing the balance of the maintenance team to begin executing preventive and predictive tasks that will drive improved reliability. As the program matures, the proportion of personnel assigned to the FIN team will eventually be reduced to about 20% of the total maintenance team, while the remaining 80% of the maintenance team will be devoted to ongoing proactive maintenance functions. Phase III is also where actual program reporting begins that will enable ongoing measurement and tracking of overall project impact. The Table-1 represents

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how the individual equipment utilization can be optimized by focusing on the root causes:

Phase IV: Enclosing Structure:

In this phase the proactive elements are added to support continuous improvement of the program. The program by now has acquired all the necessary components to support higher level of reliability initiatives such as Machine Improvement Strategies, Technology Improvements, Reliability Centered Maintenance (RCM), Root Cause Analysis (RCA), and Spare Parts Optimization. Other reliability methodologies such as Six Sigma may also be valuable depending on the requirements of the facility. Some of the initiatives listed in Phase IV may be implemented earlier in the process depending on individual facility needs and resources available to support the initiatives. For example, a formal RCA methodology and program may need to be implemented early at a new facility so that issues associated with initial plant startup can be effectively analyzed and worked to successful resolutions. Ongoing maintenance training programs are also developed in Phase IV as part of continuing development of craft skills.

Phase V: Enhancing the Structure.

In the final phase, the program is raised from “great” to World-class. The programmatic enhancements that occur in Phase V focus more on financial benefits than on reliability improvements. It is at this stage that energy consumption can be reviewed and areas of inefficiencies identified and corrected. Also, developing a capital projects prioritization process provides a structured methodology for comparing costs and benefits of two competing capital projects. The outcome of such a comparison is selection of the capital project that provides the highest rate of return to the facility over time. Asset replacement strategies should also be developed and implemented in Phase V to address aging and obsolescence issues as the plant continues to operate.

V. Conclusion

Asset Optimization is the systematic process that enables the dream of Operations Excellence. It emphasizes a logical approach to best practices through the phases of the program. The primary benefits of an asset optimization strategy are that it increases asset availability and performance, and that it maximizes operations and maintenance effectiveness. Functional excellence will never be enough to be the best. Lead functions are the glue that brings all the pieces together in an optimized set of systems, especially through the mechanism of the Managing System and Strategic Plan. Finally, organization can only be as successful as its workers' endorsement and participation in these functional excellence practices. They must enable their people to bring them the success that they desire. An organization can become the best if it starts its journey with the right model.

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