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Overall Equipment Effectiveness in Construction Equipment's (Implementation of OEE for Improving Performance and Quality Output of the Equipment)

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Abstract : ***benefits of implementing Total Productive Maintenance and evaluating the overall equipment effectiveness in construction equipment's, measuring OEE is a construction best practice. By measuring OEE and the underlying losses, you will gain important insights on how to systematically improve your construction process. OEE is the single leading metric for finding losses, benchmarking progress, and improving the productivity of manufacturing equipment (i.e., eliminating waste). Overall Equipment Effectiveness (OEE) of a machine plays a vital role where performance and characteristic of the product are of key relevance to the company. The OEE intended at minimizing the breakdowns, increasing performance and quality rate and thus improving the efficiency of the machine. The availability rate of the machine, performance rate of the machine and quality rate of the products are considered as parameters while escalating the Overall Equipment Effectiveness (OEE) of a management system. The objective of the work is to increase the overall equipment effectiveness (OEE) at a construction company. The answer is OEE which extracts all the reason for delay of the job. OEE not just only measures Inefficiency but also categorises those into 3 categories for better understanding of manufacturing procedure In construction activities on an immense scale require the standard equipment's for effective operations especially in the area of infrastructural development. This is the true picture of large construction companies whose physical lucrative activities lean on men, materials and sophisticated machineries that will produce output of operations during a particular period use. Therefore, the effectiveness of construction machineries is a major consideration that denunciates construction companies in terms of heavy construction and light construction. In the today's period of agonizing global competition, construction industries are determined to progress and amend their productivity in order to remain competitive***

Key Words: Overall Equipment Effectiveness, OEE Losses, 5S, World class OEE, TPM

I. INTRODUCTION

Overall Equipment Effectiveness (OEE) is a tool to evaluate the productiveness of a machine or a production line. The higher the OEE measure the more good products (per shift) a machine or line produces. This results in lower costs per unit produced and helps operations to be more competitive. OEE Analysis is a tool used to analyse equipment performance, accounting for losses due to availability, performance, and quality.

II. DEFINING OEE

When considering a strategy for achieving maximum efficiency from a production facility, one of the most important elements to consider is the production equipment. By increasing equipment effectiveness, a facility can increase the throughput and quality of product with less downtime and scrap. Although simply stated, it involves a greater depth of detail. It is essential to understand the equipment, and to successfully classify the equipment problems.

When investigating equipment effectiveness, most manufacturers begin by evaluating the Overall Equipment Effectiveness (OEE), a quantitative measure of the yield of a machine. The OEE value of the equipment actuate productivity into three major categories: availability, performance, and quality, taking into consideration the losses encountered within each of those categories.

OEE = Availability * Performance * Quality

To begin an OEE evaluation, an overall assessment of availability, performance and quality, must take place. Then, a more detailed analysis is needed to uncover definite problems and losses encountered in each of these areas. Next, options must be reviewed to

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determine a proper course of action to correct the inefficiencies. Finally, a return on investment (ROI) must be calculated to justify the decision.

In general there are three options applicable to manufacturers looking to increase their OEE. They are fixing the existing machine by implementing basic maintenance corrective actions and upgrade the existing equipment with new components purchase new equipment.

III. CLASSIFICATION OF OEE FACTORS

OEE is classified into three metrics Availability This metric describes how really the machine is available for production. Availability accounts with down time losses. Down time are those events which can be stop planned production for a particular time. For e.g.:- machine is stop due to overheating, tool not available, voltage trip suddenly, coolant supply stopped due to technical fault , job change over time.

A. Availability = Actual Operating Time /Planned Production Time

1) *Performance:* It accounts for speed losses. Performance metric tells how fast and effectively the operator carries out the job as soon as possible within the budget hours. It identifies and focuses on those factors which cause delay in production and speed reductions some of the causes are (Improper casting, miss fed, and operator Inefficiency, and machine vibrations.)

B. Performance = Budgeted Allotted Time/ Actual Completion Time

1) *Quality:* Quality metric accounts for quality losses i.e. good product among all fabricated product. In this case study we contemplate rework time as one of a parameter for quality. After completion of job due to machine and operator Inefficiency rework is carried out for dimensional accuracy of the job. This quality metric shows how great the operator carried out the process for producing a job. This metric shows quality of machine as well as operator skill to run the machine effectively. Quality losses are due to scrap, rework, incorrect, dimension, incorrect sequence of operation, in process damage.

C. Quality= Actual Time to Turn Out Job/ (Actual Time + Rework Time)

1) OEE= Availability x performance x quality

IV. SIX BIG LOSSES

The losses are those activities which consume input and resources without giving any valuable output in terms of monetary value. So for that Seiichi Nakajima categorises these losses in six frameworks.

Losses which are identified in this case study are shown below.

A. Breakdown

1) Machine failure
2) Tool breakage
3) Machine program hang
4) Electric power trip
5) Unplanned maintenance
6) General breakdown
7) Tool unavailability

B. Set-Up and Adjustment

1) Operator unavailability
2) Fixture are not up to mark
3) Helper inefficient

C. Small Stops

1) Obstructed product flow
2) Component jam
3) Misfed

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4) Housekeeping of machine
5) Frequent dimension check due to lack of confidence and documentation.

D. Reduced Speed
1) Low grade of tool used
2) Low maintenance of equipment
3) Operator procrastinates job
4) Level of machine operator training

E. Production Start-Up Reject
1) Casted/fabricated job damage during setup

F. Production Reject
1) In process damage
2) Scrap
3) Rework

V. 5S OF TPM

A. Sort
The first pillar of 5S helps to clearly categorize the items needed in a work area from those no longer needed.

B. Set in Order
The second pillar of 5S helps to keep the needed items in the right place to allow for easy and immediate improvement.

C. Shine
The third pillar of 5S helps to keep work areas, all work surfaces and equipment clean and free from dirt, debris, oil, etc.

D. Standardize
The fourth pillar of 5S defines the standard activities, procedures, schedules and the persons responsible for keeping the workplace in a clean and organized manner.

E. Sustain
Sustain is the last pillar of 5S and drives the organization to be disciplined in maintaining these new standards and procedures and in continuously improving the 5S state of the workplace.

VI. TPM AND WORLD CLASS OEE

Seiichi Nakajima led the intiation of TPM, OEE and the Six Big Losses in the early 1970s while at the Japanese Institute of Plant Maintenance. In his 1984 book, Introduction to TPM, Seiichi Nakajima included the four "world-class" numbers. Seiichi defined these numbers based on his practical experience, as minimums for which companies should strive. He also noted that all of the companies winning the Distinguished Plant Prize, awarded annually in Japan to plants that had successfully implemented TPM, had OEE scores in excess of 85%. The World-Class OEE figures are compelling and helpful, but keep in mind that they have roots in a particular place (Japan), at a particular time (1970s), and in a particular industry (automotive). The reality is that most construction companies, even today, have OEE scores closer to 60%.

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VII. CONCLUSION

TPM aims at improving the OEE of the construction equipment's. Therefore to improve the overall output and productivity of the construction systems the performance of the equipment must be over looked and should be treated as an important factor in order to obtain better OEE results. Various success pillars like planned maintenance, quality maintenance, office TPM, safety, health and environment plays a major role in successful values of OEE. Quality factor should not be compromised therefore the production output is achieved through high equipment availability which is influenced by equipment maintainability. In order to obtain the world class OEE values, the principles of TPM should be followed in every step of OEE outputs or end results. As TPM is a equipment-centric continuous improvement process that enhances the OEE values by identifying losses, efficiency and the possible outputs. Active team based management of employees at all the levels in the hierarchy is also an effective output of TPM.

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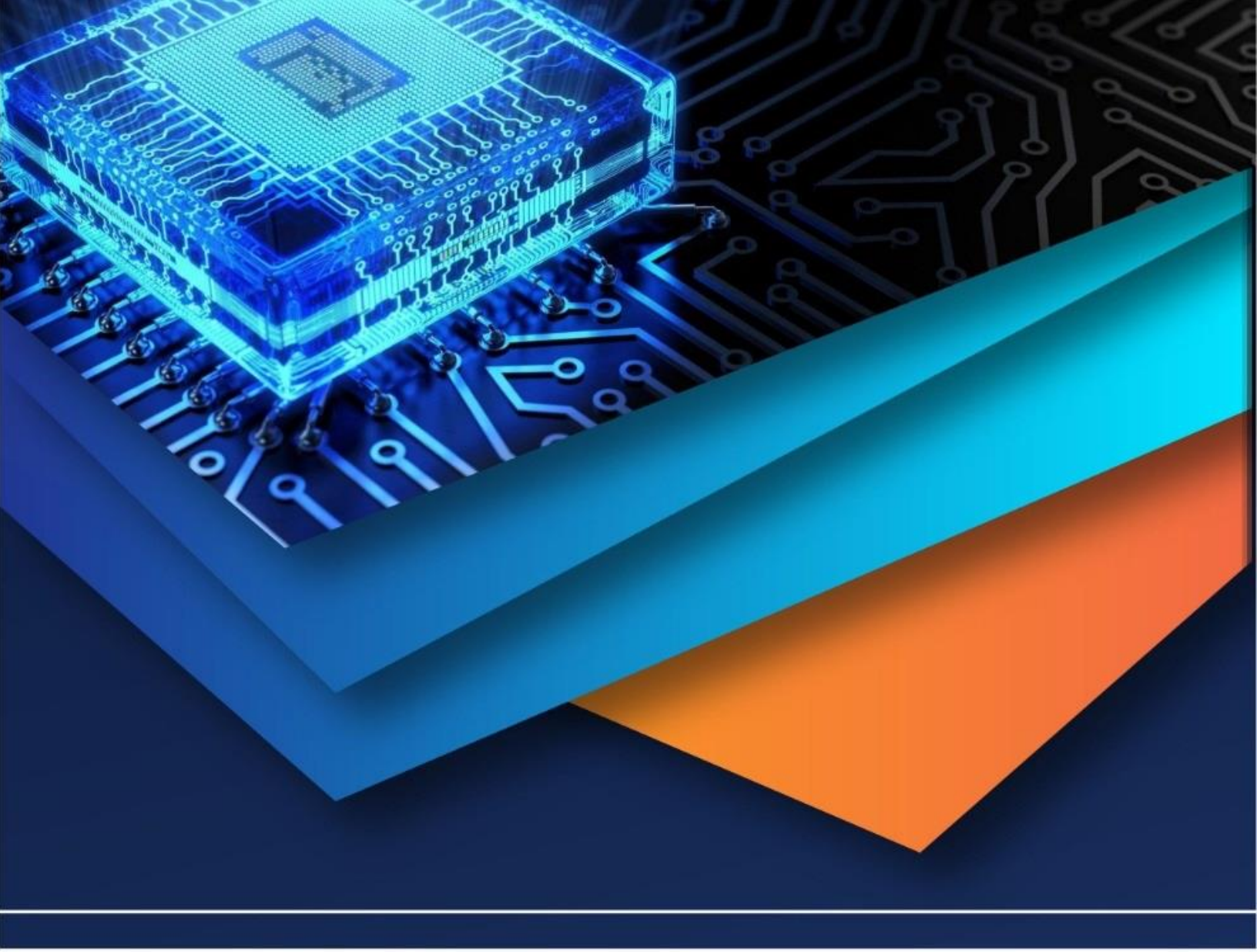

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