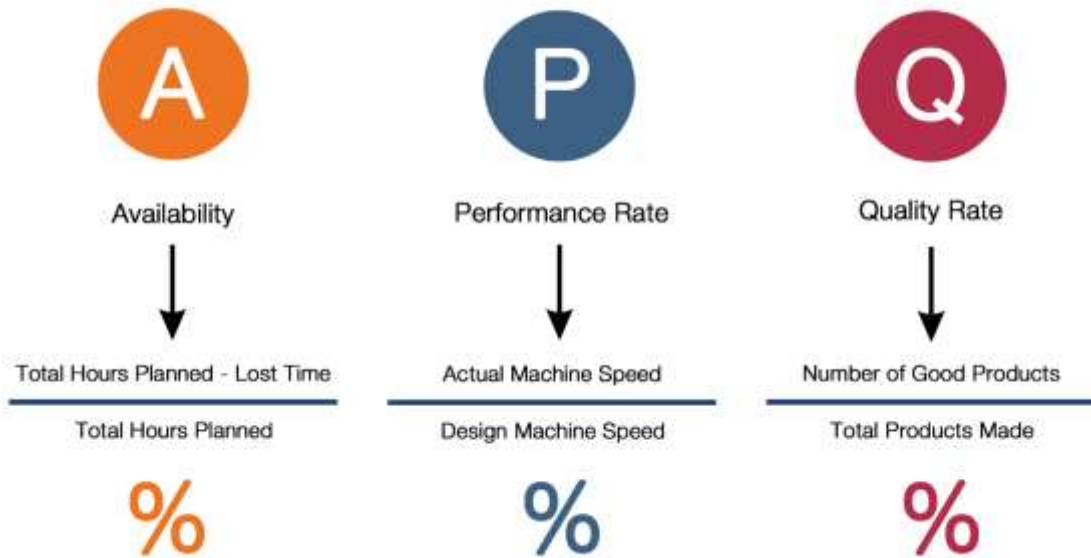


OEE

Performance Acceleration on Production Machines Using the Overall Equipment Effectiveness (OEE) Approach

The overall equipment effectiveness or efficiency (OEE) is a metric that has been accepted in the semiconductor industry. OEE is simple and clear, and standards and guidelines have been developed. Nonetheless, the literature indicates imperfections in applying OEE with regard to the time base and rate efficiency. As OEE lacks a proper framework, the equipment effectiveness (E) has been developed based on a systematic approach to the equipment. E considers the effectiveness of the equipment with respect to availability, speed and quality losses. Unlike OEE, E is a performance measure for stand-alone equipment, isolated from the environment. In addition, E uses the available effective time as a basis in contrast to OEE, which uses the total time as a basis for measurement. Finally, due to the fact that E is measured directly by the production and effective time, it does not depend on the utilization of the equipment, unlike OEE. Furthermore, it has been shown that OEE does not indicate the influence of downtime and rework, whereas E gives these influences correctly.



Total Productive Maintenance (TPM)

Total Productive Maintenance was first defined in 1970s by Seiichi Nakajima from the Japan Institute of Plant Maintenance. Maintenance is an activity to preserve and maintain the existing facilities as well as do the required reparation, adjustment, or replacement to get the ideal condition of production operation as planned. Total Productive Maintenance began from the idea of Preventive Maintenance and Production Maintenance, which came from America to Japan and developed into a typical Japanese new system and later it's called as Total Productive Maintenance (TPM). TPM is a maintenance concept which involves all the employees to reach effectiveness of the production system through participation as well as productive, proactive, and well-planned maintenance activities. According to, the comprehensive definition of TPM covering five elements as follows:

Its objective is creating a preventive maintenance (PM) system to extend the machines or equipment's useful life.

Its objective is optimizing the overall effectiveness of machines or equipment.

It can be applied in several departments such as engineering, production, and maintenance department.

It involves all of the internal stakeholders, from the highest management to the employees/ operator in production department.

It is the development of maintenance system based on PM through motivational management.

Overall Equipment Effectiveness (OEE)

Overall Equipment Effectiveness is a method used as measuring instrument in TPM implementation program, to maintain the equipment in ideal condition by erasing the six big losses. The measurement of OEE score is determined by these three main ratios:

Availability Ratio

It is a ratio that illustrates the use of the available time for the machines or equipment operations. Availability ratio also measures the overall time in which the system is not in operation because of the occurrence damage to the equipment, production preparation and adjustment. The formula to calculate this ratio is:

$$\text{Availability Ratio} = (\text{Operation Time} / \text{Loading Time}) \times 100\%$$

$$\text{Loading Time} = \text{Total Planned Time} - \text{Planned Downtime}$$

Performance Efficiency

It is a ratio that illustrates the machines' capability in producing products. Performance ratio is also a ratio of the actual operating speed of the equipment with ideal speed based on design capacity. The formula to calculate this ratio is:

$$\text{Performance Efficiency} = (\text{Actual Product} \times \text{Ideal Cycle Time}) / \text{Operation Time} \times 100\%$$

Data required in the performance efficiency of the company in the form of percentage of working hours and production machine parts per month.

Rate of Quality

It is a ratio that illustrates the products' quality produced by the equipment in accordance with standards. Quality Ratio is intended on the loss quality of products such as of defects that occur related to equipment, for conversion into time with the intention of how much time equipment is consumed to produce the defective product. The formula to calculate this ratio is:

$$\text{Rate of Quality} = (\text{Good Products} - \text{Total Defect}) / \text{Gross Products} * 100\%$$

Data required in the rate of quality of the company in the form of a product that results are good and defective products.

Six Big Losses

The objective of the Six Big Losses calculation is to determine the OEE score. The low productivity of the machine causing harm to the company is often caused by the use of machinery / equipment that are not effective and efficient.

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