Overall Equipment Effectiveness (OEE)

A machine may run all day and still waste much of its capacity. Overall Equipment Effectiveness, or OEE, measures how much of the planned production time is truly productive. It is associated with Seiichi Nakajima, who helped to develop Total Productive Maintenance in Japan. OEE multiplies three factors: availability, performance and quality. Many plants have more hidden capacity than they realise, and OEE helps to find it. We can follow four parts: the three factors, and how to combine and improve them.

1. Availability

Availability asks how much of the planned production time the equipment actually runs. This time is lost to breakdowns, set-ups, changeovers and waiting for materials. Stops that are logged as downtime add up when they happen many times a day. The formula is run time divided by planned production time. Time when no production is planned, such as a holiday, is normally left out.

Example: A taxi is available for ten hours of its shift, but spends two hours in the workshop. Applying Availability, it ran for eight of the ten hours, which is eighty percent. Those two hours are the loss to understand first.

At work: Tariq's packing line is planned for five hundred minutes. Applying Availability, he sees fifty minutes of stops, so the run time is four hundred fifty minutes. Availability is ninety percent. Most of the stops come from changeovers between products.

2. Performance

Performance asks whether the equipment runs at its ideal speed while it is running. It is lost to slow cycles, small stops and running below the designed rate. These losses are often invisible, because the machine never fully stops. The formula compares the actual output with what the ideal speed would produce in the run time. A machine can be running and still be slow.

Example: The same taxi should complete twenty-five trips in its eight hours, but completes twenty. Applying Performance, its performance is eighty percent. The five missing trips are lost to slow cycles.

At work: At the ideal speed of one unit a minute, the line could make four hundred fifty units in its run time. Applying Performance, Tariq counts three hundred sixty units actually made. Performance is eighty percent. The missing ninety units are a loss of speed, not of time.

This document is a property of Asaseeyat Academy - © Copy Right Protected.

3. Quality

Quality asks what share of the units made are good the first time. Rejected and reworked units waste time, materials and effort. Quality losses are expensive because the time and materials are already spent. The formula is good units divided by total units. Counting only first-pass good units shows the true cost of defects.

Example: Of the taxi's twenty trips, two end with complaints and refunds. Applying Quality, eighteen of the twenty are good trips, which is ninety percent. The two bad trips cost fuel and goodwill.

At work: Of the three hundred sixty units, thirty-six are rejected. Applying Quality, Tariq counts three hundred twenty-four good units. Quality is ninety percent.

4. Combine and Improve

OEE is availability times performance times quality. In Tariq's case, ninety percent times eighty percent times ninety percent gives about sixty-five percent. The losses behind these factors are often grouped into six big losses, from breakdowns to start-up losses, so that teams know where to look. A figure often quoted as a world-class target is eighty-five percent, but the best comparison is a plant's own history, because products and processes differ. We attack the biggest loss first, then measure again.

Example: The taxi's figures are eighty percent, eighty percent and ninety percent. Applying Combine and Improve, they multiply to about fifty-eight percent, and the owner works on the biggest loss first.

At work: Tariq multiplies his three figures and gets about sixty-five percent. Applying Combine and Improve, he looks at the biggest loss, which is slow running at eighty percent. After fixing a feeder problem, performance rises and OEE improves.

Conclusion

In summary, OEE shows how much of the planned production time is truly productive. It multiplies availability, performance and quality. The idea is associated with Seiichi Nakajima and Total Productive Maintenance. It is most useful for finding the biggest loss and tracking progress over time. It turns a vague feeling that the line is slow into numbers that a team can discuss.

Sources

- Nakajima, S. (1988). Introduction to TPM: Total Productive Maintenance. Productivity Press (the book where OEE and the six big losses are associated with TPM).
- Wikipedia: Overall equipment effectiveness (formula, history and examples) – https://en.wikipedia.org/wiki/Overall_equipment_effectiveness
- Wikipedia: Total productive maintenance – https://en.wikipedia.org/wiki/Total_productive_maintenance

This document is a property of Asaseeyat Academy - © Copy Right Protected.