AUGURY

How to Use OEE Effectively

Overall Equipment Effectiveness (OEE)

OEE is one of the most common metrics in manufacturing, but are you using it effectively? Analyst Dan Miklovic is a recognized thought leader in manufacturing productivity. He founded Lean Manufacturing Research, led Gartner's Manufacturing Industry Advisory Services practice and has 20 years of industry experience at companies such as Weyerhaeuser and Mallinckrodt Chemical.

Here are Dan's top tips for using OEE effectively.

What is OEE?

The OEE metric first emerged from Toyota's Total Productive Maintenance (TPM) program in the 1970s. It was designed to measure the productivity of a single machine center as a percentage of its maximum theoretical productivity. 80-85% OEE is often cited by analysts like Gartner as world-class but OEE at many plants hovers closer to 60-65%.

A Brief History

1970

70's

OEE emerges from Toyota's Total Productive Maintenance (TPM) to measure a single machine center's performance.

1980

1984

Seiichi Nakajima publishes Introduction to TPM. The book is translated into English in 1988.

1990

Mid-90's

Interest grows in semiconductors andamong European manufacturers and lean adherents.

2000

Early 2000's

Standardization efforts begin. OEE becomes a "miracle metric" applied to entire lines, plants and businesses.

Calculating OEE

Availability x Performance x Quality = **OEE %**

Availability

Uptime divided by total planned production time

$$\frac{\text{360 minutes}}{\text{480 minutes}} = .75 \text{ availability}$$

Performance

Parts produced divided by maximum part rate

$$\frac{\text{12,000 parts}}{\text{20,000 parts}} = .60 \text{ performance}$$

Quality

Good count parts divided by total parts

$$\frac{\text{11,760 parts}}{\text{12,000 parts}} = .98 \text{ quality}$$

Measure OEE Accurately

To measure OEE accurately, you must measure it precisely, consistently and by giving staff the right incentives to measure it correctly. People do what they're rewarded for. If you base compensation on high OEE, staff will find a way to give you high OEE even if it means gaming the metric.

Precisely

Define how to measure each element of OEE, e.g. is this a stop or downtime?

Consistently

All functions should measure the elements of OEE in the same way

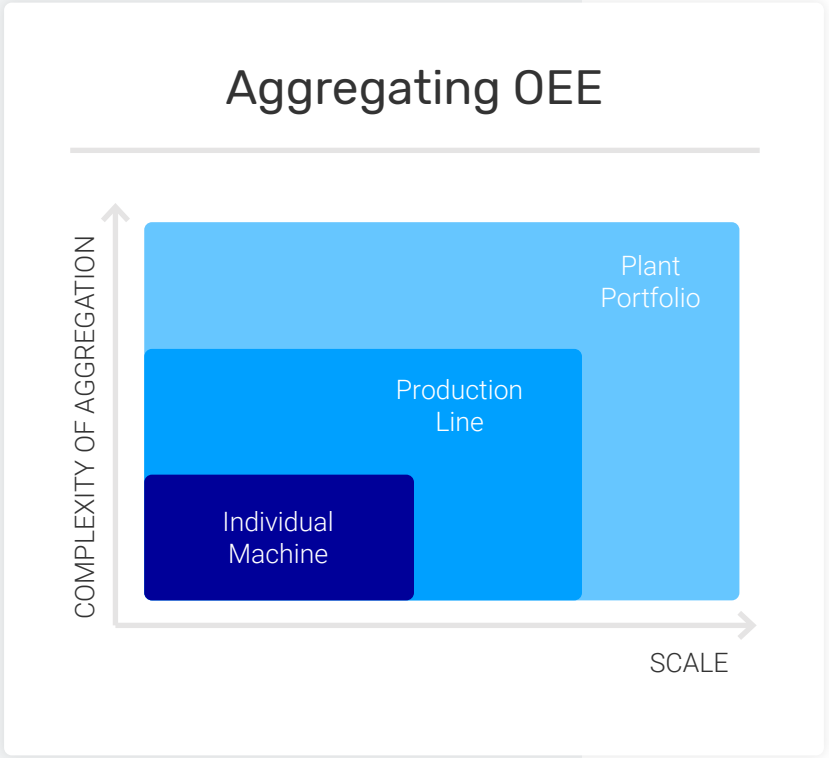
Incentives

Don't incentivize staff to game OEE, e.g. by basing compensation on it

Use OEE Appropriately

Use OEE primarily to measure the effectiveness or productivity of a single machine center. If you aggregate OEE across an entire plant or production line, it becomes much more difficult to use it in a meaningful way.

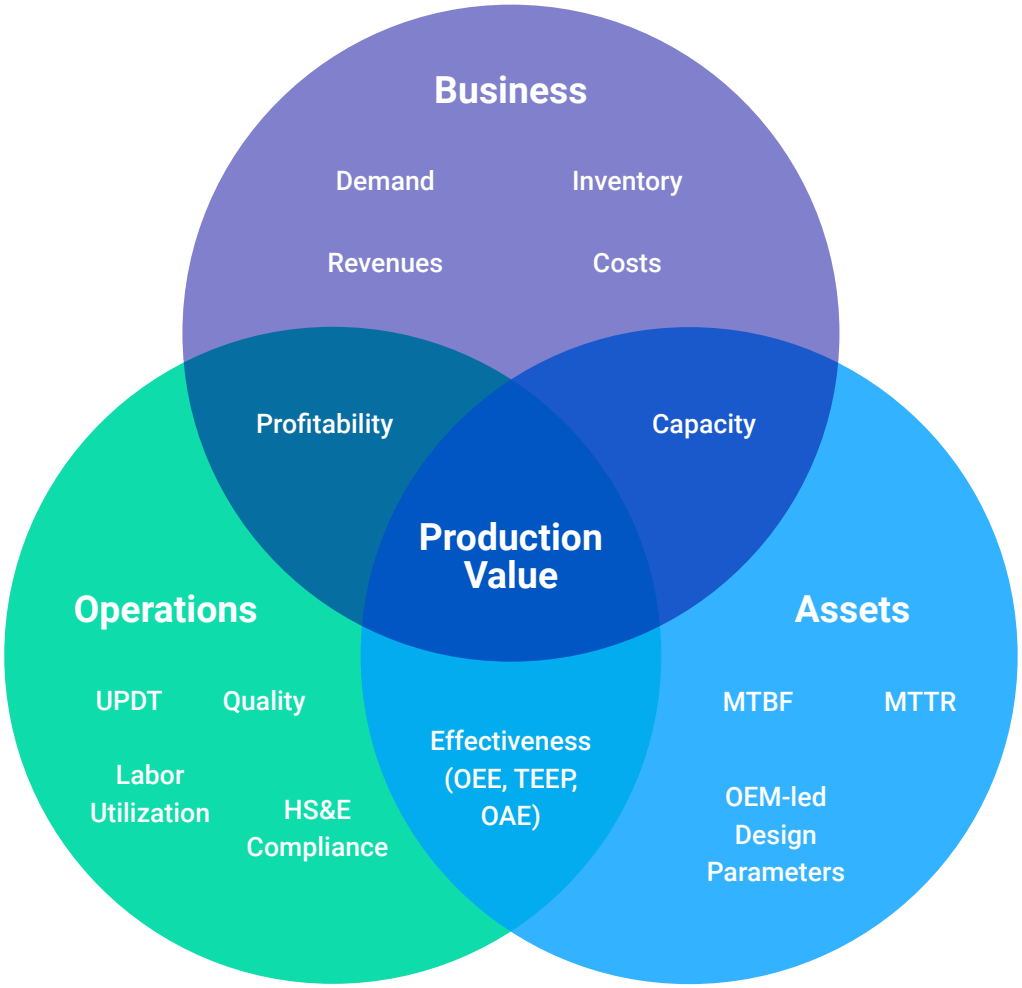
Only compare the OEE of a machine to itself and to very similar machines (machine type and function) used in a very similar way (product, environment and operators). For example, two different products may naturally run at different piece rates through the same machine.



Use OEE in Context

Track OEE and other effectiveness metrics like TPM or Overall Asset Effectiveness (OAE) in conjunction with business metrics. OEE tells you how your assets are performing given how you are operating them. It doesn't tell you anything about profitability. Machines running a product which takes a lot of time and energy to make will naturally have lower OEE, but that same product might be highly profitable.

Therefore, it's important to measure your operation using multiple types of metric and to be aware of the tradeoffs between those metrics.



How Machine Health Improves OEE

Machine Health uses the Internet of Things (IOT) and Artificial Intelligence (AI) technology to predict and prevent machine failures, and improve machine performance. Machine Health helps improve OEE in several ways.

Availability

Prevents unplanned downtime and reduces planned downtime

Performance

Eliminates machine issues causing slow cycles, short stops and longer changeovers

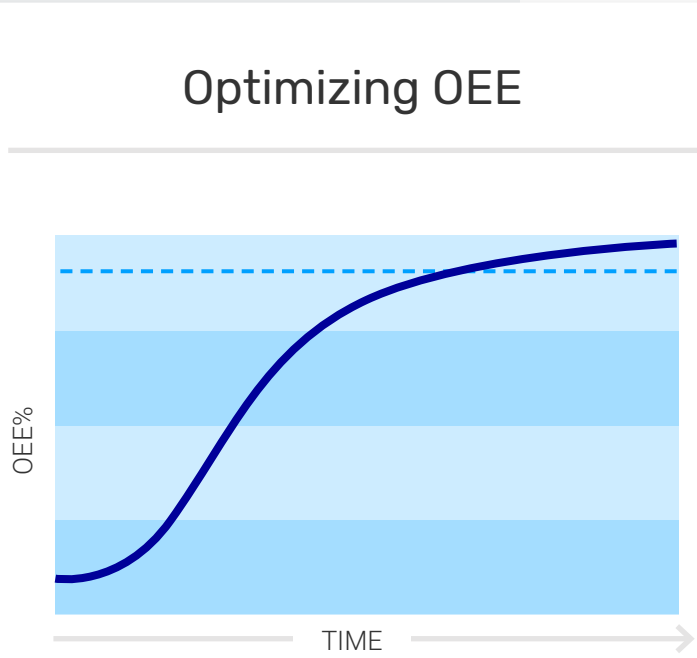
Quality

Cuts scrap by increasing MTBF and prevents quality issues caused by machine condition

OEE in Industry 4.0

OEE will not disappear in Industry 4.0, but manufacturers will use Machine Health and other data-driven technologies to optimize it. As OEE trends towards 100% it will become an alarm threshold instead of a target metric. In other words, a manufacturer will define a minimal acceptable OEE for its operations rather than constantly try to improve it.

Ultimately, manufacturers will shift from using lagging effectiveness metrics like OEE to new predictive performance metrics. Individual components of OEE will still provide predictive insight, i.e. manufacturers will track predicted availability, performance and quality.



Augury is building a world where people can always rely on the machines that matter. Augury supports its partners by enabling Digital Transformation through superior insights into the health and performance of the machines they use to make products, deliver services and improve lives.

augury.com

support@augury.com