

Mind Your Metrics

Customer focus improves overall equipment effectiveness

MANY MANUFACTURING organizations use overall equipment effectiveness (OEE) as a key performance indicator (KPI) for measuring results. OEE, which is a concept used in lean manufacturing, can serve as an organization-wide metric to monitor the efficiency of a particular process, machine or production line. OEE is based on a machine's operational availability, performance efficiency and first-pass yield.

Let's say a machine can produce 100 widgets a day. Material constraints cause only 85 to be produced—a performance efficiency of 85%. Because of maintenance and tool changes, the machine is used six of seven hours. Operational availability or utilization is 86%. First-pass yield is 80 of 85, or 94%. OEE is calculated as $0.85 \times 0.86 \times 0.94$, or 69%.

Using a customer viewpoint paints a

different picture of effectiveness, however. Most customers in competitive markets require organizations to deliver products and services faster, better and cheaper. You can calculate a metric similar to OEE using a customer focus. Performance quality (PQ) is performance efficiency multiplied by first-pass yield— 0.85×0.94 , or 80%. PQ captures the faster and better components embedded in lean thinking, while OEE accounts for the cheaper component by using the availability percentage—86%, or six of seven.

The availability or utilization of equipment can range from being a fair indicator to a poor surrogate for the cost of production. At best, utilization normally cannot exceed one and OEE, by definition, also would not exceed one.

Achieving profitability

Because markets and customers often set the price of goods and services, an alternative metric for utilization would be the final sales price divided by total production costs. In Australia, this is known as value for money (VFM). If VFM is less than 100%, it is impossible for an organization to earn a profit. A product must be sold at a price that is higher than its production costs. No producer can sell a product below cost over the long term. Reducing production costs and increasing prices can drive profitability.

In competitive markets, organizations that use VFM are driven to lower costs and align price tags with customer expectations, unless a premium price can be established that is dependent on

product quality differences. Quality differences are captured separately as the yield contribution to the KPI and within the market price.

Value recognition and overall efficiency can recombine into a single KPI that normally exceeds 100%. This approach, overall value efficiency result (OVER-1), is simple to remember; "Over one" can provide a sustainable outcome for the organization.

What customers value

OEE does not transparently address business sustainability. Considering the availability or utilization measurement, OEE is primarily capable of driving the unit cost of production down. In lean systems, utilization is less important than improving process flow to minimize buffers, reduce inventory and eliminate wasted effort—all of which can reduce production costs and increase profitability. *Takt* time is used to level production and may create a counterintuitive effect of reducing utilization.

Customers want to receive the right quantity of goods at the expected quality level at the right time and price. Whether the plant and its equipment had high utilization in production is irrelevant to customers. OVER-1 captures VFM while acknowledging operational efficiencies. **QP**

OVER-1 CALCULATION:

Use the same metrics for performance quality (PQ) referenced in the article—PQ multiplied by first-pass yield: 0.85×0.94 or 80%. Then, complete a new calculation by including customer value-for-money (VFM), which is sales price divided by manufacturing cost: $\$40/\25 (0.40×0.25) or $\$1.60$. The result is OVER-1 = $PQ \times VFM = (0.85 \times 0.94 \times 1.60)$ or 1.28. This newly developed key performance indicator should continue to trend with cost and pricing changes and operational efficiency.



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