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Determining an OEE Goal Based Upon Customer Takt Time

Rich Jansen

What is the basis for your current overall equipment effectiveness (OEE) goal? Is it clear to you and is it one in which employees in the organization have a motivation to achieve?

Regardless of how you get there, it all starts with building an awareness of the need for the targeted performance level. It is from this awareness that the desire/motivation can be developed. There are a variety of approaches for establishing your OEE goal, each with their share of questions that can limit the level of motivation.

- Is it based upon an industry benchmark? "*But we are unique and no one else does what we do.*"
- Is it based on a senior management directive? "*They just always want more and are never satisfied!*"
- Is it based on a popular, well-rounded number, for example 85%? "*But why not 86% or 87%? What is so magical about 85%?*"

Because these approaches do not provide a clear answer to the question "Why?," they are often not effective. So how about a goal that focuses on customer satisfaction, like takt time?

You might be wondering, "What is takt time?" First you have to understand the word "takt," which is a German word meaning *pace* or *rhythm*. Takt time means the pace or rhythm of customer demand. The ability to match your production with your takt time requires mastering the art of making the *right part* at the *right time* in the *right quantity*. This concept is a key aspect of lean manufacturing, and building a connection to the customer is one way for rationalizing a goal that the general population can understand.

But first we need to comprehend takt time value more clearly by understanding its formula shown below:

$$\text{Takt Time} = \frac{\text{Total Planned Production Time during Period (hours or seconds)}}{\text{Total Customer Demand during Period (units)}}$$

An actual example could be as follows:

Four Week Demand = 150,000 units

Production Day = 3, 8-hour shifts, each with 50 min for breaks and lunch

= 3 x (8hr x 3600 sec/hr – 50 min x 60 sec/min) = 77,400 seconds

Weekly PM Time = 6 hours or 21,600 seconds

If you used all 28 days over the four-week period, then the takt time (TT) would be:

$$TT = \frac{\left[(28\text{days} \times \frac{77{,}400\text{sec}}{\text{day}}) - (4\text{weeks} \times \frac{21{,}600\text{sec}}{\text{week}})\right]}{150{,}000\text{units}} = 13.9\text{sec/unit}$$

So we now know that the customer needs the production of one unit every 13.9 seconds. This is a goal that is easy to understand, but how does it relate to OEE?

OEE is a representation of operations performance that is composed of three key performance indicators (KPIs):

- Availability rate (breakdowns + changeovers)
- Production rate (minor stoppages + cycle time losses)
- Quality rate (rework + scrap)

These OEE KPIs, represented as loss factor percentages, can be applied to the target process cycle time to determine the actual production pace (PP), which is demonstrated in the following example.

Target Process Cycle Time = 10 sec/unit

OEE = 72% (or a 28% loss)

Availability loss = 12% breakdown + 8% changeover

Production loss = 3%

Quality loss = 5%

PP = *Target Cycle Time x (1+OEE loss %) = 10 sec/unit x 128%* = **12.8 sec/unit**

Now we understand that despite the 10-second cycle time, product is actually produced at a rate of only one unit every 12.8 seconds based upon the current OEE performance. At least this is faster than customer demand of one every 13.9 seconds. By using these same basic formulas and matching takt time with production pace (Table 1), one can see that customer demand requires 26 production days to produce under the current OEE performance.

Production Days	Takt Time sec/unit
28	13.9
27	13.4
26	12.8
25	12.3
24	11.8

Table 1

Twenty-six production days over four weeks means the operation is required to run six days per week, plus two Sundays. This is the starting point for establishing a goal. For example, what about the goal to produce the required demand without the Sunday overtime? In other words, in 24 days. Using the data from Table 1, this would mean a takt time of 11.8 sec/unit. By knowing that the production pace needs to satisfy the takt time, an OEE goal can be established.

PP = Target Cycle Time x (1+OEE Loss %)

$$\text{OEE Loss \%} = \frac{\text{PP - Target Cycle Time}}{\text{Target Cycle Time}} \times 100\%$$

$$\text{OEE Loss \%} = \frac{11.8\text{sec/unit} - 10\text{sec/unit}}{10\text{sec/unit}} \times 100\% = 18\%$$

The OEE loss of 18% means an OEE goal of 82% is required to achieve customer demand in 24 days – a goal focused upon satisfying the customer.

By understanding OEE losses, a strategy can be established to achieve the business goal.

Based upon loss factors for the example provided (visualized in Figure 1), the following strategy could be rationalized:

- Eliminate cycle time losses
- Reduce rework loss by 50%
- Reduce change-over loss by 33%
- Reduce breakdown loss by 25%.

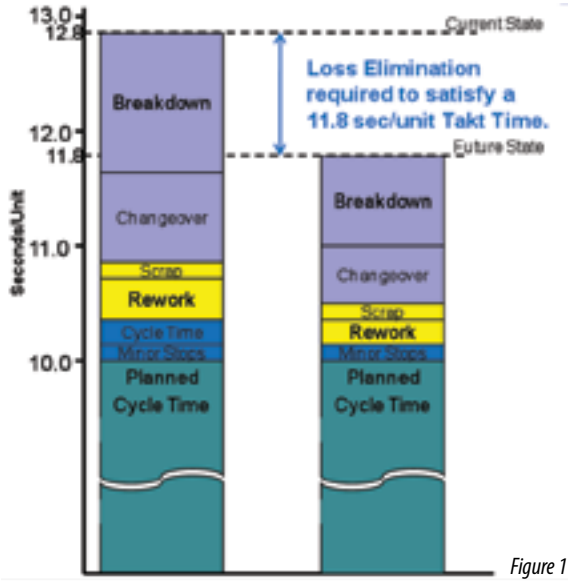

Figure 1

With this approach, employees of the organization, working in teams to address these specific goals, can understand the basis for the individual goals that are being deployed. Respecting employees by providing this understanding during the process of goal deployment can go a long way in determining if the goal is achieved.

The value of the OEE metric is to identify sources of losses that affect the ability to achieve business goals, which then leads to improvement strategies. Connecting the OEE metric with business goals keeps it aligned with a continuously improving organization so there is no static number for a goal. Using the concept of takt time is one way to maintain alignment with the business goals (goals that are aligned with satisfying the customer).

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