

PRODUCTION GOAL	3500
PRODUCTION COUNT	980
DOWNTIME	00:36
OEE	97%

# The Complete Guide to Simple OEE

OVERALL EQUIPMENT EFFECTIVENESS (OEE)

Presented By:

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## **DataVisor Marquees Vision:**

When manufacturing companies run up against capacity problems today, they immediately look to increase overtime, add shifts, or purchase new equipment. Instead they should look to optimize the performance of their existing machines to increase equipment reliability, minimize changeover times, improve operator performance, and lower overall downtime. All these investments can be made to increase capacity and will pay greater dividends by allowing a manufacturing plant to spend its valuable time and money on their manufacturing process instead of new machine purchases.

The question is “How can a manufacturing company optimize the performance of their existing equipment?” The answer is **Overall Equipment Effectiveness (OEE)**. OEE is an effective tool to benchmark, analyze, and improve your production process. The OEE tool gives you the ability to measure your machines for productivity improvements. OEE not only measures these inefficiencies but groups them into three categories to help you analyze the machine and have a better understanding of the manufacturing process.

Here is a list of common concerns of many manufacturing companies:

- Reducing Bottlenecks – Increase Throughput
- Implementing Machine Operator Training
- Reducing Machine Setup Time
- Improving Machine Reliability – Implement Preventive Maintenance
- Maximizing Optimal Run Rates and Capacity
- Eliminating Down Time – Provide Down Time Reason Codes

Putting this tool in place to address these concerns and improve the manufacturing process can be very time consuming and costly. DataVisor Marquees has designed a system called the **Production Marquee** to help with this process. The Production Marquee allows the whole plant to be involved in the process of improving OEE. From the machine operator to the production manager to the plant manager, this production monitoring solution visualizes information that can help everyone recommend solutions. The bottom line for all employees should be to reduce production losses and build profitable products.

The Production Marquee provides production managers and machine operators with the necessary real time information to make crucial decisions about the effectiveness of the production process. Machine operators get a first hand look at the production process and the key information of the machine by viewing the data on the Production Marquee. Instead of manually recording this data for end of shift results, the machine operator can monitor, analyze, and improve their process in real time throughout the day.

A truly comprehensive OEE solution will provide machine operators and production managers with continual line notification and control so that actions can be taken to prevent events that can result in downtime, slower cycle speeds, and poor product quality. This system should also provide a way for operators to capture codes or comments about the production process to review and analyze later during root cause analysis meetings. The Production Marquee provides all these features to help implement a Simple OEE solution.

Knowledge is imperative for survival in this global economy. Measuring the efficiencies of your machine operators and equipment can yield significant results for your company. Get to know what motivates your team and the efficiency metrics of other companies within your industry. Compare your production data to World Class OEE and see if implementing this Simple OEE tool can achieve and maintain better results with your machine productivity.

We call it Simple OEE because of the design of the self contained Production Marquee. With no software to install and the data source formulas programmed into the marquee, all you have to do is select the functionality of the application from drop down menus. You provide the inputs, select the data sources and the Production Marquee will take care of the rest. It's that simple. **Simple OEE.**

DataVisor Marquees invites you to take the time to read this guide to understand Simple OEE and how to implement this tool in your facility. After reading our "Complete Guide to Simple OEE" you will have a better understanding of Simple OEE and how we can help you visualize, monitor, and collect OEE data in your plant with the Production Marquee.



**Production Marquee (Part # PM-0420-T)**

## **Definition of OEE:**

Overall Equipment Effectiveness (OEE) is a way to monitor and improve the efficiency of your manufacturing process. Developed in the mid 1990's, OEE has become an accepted management tool to measure and evaluate plant floor productivity. OEE is broken down into three measuring metrics of **Availability**, **Performance**, and **Quality**. These metrics help gauge your plant's efficiency and effectiveness and categorize these key productivity losses that occur within the manufacturing process. OEE empowers manufacturing companies to improve their processes and in turn ensure quality, consistency, and productivity measured at the bottom line.

By definition, OEE is the calculation of Availability, Performance, and Quality.

**OEE = Availability x Performance x Quality**

### Metric 1: Availability

**Availability = Run Time / Total Time**

By Definition: Percentage of the actual amount of production time the machine is running to the production time the machine is available.

**Simple OEE:** The total run time of the machine subtracting all unplanned downtime.

### Metric 2: Performance

**Performance = Total Count / Target Counter**

By Definition: Percentage of total parts produced on the machine to the production rate of machine.

**Simple OEE:** How well a machine is running when it is running.

### Metric 3: Quality

**Quality = Good Count / Total Count**

By Definition: Percentage of good parts out of the total parts produced on the machine.

**Simple OEE:** How many good parts versus bad parts a machine has produced.

### **Simple OEE Terminology:**

This section describes the various plant manufacturing terms that make up Simple OEE and the three metric values (Availability, Performance, Quality) used in the calculation of Simple OEE.

(1) **RUN TIME** (Availability Metric) - The total production time that the machine has been running and producing parts.

(2) **SETUP TIME** (Availability Metric) - The period of time on the machine required for an operator to perform all the necessary tasks to produce the first good part.

(3) **DOWN TIME** (Availability Metric) - The period of time the machine is not available for production due to maintenance or breakdown

(4) **TOTAL TIME** (Availability Metric) - The total accumulated machine time of Run Time + Down Time + Setup Time.

(5) **TARGET COUNTER** (Performance Metric) - the number of parts or cycles that should be completed at a particular point within the shift, day, or production run.

(6) **TOTAL COUNT** (Performance & Quality Metric) - The total number of parts, good and bad, that are produced on a machine.

(7) **GOOD COUNT** (Quality Metric) - The input count for any part produced to manufacturing specifications on the machine.

(8) **AVAILABILITY** = Run Time / Total Time

(9) **PERFORMANCE** = Total Count / Target Counter

(10) **QUALITY** = Good Count / Total Count

**Simple OEE** begins with Planned Machine Run Time and with reductions from the three metrics, **Availability** (Downtime Losses), **Performance** (Speed Losses), and **Quality** (Quality Losses) determines the Final Machine Run Time.

**Availability** takes into consideration any Down Time Losses

**Performance** takes into consideration any Speed Losses

**Quality** takes into consideration any Quality Losses

### **Loss Categories of Simple OEE:**

On the previous page, we explained that the three Loss Categories reduce the Planned Run Time of the machine. Listed below in Table 1 are the three Loss Categories (Down Time, Speed, and Quality) of Simple OEE and examples of events that can occur in a production process of a machine to reduce productivity. These Loss Categories contribute to lowering the overall Simple OEE value of the machine.

<b>Simple OEE Loss Category</b>	<b>Simple OEE Metric</b>	<b>Loss Category Examples</b>
<b>Down Time Losses</b>	<b>Availability</b>	<b>1. Equipment Failures 2. Tooling Damage 3. Unplanned Maintenance 4. Process Warm Up 5. Machine Changeovers 6. Material Shortage</b>
<b>Speed Losses</b>	<b>Performance</b>	<b>1. Product Misfeeds 2. Component Jams 3. Product Flow Stoppage 4. Level of Machine Operator Training 5. Equipment Age 6. Tooling Wear</b>
<b>Quality Losses</b>	<b>Quality</b>	<b>1. Tolerance Adjustments 2. Warm Up Process 3. Damage 4. Assembled Incorrectly 5. Rejects 6. Rework</b>

**Table 1 (Loss Categories)**

**100% Availability = No Down Time Losses**

- Machine has been running without any recordable stops

**100% Performance = No Speed Losses**

- Machine has been running at the maximum speed (target counter)

**100% Quality = No Quality Losses**

- Machine has not produced any bad parts (bad/reject/rework)

## **Major Loss Events Affecting Simple OEE:**

There are many events within a manufacturing process that can affect Simple OEE. The major goal behind a Simple OEE program is to minimize or reduce the causes of inefficiency in the manufacturing environment. Below in Table 2 is a list of the Major Loss Events that commonly occur to decrease the productivity and efficiency of a machine and the Loss Category associated with the Simple OEE Metric.

Major Loss Event	OEE Metric	Loss Category	Example of Loss Category
Machine Breakdowns	Availability	Down Time	Equipment Failures, Tooling Damage, Unplanned Maintenance
Machine Adjustments/Setups	Availability	Down Time	Process Warm Up, Machine Changeovers, Material Shortage
Machine Stops	Performance	Speed	Product Misfeeds, Component Jams, Product Flow Stoppage
Machine Reduced Speeds	Performance	Speed	Level of Machine Operator Training, Equipment Age, Tooling Wear
Machine Startup Bad Parts	Quality	Quality	Tolerance Adjustments, Warm Up Process, Damage
Machine Production Bad Parts	Quality	Quality	Assembled Incorrectly, Rejects, Rework

**Table 2 (Major Loss Events)**

- 1) Downtime Losses are events requiring maintenance
  - Machine Breakdowns
  - Machine Adjustments/Setups
- 2) Performance Losses are events not requiring maintenance
  - Machine Stops
  - Machine Reduced Speeds
- 3) Quality Losses are rejects occurring during initial startup & full production runs
  - Machine Startup Bad Parts
  - Machine Production Bad Parts



## **Addressing & Improving the Major Loss Events of Simple OEE:**

Breaking your Simple OEE data up into the three metrics helps monitor and analyze the data. If you can improve your Simple OEE numbers you will improve your machine's productivity. Listed below are the six Major Loss Events we outlined on the previous page that affect Simple OEE and steps to help reduce these events to increase your overall machine's productivity. The overall goal of the Simple OEE tool is to reduce or eliminate these Major Loss Events.

### **(1) Machine Breakdowns (events reducing availability)**

To improve Simple OEE, you must eliminate unplanned downtime. Downtime is the most critical factor to improving Simple OEE because when the process is not running you cannot address other metrics. Supplying downtime reason codes will help you monitor and specify a particular source for later evaluation using Root Cause Analysis.

### **(2) Machine Adjustments/Setups (events reducing availability)**

Tracking machine setup time is important to improving Simple OEE. This time could include warm up time to consistently produce quality parts or reducing the time it takes to exchange tooling/dies. Implementing S.M.E.D. (Single Minute Exchange of Die) programs will reduce setup times.

### **(3) Machine Stops (events reducing performance)**

Minimizing machine stops such as product misfeeds and component jams will help improve performance. These stops are typically under five minutes and don't require maintenance to be called to the process. Train your machine operators to handle these events that occur on the machine.

### **(4) Machine Reduced Speeds (events reducing performance)**

Benchmarking your machine's Target Counter will help determine the theoretical maximum speed of the machine. Understanding the machine's Ideal Run Rate (Target Counter) then categorizing the data will help with your analysis. Monitoring the data will help understand events such as tooling wear, design capacity, and the training level of the operator running the machine.

### **(5) Machine Startup – Bad Parts (events reducing quality)**

Your machine may produce bad product during the initial startup of the process. Tracking these rejects from the machine will help pinpoint potential causes that can be monitored and reviewed. Machine tolerances and temperature adjustments can be made.

### **(6) Machine Production – Bad Parts (events reducing quality)**

Eliminating bad parts/rejects are essential for all manufacturing machines after the initial start up of the process. Tracking these bad parts will help you monitor the data to discover possible patterns or causes in the manufacturing process.

## Calculating Simple OEE:

Simple OEE begins with Planned Machine Run Time and measures the productivity of the machine. With reductions from Losses of the Down Time, Speed, and Quality categories, the formula calculates the Final Machine Run Time of the machine.

The OEE metric **Availability** takes into account any **Down Time Losses**.

The OEE metric **Performance** takes into account any **Speed Losses**.

The OEE metric **Quality** takes into account any **Quality Losses**.

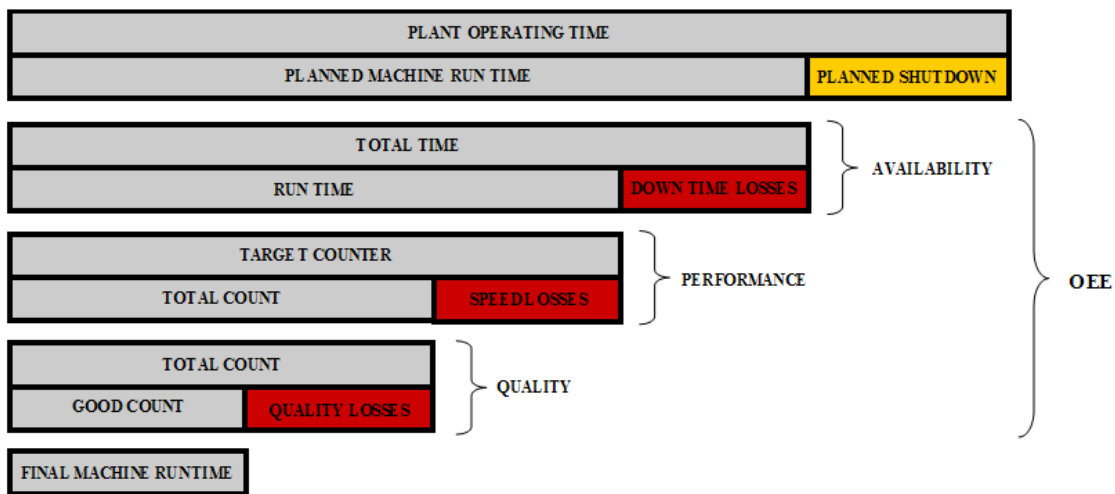
Planned Machine Run Time

- Reductions from down time losses (machine breakdown, setup time, material shortage)
- Reductions from speed losses (operator inefficiencies, part jams, machine wear)
- Reductions from quality losses (bad, reject, rework, startup scrap, assembled wrong)

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= Final Machine Run Time

The overall goal of OEE is to maximize the Final Machine Run Time



Again, here are the formulas that make up Simple OEE:

**Simple OEE = Availability x Performance x Quality**

**Availability = Run Time / Total Time**

**Performance = Total Count / Target Counter**

**Quality = Good Count / Total Count**

Also, Simple OEE can be defined as:

**Simple OEE = Final Machine Run Time / Planned Machine Run Time**

### A Real Example of Calculating Simple OEE:

Below in Table 3 is an example of real machine production data to help you understand the concept of OEE and the calculation of this data. This example will show the calculation of Simple OEE and the Simple OEE Metrics of Availability, Performance, and Quality.

Machine Data	Values
Shift Length (8 hours)	480 minutes
Run Time	375 minutes
Breaks	60 minutes
Setup Time	15 minutes
Down Time	30 minutes
Total Time	420 minutes
Ideal Cycle Time	1 part every 63 secs
Total Count	360
Good Count	355
Target Counter	400

**Table 3 (Machine Production Data)**

Production Data (Calculated Values from Production Marquee)			Data Source
Run Time	375	Total Production Minutes per Shift	Run Time
Break Times	60	Total Break Minutes per Shift	Run Time
Down Time	30	Total Downtime Minutes per Shift	Down Time
Setup Time	15	Total Setup Minutes per Shift	Setup Time
Total Count	360	Total Parts Produced per Shift	Total Count
Good Count	355	Good Parts Produced per Shift	Bad Count
Target Counter	400	Expected Parts per Shift	Target Counter

Process Data	Formula	Result
Run Time	Total Production Time of the Machine	375
Total Time	Down Time + Run Time + Setup Time	420
Good Count	Total Good Parts Produced on the Machine	355

OEE Variables	Formula	Result
Availability	Run Time / Total Time (375 / 420)	89.29%
Performance	Total Count / Target Counter (360 / 400)	90.00%
Quality	Good Count / Total Count (355 / 360)	98.61%
<b>Simple OEE</b>	Availability x Performance x Quality	<b>79.24%</b>

The **Target Counter** interval period or Ideal Cycle Time = 1 part every 63 seconds  
(400 parts should be produced in 420 total minutes of the machine)

If downtime is reduced by 15 minutes (900 seconds), the machine could produce 14 more parts. (900 seconds x 1 part / 63 seconds = 14 parts)

**Availability** improves to  $(389/420) = 92.62\%$

**Performance** improves to  $(374/400) = 93.50\%$

**Quality** improves to  $(369/374) = 98.66\%$

**Simple OEE** improves to  $(.9262 \times .9350 \times .9866) = 85.44\%$

Reducing your downtime by 15 minutes in this example produced a **6%** increase in Simple OEE. Downtime is the most critical factor to improving Simple OEE because when the process is not running you cannot address other metrics.

Many manufacturing companies have capacity constraints and consider adding overtime, hiring new workers, or buying new equipment. The bottom line is a modest investment to optimize the performance of their existing machines may outweigh the major investment to purchase new equipment. By reducing down time, minimizing setup time, and improving operator performance, a manufacturing company can unleash hidden capacity and benefit from monitoring Simple OEE data.

Below in Table 4 lists the World Class Goals for each metric you are trying to measure. The average OEE value in manufacturing plants is 60%. World Class standards for OEE metrics are Availability 90%, Performance 95%, Quality 99.9%, and OEE 85%. Measure the OEE data from your machine and see how you compete with the “World Class”.

OEE Metric	World Class Value
AVAILABILITY	90.00%
PERFORMANCE	95.00%
QUALITY	99.90%
OEE	85.00%

**Table 4 (World Class Goals)**

## **Frequently Asked Questions about Simple OEE:**

### **1) Are Simple OEE metric values subject to misinterpretation?**

Yes. You should look for these Simple OEE metrics to help you monitor the machine to minimize losses and eliminate bottlenecks in your process. Simple OEE data does not supply you with the best decision to make an improvement or how much it will cost to make these changes. But, Simple OEE data is very useful in your efforts to improve the process of your machine by separating data into the three metrics of Availability, Performance, and Quality.

### **2) Can Simple OEE create political differences at the management level?**

Yes. Sometimes this misinterpreted data can be used for political purposes rather than working to improve the overall productivity of the machine. The important concept to keep in mind is to produce more quality parts with reduced downtime and less waste. As with the measurement of any number, make sure you have a clear plan that will deliver a result. This will help you create a plan to incentivize your machine operators to maximize the productivity of the equipment.

### **3) Can Simple OEE help management enable machine operators?**

Yes. The real value of Simple OEE is providing management and machine operators the ability to make systematic improvements to the process of the machine. The concept of Simple OEE is to put this information in terms that are easily understood and keep the machine operator informed with visual data on the manufacturing plant floor.

### **4) Are Simple OEE metric values defined in numbers of parts or units or time?**

The answer is to use the unit of measure that you best understand. Availability is usually described in hours and minutes, Performance in parts per minute or hour, and quality as the ratio of good product to total production. All of these metrics are converted to the percentage (%) of the actual versus potential in the Simple OEE calculations.

### **5) What sample time period should I use for my Simple OEE test?**

The Simple OEE sample time period can be any period of time. Usually, it is set on the working cycle of the machine. One shift equals 8 hours or 480 minutes. Some other sample periods could include 10 hours, 12 hours, 1 day, the job or part number, or continual monitoring.

**6) Do the Simple OEE metric calculations of a machine represent a magical number?**

No. The strength of Simple OEE is that it gives you four metric numbers. These numbers can be used individually to make decisions as your machine process changes from day to day. The Simple OEE metrics help you visualize the total resources of your manufacturing process as it relates to what the machine actually produced. If your machine produces these Simple OEE metric numbers: Availability 90%, Performance 85%, Quality 99%, Simple OEE = 76% only you can decide if these numbers are good or bad. However, if your machine produced these Simple OEE metric numbers: Availability 98%, Performance 85%, Quality 91%, Simple OEE = 76% are these numbers any better. The Simple OEE metric stayed the same but is the drop in quality worth the improvement in availability. Most manufacturers always try to improve quality so they would consider this to be an unacceptable tradeoff.

**7) Is it possible to have to have a Simple OEE metric exceed 100%?**

No. If your Simple OEE metrics (Availability, Performance, Quality, Simple OEE) are greater than 100%, you are not defining something in your process correctly. You are probably underestimating the capacity of a process when you input your machine parameters. Most commonly, the Performance metric has not been correctly calculated when determining your Ideal Cycle Time (Target Counter Value) of your process.

**8) What defines if a machine is producing parts (running)?**

For the purpose of measuring productivity, the Simple OEE metric needs to know if the machine is producing product, even if this product is good or bad. If the machine is scheduled for production (not in break or planned maintenance), the production clock is running and the machine is considered producing parts.

**9) How do you determine the Ideal Cycle Speed (Target Counter Value) of your machine?**

If the “nameplate capacity” of the machine is available from the equipment manufacturer, this would give you the capacity data for that particular machine. If this data is unavailable, you should perform machine calculations to measure the cycle times and rates of the machine. These numbers will give you a starting point but may vary depending on machine age and operator training. Take measurements, experiment, and calculate your own Ideal Cycle Speed (Target Counter Value).

**10) Are reworked parts counted as good or bad parts in the Simple OEE calculation?**

In the Simple OEE calculation, any part that comes out of the machine not manufactured to specifications the first time is considered a bad (reject) part. This is a production problem that exists at the machine and needs to be addressed by management. You need to implement a production practice for improving original part quality versus reworking bad parts.

**11) If I have multiple machines in a group cell, which machine should you base my Ideal Cycle Time (Target Counter Value) on?**

Your Ideal Cycle Time (Target Counter Value) should be based on the fastest machine of the group cell. Typically, most machines in a group cell are designed to produce product at the same rate. Using the fastest stage as your target, forces you to recognize the bottlenecks and work on improving the process of product flow in the machine.

**12) If my machine is running during a scheduled break, is this break time factored into machine availability?**

If the machine is producing parts, then regardless if that machine operator is or is not on break Simple OEE considers this to be part of the machine runtime and is factored into machine availability.

**13) Does preventive maintenance downtime penalize the Simple OEE performance calculation?**

If the preventive maintenance occurs during actual production time rather than during planned shutdown, you are interfering with machine production and should count this downtime in the Simple OEE Performance metric. Monitoring downtime and supplying a reason code will help us monitor and measure if this scheduled maintenance will result in less overall downtime due to fewer surprises and more efficient machines than losing production when maintenance is called to the machine.

**14) How do I optimize my data collection to make OEE, simple OEE?**

Automate your OEE data collection and collect your plant information in real time by installing Production Marquees. Production data is not very useful if you see it in a printout tomorrow in the production office or don't visualize it on the plant floor. With this real time plant information, management and machine operators can react to the information and alarms displayed on the plant floor and monitor and collect the Simple OEE metrics anywhere within your manufacturing plant.

## **Simple OEE Glossary of Terms:**

### **A**

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#### **Availability**

One of the three Simple OEE metrics. This is the possible production time after all downtime losses (machine breakdowns, machine adjustments/setup) are subtracted.

### **B**

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#### **Bad Count**

The input count for any part not produced to manufacturing specifications. (bad/reject)

#### **Balanced Production**

When a manufacturing process produces exactly what the product demand is. Takt time is the measurement used most often to determine if a manufacturing process is balanced.

#### **Benchmarking**

A comparison tool used to determine the level of product, process, growth, or other successes your manufacturing plant is experiencing when compared to similar companies with similar processes and products. Used to identify a company's strengths and weaknesses compared to their competitors and make necessary adjustments.

#### **Best Practices**

Repeatable procedures that over time prove to be the most efficient and effective way of accomplishing a task. Successful companies use to develop a standard of measuring.

#### **Bottleneck**

The slowest operation or choke point in a manufacturing process or machine.

### **C**

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#### **Capacity**

The maximum amount a machine, system, or process can produce.



## **Changeover Time**

Time lost on a machine due to swapping out material, tooling, connections, or equipment.

## **Changeovers**

Switching from producing one product to a new product on a machine. This process may involve replacing dies or removing unused materials. In Lean Manufacturing terms changeovers are accomplished through S.M.E.D. (Single Minute Exchange of Die) programs which strive to accomplish a complete changeover in under ten minutes.

## **Continuous Improvement**

The ongoing process of trying to do things better, faster, and less expensive.

## **Cycle Time**

The time to produce one part or one repetition of a particular task on a machine.

## **Cycle Time Analysis**

Tool used to determine cycle times of a machine and a way to understand the events that affect the Performance metric of Simple OEE.

# **D**

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## **Down Time**

The period of time the machine is not available for production due to maintenance or breakdown.

## **Down Time Loss**

Any production time lost due to unplanned shutdowns. One of the three Simple OEE Loss Categories which reduces the Simple OEE metric, Availability.

## **Down Time Reason Codes**

Available codes to select that explain why a machine is down or not producing parts. These codes help to attribute the specific source or reason to why the machine is down and can be monitored and collected to analyze the production process. With down time reason codes, Root Cause Analysis can be applied to start determining Down Time Losses.

## E

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### **Empowerment**

Giving employees more authority, accountability, and responsibility to affect their work place and improve their daily lifestyle. Many of the best manufacturing companies invest in Simple OEE programs that empower an individual to be more productive.

### **External Setup**

The steps and procedures you can perform while the machine is still running that facilitate the S.M.E.D. (Single Minute Exchange of Die) process.

### **Event**

In Simple OEE, an event is a production loss which occurs on a machine that is categorized.

## F

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### **Final Machine Run Time**

The actual production time of the machine after subtracting all Losses (Downtime, Speed, Quality). This is what Simple OEE measures – your machine’s real efficiency.

## G

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### **Goal**

A measurable objective a machine intends to achieve within a specific period of time. S.M.A.R.T. Goals are Specific, Measurable, Attainable, Relevant, and Timely.

### **Good Count**

The input count for any part produced to manufacturing specifications. These parts meet quality standards without any rework. Good count is used to calculate Simple OEE Quality.

## K

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### **Kaizen**

A Japanese term for “improvement”. A Japanese philosophy that implements the Lean Manufacturing tools used to effect improvements in the manufacturing process. This approach is to motivate employees plant wide to become involved in the evolution and improvement of all functions of the business by eliminating waste.

### **Key Performance Indicators (KPI's)**

KPI's refer to a list of measurable parameters that will indicate how well a manufacturing plant is doing at attaining goals. Availability, Performance, Quality, and Simple OEE are all KPI's that a manufacturing plant would like to measure. The Production Marquee has these plus 25 more KPI's built into the product for your easy implementation.

## L

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### **Lean Manufacturing**

A manufacturing system that strives to relentlessly eliminate waste from its operations. Lean Manufacturing strives to produce products that are on time and use as few resources as possible. The Simple OEE metric is a key tool in Lean Manufacturing programs. Lean Manufacturing includes many manufacturing improvement tools such as S.M.E.D, TPM, 5S, and Kanban. Lean Manufacturing empowers and motivates employees to engage in activities to better their respective companies.

## M

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### **Machine Adjustments/Setups**

One of the Major Loss Events. Machine Adjustment/Setups is the time lost on the machine due to configuring equipment. Setup and machine changeovers contribute to Simple OEE Downtime Losses and reduce the Simple OEE metric, Availability. Tracking machine setup time is critical in reducing this Downtime Loss.

### **Machine Breakdowns**

One of the Major Loss Events. Machine Breakdowns is the time lost on a machine due to equipment failure. Machine Breakdowns contribute to Simple OEE Downtime Losses and reduce the Simple OEE metric, Availability.

## **Machine Production Bad Parts**

One of the Major Loss Events. Manufactured parts which did not meet quality specifications. These bad parts or rejects were produced during the steady state production of the machine. Machine Production Bad Parts contribute to Quality Losses and reduce the Simple OEE metric, Quality.

## **Machine Reduced Speeds**

One of the Major Loss Events. Machine cycle where the process is running but at a slower than expected rate. Machine Reduced Speeds contribute to Simple OEE Speed Losses and reduce the Simple OEE metric, Performance.

## **Machine Startup Bad Parts**

One of the Major Loss Events. Bad parts produced while the machine is adjusted for production. Machine Start Up Bad Parts contribute to Speed Losses and reduce the Simple OEE metric, Quality.

## **Machine Stops**

One of the Major Loss Events. A Machine Stop is a pause in production typically less than five minutes. It is usually not long enough to be tracked as downtime. Machine Stops contribute to Speed Losses and reduce the Simple OEE metric, Performance.

## **Machine State**

The active state of the machine. The machine state can be run, jog, setup, or down.

## **Major Loss Events**

The categories of production losses that are most prevalent in the manufacturing process. Machine Breakdowns, Machine Adjustments/Setups, Machine Stops, Machine Reduced Speeds, Machine Startup Bad Parts, and Machine Production Bad Parts make up the Major Loss Events. The Simple OEE metrics help isolate these six different Major Loss Events to help you address them each individually and improve your process.

## **Material Shortage**

A condition causing a machine to be down from being out of parts or the materials needed to make that part. The machine cannot continue to produce product until the material flow has been corrected. A downtime reason code can be associated with this condition and displayed on the Production Marquee for plant wide notification.

## N

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### Nameplate Capacity

The design capacity of the machine or its manufacturing process.

## O

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### Overall Equipment Effectiveness (OEE)

The key measurement in Total Productive Maintenance (TPM). Simple OEE is the essential measurement for determining the efficiency and effectiveness of your process. By breaking down Simple OEE into the three key metrics Availability, Performance, and Quality, you can measure and analyze a problem with the machine and provide improvements to fix the manufacturing process and benchmark your progress.

**(Formula) Simple OEE = Availability x Performance x Quality**

**Availability:** Actual production time left after subtracting all planned downtime.

**Performance:** How well the machine was running when it was running.

**Quality:** How many good parts versus bad parts the machine has produced.

### OEE Metrics:

The three components of Simple OEE: Availability, Performance, and Quality. Focusing on these three metrics is sometimes more important than the final calculated Simple OEE value.

### OEE Losses

The three types of Productivity Losses (Downtime Losses, Speed Losses, and Quality Losses) associated with the three Simple OEE metrics.

## P

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### Performance

One of the three Simple OEE metrics. Performance is the rate at which a machine converts available time into product. Performance tells us how well the machine was running, when it was running. Performance takes into account all the factors (Speed Losses) that cause the machine to operate at less than the maximum speed.

## **Planned Machine Run Time**

The total run time that the machine is expected to produce parts.

## **Planned Shutdown**

Unproductive time on a machine that is deliberately scheduled. Planned shutdown on a machine is excluded from the Simple OEE calculation.

## **Plant Operating Time**

The time that a manufacturing plant is open and the machine is capable of operation.

## **Q**

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### **Quality**

One of the three Simple OEE metrics. Measured in the Simple OEE metric by tracking rejected parts. Quality takes into account bad parts (Quality Losses) that do not meet quality standards.

### **Quality Loss**

Quality loss is the percentage of pieces that do not meet quality standards. One of the three Simple OEE Loss Categories which reduces the Simple OEE metric, Quality.

## **R**

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### **Reject Parts**

Product produced on the machine that do not meet quality specifications.

### **Rework Parts**

A category of rejected parts that can be remanufactured into good parts. The Simple OEE calculation does not make the distinction between reworked parts and bad parts that are scrapped and thrown away.

### **Run Time**

The total amount of production time that a machine has been producing parts.

## S

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### **Scheduled Downtime**

The period of time that a machine is not performing its intended function due to planned downtime events. Preventive maintenance and machine production tests are a few of the more common types of scheduled downtime.

### **Setup Time**

The period of time on a machine required for an operator to perform all the necessary tasks to produce the first good part.

### **Simple OEE**

DataVisor Marquees easy way of implementing OEE and calculating the Availability, Performance, and Quality metrics of your manufacturing process.

### **Single Minute Exchange of Die (S.M.E.D.)**

A Lean Manufacturing tool used to quickly change a machine over from producing a specific part or product to producing a different part or product. This program is used to help reduce setup time on the machine. This setup time can be exchanging dies or mechanical structures, but also include changing material thickness, color, or type.

### **Speed Loss**

Any production time lost due to machine running below maximum speed. One of the three Simple OEE Loss Categories which reduces the Simple OEE metric, Performance.

## T

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### **Takt Time**

The production rate of the machine that matches the rate of sales or consumption. Takt time is a German word meaning measure. In its purest sense, takt time is used to produce exactly what the customer will consume. Knowing what your takt time is for a specific product will help you understand the machine's ideal cycle time (target counter) to meet your customer's demand.

## **Target Counter**

The target counter is also referred to as Takt time or calculated target of the machine. The target counter illustrates to the machine operator the number of parts or cycles that should be completed at a particular point within the shift, day, or production run. The target counter is a variable within the marquee that increases its value based on a set time value.

## **Total Count**

The total number of parts, good and bad, that are produced on a machine. Total Count is used in calculating the Simple OEE metric, Quality.

## **Total Productive Maintenance (TPM)**

An equipment maintenance system that addresses maintenance issues that cause equipment downtime before they become major problems with the machine. TPM includes scheduling maintenance on a regular basis to allow for more proactive and preventive maintenance on the machine. A solid TPM program plans your machine downtime and keeps breakdowns to a minimum.

## **Total Time**

The total accumulated machine time of Run Time + Down Time + Setup Time. Total Time is used in calculating the Simple OEE metric, Performance.

# **W**

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## **World Class OEE**

A measured OEE percentage of 85% or greater is known as World Class OEE. World Class OEE is the metric to compare current equipment performance to world class performance. World Class figures of OEE also include Availability of 90%, Performance of 95%, and Quality of 99.9%. Studies throughout the world indicate that the average OEE value in manufacturing plants is 60%.



**Getting Started with DataVisor Marquees:**

DataVisor Marquees has built the **Production Marquee Series** that combines a visual display with ethernet communications, digital I/O, and web server technology integrated into one self contained package. With **no software to install** and the data source formulas programmed into the marquee, all you have to do is select the functionality of the application from drop down menus. Setup and monitoring of this real time production data is as simple as opening a web browser and entering the IP address of the marquee display. Imagine real time plant floor production data monitored and collected anywhere within your facility. Just supply two inputs, enter your target counter value and cycle time and the Simple OEE calculation is displayed, monitored, and collected by simply choosing OEE as the data source. Additionally, you can select your Goal, Break Schedule, and other Production Data Sources that are important to view and monitor from your production process.



Production Marquee (Part # PM-0420-T)

Below Table 5 lists the functionality of the Production Marquee. You provide the inputs; select the data sources and the Production Marquee will take care of the rest. It's that simple. Simple OEE.

Customer Selects	DataVisor Marquees Displays, Monitors, and Collects	Data Source / Web Tab
One Input	Availability, Total Count, % Complete, Rate, Cycle Times, Run Time, Down Time	Total Count
Second Input	Quality, Bad Count, % Bad	Bad Count
Target Counter Value	Performance, OEE, Pace, % of Pace	Target Counter
Takt Time Interval	Target Counter, Takt Time Remaining, Takt Time Elapsed	Count / Rate / OEE
Target/Goal	Goal, % Complete, Pieces to Goal	Goal
Run Input	Monitor Down Time and Run Time	Down Time
Setup Input	Monitor Setup or User Time	Setup Time
Call Inputs	Display Override Messages along with Timer Values	Override Messages
Break Schedule	Select Break Times and Lunch Break Times	Break and Down Times

**Table 5 (Functionality of the Production Marquee)**

## Who is DataVisor Marquees?:

DataVisor Marquees is an engineering company designing, programming, and manufacturing visual displays and marquee scoreboards to help improve machine productivity within manufacturing facilities. DataVisor Marquees sells their products through distribution allowing product knowledge, application assistance, and technical support to be available at your local plant level.

Whatever your needs - reducing downtime, increasing productivity, or improving quality, DataVisor Marquees can help you reach the goal.

Here is a list of “**Benefits**” when implementing the **Production Marquee**:

- **Inform** & motivate plant personnel
- **Display** important key performance indicators (KPI's)
- **Monitor** your real-time production data anywhere in the world
- **Collect** production data to evaluate your process
- **Minimize** downtime and setup costs
- **Reduce** material scrap through alarms and monitoring
- **Alert** with early warnings of change in production process
- **Replace** whiteboard style monitoring and data collection

Our goal is to make OEE simple and affordable so that every manufacturing company can implement this Simple OEE tool as widely as world class companies.

Here is our contact information about DataVisor Marquees. Call or visit our website to learn more about our product offering or to have a sales engineer visit your plant.

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