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GUIDE

How to Increase Manufacturing Production Capacity.

English

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Introduction

Increasing manufacturing production capacity is essential for companies looking to meet customer demands, keep up with competitors, and deliver worthwhile returns on investment.

This comprehensive guide outlines several ways to drive production capacity, covering the Six Big Losses, relevant measurements, calculations, metrics, and more.

You'll also find a variety of frequently asked questions answered by industry experts.

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What is Production Capacity?

Production capacity refers to the maximum amount of product that a manufacturing facility can produce in a set period of time.

Having sufficient production capacity is essential for manufacturers to meet the demands of customers and achieve operational goals.

Measuring capacity in manufacturing

Measuring manufacturing capacity is essential to understand how much product can be produced in a given period, allowing manufacturers to accurately predict lead times, order the right parts in time, schedule staff, and so much more.

Manufacturers can determine their ideal level of capacity utilisation by examining their current capacity and maximum capacity levels. This can help them establish goals to achieve optimal capacity and maximise their productivity.

There are several ways to measure production capacity, including machine utilisation, cycle time, and volume, we'll explore these on the following page.

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01 Machine Utilisation

Machine utilisation measures the amount of time that a machine is in use compared to the total available time. This metric helps identify opportunities to improve machine usage and increase production.

For example, if a machine has a utilisation rate of 80%, it means that it's not being used 20% of the time, highlighting an opportunity to increase production.

02 Cycle Time

Cycle time is the time it takes to complete a production process from start to finish. By reducing cycle time, manufacturers can increase the number of products produced in a given period.

For example, if a cycle time is 10 minutes, reducing it to nine minutes means that an additional product can be produced in that same period, increasing outputs and often, profitability.

03 Volume

This involves tracking the actual number of units produced over a specified period and comparing it to the maximum number of units that could be produced given the available resources.

> Improved cycle times by creating new jigs and reduced on-job operations of big jobs by 50%.

Operations Director | Run Flat International

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What are the calculations for measuring capacity?

01 Machine Availability – Hours

Machine Availability capacity is calculated by multiplying the number of machines available with the number of manned hours to operate.

The formula for calculating Machine Availability Capacity:

Machine Availability Capacity (MAC) = No. of Machines x Manned Hours

02 Production Capacity For One Component Type

Production capacity for one component type is determined by dividing the machine availability capacity by the amount of time required to produce one unit.

The formula for calculating the Production Capacity of a component type:

Production Capacity = Machine Availability Capacity (MAC) / Time to Produce One Product

03 Production Capacity Of Multiple Component Types

Production capacity of multiple component types: is determined by adding together individual products to equal the total output capacity for all product types. We need to know the demand for each component type to calculate this.

The formula for calculation of the Production Capacity of Multiple component types:

Capacity for Multiple Products = (Amount Product 1 X time to Produce Product) + (Amount Product 2 X time to Produce Product)

Traditional calculations of measuring capacity contain baseline assumptions either on the component cycle time or the current effectiveness of a manufacturing process.

Keeping constantly changing cycle times up to date in the system is difficult, and machine effectiveness changes constantly based on things such as shift headcount, breakdowns and work-loading interactions.

This means that accurately measuring both capacity and lead times through a process is sometimes difficult to get right without adding large amounts of contingency into the plan, effectively creating waste or delivering late to customers.

Why is measuring production capacity important?

Measuring production capacity means that production teams can accurately predict lead times, improve production scheduling, better forecast cash flows and ensure the product is delivered to the customer on time. Ultimately, this will help increase customer satisfaction, productivity, and profitability whilst also reducing lead times and wastage.

Benefits Of Measuring Production Capacity

By identifying and resolving flaws in manufacturing operations, managers can drive sustainable growth by using continuous improvement measures to increase efficiency, Overall Equipment Effectiveness (OEE) and output.

Here are a few key advantages:

- Accurate/reduced lead times
- Improved workplace efficiency
- Better planning and use of resources
- Increased supply chain control
- Easily identify additional capacity
- More control over production operations

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What are the Six Big Losses?

The Six Big Losses is a framework used in lean manufacturing that helps manufacturers identify areas of inefficiency in the production process. It was developed In 1971 by Seiichi Nakajima while working at the Japanese Institute of Plant Maintenance.

The Six Big Losses in manufacturing capacity are:

Manufacturers can use this framework to identify areas that are affecting production capacity and work to improve them.

By identifying and resolving flaws in their manufacturing operation, managers can drive sustainable growth by using continuous improvement measures to increase efficiency, Overall Equipment Effectiveness (OEE) and output.

How to leverage the 'Six Big Losses'

Once the Six Big Losses have been identified, manufacturers can implement countermeasures/process improvements to reduce or eliminate them.

The Six Big Losses align with OEE, so addressing them will have a direct impact on your OEE. Resulting in a reduction of Availability loss, Performance loss and Quality loss.

We explore a few strategies to leverage the Six Big Losses on the following page.

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Strategies to leverage the Six Big Losses:

Equipment failures

Regular preventative maintenance and upgrades to equipment can reduce the frequency of failures and increase production capacity. Using a downtime logging system will enable you to understand how much equipment failures are costing you. This will give you the insight to make confident decisions, such as investing in preventative maintenance or replacing the machine with a new one.

Setup and Adjustments

To tackle setup loss, the SMED (Single-Minute Exchange of Die) program is a well-established and highly effective technique used in manufacturing.

The ultimate goal of SMED is to reduce the setup times to less than 10 minutes. Every aspect of the setup is carefully analysed to determine if it can be optimised in any of the following ways:

- **Separated:** Can it be moved before or after the setup?
- **Converted:** Can it be modified to allow it to be moved before or after the setup?
- **Streamlined:** Can it be modified to reduce the time required to complete it?

Through SMED, manufacturers can achieve significant improvements in their production processes.

Idling and minor stops

Improving communication between team members and implementing more efficient processes can reduce the amount of time wasted during idling and minor stops.

Measuring machine downtime (stops), whether planned or unplanned, is an effective way for managers and operators to use data to take corrective action.

Reduced speed

Using machine monitoring to identify cycle times provides valuable insights to managers and operators, helping them to take corrective action, and ensuring cycle times that are slow, can be improved. Things such as investing in training, continuous improvement projects or putting more skilled operators on a job, are all examples of process improvements that can be identified when using machine monitoring.

Process Defects/Rejects

Implementing a quality control process and regular monitoring can reduce the number of defects and improve production. Using OEE and the Quality measure will provide a good benchmark of overall product quality. Since defects and rejects can occur from operator or equipment errors, regular training and checks will help to reduce waste.

Reduced Yield

During startup, a higher rate of defects is usually attributed to variation in the process. To mitigate this, it is essential to pay close attention to equipment settings and materials used in the production process. Higher inspection rates at the start of the shift and making use of quality control charts to capture drifting processes are effective ways of reducing variation in manufacturing.

> It has allowed us to slicken up our process and it provides us with more confidence when quoting. We can now see if a job has made a profit and if we achieved it in the time we estimated.

Production Manager | Subcontract Manufacturer

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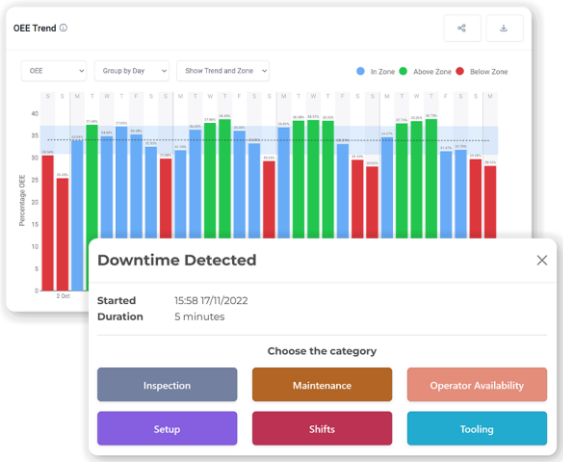
Six ways to improve Production Capacity

01 Implement A Lean Manufacturing Process

Lean manufacturing is a process that focuses on eliminating waste and improving efficiency. By reducing waste and improving processes, manufacturers can increase production capacity and reduce costs.

02 Invest In Smart Technology

Investing in smart technology can help improve production capacity by automating processes, reducing waste, and increasing efficiency. This could also mitigate the need to spend significant cash on capital investment by maximising the equipment already available today.



Automating your manufacturing systems can help streamline the production process, reduce human error, and offer more consistent, accurate results.

Automated systems, such as machine monitoring also replace a lot of processes that would traditionally be manual and time-intensive exercises, therefore freeing employees up for more productive tasks.

> Machine monitoring captures the downtime reasons to highlight trends to enable proactive corrective action.

03 Reduce Downtime

By understanding the top reasons for machine downtime, managers, and supervisors can work with the operators to improve processes to minimise the amount of time that machinery or equipment is not in use, increasing overall efficiency and output.

04 Increase Shifts

Adding extra shifts is a viable option to increase immediate or short-term capacity in factory output, although it can be expensive if it means paying overtime.

Another option, if you have a production line that doesn't require continuous operator attention, is to utilise 'lights-out-manufacturing' between 'normal shifts' provided that the facility does not already operate 24/7. Typically, lights-out manufacturing doesn't require the labour a 'normal shift' would and therefore is a cost-effective way to increase capacity.

05 Reduce Defects Through A Quality Control Process

Implementing a quality control process and regular monitoring can reduce the number of defects and improve production. Quality control processes help to identify and address any issues before they become a problem, allowing for more efficient and streamlined production.

The first step in implementing a quality control process is to assess the current process and identify any areas where defects are occurring. Once the problem areas have been identified, corrective actions can be put in place to reduce or eliminate these issues.

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Two Common Methods To Support Quality Control Include:

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Statistical Process Control (SPC)

SPC is a method that tracks production metrics to monitor and control quality, enabling quality managers to detect and resolve issues before products are shipped

Manufacturing Process Control Charts

Can be used to understand the process drift over time, by measuring components at set intervals (such as 1 in every 5) the process can be quickly monitored to understand its capability. It can also capture process drift with a view to correcting it before the non-conforming product is produced.

By combining with lean tools such as Total Productive Maintenance (TPM), 5S, and Kaizen, defects can be significantly reduced or eliminated altogether.

06 Machine Monitoring Software

As we have touched on briefly in this article, machine monitoring software, such as FourJaw enables manufacturers to improve a number of manufacturing processes. By providing real-time data insight into the current productivity levels and using key metrics such as utilisation and/or Overall Equipment Effectiveness, manufacturers can increase their production capacity.

Managers, supervisors, and operators can then use the data to take corrective action which will have the biggest impact on improving efficiency and production capacity.

Technology in action

Let's look at the example of UK manufacturer, Armac Martin. A successful and highly regarded manufacturer of luxury brass cabinet fixtures and fittings, operating around 20 CNC machines.

However, they had an issue. Demand was outstripping production capacity and therefore growth was being slowed. The higher sales were welcomed, but the management recognised that due to increased lead times, they were in danger of not being able to fulfil orders and potentially losing sales.

The Armac Martin management team felt the business had more production capacity but had no quantifiable measure of where that capacity was. They felt that a machine monitoring solution would provide the answer.

They turned to FourJaw's machine monitoring platform and very quickly benefited from the data captured. They could identify machines that were being well-utilised and in high demand, and those that were under-utilised and whose function was becoming redundant.

Over a period of six months, FourJaw machine monitoring software enabled Armac Martin to:

- **Improve machine utilisation by more than 14%**
- **Increase production capacity by 65%**
- **Change their production model to focus on their own products**
- **Sell under-utilised machines**
- **Drive and support a culture of continuous improvement**

> Machine monitoring software has enabled our machine utilisation rate to go from 21.7% to 35.8%.
>
> An increase of 14.1% utilisation, but even more impressively – in terms of capacity, we are now able to make 65% more parts.

Head of Operations | Armac Martin

Increasing Production Capacity - The Metrics

Increasing manufacturing capacity in the short term can be both costly and risky. If production runs last longer than planned, overtime can become a massive expense and late or under-delivered orders can cause lasting reputational damage with customers.

A cost-effective way of maximising capacity is to deploy a machine monitoring software capable of capturing, analysing, and contextualising production data. By leveraging real-time, accurate data, factory managers can gain a deeper understanding of their operations and identify opportunities for improving performance.

There are several key metrics that management can use in order to effectively increase output; OEE, TEEP and Utilisation. These metrics offer valuable insights into the factors that influence production output and can help drive operational efficiency to achieve maximum production output.

OEE

Overall Equipment Effectiveness (OEE) measures the effectiveness of production equipment by tracking availability, performance, and quality. By tracking OEE, manufacturers can identify inefficiencies and bottlenecks in their production processes and implement improvements to boost performance. Leveraging manufacturing analytics software such as FourJaw enables manufacturers to harness the power of OEE, optimise their operations and increase output.

By monitoring machine data in real-time, manufacturers get the data-driven insights they need to optimise their operations, boost productivity, and reduce costs.

TEEP

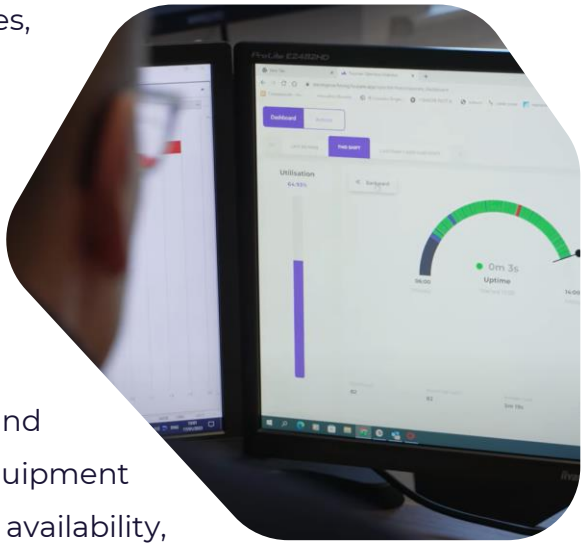
Total Effective Equipment Performance (TEEP), is a powerful metric that incorporates OEE with the additional factor of schedule losses.

Whilst OEE measures the productivity of planned production time, TEEP measures the equipment's effectiveness throughout all available hours. A TEEP score of 100% indicates maximum possible production, with no downtime or equipment idling.

Utilisation

Utilisation is the time that the machine is productive (uptime) as a percentage of all the available time. It can be shown as a percentage of all the available time or in raw hours.

Through careful analysis of utilisation rates, manufacturers can identify areas for improvement and make informed decisions to help increase output without the expense of adding additional machines or labour.



Maximising utilisation requires a deep understanding of production processes and the factors that affect them, including equipment downtime, process bottlenecks, resource availability, and much more.

With the help of manufacturing analytics software and real-time data monitoring, manufacturers can gain data-backed insights into these factors and take the necessary action to optimise production and increase utilisation rates.

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Summary

The Importance And Value Of Increasing Production Capacity In Manufacturing

Increasing production capacity is essential to meet customer demands and achieve overall business goals.

Through the accurate measuring of production capacity, informed leveraging of the Six Big Losses, and the implementation of strategies to improve production processes, manufacturers can efficiently increase their production capacity and drive continuous improvement to increase productivity and profitability.

Technology, particularly, smart technologies such as machine monitoring provide immense value to manufacturers, enabling them to understand their manufacturing processes and understand where efficiencies can be gained, opening up production capacity and opportunity.

Get in touch if you would like to explore how FourJaw's machine monitoring platform can benefit your business!

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Discover more about FourJaw

FourJaw Manufacturing Analytics is a SaaS technology company made up of a diverse team of talented individuals, who individually and collectively share a passion to harness the power of technology to drive efficiency, productivity and profitability for manufacturers throughout the world.

Customer Success Stories

We're big advocates of promoting best practices, so we have a number of customer success stories that show how manufacturers just like you have installed and used FourJaw to enable them to overcome challenges on their shop floor.

Learn from your industry peers
See our reviews on Capterra

Latest Blogs & Guides

If you like reading about the latest manufacturing news/trends, product updates or getting helpful tips and advice, our resource area is a good place to look, it includes things like blogs, guides and webinar content we have created.

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