



Your manual for Key Performance Indicators (KPIs) in Maintenance

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Preface

Why and how we use KPIs

KPIs as a basis for decisions in Management has gained relevance during the past years. This developments includes in many cases the maintenance department of our customers.

When it comes to maintenance however standardized KPIs need to be evaluated carefully. Measuring the performance of people without careful consideration can lead to unpredicted behavior.

KPIs always assume a temporal perspective. They should never be seen as a static number but rather take into account the development over time. The term Key Performance Indicator in its parts hints towards a scaling of the observation period: Performance indicators are seen as a shorter-term perspective whereas Key Performance Indicators assume a more long-term perspective. For the sake of simplicity, we will use the term “KPI” for all calculations independent of their assumed observation period.

Each KPI can in most cases be calculated on a variety of entities such as people, objects or departments and on a variety of units such as instances, hours or costs. Provided that the data is accessible, MaintMaster can calculate the KPIs whichever way desired but it remains up to the customer to decide which mode of calculation is the most promising.

Top 3 KPIs

...that no Maintenance department should do without!

#1: Number of unplanned stops

How often are unplanned stops occurring

Needed Data:



Number of unplanned stops

Calculation:

Selection in
MaintMaster.
No calculation
necessary

Tracked for:



Departments



Companies



Site Objects

Why this KPI?

The number of unplanned stops is the simplest and most powerful KPI that you can use. It gives you a clear direction on what to improve. The less unplanned stops you have, the better.





MaintMaster
Peter Barkland
CEO and founder

#2: Immediate corrective maintenance ratio

How much immediate corrective maintenance is done in relation to all other maintenance activities?

Needed Data:

-  Time or number of immediate corrective maintenance jobs
-  Overall time or number of maintenance jobs

Calculation:

Number or time of immediate corrective maintenance jobs

Number or time of overall maintenance jobs

=

Immediate corrective maintenance ratio

Tracked for



Companies



Site objects



Departments

Why this KPI?

Immediate corrective maintenance means that the team has to respond **NOW** – Often because it causes production stop or because there are safety issues involved. These tasks are often accompanied by emergency deliveries and other costly measures and have a negative effect on the stress level of the maintenance team. You can really get a sense of how well the maintenance organization and production equipment are doing by tracking the amount of immediate corrective maintenance tasks.

Tip: If you also report downtime in your immediate corrective maintenance jobs and track it in another KPI, you will get even better opportunities to identify the biggest shortcomings regarding reliability on your production equipment's.



MaintMaster
Mikael Andersson
Senior Project Manager

#3: Top 5 Site-objects

Which objects are causing the most trouble?

Needed Data:



Number of jobs per Site-Object



Costs per Site-Object

Tracked for:



Site objects

Calculation based on:



Jobs



Costs

Why this KPI?

Site-Objects need to be traced both in terms of their maintenance costs but also for the number of jobs created on them. Tracking both these aspects will create a clear picture as to which Site-objects (machines, equipment, assets, buildings, lines ...) are the most resource-demanding. The intention is that these Site-objects will change over time due to renovations, improvements and investments based on this KPI.

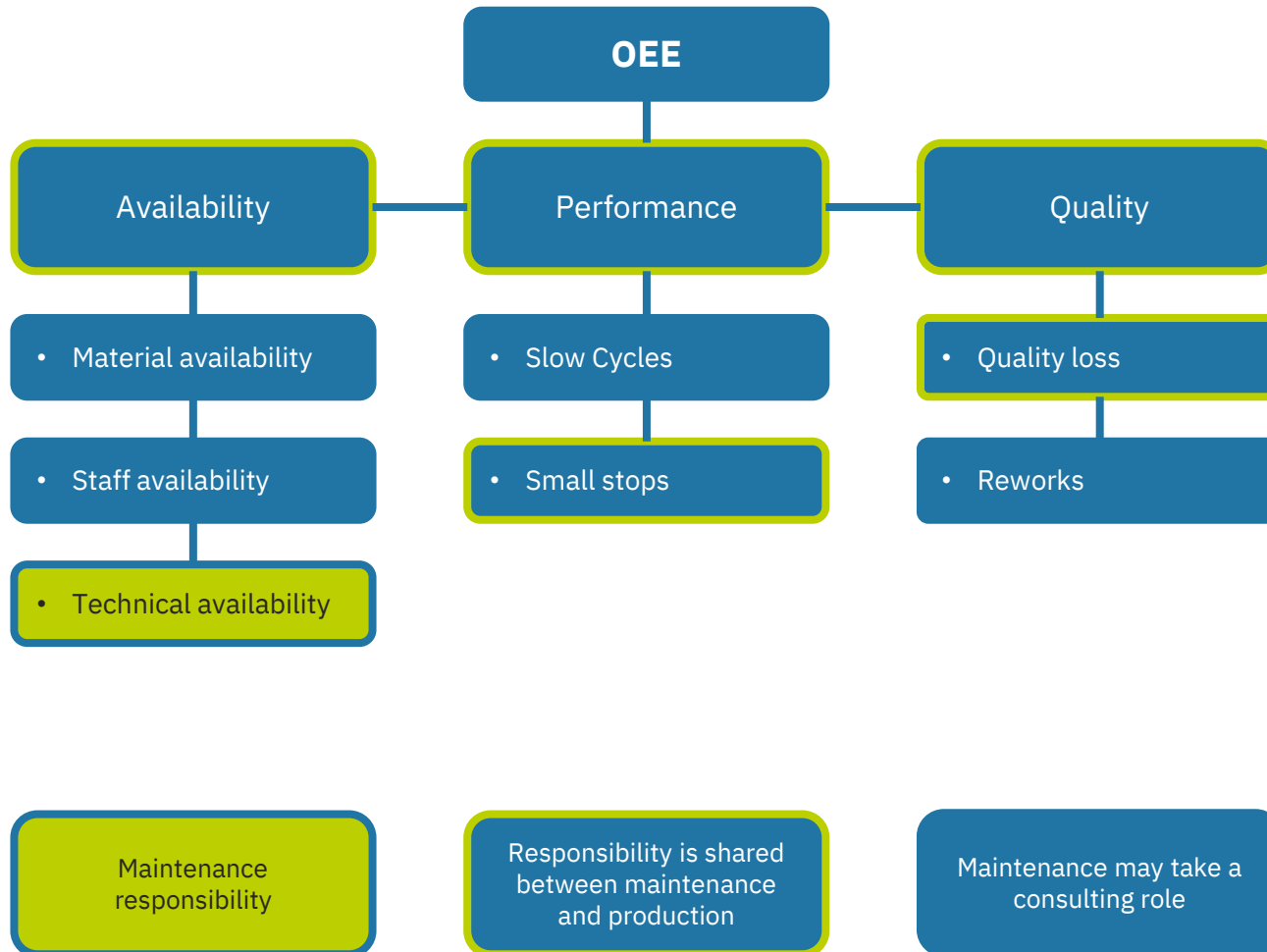


MaintMaster
Walter Foltin
Senior Business Manager

OEE and maintenance KPIs

...getting the responsibilities straight

Some words about OEE and Maintenance KPIs



Don't make maintenance responsible for OEE!

Overall equipment efficiency (OEE) is based on a variety of factors. Only parts of them are within the scope of the maintenance department. Therefore it's not recommended for the maintenance department to take responsibility for the entirety of OEE related measures!

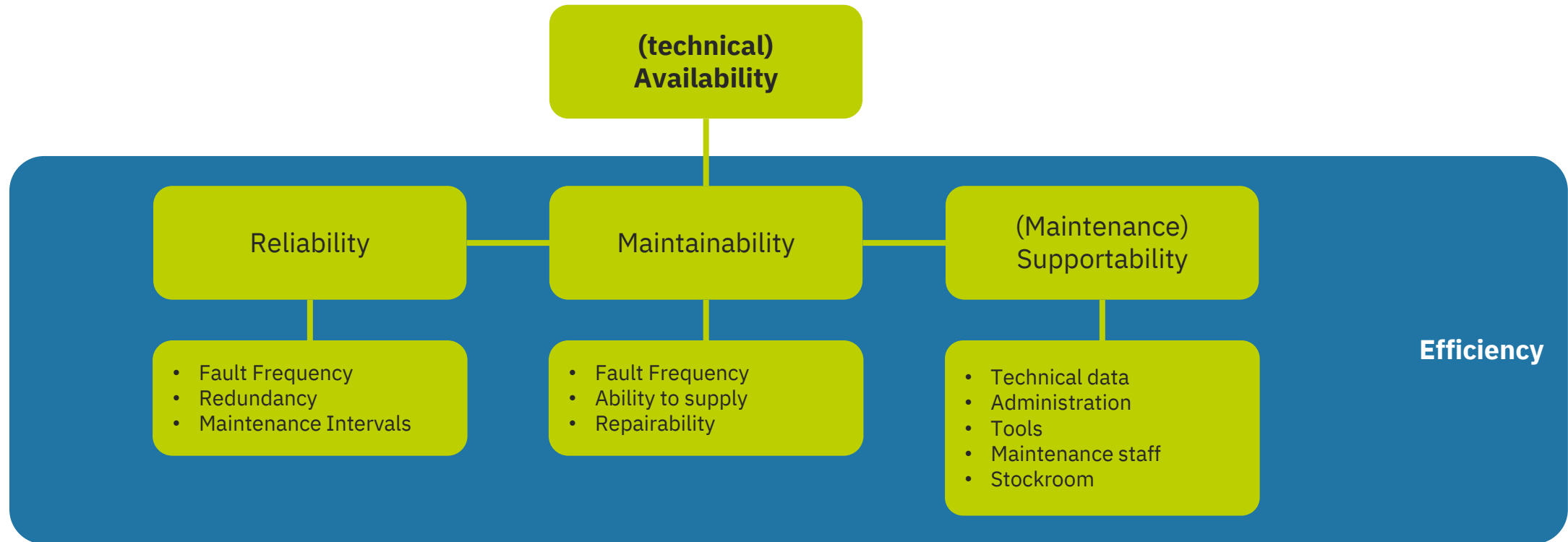


MaintMaster
Mikael Andersson
Senior Project Manager

KPIs for technical availability

A selection of KPIs that matter

KPIs for Technical Availability



Maintenance has always the objective to increase the **availability of production equipment** under the assumption of scarce resources such as time and money. In detail, availability consists of the **reliability** of objects, their **maintainability** as well the **maintenance supportability**. Maintenance KPIs are always set to indicate one or several of these components.

The MaintMaster mechanics of KPIs

Calculation based on (Units)



Purchase Order



Items



Jobs



Costs



Value of Items



Planned Time



Reported Time



Downtime



Time Difference



Completion codes

This is why you, the maintenance department, get to decide which KPIs are to be monitored and on what bases they are to be calculated. But we are happy to discuss this in detail and help to set it up in MaintMaster together with you.

KPIs in MaintMaster are always tracked for entities such as people or objects and based on units such as costs or time. MaintMaster, being the most flexible maintenance software lets you configure KPIs on the fly in unlimited variations.

Tracked for (Entities)



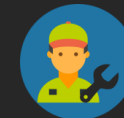
Companies



Departments



Groups



People



Spare Parts



Stockrooms



Site Objects



KPIs for Breakdown Analysis

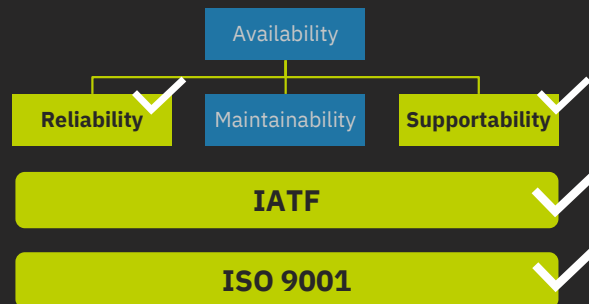
Immediate corrective maintenance ratio

How much immediate corrective maintenance is done in relation to all other maintenance activities?

Immediate corrective maintenance describes the relation of planned vs. unplanned activities.

Example: during the last quarter, the maintenance department had to spend 45% of their time on breakdowns that required immediate action.

Relevant for:



Needed Data:



Time or number of immediate corrective jobs



Overall time or number of non-immediate maintenance jobs

Calculation:

Number or time of immediate corrective maintenance jobs

=

Number or time of overall maintenance jobs

Immediate corrective maintenance ratio

Tracked for:



Companies



Site Objects



Departments

Calculation based on:



Time



Jobs

In MaintMaster:

Part of the default setup

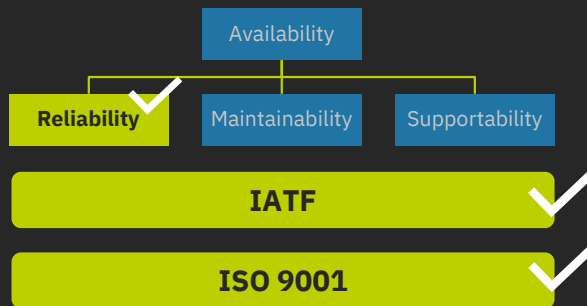
MTBF – (MOTBF)

Mean (Operation) Time Between Failures




MTBF describes how long in average an equipment will run between breakdowns.

Example: A machine has a planned production of 200 hours. During that time it stopped 4 times due to breakdowns and each time it took 2 hours to get started again. The total production time will then be $200 - 8 = 192$ hours. Which gives a MTBF of $192/4 = 48$

Relevant for:



Needed Data:

-  Object
-  Number of failures
-  Total (operating) time

Calculation:

Total (operating) time

Number of failures

MTBF

Calculation based on:



Time
Difference

Tracked for:



Site Objects

In MaintMaster:

Part of the default setup (needs journal data)

Top 5 objects

Top 5 objects with the most jobs / highest costs / most reported time...




Top 5 objects can be used to identify the costliest objects, objects with the most breakdowns or the most time-consuming objects

Example: sometimes, site-objects that have the most jobs, are not the ones that cause the most trouble. Therefore, other parameters need to be looked at as well.

Relevant for:



Needed Data:

-  Site Object
-  Job Category / Completion code
-  Reported time / Costs

Calculation:

Sum of desired unit listed by site object

=

Top 5 Site-Objects

Tracked for:







Departments



Site Objects

Calculation based on:

-  Reported Time
-  # Jobs
-  Costs
-  Completion codes

In MaintMaster:

Part of the default setup

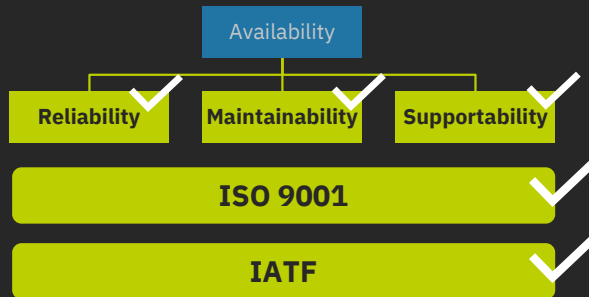
Breakdown hours

Objects with the most downtime caused by breakdowns.



Breakdown hours per objects lists the objects with the most reported breakdowns.

Work with follow up jobs in improvement maintenance to find the root cause and improve the availability of objects.

Relevant for:



Needed Data:

-  Site Object
-  Downtime caused by breakdown

Calculation:

Sum of all breakdown hours per site object

In MaintMaster:
Configured by user

Tracked for:



Departments



Site Objects

Calculation based on:



Downtime



KPIs for Restoration speed

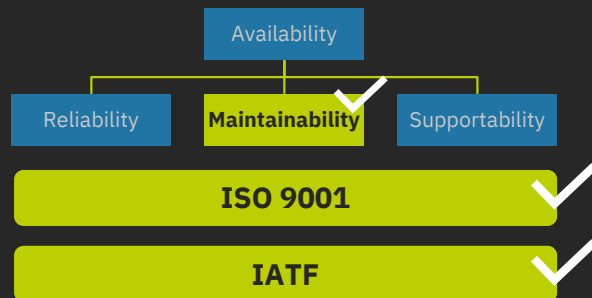
MTTR – (MDTR)

Mean Time To Restoration – (Mean Downtime To Restoration)




MTTR describes the time from fault detection to restoration of the machine. It may include administrative and logistics delays.

Example: during a month, the maintenance department spent one hour fixing a pump the first time, two hours the second time and three hours the last time. MTTR for this pump is two hours.

Relevant for:



Needed Data:

-  Site-Object
-  Time for restoration (Downtime for restoration)
-  Number of failures

Calculation:

Total (down)time to restoration

Number of failures

MTTR

Tracked for:



Departments



Site Objects



Groups



People

Calculation based on:



Time differences

In MaintMaster:
Configured by user

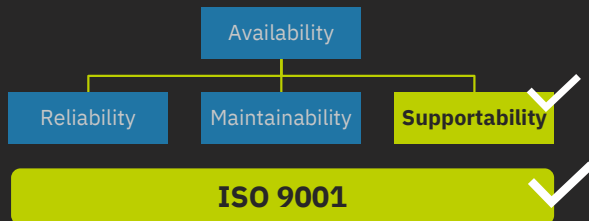
MWT

Mean Waiting Time




Mean waiting time describes the time it takes for a fault (not planned jobs) to be registered and maintenance technicians starting to work on the problem. In order for this KPI to be measurable, it has to be clearly defined what it means to start working on a task.

Example: A corrective maintenance task takes 8 hours to complete. It took 4 hours for the spare part to arrive until the team could start working. MWT is at least 4 hours.




Relevant for:



Needed Data:

-  Time of fault report
-  Reported times
-  Object / Person / Group

Tracked for:


-  Site Objects
-  People
-  Groups

In MaintMaster:
Configured by user

Calculation:

$$\frac{\text{TTR*} - \text{Reported time on job**}}{\text{Number of repairs}} = \text{MWT}$$

Calculation based on:

-  Time Difference
-  Reported Time

*Time to restoration

**Reported time by several people needs to be separated

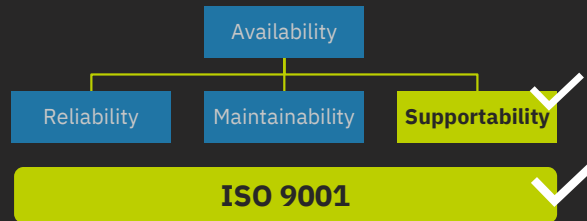
Downtime due to missing spare parts

Hours of downtime caused by missing spare parts

Describes the downtime for a machine due to lack of parts.






Example: We have a breakdown in one of our machines. It took 7 hours to get the machine up and running again. 5 of them were spent waiting for a spare part to arrive.

Relevant for:



In MaintMaster
Configured by user

Needed Data:

-  Site-Object
-  Downtime
-  Time of completed restoration
-  (Responsible Person / Group)
-  Needed spare part




Calculation:

Sum of all hours marked as “Waiting for parts” in corrective maintenance


=

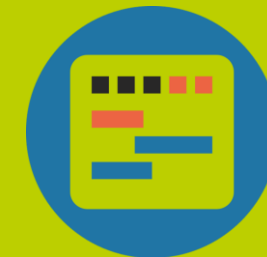
Downtime due to missing spare parts

Tracked for:

-  Site Objects
-  Spare parts
-  Departments
-  Companies

Calculation based on:

-  Downtime



KPIs for Maintenance Utilization

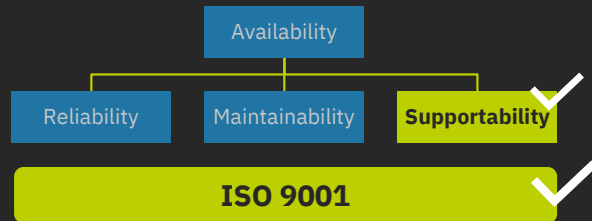
Backlog

Planned jobs / time that according to plan should have been performed

Backlog describes planned jobs that should have been started already but are lagging.






Tip: Evaluate whether all jobs really are delayed or if some recurring jobs are planned with too frequent intervals.

Relevant for:



Backlog In MaintMaster:
Configured by user

Needed Data:

-  Site-Object
-  Planned jobs
-  Deadline for jobs
-  Planned time for work orders
-  (Responsible Person / Group)






Calculation:

Sum of all jobs or time on jobs not started but due to start

=

Backlog

Tracked for:

-  Site Objects
-  People
-  Groups
-  Departments
-  Companies

Calculation based on:



Planned Time



Jobs




On-Time delivery ratio

Relation of jobs with delayed completion vs all completed jobs

On-Time delivery ratio shows the relation between jobs completed after expired deadline and all completed jobs

Example: during a month, electricians managed to complete 80% of their preventive maintenance tasks on time

Needed Data:

-  Person / Group / Department
-  Job deadline
-  Time of completion

Calculation:

$$\frac{\text{Total number of completed jobs} - \text{completed jobs delayed}}{\text{Total number of completed jobs}} \times 100 = \text{On-Time Delivery Ratio}$$

Relevant for:



Tracked for:



People



Groups



Departments

Calculation based on:



Jobs

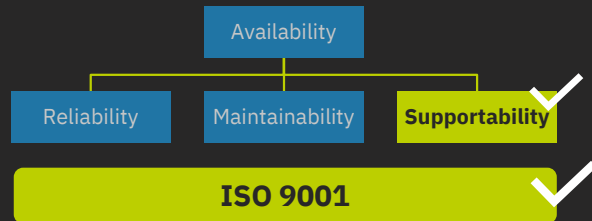
In MaintMaster:
Configured by user

Created vs. Completed jobs

Ratio of completed vs newly created jobs



Newly Created vs completed jobs will help you determine whether you are starting more jobs than your maintenance department can handle. If the ratio is above 1, the backlog will grow eventually

Relevant for:



In MaintMaster
Part of the default setup





Needed Data:

-  # Jobs / Start date
-  Responsible Person / Group

Calculation:

$$\frac{\text{Number of created jobs}}{\text{Number of completed jobs}} = \text{Created vs. completed jobs}$$

Tracked for:

-  People
-  Groups
-  Departments
-  Companies

Calculation based on:



Jobs



KPIs for root cause analysis

Completion code distribution for preventive maintenance

Chart with number of jobs / time / costs grouped by completion code and completion code group




Looking at **Completion code distribution for preventive maintenance** helps you to improve your preventive maintenance processes by identifying the right intensiveness and level of preventive maintenance.

Relevant for:



In MaintMaster:
Configured by user

Needed Data:

-  Completion code
-  Site Object
-  Follow-up jobs (if applicable)

Tracked for:



Site Objects

Calculation based on:



Completion codes



Jobs

Completion code distribution for Corrective maintenance

Chart with number of jobs / time / costs grouped by completion code and completion code group




Looking at **Completion code distribution for corrective maintenance** is the data you need to look at in order to find the root causes for your corrective maintenance. This is the necessary first step to start the improvement maintenance processes.

Relevant for:



In MaintMaster:
Configured by user

Needed Data:

-  Completion code
-  Site-Object
-  Follow-up jobs (if applicable)

Tracked for:



Site Objects

Calculation based on:



Completion codes



Jobs



KPIs for Stockrooms

Stockroom value compared to overall insurance value

Correct parts at stock

The value describes if you have enough or not enough spare parts in your stock room. A too high value is too much. A too low value means too few.

Example: If the value is 0,9 %, this indicates that you might have to few items on stock and therefore is at risk of standing still due to lack of parts. Threshold value depends on type of industry.

In MaintMaster:
Configured by user

Needed Data:



Stock room value



Overall insurance value

Calculation:

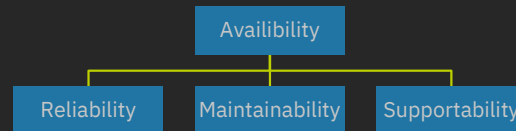
Stockroom value

$\times 100 =$

Overall insurance value

Relative
Stockroom
Value

Relevant for:



Efficiency/Finances ✓

Tracked for:



Companies

Calculation based on:



Value of Items

Top 5 used spare parts

Most used spare parts

Describes which parts that have been withdrawn the most. Can be based on amount or value.

Example: gives you an indication on which machines that are causing problems since they require a lot of spare parts.

Needed Data:



Number of withdrawn items

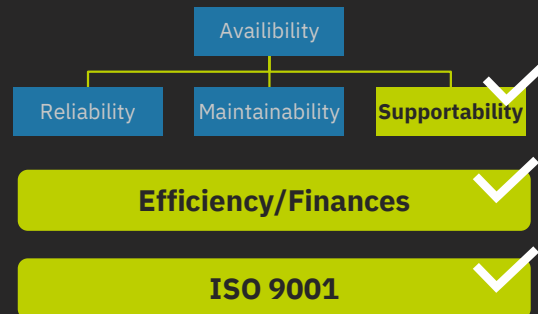


Value of withdrawn items

Calculation:

Selection and graph in MaintMaster.
No calculation needed.

Relevant for:



Tracked for:



Stockrooms



Site Objects

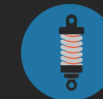


Departments



Companies

Calculated based on:



Amount of Items



Value of Items

In MaintMaster:

Part of default setup

Top 5 not used spare parts - shelfwarmers

Least (seldom) used spare parts

Describes items that haven't been used in a long time or never that we have on stock

Example: There is an item that haven't been used for 5 years. Why? Maybe the machine is not in use anymore. Note: This will not apply to insurance spare parts

Needed Data:



Number / date of withdrawn items

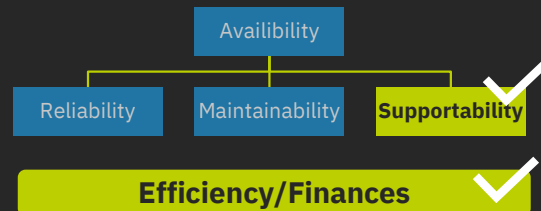


Value of withdrawn items

Calculation:

Selection and graph in MaintMaster.
No calculation needed.

Relevant for:



Tracked for:



Stockrooms



Companies

Calculated based on:



Number of Items



Value of Items

In MaintMaster:

Part of default setup

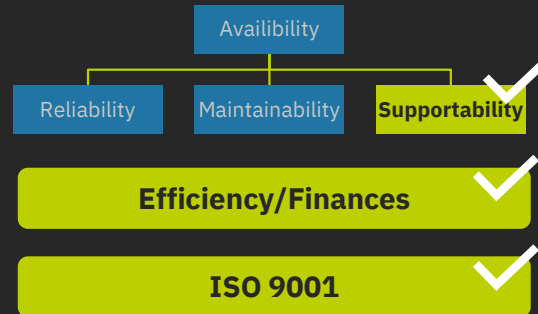
Emergency Orders

Spare parts ordered in emergency

Describes the number of emergency orders that have been made.

Example: a high number indicates that we need to evaluate which and how many items we have in stock in order to minimize downtime and special delivery costs.

Relevant for:



Needed Data:



Purchase orders

Calculation:

Sum of all orders marked as “Emergency Order”

Tracked for:



Site Objects



Departments



Companies

Calculated based on:



Number of Purchase Orders

In MaintMaster:

Configured by user



Financial KPI

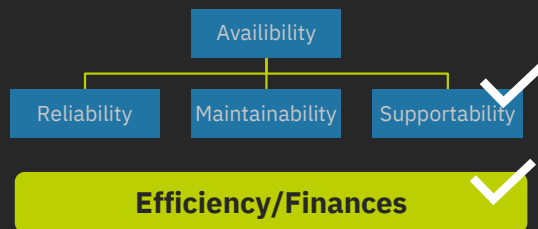
Maintenance cost vs. overall output value

Ratio of total maintenance cost vs. value / volume of output



Maintenance cost vs. production value
describes the cost for all maintenance tasks performed in relation to production output.

This ratio should be measured over a long period of time and hints at the development of the maintenance department. **Note 1:** Short term spikes for this KPI are normal and should never lead to any quick and radical measures. **Note 2:** Definition of maintenance cost is necessary

Relevant for:



Needed Data:

-  Total Maintenance Costs
-  Overall output value / volume

Calculation:

$$\frac{\text{Total maintenance costs}}{\text{Overall output Value}} = \text{Maintenance cost ratio}$$

Tracked for:



Departments



Companies

In MaintMaster:

Additional data needed (ERP data integration available)

How to improve your KPI:s

KPIs mean nothing when they don't result in actions

“

Most KPIs have the aim to help prioritize tasks. They may help identify the most resource-consuming objects but if there is no ambition to consequently conduct root-cause analysis or to spend time on improvement maintenance, tracking these KPIs won't do any good.

If you're unsure where to start, a rule of thumb may be to improve one thing every day. This means working on one task a day that is marked as “Improvement Maintenance” and has the aim to increase reliability, maintainability, or supportability of a site-object.

”



MaintMaster
Mikael Andersson
Senior Project Manager

KPIs in MaintMaster

Each of the mentioned KPIs can be calculated in a variety of ways. They may consider different entities such as spare parts, site-objects, people or departments. On the other hand, they can be calculated based on different units such as number of jobs, time or money.

MaintMaster is the most flexible Maintenance Software on the market. It allows you to set up all mentioned KPIs in all their variety on the fly. Even historically! – Provided that all the needed data is present.

When you run MaintMaster the first time, there are some KPIs preconfigured for you. Apart from these, MaintMaster does not give you any recommendation on which KPIs are to be tracked in what way.

This is why you; the maintenance department get to decide which KPIs are to be monitored and on what bases they are to be calculated. But we are happy to discuss this in detail and help to set it up in MaintMaster together with you.

