



## WHITE PAPER

# Smarter asset maintenance in factories

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# Smart Asset Management



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# Introduction

“One way of making the maintenance of your assets smarter is by monitoring the condition of assets and planning maintenance accordingly.”

Managing and maintaining assets is crucial for all organisations that are active in the manufacturing industry. This has always been the case of course, but it became even clearer for many companies in recent years. Outside influences, such as rising energy costs and the Covid-19 pandemic, have increased the pressure to manufacture faster, cheaper but also more sustainable products, while at the same time maintaining the quality. This has made it even more important to reduce the risk of failures and for assets to keep performing. Ideally, you would like to know beforehand which assets require maintenance and what parts you have to replace. Or, even better, get notified automatically when assets require maintenance and know what knowledge, skills, tools and parts you need.

However, in practice, we see that many manufacturing organisations still manage their assets correctively or preventively. This means that faults or failures are often fixed after they have already occurred. This is often too late or may mean that the required parts are not in stock,

resulting in shut down production lines. Most organisations solve this by scheduling maintenance beforehand to prevent failures. The downside here, however, is that you are maintaining assets when it may not even be necessary yet. Parts that are still functioning well are replaced and machines are unnecessarily out of order. In both situations you lose time and money.

## HOW CAN ASSET MAINTENANCE BE MADE SMARTER?

One way of making the maintenance of your assets smarter is by monitoring the condition of assets and planning maintenance accordingly. By getting more insight into all processes in your factory, you can reduce the number of maintenance moments without risking production downtime. But this way of maintaining assets is very labour-intensive when your operators have to record wear and tear, meter readings and other factors multiple times a day. Time is precious and staff is limited for many organisations, making it difficult to monitor assets intensively. And top of that, a periodical measurement only gives you a limited picture of the condition of your assets. So monitoring will always be just a snapshot of the situation, and the quality of the findings highly depends on the knowledge and skills of your operators.



“If you know how fast parts of a machine wear down, you can change your maintenance strategy accordingly and provide technicians with good, up-to-date information faster.”

Many organisations have the additional challenge of having to say goodbye to experienced people closely involved in the operation within the next few years. That gap is difficult to fill with new personnel because of the chronic lack of technically educated personnel on the labour market. So even if your organisation has the current process of manually monitoring and maintaining assets under control, it is not sustainable for the long term. Now you could try to work even harder with the people you have, but that is not a sustainable solution either.

### BREAK DOWN DATA SILOS

A practical way of successfully managing and maintaining your assets is by using data smarter and automating processing. A lot more data is present in your organisation than you think, so why not use it? Think of SCADA and MES systems to manage production processes. Or maybe an Enterprise Asset Management system (EAM) to keep track of the specifications of machines, maintenance history, operational hours or other relevant data, and to get more insight into production lines. But data from ERP, HRM and CRM systems can also be valuable for maintaining and managing your assets.

By analysing data from these systems you get more control over the lead time of your production lines. What are the most important causes of downtime? Which machines and equipment are out of order often? How do valves, pumps and other parts behave? How do your assets perform per month or per year? If you know how fast parts of a machine wear down, you can change your maintenance strategy accordingly and provide technicians with good, up-to-date information faster. This way you prevent unplanned downtime and costs. And because you maintain your assets exactly on time, you can improve the quality of your production.

The biggest challenge for many organisation is to combine this valuable information from separate systems. The different departments involved in asset management and maintenance often operate separately. They each

have their own systems and data, which means it takes a lot of time and effort to prevent or solve failures. When an operator reports a possible fault in an application, they then have to mail or call maintenance to inform them. A planner of the Maintenance department then creates a work order and coordinates with purchase or stock management which parts are needed for the maintenance of the assets. All those separate work instructions, phone calls and emails are prone to errors, slow down the process and prevent operators from intervening quickly in case of possible failures. But the data from these different departments would be most valuable when combined.

### SMART ASSET MANAGEMENT

But then how do you manage assets smarter? With smart asset management. This allows you to create an integrated overview of your assets and their performances with the purpose of extending their life span, lowering maintenance costs and improving collaboration between departments. This can be done by connecting different sources—such as production lines, business applications and sensors—and making information available in a central location. Not to operate systems, machines and equipment remotely, but to get a better picture of the behaviour and performance of all assets in your organisation. And you collect data from your assets and their environment. For example, by using smart sensors or by simply reading out the PLCs of machines. This gives you a more up-to-date and complete idea of the performance of your assets and allows you to spot deviations even quicker.

This may sound complex, but you could start today. How? By taking stock of what is already possible. What data are collected in your organisation? Are you able to get data from your data or systems easily? You don't have to switch to automated work orders and smart algorithms in one go. You can already gain a lot by just combining data and monitoring the already available data with pre-set rules. And that then provides you with leads for further improvements in your assets and maintenance, and helps you innovate further step by step.

# Smart asset management step by step

**How do you achieve smart asset management? How do you make sure that you actually get more insight into all important factors related to your asset management and maintenance? What do you need to know exactly what failures you can expect and which parts you need to replace? And how do make sure a technician is automatically available to intervene? Let's look at the steps to get more insight into the assets you have to manage and maintain.**

## **STEP #1 REGISTER DATA FROM YOUR ORGANISATION IN A CENTRAL LOCATION AND STRUCTURE YOUR DATA**

Many manufacturing companies lack an up-to-date and clear overview of all of their assets. What type of machines, brands and series are part of which production line? And where are they? What parts do the assets have? When were these last maintained? What is the average life span of parts? Without this information, you can only guess what causes a failure. In short, asset management is a form of sanitation for every production company. If you know the location and current status of each asset, you can determine what exactly it is that needs maintenance or repairs quicker. You can achieve this by registering all relevant information from different systems in one central location. That way you can manage detailed information about equipment, locations, brands, models, serial numbers, relations with other equipment and the maintenance history. This gives you a good overview of all assets in your organisation and gives better insight into the performance and maintenance history of machines and equipment. You have all up-to-date information you need to send the right mechanic with the correct parts for failures and planned maintenance.

## **STEP #2 MAP THE BEHAVIOUR AND PERFORMANCE OF ASSETS**

The machines and equipment in your production lines have troves of valuable information. This not only goes for the new generation of machines but also for many of the older machines and equipment that are operated on location. The codes and data they use is mainly used to operate all parts. An example of machine data are the error codes on the display (HMI) of a machine. In many cases it is possible to retrieve and collect these codes and other forms of data. Not to operate assets, but to get an accurate idea of the behaviour and performance of equipment and their individual parts. Basically, you make a log per asset to see which failures have occurred. This allows you to review the data over a specific period to see in which machines failures occur often and to find out why. And you can predict the lifespan of parts more accurately, giving you more insight into when they have to be replaced. Assets that use little to no data for their operation can be equipped with sensors to measure the temperature, electricity consumption, vibrations and other values.

*“Assets that use little to no data for their operation can be equipped with sensors to measure the temperature, electricity consumption, vibrations and other values.”*



“A good first step is to make assets observe wear and tear or deviations and send a report immediately if certain values are exceeded.”

### STEP #3

#### WORK INTEGRALLY AND BREAK DOWN DATA SILOS

A known issue in failures is a lack of communication between operation, maintenance and planning. If service engineers have no insight into production lines and where assets are located exactly, they have to depend on the operator's description of the failure. But to what extent can you trust the operator to give a description of the failure that is clear enough for the engineer to know exactly what to do? That is very difficult. Especially if you have dozens or hundreds of assets in a factory. How do you know they are describing the correct machine?

Production and maintenance often use different systems that are not connected. The first step is to connect those systems (see step 1) and create integral insight to streamline the step of observing to solving a failure. However, just sharing data is not enough to ensure more efficient collaboration. What you need are clear agreements about reporting failures and other communication about assets. You want to set up the process in way that allows operators to give the correct error description and/or failure code. You can do this by giving every asset a unique Id. This eliminates the need for operators to describe which assets need maintenance; all they have to do is state the Id number. This makes it easier and quicker for maintenance to determine which asset it concerns. You can also categorise the failure reports and make agreements about using them. This makes it easier for maintenance to understand what the problem is and helps them act quicker. Think of categories such as:

- ▶ Full downtime or reduced performance
- ▶ Ongoing failure or intermittent failure
- ▶ New failure or same failure occurred before

### STEP #4

#### LET YOUR ASSETS REPORT THE FAILURES

The next step is working towards the principle of Just-In-Time Maintenance: you are going to determine the exact time of maintenance. So no longer too early and especially not too late. This can significantly reduce downtime and it is a sustainable approach because you're not unnecessarily replacing parts. You achieve this by using data to automate certain processes in your organisation.

A good first step is to make assets observe wear and tear or deviations and send a report immediately if certain values are exceeded. This can be an e-mail, text message or a notification in an app. A big advantage is that you always know exactly which assets, and maybe even which parts, are concerned. But for this process it is very important to determine who will receive the message and what the response will be. The most ideal scenario is that the assets send the report directly to maintenance, saving a lot of time and steps. No human observation or communication by operators is needed and you can act immediately if necessary. And if your information is registered in one location (step 1), maintenance can immediately view the machine's history and determine what parts to bring.

“Step by step, you can use data to optimise more and more processes in the factory.”

**STEP #5  
OPTIMISE AUTOMATED PROCESSES  
(LIKE WORK ORDERS)**

Reporting failures is only one aspect organisations can automate. Many manual actions in the asset management and maintenance process are currently still done with separate tools and spreadsheets, which is time-consuming and error-prone. And you risk overlooking deviations or failures or linking incorrect information to an order so that maintenance does not have the right parts at their disposal for timely maintenance. This reduces the chance of reducing failures and downtime. You can prevent these issues by, for example, creating automatic work orders on the basis of the notifications from the assets (see item 4). The notifications are read into a planning tool and contain information about the location, the type of asset and the type of maintenance required. A work order is then created on the basis of that information and assigned to an available technician. It is even possible to automatically order or prepare spare parts for an engineer.

**STEP #6  
FIND PATTERNS IN THE BEHAVIOUR OF  
YOUR ASSETS**

The five steps described above are the foundation for smarter asset maintenance. But it also makes a valuable source of information available that helps you better understand how your assets perform and when failures occur frequently. This can be due to temperature, vibrations or the strain on certain parts, but also external factors such as the humidity in a factory. By collecting data, you can start to recognise patterns in the behaviour of your assets. The more information you have about your production lines, resources, stocks, maintenance, environmental factors and more, the faster and more accurately you can discover those patterns. With smart technology you can start to predict the behaviour of assets on the basis of this information, even when failures start to occur or assets wear down faster than expected. It helps you more accurately determine when you have to carry out maintenance to reduce downtime and breakdowns.

**MUCH MORE THAN SMARTER  
MAINTENANCE**

By combining data from your systems, assets and other sources, you can give more up-to-date context to the historical information you already have. That then helps you shift from maintenance based on interpretation and intuition to maintenance based on facts and figures. You will be amazed at how much of an impact that can have. And it doesn't stop there. By better understanding how your assets perform, and which factors contribute to it, you can also change your operation accordingly, change your recipe and improve the quality of your production process. Step by step, you can use data to optimise more and more processes in the factory. The options are there, the limit is up to you!

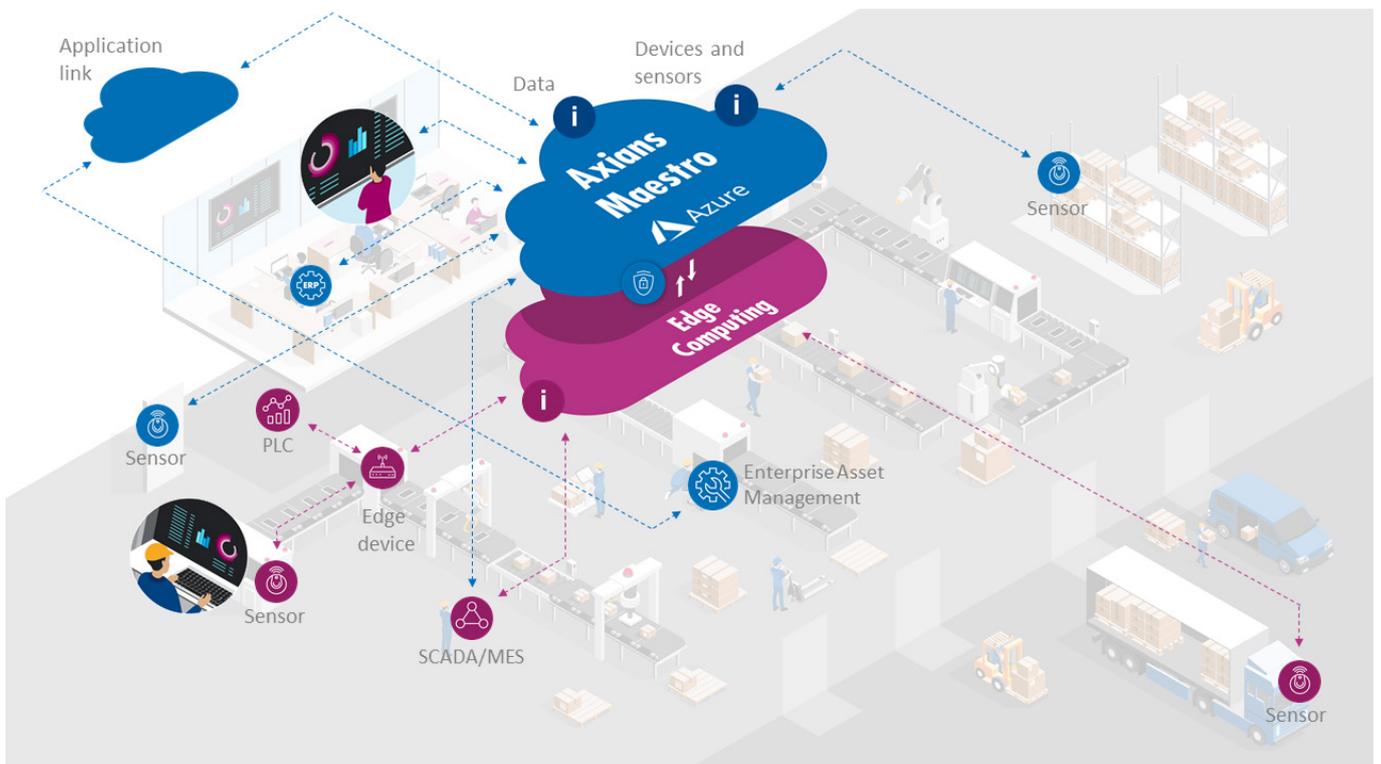


# Smart asset management in practice

To make the smart asset management steps successful, organisations need a solid foundation. You probably have several important sources at your disposal that you need to build that foundation. For instance, because you organisation is already working with a MES, SCADA, ERP or Asset Management system. Or maybe your machines are already equipped with smart sensors. In this chapter we show you how you can structure and standardise those different systems, sensors and other sources, and how you can make them available in one location with the combined strength of a Data Analytics & IoT platform and an Enterprise Asset Management system (EAM). We will then show you in a use case what smart asset management looks like in practice.

## THE FACTORY AT A GLANCE

The image below shows an integrated outline of a factory, including production floor, warehouse, office and logistics. Data sources are present in many different places in the factory, including sensors, PLCs, production management systems (SCADA/MES), ERP and asset management systems. These sources are all connected to the Data Analytics & IoT platform (Axians Maestro in this case). On that platform the data are managed in one central cloud environment. The platform is not meant to operate the source directly but only to structure and standardise data, and to make it available in a central location for monitoring and analysing purposes. With a platform, you let the data 'communicate', which creates a situation in which every step in the process results in feedback for next time.



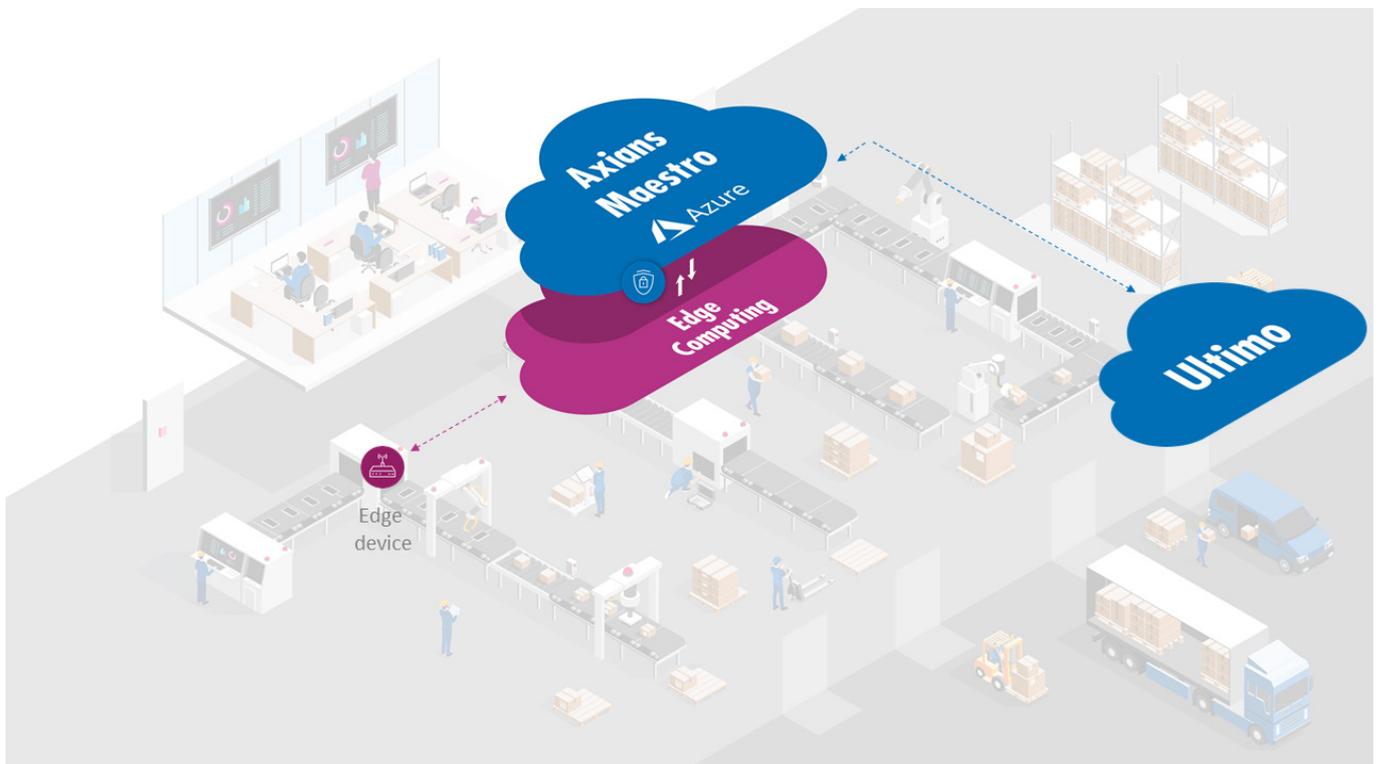
In addition to structuring, standardising and centralising the data, the platform also offers the option to safely connect equipment and sensors to the platform and exchange data in real time. The data are then analysed in the platform, and warnings and messages can be set to immediately determine where and when errors occur. The platform can also integrate data of machines with your business applications to coordinate your planning or resources, for example. With these insights, the platform can also build smart models to create a predictive strategy.

### THE ROLE OF EDGE COMPUTING & ENTERPRISE ASSET MANAGEMENT

The Data Analytics & IoT platform uses edge computing. This allows you to save and process machine data close to the source easily and safely. That way a part of monitoring and data analysis can take place close to the machine without having to transfer data. This is essential for certain organisations so they don't have to depend on the speed

or availability of the Internet for production uptime. So with edge computing you can work locally in addition to in the cloud or with a combination of cloud and local.

The Data Analytics & IoT platform is directly connected with the asset management system (i.e. Ultimo in this example). The benefit of this is that you can expand all available and valuable data in the asset management system with up-to-date data. This gives you a more comprehensive picture of all machines in your factory. Not just of type X in production line B, but also of how that type performs and how it differs from machines in a different plant or production line. This makes it very easy to benchmark data and to understand how your machines and equipment perform in different environments. And by linking the two platforms, orders and transactions can be created automatically. For instance, to create a work order proactively if you predict a part of your production line is about to break down. That's smarter asset management!

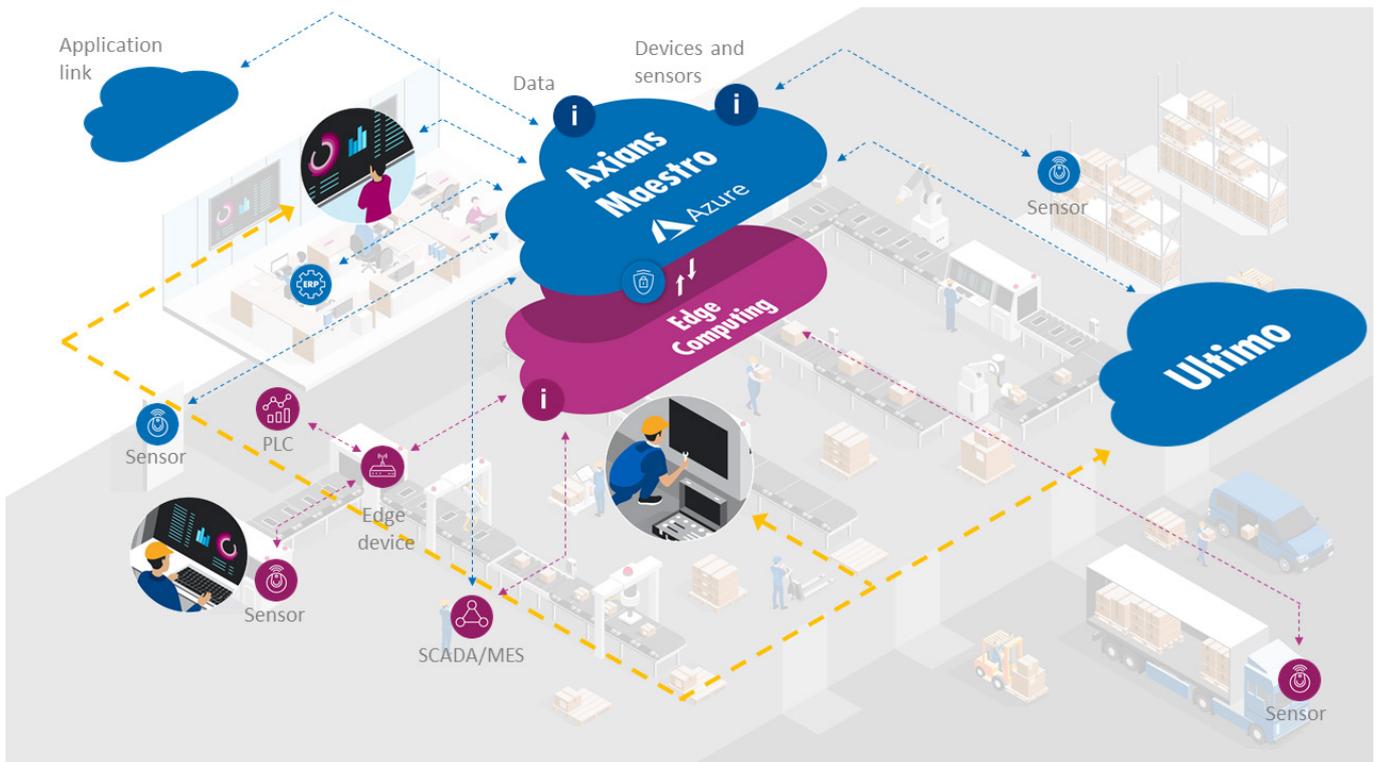


### INSIGHT INTO YOUR DATA

With the combined strength of asset management and data, you have a lot of information about processes in the entire production organisation at your disposal. This information is presented in clear and organised dashboards to different user groups. With these dashboards you can closely monitor all critical production processes, and the dashboards give you real-time insight into the KPIs of those processes. Think of performance, status, planning, values, maintenance data, work orders, etc. And in addition to the operational insights, it is also possible to show management information. That way you cannot only spot when and where a failure occurs, but you can also determine the underlying causes of incidents. Like the different reasons for downtime, the number of faults per material and comparing production lines of different sites and suppliers.

You can then use these insights for quality purposes, for example. What impact did something have on quality? Or on the lead time of the production? What was the total number of faults per year, quarter or month? With this information you can work towards different use cases that truly add value for your organisation. Think of:

- ▶ Reducing unplanned downtime per machine
- ▶ Improving the utilisation of capacity
- ▶ Reducing the total lead time of production
- ▶ Reducing the amount of electrical energy consumed per equipment
- ▶ Improving the order delivery



### WHY A PLATFORM?

You have numerous solutions available to you if you want to get more data out of your organisation. However, this runs you the risk of getting in your own way at a later stage because you have to connect different applications. In the end this will cost you more time and money than getting one solution for all challenges would have. With one central platform you can make quick and balanced steps to secure all solutions for the future. With the underlying platform you can grow safely and controllably. With one platform you easily integrate more and more systems, and you are scalable in the data volume and processing power.

A Data Analytics & IoT platform offers many out-of-the-box functionalities that help you get started with unlocking, monitoring, integrating and analysing data. Setting up a platform is easy and gives almost immediate insight to improve the maintenance of assets. If you want more information, you can easily integrate additional sources and add new data to your analyses. This way you build a collective brain to make your factory smarter.



# A practical example



Now that you have more information about the foundation of smart asset management, it's time to see it in action. How does smart asset management work in practice? We will show you in the following example. It shows you the steps of how a failure in a production line causes a series of actions that will affect the entire organisation.

- 1 A machine breaks down Because the machine is linked to the Data Analytics & IoT platform, a real-time signal is given off.
- 2 The platform automatically creates a work order in the asset management system. The downtime is registered for the machine in question with an exact description of the cause of the failure.
- 3 A maintenance engineer receives a notification on their smartphone with the work order and all specifications of the failure they need to solve the problem.
- 4 Planning and stock are linked to the platform so the required materials are ordered automatically and the planning is adjusted accordingly. Because the data about the available stock of spare parts is linked to the platform, the engineer knows that the required part is available or has been ordered.
- 5 The plant manager has a total overview of the current status in their plant. And with the link with other company data, they can analyse failures and leverage these results to minimise downtime. For example to turn a preventive maintenance strategy into a predictive model.
- 6 The maintenance manager has all up-to-date information available at a glance in the asset management system. This helps them to maintain their machines and assets smarter. On the basis of data, they can see how well they are performing and adjust the maintenance strategy accordingly.
- 7 The purchase manager does an analysis of downtime, waste and energy consumption, which gives them increasing insight into all required resources and associated costs. They can then use these insights for vendor rating but also to purchase essential raw materials for production more timely and efficiently.
- 8 By getting more control over asset maintenance and the use of production resources and all critical resources, the Sales department can make better forecasts, and negotiate and meet more concrete delivery agreements. This way margins and incentives are not jeopardised and customer satisfaction is increased.
- 9 Management receives a total overview of the production capacity and scarce resources. By combining the capacity data and the future demand from the market, you can make strategic decisions about investments and pricing policy. But most of all, the productivity of the employees can be increased by coordinating processes better. This is essential for a market that is under so much pressure due to an enormous scarcity in good personnel.

# Smart asset management as a part of the intelligent factory

“With every process you improve, you get a more complete picture of your production organisation and new insights about the processes that play a part in it.”

The power of smart asset management is that it gives you control over your production and maintenance processes in a smart way, and it usually uses data that are already available. You learn what the most important causes of downtime are in your organisation. You understand how certain assets behave in a wide variety of environments and under different circumstances. This way you know exactly what to do to adjust your maintenance accordingly. And how you can prevent certain issues in the future together with different departments in your organisation. You can plan ahead and you face a lot fewer unpleasant surprises. That shifts the focus in your factory from solving unexpected problems to the structural improvement of production. This is the first step to an intelligent factory.

Combining data from different systems and machines for smart asset management is basically laying the groundworks for further optimisations. Many organisations that are now data-driven are getting the hang of it. By analysing their assets' maintenance, they also discover other processes in their factory that can be made smarter, more efficient or more sustainable. For example, they look for ways to reduce their carbon emissions or deliver better products with more insight into the factors that affect the quality. Or to reduce the waste of raw materials and other materials by analysing the composition of their recipe.

With every process you improve, you get a more complete picture of your production organisation and new insights about the processes that play a part in it. This helps you to keep optimising your production and work towards a factory where you work smarter on the basis of data. But this does not happen overnight. You read in this whitepaper how to get started. From there, you continue to innovate step by step. On your way to the higher goal: the intelligent factory.



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