FASTEC
Software for Production

WHITEPAPER
INDUSTRY 4.0

Step 4 | Focus on Transparency

We digitalize factories
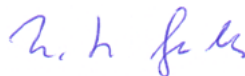
Produce Transparently – Increase Efficiency

Far too many companies still produce without reliable productivity key figures. But to produce according to gut feeling is already negligent given the options available today. Goal orientation requires numbers, data and facts. With the introduction of an MES, productivity potentials can be uncovered. Even skeptics are quickly convinced by tangible data in real time that an MES is an indispensable tool for production optimization. With digitalization, the importance of data has advanced to new dimensions in all areas. Big Data and Deep Learning allow to gain better insights from huge amounts of data in order to become even more productive. In this way, data becomes as valuable as gold. In production, digitalization is the key to Industry 4.0.

Looking at it from this point of view, many companies still have huge potential for the collection and use of machine and production data. It is not uncommon for production employees to record their entries for downtimes and malfunctions manually on pre-printed forms, and quantity feedback is provided via order slips. This manual data acquisition and manual logging of downtimes, malfunctions, etc. is prone to errors with regard to exact times, exact duration and description of causes and is too imprecise for meaningful evaluations. Controlling creates the required key figures on the basis of this data. With a lot of effort and several days' delay, the decision-makers have the corresponding evaluations at their disposal, but there are justified doubts about the validity of these evaluations. It is

also far more important that the manual recording of production data does not allow for a quick reaction in case of malfunctions. This can be called a kind of „rear-view mirror method," since special events are only visible when it is already too late to intervene. Not to mention methods such as Preventive or Predictive Maintenance, which can help to avoid malfunctions and failures in advance. Companies that introduce an MES solution invest in the future and competitiveness of their production. In doing so, they pursue the following objectives:

Objective 1: Identify weak points that might have gone unnoticed without Production Data Acquisition.
Objective 2: Relieve employees in their work (e.g. machine operators, maintenance engineers, planners, etc.).
Objective 3: Transparency at all levels so that information reaches all relevant employees and enables faster, more targeted and forward-looking responses.
Objective 4: Sustainably optimize processes, which leads to an increase in efficiency in the entire production environment.
Objective 5: Build up data collections to enable further evaluations by means of AI.

In this whitepaper you will learn which modules and functions you need to achieve these goals.

Dr. Karl-Heinz Gerdes, Founder of FASTEC GmbH

About the Author

Dr. Karl-Heinz Gerdes is the founder and former Managing Director of FASTEC GmbH and has been active in the field of computer-integrated production for over 30 years. During his studies he was already working on microprocessor-controlled automation solutions. The development of decentralized control and networking solutions for interlinked plants with master computers was ultimately the guiding principle for the founding of FASTEC GmbH. The MES solution FASTEC 4 PRO, which is distributed by FASTEC today, was developed on this basis and has become even more sophisticated due to the experience gained from many complex customer projects.

Machine Data Acquisition (MDA)

View Details

The MES module Machine Data Acquisition (MDA) analyzes and visualizes machine data acquired in real time in clear evaluations. This means that weak points in the production process can be reliably identified. This gives you full transparency over the entire production process.

Data Instead of Gut Feeling ✔

Due to the high degree of automation in production, losses in the area of machine and plant availability hit hard. The effects of short shutdowns in particular are often underestimated; linked assembly lines are especially affected by this phenomenon. In most cases, there is a lack of complete records and evaluations for a systematic analysis, which can help to detect and reduce losses and thus increase machine utilization. With the module MDA, you can save costs and significantly increase the effectiveness and quality of production through the exact, automatic recording of machine data such as quantities, running meters, downtimes and reasons for downtimes. Compared to manual data acquisition, this saves a lot of time and is less prone to errors and manipulation.

Evaluations and Reports in a Matter of Seconds ✔

MDA also replaces the previous, time-consuming manual evaluation using Excel spreadsheets or similar programs. All downtimes and malfunctions are recorded with detailed time information and the reasons for the downtime; by means of disturbance analysis, you can thus quickly identi-

fy organizational and technical weak points in the operational process. The reduction of the weak points leads to a sustainable increase in machine availability and thus the degree of utilization.

Connection of Your Machines, Plants and Assembly Workstations ✔

Interfaces are required to acquire machine data. Ideally, your MES provider can use existing interface modules for many common interfaces (e.g. OPC UA, Siemens S5/S7, Profibus, Euromap E63, etc.) and has extensive experience in quickly implementing interfaces that are not yet available.

The more experience an MES provider has in this area and the more interfaces the provider can implement as standard, the more cost-effective and time-saving the implementation of the MES solution will be for the production company. Not every MES provider has ready-made interface modules for specific machines or plants, as well as the know-how to implement them quickly and cost-effectively. Therefore, clarify in advance which interfaces are to be implemented, what effort this requires and what costs are to be expected in this regard.

Real-Time Data Supplier ✔

The module MDA provides real-time data from production. Many other MES modules, in particular Monitoring and Alerting, but also Maintenance, Traceability and Detailed Scheduling, use the data provided by the MDA. The combination with other modules creates a complete MES that enables the planning, control, monitoring and evaluation of all production processes – from the high-tech special purpose machine to the assembly workstation.

Transparent Production ✔

MDA informs you at your PC workstation at any time about the status and many other production-relevant data of the individual machines, machine groups or all machines in a hall, in the selected foreman area, plant, cost center, etc. At the click of a mouse, you receive up-to-date detailed information on all relevant production key figures (e.g. performance, availability, quality, OEE and quantities).

Process Data and Process Messages

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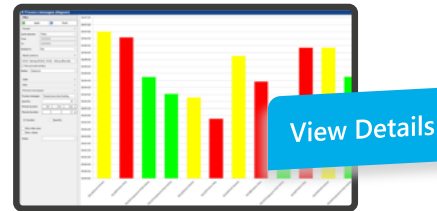
Detect Problems Early on, Eliminate Weak Points ✔

With process data acquisition (PDA), process values such as temperature, pressure etc. can be recorded, permanently saved and analyzed on a time-related basis. Production processes thus become traceable, production errors and process defects can be identified, and deviations are detected at the outset, which means, for example, that the production of rejects can be avoided.

What Is Process Data?

Process data are analog and digital measured values that are either read out directly from the machine controls via a data interface or recorded via sensors at analog or digital inputs (e.g. via I/O modules). With the module Process Data Acquisition, this data can be recorded and evaluated, e.g. to detect deviations at an early stage. The acquisition can be done either by a trigger (e.g. for every part produced) or cyclically (e.g. every x seconds).

Tolerance ranges, indication, warning and action limits can be configured for each process value. These are then automatically monitored and can indicate problems at an early stage. The link with an alarm function, with which the stored contact persons are alerted immediately, allows rapid intervention in the event of malfunctions.

What Are Process Messages?

Machine control systems (PLCs) generate a large number of messages and alarms. These provide information on the frequency and duration of malfunctions of the units and can be called up via operating panels on the machine control system. In the controls, however, the messages are usually only available for a limited period of time, are cyclically overwritten or are lost when the machine is switched off. In addition, due to the lack of filter and sorting options, it is hardly possible to create effective evaluations on the machine.

Evaluate Process Messages Profitably ✔

For this reason, any process messages that occur are read out in real time directly from the machine control via a data interface. They are then permanently stored in a database and can be accessed at any time via the MES office client. For example, the maintenance engineer can call up current messages from the respective machines on the PC and react accordingly. For this purpose, the messages are made available in clear evaluations. Optimization strategies can be derived from this in order to sustainably minimize machine downtimes and thereby increase productivity in the long term.

> The module MDA and the additional function Process Data Acquisition most notably develop their full potential in combination with other modules. With the modules Production Data Acquisition (PDA) and Traceability, the process data obtained can also be traced back in relation to articles and orders.
>
> The additional function Process Messages enriches the MES module Maintenance, for example, since all machine messages are available on the Office Client and can thus be retrieved at any time.

Production Data Acquisition (PDA)

View Details

With the MES module Production Data Acquisition (PDA) you take a further step in the direction of paperless production. At the production terminal, the machine operators have access to all order data for the respective workstation in real time.

In this way, orders can be registered and deregistered directly at the machine. Order status reports and (scrap) quantities can also be entered manually via the production terminal. The PDA module records the data that is generated during the processing of production orders or the resulting operations. This includes, for example, order times, quantities and order status messages, as well as quality-related data (such as good pieces or rejects).

The PDA module precisely maps the production processes. In this way, all relevant production managers can be informed about upcoming, ongoing or already completed orders. You get transparency in the entire production process! In most cases, the PDA module is connected to the ERP system via an interface, which provides the orders for production.

A bidirectional interface offers the following advantages thanks to the additional return channel:
- Ready messages without time delay due to automatic order feedback to the ERP/PPS system
- Avoids transmission errors by eliminating the need for manual feedback on paper

A Great Variety of Information for Production Optimization ✔
Tabular and graphical evaluations are available on demand using the Office Client. It is possible at any time to view order and article data, work schedules, shift calendars, quantities and scrap values as well as comparisons of target and actual data for production or set-up data. The user can use filters to select the criteria according to which the collected data is to be analyzed.

Document Display: Paperless Production – Documents That Are Always Up-to-Date Help to Avoid Errors ✔
The additional function Document Display supports the machine operators and other employees in production. All relevant information for production, assembly or maintenance (e.g. work and test instructions, photos and drawings) is made available to them in paperless form via the production terminal at the workplace. This means that there is no need to pick up or search for documents and it avoids deviations due to outdated documents. This reduces production errors and prevents rejects.

> **More Transparency for More Effective Production**
>
> The user benefits can be significantly increased in most application scenarios by combining the MES modules PDA and MDA. For example, quantities can be counted automatically. A maximum of transparency can be achieved with automatically recorded operating data and machine data from the controls.

Monitoring, Energy Monitoring and Alerting

View Details

Visualized information in real time helps to improve the flow of information. From machine states in the hall layout to the visualization of order-related process data to general information of the management, plant management, quality assurance etc.: With the module Monitoring, selected information can be displayed on various devices such as PCs, production terminals or large screens in real time.

Monitoring in Every Department:
A Look at the Real-World Applications
How monitoring is used sensibly is best illustrated by practical examples:

- At a large electronics manufacturer, online monitoring screens are used in all areas that are directly related to production. For example, the test data of all testers is displayed in real time in Maintenance. Whenever the stored error tolerance limit of 96% is undershot, the software signals to the maintenance employee that action must be taken. He then checks the problem online and fixes it.
- In an iron foundry, the furnace operator can see whether the start of the casting process has been delayed by monitoring the progress of the order in the core shop. This allows the operator to better control the melting process and thus drastically reduce energy costs.
- At a food manufacturer, a line is divided into two areas without visual contact by a cooling tunnel. Through monitoring, each area knows the productivity of the

other and can better assess the consequences for its own area in the event of disruptions.

Conclusion: Transparency in all areas helps to increase efficiency in production in the long term.

Energy Monitoring:
Uncover Potential Savings and Reduce Energy Costs ✔
Usually, production is the corporate division with the highest energy consumption. Therefore, the highest savings potential can be expected here. The MES additional function Energy Monitoring offers support for this by acquiring, visualizing and evaluating energy data. In this way, energy consumption can be transparently displayed, existing savings potential can be uncovered and used, and resources can be saved. Thus, you contribute to the sustainability of your company. This additional function provides particular added value, e.g. in combination with PDA or MDA, enabling conclusions to be drawn about energy requirements on the basis of orders and articles, thus enabling even more comprehensive post-calculation of production orders. The energy data can be recorded via I/O plug-on modules or via interfaces to energy measuring devices.

Alerting – Be Fully Informed at All Times ✔
In order to be able to react quickly to deviations in the production process, the alerting module informs the responsible personnel. Calls (voicemail), e-mails, SMS, push messages or alarm apps for smartphones or tablets can be used as alarm methods. Alarms can be triggered by various events: The change to certain, mostly undesirable states, timeouts, limit violations, loss of performance, reaching of set counter values, the (imminent) end of an order, material shortage, etc. The events that should trigger an alarm are specified in alarm chains. If the parameters defined here, such as limit values, delays or waiting times are exceeded, the alarm is triggered.

A multi-level escalation management can be defined by configuration. It is possible to always stay informed via smartphone and tablet: The app makes real-time data from production available on mobile devices. This means that current data such as status, status duration, order and produced or processed quantities (e.g. total quantities, rejects or good parts) can be retrieved anytime, anywhere.

MES = More Than MDA, PDA and Monitoring

You have now briefly become acquainted with basic MES functions that play a decisive role in ensuring that production companies achieve the goals presented above:

Objective 1: Identify weak points that might have gone unnoticed without Production Data Acquisition.

Objective 2: Relieve employees in their work (e.g. machine operators, maintenance engineers, planners, etc.).

Objective 3: Transparency at all levels so that information reaches all relevant employees and enables faster, more targeted and forward-looking responses.

Objective 4: Sustainably optimize processes, which leads to an increase in efficiency in the entire production environment.

Objective 5: Build up data collections to enable further evaluations by means of AI.

A Solid Information Technology Basis for Industry 4.0.

One thing is certain: The MES functions presented help production companies to achieve transparency in important production areas, support employees in their activities and are thus core elements for efficient, transparent and digital production. In the previous whitepapers, however, it was emphasized that an MES is much more than just MDA, PDA and Monitoring – even if many providers reduce MES to precisely these functions, because the range of functions of their solution often does not include more than the above-mentioned core functions.

In order for a company to be able to successfully and continuously develop its production area in terms of information technology in the long term, the selected MES solution must also cover further requirements and thus also be able to provide functions such as Maintenance, Detailed Scheduling or Traceability, etc. The MES benefits are only fully exploited when all departments work with the MES and a seamless, continuous flow of information is created.

However, it must be clearly stated that an MES does not bring the desired added value just by its mere presence. Only persistent work in the sense of a CIP leads to sustainable improvement. The MES is an essential tool for this, but simply only a tool. And as with any other tool, they must be used wisely. All employees who are to work with the MES must be engaged and involved. It is very important that they understand the goals, the path and the methods.
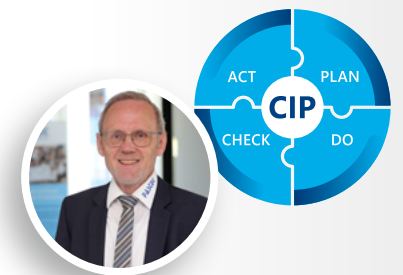
"Decide today on a future-proof solution that offers you sufficient development potential for years to come – this way, you avoid isolated solutions and costly interfaces for expansions."

Dr. Karl-Heinz Gerdes, Founder of FASTEC GmbH

FASTEC
Software for Production

The Complete Industry 4.0 Whitepaper Series From FASTEC

FASTEC provides manufacturing companies with MES solutions for discrete manufacturing. As a leading MES provider, FASTEC has implemented a wide range of customized solutions in many projects since it was founded in 1995 – each unique in terms of the production processes and manufacturing methods involved. Our systems are used nationally and internationally in various industries.

We work in a practice-oriented, efficient manner and ensure that our projects lead to lasting benefits for our customers. Together with you, we develop suitable solutions for your requirements, which we then implement precisely, quickly and cost-effectively on the basis of our MES standard software, which can be configured in many ways. Our customers benefit from our wide range of experience. In the end, there is a result that convinces our customers: A flexible and easily expandable system with sophisticted functions. FASTEC users are enthusiastic about the numerous features of the software and its usability in everyday use.

Decide on FASTEC 4 PRO – for a custom-fit MES solution with maximum customer benefit.

We take you on a journey into digital manufacturing; our whitepaper series serves as a guide.

Step 1: What Is Industry 4.0? Where Is the Journey Heading?

Step 2: How Do I Find the Right Partner on the Way to Industry 4.0?

Step 3: 10 Tips for MES Implementation – What You Should Keep in Mind.

Step 4: **Focus on Transparency: The Modules MDA, PDA, Monitoring Etc.**

Step 5: Focus on Optimization: Key Figures and How to Work With Them.

Step 6: Focus on Traceability: The Many Unknown Benefits.

Step 7: Focus on Planning: Save Time and Resources With Effective Planning.

Step 8: Functional Networking as the Basis of the Self-Regulating Factory.

Stay Competitive in the Long Term – With Us.

FASTEC GmbH is based in Paderborn, Germany and specializes in the digitalization of production processes based on the in-house developed Manufacturing Execution System (MES) FASTEC 4 PRO. The modular standard software can be configured across industries, is compatible with future releases and operated intuitively.

FASTEC has been accompanying its customers on their way to digital transformation since 1995. Around 400 companies in over 20 countries use FASTEC 4 PRO in over 10,000 production facilities. Work processes are optimized and costs are reduced in the long term thanks to the holistic digitalization of production.

We would also like to give you a good advice personally!

Our sales department will be happy to provide you with further user reports and information material! Or else, make an appointment with our sales department for a presentation at your location, in our company or via web. Of course, you can also experience FASTEC 4 PRO live and on site with our customers.

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Additionally, we offer videos of our software and customer solutions in our YouTube channel:
www.youtube.com/FASTECGmbH

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