Industry 4.0 and digitalization

What are the options –
and who will ultimately benefit from them

KRONES

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1 When does digitalization in production make sense?

Digitalization in the production environment has made a name for itself under the term “Industry 4.0”. It refers to the “intelligent networking of machines and sequences used in an industrial setting with the aid of information and communications technology“[1].

Taking the step into a digital environment makes a lot of sense for companies on many levels. It can be used to design production sequences more efficiently and to optimally plan and make use of existing resources (systems, materials, employees, etc.). Collecting and analysing data from ongoing production allows sequences to be designed more flexibly and with the greatest possible degree of automation. They are then also less susceptible to malfunctions or stops. In short: Digital production helps uncover a wealth of optimisation potential – and this is precisely why it is one of the greatest forces adding impetus to and influencing the production of the future.

But you don't have to look ahead. As in many other industries, the food and beverage industry is already home to a large number of digital solutions along the value chain today. The only prerequisite: The willingness to embrace and accomplish such a digital transformation.

1 Platform for industry 4.0 (Platform Industry 4.0 - What is industry 4.0? (plattform-i40.de))

2 On what basis are digital solutions developed?

The central technology and basis for the employment of Industry 4.0 is the **Internet of Things**. It describes the network of physical objects, a.k.a. "things", that are embedded with sensors, devices, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

Utilising such data in an intelligent manner for subjects such as predictive maintenance is the task of **data science**. This interdisciplinary field of science uses methods, processes, algorithms and systems to extract knowledge and insights from large and complex data records. Data science often necessitates knowledge and algorithms from machine learning, software engineering, as well as domain knowledge, such as machine knowledge. At Krones, so-called **data scientists** also work, for instance, on the development of models aimed at uncovering mechanical faults in machines or so-called "time stealers" in its lines.

The greatest possible benefits are gained from digital solutions if they are provided with **artificial intelligence**. Abbreviated to AI, it describes the area of computer science that deals with machine learning and the automation of human behaviour. This involves developing applications with which machines can use humanoid intelligence, meaning they are capable of learning, solving problems and recognising patterns. In Krones machines, artificial intelligence is used, for example, in empty bottle inspection and plastics technology – and, in both cases, helps to save on resources.

3. What are the prerequisites for digital production?

In an industrial environment, one speaks of the **IIoT**, or **Industrial Internet of Things**, as an enabler for the use of digital solutions. As in the IoT (Internet of Things), this is also where relevant data is collected, exchanged and evaluated – the difference being that here it is at machine or line level. Processes can be subsequently optimised, cost savings achieved or productivity increased due to the fact that the condition of the machine can be better assessed. This method makes it possible, for example, to make prognoses regarding potential downtimes or to even prevent downtimes from occurring completely.

But to make working with data possible at all, one thing is quite crucial: the connectivity of the machines and lines. **Connectivity** means that a computer, program, device or system is generally capable of connecting to the internet, another computer, etc. This connectivity is the basis for the exchange of data – and thus the basis for all digital solutions.

However, connectivity on its own is not enough – for only when the individual machines and lines are permanently connected is it possible for companies to benefit from the acquired data. It is therefore imperative to establish a **digital ecosystem** right from the outset. This refers to connected IT resources that can function as a unit, for example a variety of hardware solutions and connected software systems. Digital ecosystems are made up of suppliers, customers, trade partners, applications, third party suppliers of data services and all of the technologies related to them. Collaboration and interoperability are the key to the ecosystem's success.

3. What are the prerequisites for digital production?

3.1 Cloud solutions

All companies who wish to benefit fully from the advantages offered by digital production are wise to use **cloud solutions**.

"Using the cloud" means that data is not stored and processed locally on on-site servers, but instead in an off-site computer centre. The data is transferred through an internet connection – meaning that, in figurative terms, the data is sent into a cloud.

The advantages of software operated at cloud-based level are diverse, as it is continually updated and thus always available in its latest version. In addition, all you need is internet access to have your data available on every end device. The system is also worthwhile from a cost viewpoint, as you save on the need to make investments in a separate server landscape.

3. What are the prerequisites for digital production?

3.1 Cloud solutions

Due to the fact that the future of digital production in the food and beverage industry lies here, new machines and lines are nowadays normally equipped so that cloud solutions can be used with ease. This is achieved through the employment of a so-called **edge device**. Such a device is integrated directly in the control cabinets of the system, downloads data from the controllers and transmits it into the cloud. Connecting the edge device to the cloud makes locally generated data available independent of the location. Its use depends on the provision of a permanent internet connection. However, it is possible to equip existing systems with the necessary basics for connectivity. The subsequent integration of an **edge device** is required here. Machines from other manufacturers can also be connected by Krones if the data is processed by the customer in accordance with Krones specifications.

Before it is possible to utilise cloud solutions in your everyday production activities, an **IIoT platform** is required, as this is the central gathering point for services, also referred to as applications. This is the tool required to use cloud-based services – similar to an operating system used for running specific apps. It goes without saying that specific basic conditions must be created, for example the stability and security of the platform and its services, or a corresponding management for users, rights and roles.

3. What are the prerequisites for digital production?

3.2 On-premise solutions

Obviously not every food or beverage company wishes to dive full throttle into the world of digitalization or let someone else take over the management of its production and line data.

The application of **on-premise solutions** makes sense here. Such solutions are managed locally on a separate server. If you use on-premise software, you purchase the licensing rights to use the software on your own device in the long term. It is then installed and operated in the owner's own network. Such an option offers a high level of control, but also has the disadvantage that the software is not automatically updated when a newer version is available.

4. Which options for the use of digital solutions are available for Krones lines?

4.1 The pre-requisites: Connection to Krones.world

Krones.world is the digital gateway to Krones. All Krones online services are directly accessible through a central portal: Krones.shop, Krones.world Production and Krones.world Customer Service. It offers simplified spare parts ordering, real-time production monitoring with modular service options and round-the-clock customer support.

Krones.world therefore offers food and beverage producers just the right solutions to optimise their production and lower line production costs. At the same time, Krones can offer even more customised solutions based on production data and provide companies with even more targeted support.

A so-called **Connected Line** lays the foundation for a Krones line to be networked and integrated into Krones.world. This concept provides the basis for collecting machine and production data and for making them available to our cloud-based services for further processing. For new Krones lines, edge device hardware and a basic network infrastructure can be supplied right from the very beginning.

However, existing systems can also be connected. The subsequent installation of the edge device is required in such cases.

4. Which options for the use of digital solutions are available for Krones lines?

4.1 The pre-requisites: Connection to Krones.world

Krones.world includes **Krones.world Production.** It acts as the central platform for Krones digital solutions. On the basis of this, a network is created between the delivered production lines and Krones through the continual exchange of data – and the additional benefits of digital solutions can be comprehensively used for the plant owner and for Krones.

In the future, Krones.world Production will, of course, be expanded to include additional applications. We are thus intensifying our production data-based collaboration with plant operators to such an extent that we will also be able to make specific performance promises in the future and fulfil them.

If companies already have lines in their own or in another ecosystem, they can also be connected to the Krones digital ecosystem – interfaces to other networks are taken into consideration by Krones and their use made possible through targeted action.

4. Which options for the use of digital solutions are available for Krones lines?

4.2 Krones.world and Digital Services

To use the **Digital Services** from Krones, **Krones.world Production** must also be in use.

- This platform offers a central access point to all subscribed Digital Services, meaning applications at the machine, line and plant levels, including AI-based solutions.
- It provides real-time information on the status of all connected machines.
- It offers software and safety updates.
- It also acts as the foundation for consulting services based on machine data through a Modular Service Agreement (MSA).

The platform can be called up on various devices, including directly on the machine display. You can request an account for the online portal via the Krones Website.

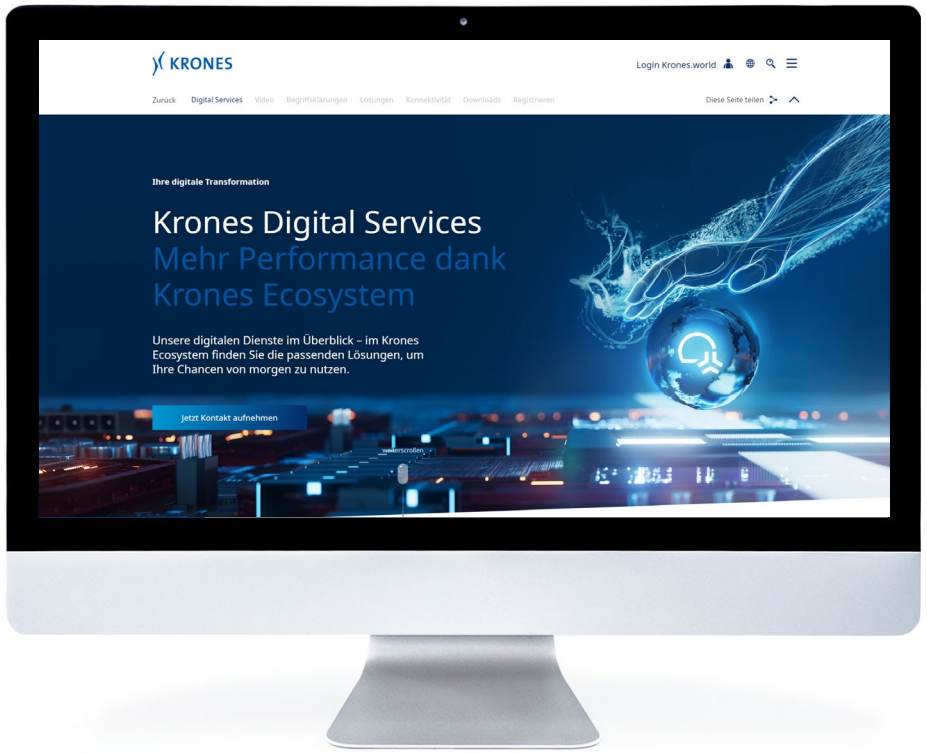
The major advantage of Krones: the combination of IT and machine knowledge. For we do not simply implement our digital solutions as empty shells, but enrich them with domain knowledge or machine-specific use cases. This helps us succeed in making deductions for production and provide you with recommended actions – tangible steps towards predictive maintenance.

4. Which options for the use of digital solutions are available for Krones lines?

4.2 Krones.world and Digital Services

Krones Digital Services ultimately help food and beverage producers to have reliable production, maintain an overview of all sequences, optimise their value creation process and thus, in the end, to optimise their Total Cost of Ownership (TCO).

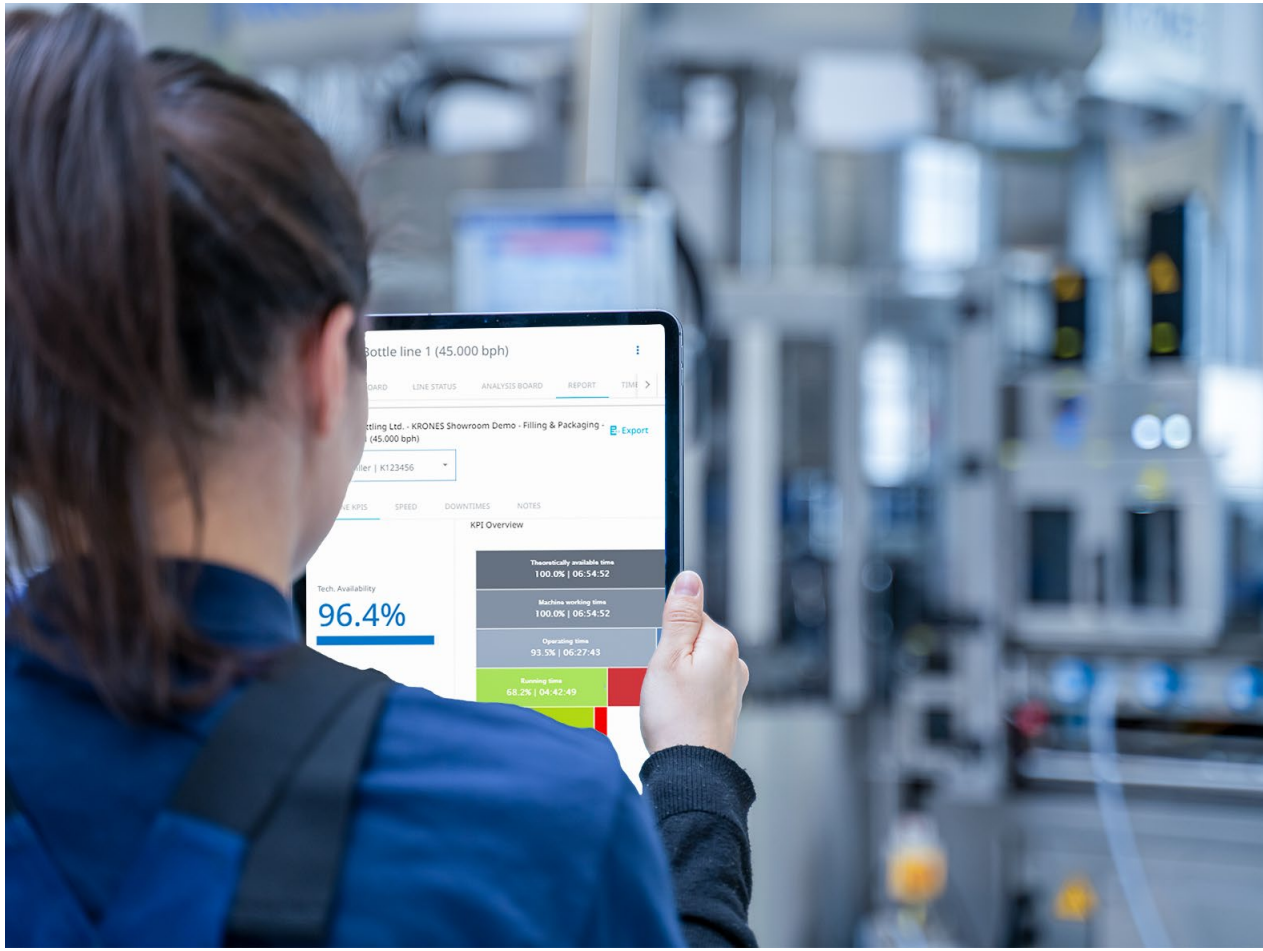
You can find an overview of all available Digital Services on the Krones website.



4. Which options for the use of digital solutions are available for Krones lines?

4.3 Digitalization in Service

If the company has access to a Connected Line, then the Krones Service team can also use it by performing machine installation and commissioning with “smart” assistance (**Smart Commissioning**). The team on the installation site uses the Advanced Analytics cloud service to structure the ramp-up more efficiently and transparently. Krones Lifecycle Service can also use Argos Augmented Reality Support to additionally benefit from the expertise of colleagues who are not on site. Thus, they not only receive better transparency and overview regarding the progress of the line, but can also eliminate faults faster and accelerate the start-up of production.



4. Which options for the use of digital solutions are available for Krones lines?

4.3 Digitalization in Service

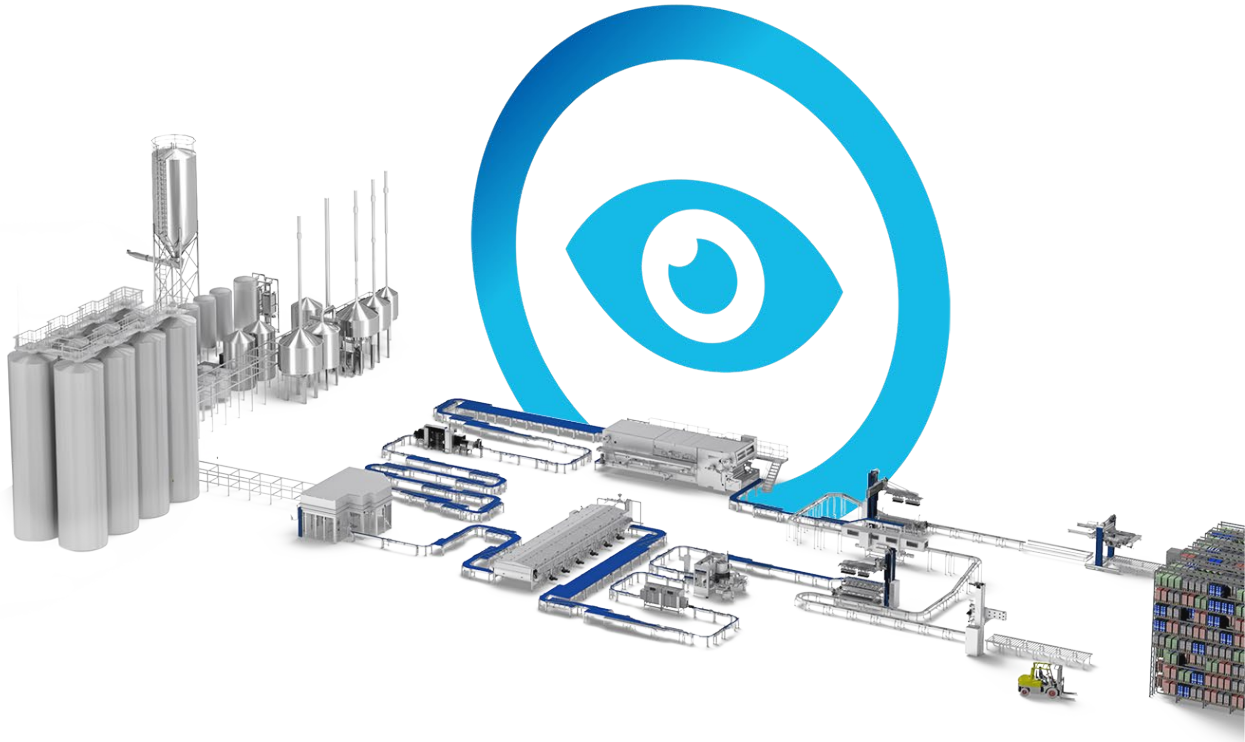
The greatest benefit is achieved through the inclusion of **Modular Service Agreements (MSA)**. These refer to packages containing pertinent solutions which Krones applies to support the customers in reaching clearly defined goals.

You can find an overview of all available Modular Service Agreements on the Krones website.

But both the plant owner and Krones alike benefit from the use of digital solutions during service activities: In addition to the existing phone and remote support, Krones also offers the **Argos Augmented Reality Support.** Its use is always possible if either so-called smart glasses or another mobile end device that supports TeamViewer is used. This way, the operating or maintenance personnel can receive support from a Krones Support specialists directly on the machine, including live video and audio transmission.

5. What about the security of the data, lines and systems?

Krones security specialists are responsible for protecting the networks and systems – and thus the production lines and their line data – against malicious or indiscriminate attacks from outside sources. They ensure that the availability, integrity and confidentiality of data and systems are guaranteed. Of course, they are also perfectly familiar with international regulations such as the Cyber Resilience Act (CRA), NIS2 and the EU Data Act.



6 Who can benefit from a step towards digitalization – and why?

A step towards digitalization is particularly worthwhile for all of those food and beverage corporations which ....

- have a high level of production and time pressure.
- have high quality demands on their product – and thus also on their production sequences.
- have limited resources – both when it comes to their production lines and on their personnel.
- wish to avoid rejects and product losses.
- produce a wide variety of batches.
- wish to reduce their CO_2 footprint and produce sustainably.

But, as a general rule, digitalization in the food and beverage industry should be of interest to every company that wishes to achieve or maintain long-standing production and intends to be future-proof. The use of digital solutions allows all of the processes and sequences to be optimised to ultimately generate a more flexible and efficient production process. A holistic, well-conceived digitalization concept can therefore ultimately create a competitive advantage.

For any further questions regarding the use of digital solutions in your production activities, simply contact:

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