

**KUPER**



**READY. SET. GO!**

**INDUSTRY 4.0 IN  
WOODWORKING**

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## KUPER PAVES THE WAY FOR INDUSTRY 4.0 IN WOODWORKING

The term Industry 4.0 is a buzzword and marketing silver bullet that everyone is talking about. The integration of advanced IT and communications technology into old and new branches of industrial production promises to revolutionize fundamental processes that have basically performed their tasks for decades in many cases.

Just as for many other industries, the implementation of bespoke concepts that optimize and automate production processes presents both opportunities and challenges for the woodworking industry. The predominant group of small and medium-sized companies is quickly overwhelmed here. Although the abstract topic has gained traction in the woodworking industry in recent years, a majority of companies are still largely reluctant to put it into practice. The main demand is for solutions that promise companies a long-term perspective.



Where it is possible to introduce strategies for the infrastructure deployment in stages, companies have the opportunity to evolve according to their own capabilities during ongoing operations. A customized pace of implementation helps them to participate in technological innovations and thus keep pace with the competition without being structurally and economically overburdened.

KUPER, which is a leading solution provider for the woodworking industry and trade, continues to move with the times and has built on many years of experience to develop a professional approach to new trends.

**KUPER embraces the idea of Industry 4.0, adapts it to the specific needs of the industry and develops it into bespoke solutions.**





**THE START**

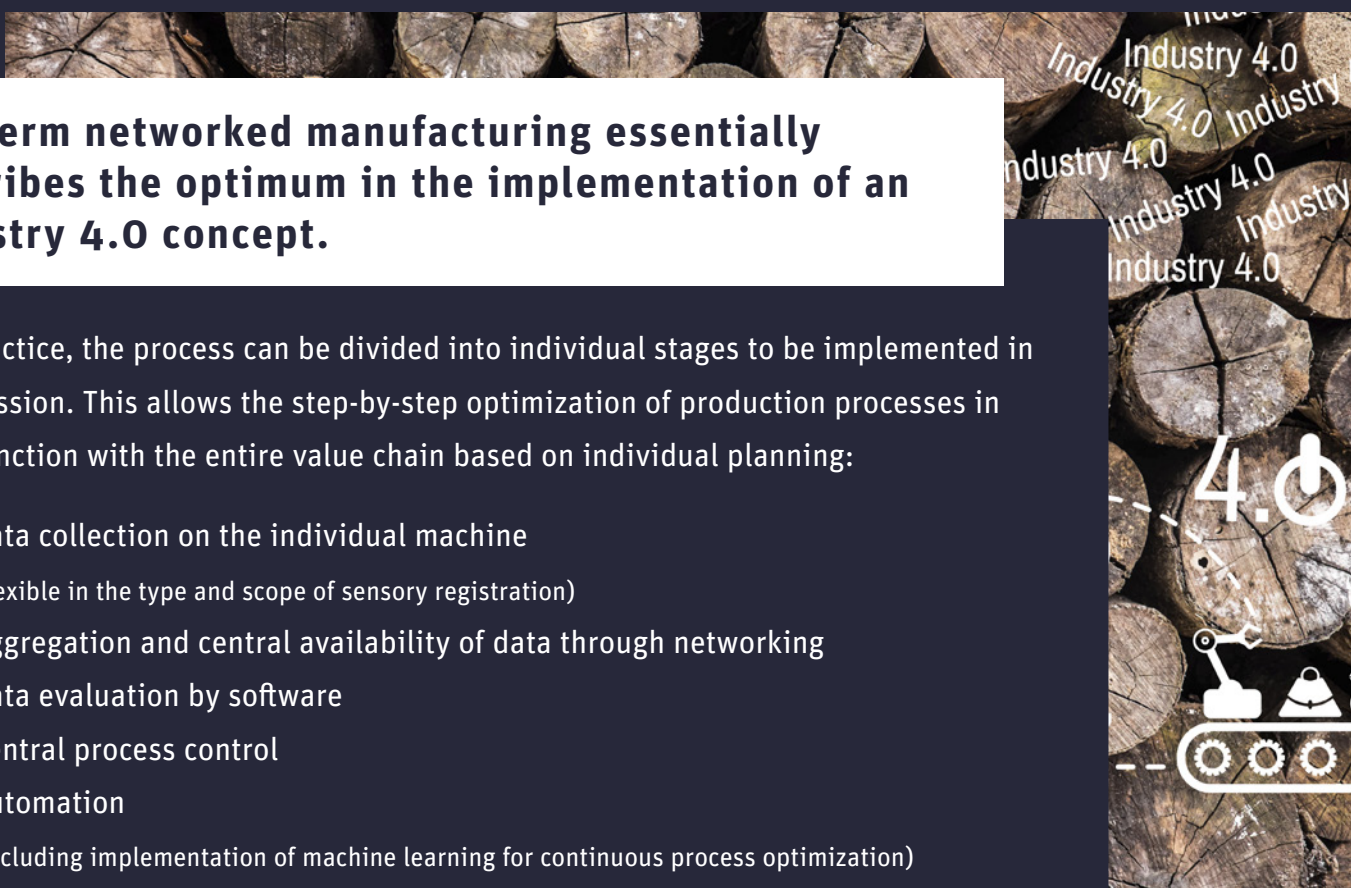
# **FUNDAMENTALS OF NETWORKED MANUFACTURING**

The prime objective behind the term Industry 4.0 is the maximum possible process optimization. In woodworking, for example, this means that while a machine's individual work steps remain basically unchanged, the multitude of work steps are perfectly coordinated to each other and to various accompanying factors.

Furthermore, processes and their interactions will be automated as far as possible. The technical possibilities of digitalization, especially data collection and analysis, serve as the backbone. Process optimization achieves an optimum ratio of production capacity, speed, product quality and energy consumption by recording process-relevant parameters, from speed and temperature to the energy consumption

of individual machines, defining target values and making adjustments or modifications during the process. The collection of relevant operating data serves to monitor individual machines in real time, the early detection of malfunctions and defects as well as the predictive planning of maintenance and servicing measures as part of predictive maintenance.

The introduction of Industry 4.0 goes one step further, particularly in the woodworking industry, by including environmental and material parameters. Wood, as a natural product, is generally subject to significant fluctuations in its range of properties. These, in turn, combined with processing characteristics, affect the quality of the end product. The principle of holistic data collection can be applied to record individual workpiece properties and adjust their handling accordingly. This guarantees consistent quality with minimal wastage. Currently, the individual expertise of the machine operator is decisive for the manual process.

The background image shows a stack of logs. Overlaid on the logs is the text 'Industry 4.0' repeated several times in a white, sans-serif font. In the lower right corner, there are white icons: a large '4.0' with a power symbol, a gear, a robotic arm, and a factory building, all connected by dashed lines to suggest a networked manufacturing process.

## **The term networked manufacturing essentially describes the optimum in the implementation of an Industry 4.0 concept.**

In practice, the process can be divided into individual stages to be implemented in succession. This allows the step-by-step optimization of production processes in conjunction with the entire value chain based on individual planning:

- Data collection on the individual machine  
(flexible in the type and scope of sensory registration)
- Aggregation and central availability of data through networking
- Data evaluation by software
- Central process control
- Automation  
(including implementation of machine learning for continuous process optimization)
- Integration into the complex infrastructure of the value chain  
(ERP, SFM, CRM etc.)

Although the various stages are interdependent, companies can decide individually which measures to implement and when, without hampering production. On the contrary, each step is in itself a step towards optimizing production processes. Although purely local data collection, when combined with manual evaluation and adjustment, generates additional work, this can still help to optimize a process considerably that would otherwise be left to the basic settings of the machine alone.



**POSSIBILITIES**

# **OPPORTUNITIES AND CHALLENGES**

Companies in the woodworking industry face increasing pressure due to the ongoing discussion about the aspects of Industry 4.0. Without always wanting to explain the concept in detail or aim for a global concept, it has gradually become a competitive marketing buzzword.

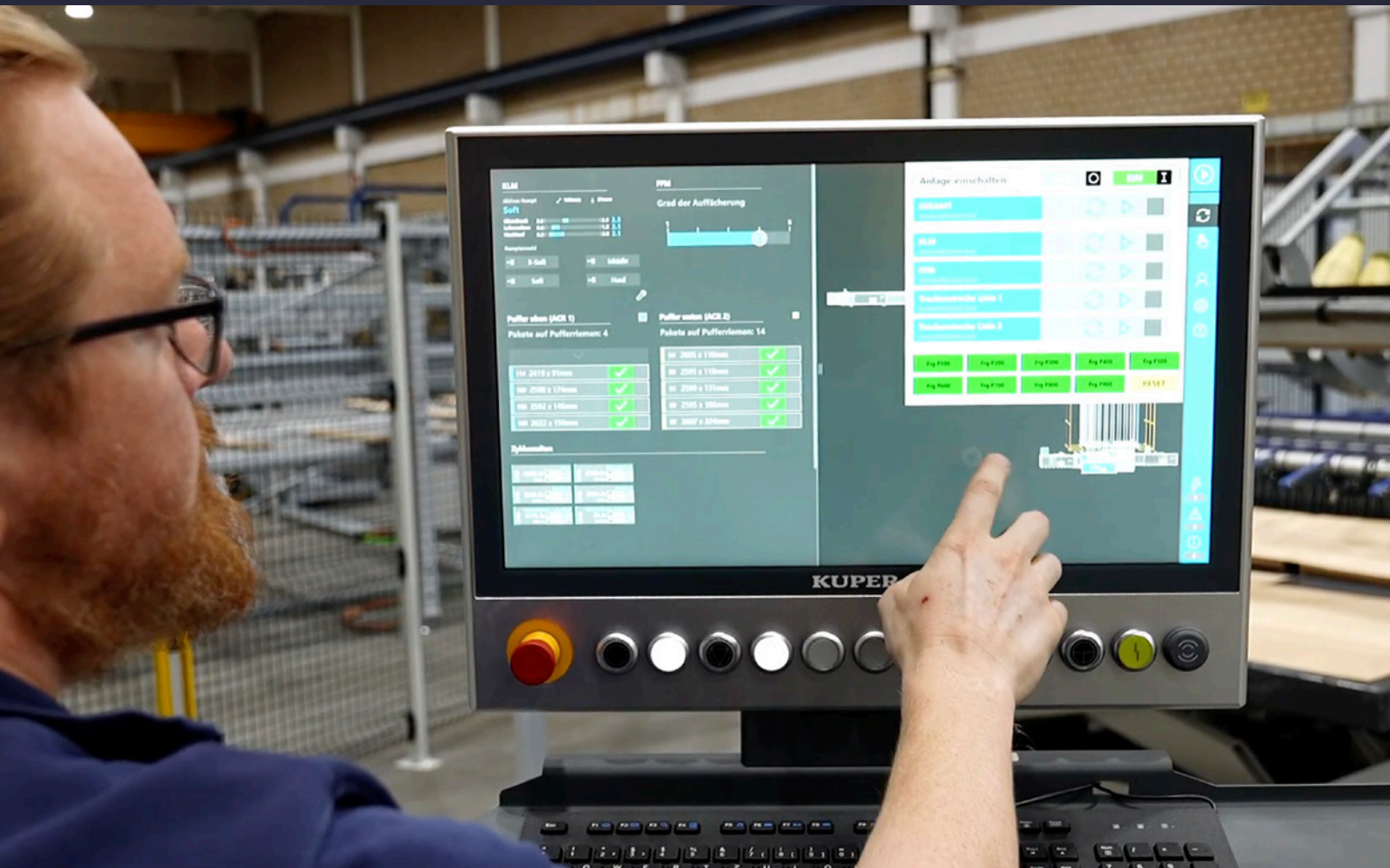
In reality, examining the individual possibilities of an Industry 4.0 strategy offers tangible opportunities to improve the company's success and secure it in the long term.

## **Energy saving potential**

The woodworking industry is among the industrial sectors with particularly high energy requirements. This means that energy costs account for a high proportion of total production costs. In the light of the global energy crisis and the consequences of the widely agreed energy transition in Germany, we can predict that these costs will continue to rise considerably over the next few years. Boosting energy efficiency as part of comprehensive energy management is therefore essential for companies in this sector in the medium term.



As we can see, this industrial sector's above-average energy consumption is not solely due to the energy requirements of its various processes. Although some machining steps are particularly energy-intensive - such as heat treatment - huge quantities of energy are simply wasted due to inefficient processes and adjustment. Along with the optimization of the energy requirements in individual processing operations, process optimization and automation provide the basis for avoiding energy losses.



This starts already with data collection and analysis: They lay the foundations for understanding energy flows and identifying the causes of significant energy loss, which ideally can be eliminated in a next step through optimization measures. The vision of fully networked production coordinates individual processes down to the level of individual machines so that energy is only consumed when needed and only in the quantities required. This is achieved both in optimum control mode and in response to unplanned changes in relevant parameters.

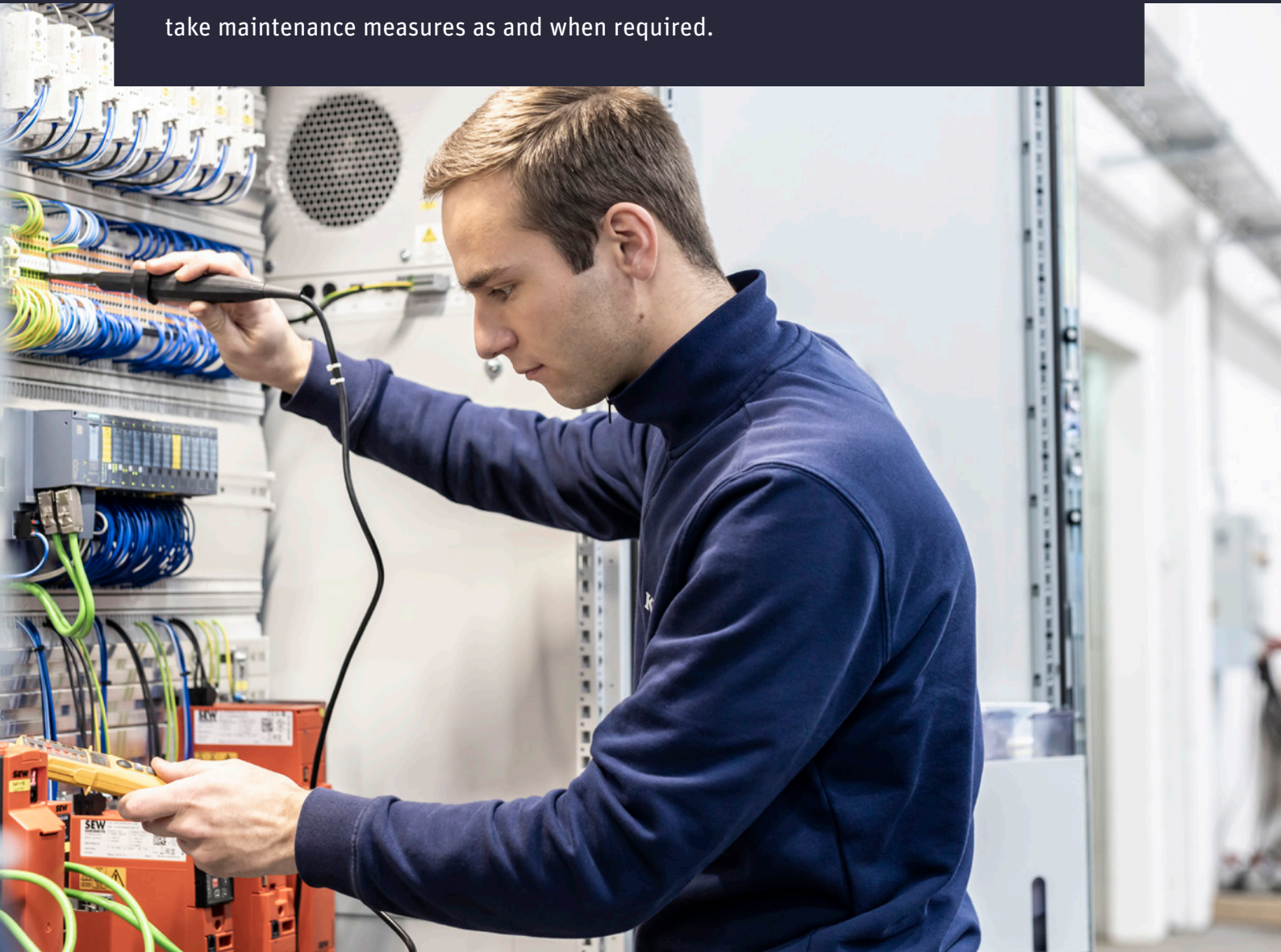


## Reduction of downtime and increase of plant availability

Both scheduled and unscheduled downtimes are among the biggest cost factors in industrial production. Whether a machine is halted for a tool change, maintenance, or cleaning work, or because of a malfunction, every non-productive hour costs money that no added value can compensate for. While planned downtimes can be used to organize the process flow so that one work step does not unnecessarily interfere with the others, an unplanned halt can harm the entire value-added chain.

Not only does it cause short-term economic loss, it can also damage a company's image and customer relations.

Maintenance work, for example, is usually carried out at regular intervals, rather than on an as-needed basis, so that downtimes can be planned. Firstly, this means that wearing parts are replaced even though they have not yet reached their actual wear limit, and secondly, increased wear causes malfunctions before the scheduled maintenance is due. As a key element of a process optimization concept, the data recorded on the various machines and plants serves, on the one hand, to identify impending faults in good time as part of predictive maintenance and, on the other, to take maintenance measures as and when required.





## Optimization of labor costs

Trends in the labor market are also presenting the woodworking industry with increasing existential challenges. The share of personnel costs as an economically relevant key figure is now almost of secondary importance. Lack of qualified personnel, or even just plain labor, can result not only in higher costs, but also in serious difficulties or even outright shutdowns of production lines.

Process optimization will also help to optimize personnel deployment. This affects both the deployment of in-house staff and external service providers. The shortage of qualified personnel is becoming increasingly pronounced, particularly in the case of maintenance and servicing. This often generates lengthy waiting times and increased costs for maintenance contracts. Again, predictive maintenance quickly pays for itself. Moreover, under optimum conditions, interconnected manufacturing gives remote access to machines and systems, so that maintenance tasks - such as software updates or troubleshooting - can be carried out remotely. As a result, downtimes are shortened, personnel costs are reduced and overall costs are lowered.

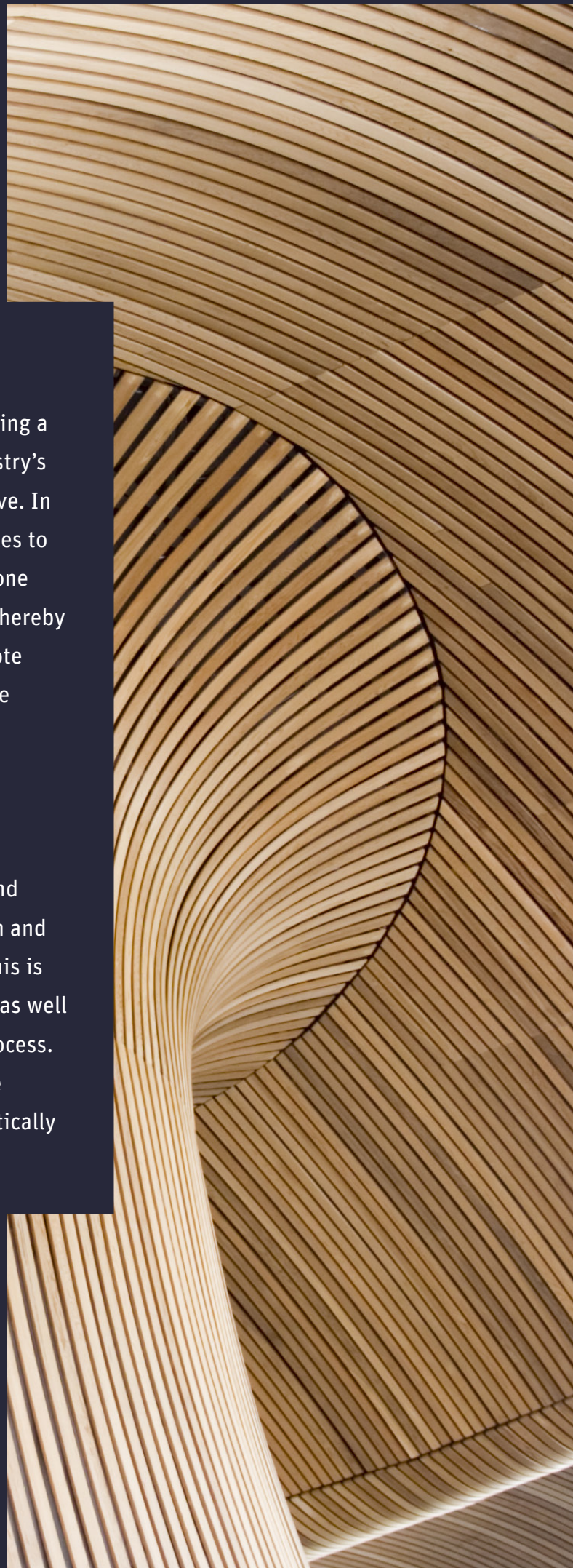
Intelligent process optimization and automation will ultimately free up personnel resources, even beyond maintenance and servicing. Even complex production lines can be operated and monitored by considerably reduced staff, through a centralized control system. Intelligent systems develop their own expertise through pattern recognition and machine learning. They reduce the need for skilled workers with long years of practical experience, as well as training time for new recruits.



## **Sustainable production**

The increase in energy efficiency is already making a valuable contribution to the woodworking industry's sustainability as a process optimization objective. In a similar way, predictive maintenance contributes to the sustainability of industrial production. For one thing, on-demand maintenance saves material thereby conserving raw materials, and for another, remote maintenance reduces travel distances for service technicians.

The efficient use of materials is playing an increasingly important role in the woodworking industry in particular, both from an economic and sustainability perspective. Process optimization and automation help to reduce offcuts and waste. This is achieved by optimum planning of material use, as well as automated quality control throughout the process. Material and production faults, for example, are detected by sensors, and the process is automatically adapted to avoid wastage.



A close-up photograph of several stacked wooden planks, showing their natural grain and texture. The planks are arranged in a slightly irregular stack, with some showing signs of wear or cracking. The lighting is warm, highlighting the natural tones of the wood.

**THE FUTURE**

# **KUPER PAVES THE WAY TO THE FUTURE FOR THE WOODWORKING INDUSTRY**

The combination of digital technologies with industrial production processes opens up multiple opportunities for process optimization and automation. Equally, industry representatives have increasingly high expectations towards machine developers and manufacturers.

Anyone considering new machines for their business today must pay close attention to their performance in terms of efficiency, flexibility, predictive maintenance and durability, with the ultimate quality requirements for both the plant itself and the products it produces.

The transformation is far more complex for established companies in the woodworking industry, especially for the large number of small and medium-sized companies that have often grown over generations. Opting for an end-to-end change is often not possible, as it would mean replacing all existing installations that do not meet current technological requirements. On top of this, the established infrastructure in many companies is also not geared towards the needs of the new technology.



KUPER has been committed to developing these technologies for many years. At the end of the day, the company's focus is on creating the basic conditions that permit users of older machinery to remain competitive in the fields of process optimization and automation, without having to transform an entire fleet of machines straightaway.



### **Industry 4.0-ready with KUPER**

## **Fit for the future**

As part of an international customer project benefiting from an EU financial aid program, KUPER experts tackled for the first time the real possibilities of practically combining the basics of Industry 4.0 with their own standard machines. As a result, they developed a module that KUPER can optionally install in new machines and easily retrofit to all machines built in the last five years.

Based on a conventional data logger reengineered by KUPER, this Industry 4.0-ready basic module records operating data, transmits them in digital form, sorts and processes them, and finally visualizes them on the customer's IT system. Today, KUPER is laying the foundations for what the vision promises: users can also control data beyond the machine itself, comparing, analyzing and interpreting it in the light of their own expertise, and integrating it into their decision-making processes. KUPER presents a real innovation here: Conventional data loggers only collect data at fixed intervals which is then stored locally. Once processed, such data needs to be read, and sometimes even transmitted manually. The KUPER basic module provides live access to operating data at the computer workstation at any time. Maintenance data, such as when and by whom the last maintenance was carried out and when the next scheduled maintenance is due, is collected in parallel with the operating data.

With a model installation, KUPER is demonstrating on its own premises the collection of operating data - which provides the expert user with the foundations for predictive maintenance - as well as the full potential of its solution: here, the KUPER module collects operating data from several machines in parallel, as well as fundamental performance data and energy values. Together, these data provide the means to control, monitor and trace the productivity of each machine in the long term, and to visualize how different machines compare with each other. This in turn generates crucial information in keeping with the very principle of Industry 4.0: Changes in the performance data of individual machines over a defined period can provide evidence of malfunctions, for example, or at least provide the impetus for further causal research. Comparing productivity between different machines likewise provides valuable information for targeted long-term process optimization.

Even if KUPER is only taking a minor step on the road to Industry 4.0 with its data module providing access to process data, this already represents impressive added value for users. As outlined above, the data can be used in practice to monitor, analyze and optimize processes, even if this still needs to be done manually and involves personal interpretation of the data based on extensive experience and specialist knowledge. Furthermore, KUPER prepares its machines for Industry 4.0, even retroactively, and creates the conditions for implementing further stages of the aforementioned comprehensive concept.



**KUPER**  
ACR 3200





**KUPER 'S VISION**

# **FOR THE FUTURE OF THE WOODWORKING INDUSTRY**

After creating an initial base for data processing with the Industry 4.0-ready KUPER base module, the task ahead looks simple enough:

Data must be automatically evaluated and analyzed before each process can be optimized in relation to previous and subsequent processes, within the entire value-added chain, and to react in real time to all eventualities automatically and lastingly. The perfect system uses artificial intelligence to learn from mistakes and guarantee maximum yield and quality at all times. This is a task that is clearly within the field of software development, particularly in algorithmics, and which, on sober reflection, represents a project for the next 10 to 15 years. Alongside the development work already undertaken by our experts, KUPER relies above all on its regular collaboration with international customers in the woodworking industry. Over the next few years, KUPER will continue to work with them and with software developers, and tackle the next steps in Industry 4.0 for the woodworking industry.

Through exemplary customer projects, the experienced machine manufacturer KUPER shows that it has all the necessary know-how and inexhaustible commitment to build on the status quo and move forward.



## Natural diversity as a challenge

If we consider the objectives of Industry 4.0, woodworking represents a particular challenge. Just like any natural material, wood is subject to extreme fluctuations in its quality and its basic properties, with a significant influence on its processing. Besides visual aspects such as defects and variable grain, environmental factors such as temperature, air humidity or residual moisture have a direct impact on machining processes. Changes in environmental factors can result in incorrect gap widths or inferior joint quality in veneers, for example.

**To achieve consistent, reproducible quality and work at the highest efficiency, further parameters need to be captured, for instance through integrated camera monitoring throughout the process. Targeted readjustment by a process optimization and automation system takes these factors into account and ensures consistent quality.**

The experts at KUPER are always wondering how to accurately capture these factors in practice, and above all how to interpret them and translate them into process adaptation solutions. The key challenge is how to teach a digital system the way an experienced machine operator or an expert at KUPER proceeds when manually adapting relevant processes so as to create the basis for automating the entire process.





# INDUSTRY 4.0 MEETS KUPER

In addition to developing its own products to respond to the demands and potential of digital transformation in industrial woodworking, machine builder KUPER also focuses on modern business management and process optimization.

The transition to paperless business procedures and workflows is just one example. KUPER is also working on a central ERP system to represent all key processes, with the various responsibilities and validation mechanisms required. KUPER is increasingly relying on Microsoft Teams for project communication. Not only does this simplify communication, it also involves the customer in the development process, providing them with real-time information. Clearly, digital transformation can only succeed if people's benefits and needs are at the forefront: after all, any transformation always involves active change management.



## **Efficient development with the KUPER Code Generator**

Another example of how KUPER also optimizes its own processes is the development of a code generator to equip special machines with bespoke customer software. Here, KUPER's software experts are working on the modularization of the various components, which in future can be assembled as required via an application, in line with the principle of modularity. This largely eliminates the need for individual programming, including the inherent risk of error. The selected components are assembled by a simple “click” as required, the software is generated from the specified code modules and then transferred to the machine. Customers thus benefit from a significant reduction in development time, right up to delivery of the operational machine.





# TRANSFORM INDUSTRY 4.0 INTO A JOINT PROJECT WITH KUPER

At KUPER, we make new standard machines and many older machines Industry 4.0-ready thanks to the basic module for the collection and visualization of operating and performance data. As a customer, this gives you a first taste of what will be possible in the field of process optimization and automation in the future.

Simultaneously, you are creating important prerequisites for benefiting easily from the development of technologies and their adaptation to the specific requirements of the woodworking industry in the long term.

At KUPER, we pursue ambitious visions in the implementation and development of digital technologies in interaction with our machines. In this way, our customers' individual needs and requirements remain at the forefront. This is why we also rely on cooperative working and maximum transparency in our own processes.



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Beyond the possibility of delivering new - standard or special - Industry 4.0-ready machines and retrofitting existing machines wherever possible, we make our know-how and KUPERPOWER available for ambitious projects in which we can develop with you solutions for your bespoke tasks. In this way, machines equipped with the basic module can be integrated with existing software solutions as part of their infrastructure. What's more, we can develop new solutions with qualified software developers to help you achieve consistently high product quality with greater flexibility, efficiency and profitability. This will help you to consolidate your competitive position in the long term and stay fit for the future.

## CONTACT KUPER

Please do not hesitate to contact KUPER if you would like to find out more about the possibilities of the Industry 4.0 module, or if you are interested in an individual project to automate and optimize your production line.

[CONTACT US →](#)