# Smart connectivity, step by step

**The KNOLL company does not do things merely for the sake of doing things. And certainly not when it comes to the pivotal matter of digitalization. Within just a few years, KNOLL optimized production from A to Z – carefully and deliberately, step by step.**

One step at a time? Over the course of years? Just to get closer to becoming a smart factory? Joachim Riebsamen, manager of the Unfinished Structures department at KNOLL, chuckles and says: "I suppose taking a cautious approach is typical in this part of Germany. Personally, I wish everything had happened a bit faster; and that goes double for my boss! But I have to say that, looking back, we managed to accomplish a great deal in just four years, and we did everything right. And because that matters more to us than rushing things, we will stay the course."

## Lean manufacturing points the way to the future

KNOLL Maschinenbau GmbH is a leading supplier of feeding, filtering and pumping systems and is headquartered in Bad Saulgau in southern Germany. The company embarked on its journey to the future four years ago, but KNOLL began preparing to do so in 2005, when it implemented lean management of production processes. Riebsamen explains: "We actually procured an automated storage system for production materials back in the early 1990s. Two laser cutting machines were connected to the storage system; one of them was even equipped with a fully automatic loading system."

By implementing the lean-management principles of cleanliness and order, KNOLL laid the foundation for subsequent automation of manufacturing – but that would prove to be just the beginning. The KNOLL family founded this company 48 years ago, and it has grown steadily ever since. One production facility after another was built. Did the company plan properly? Not exactly! That's why, in 2007, Riebsamen and his team adopted a completely new approach to production planning. They envisioned relocating their sheet metal processing facility from the middle of the company premises to the edge of the property. This would reduce the distances that workers had to walk, thus accelerating processes.

## Turbocharged production of small series

The European debt crisis that started in 2009 led KNOLL to suspend the project. In 2011, Riebsamen resumed by bringing experts from TRUMPF and Stopa on board to help plan storage solutions. Riebsamen explains: "This project marked the first time we specified detailed requirements. Working with our project partners, we examined every single step." The fruits of their labor are still evident today. "We planned deliberately, leaving no stone unturned. We had to ensure that we'll always have enough storage capacity, regardless of future requirements," Riebsamen says. But capacity wasn't the only challenge. "We use as many as seven different materials to produce just one component or assembly for our machines. Sometimes we produce 20 units of something, and other times, only one. For us, the deciding factor was how fast we can get the materials to the right machine at the right time," Riebsamen says.

## Automated XXL storage system

The fully automated Stopa storage system at KNOLL is 70 meters long. It also boasts more than 1,200 storage spaces and 13 loading/unloading stations. Riebsamen explains: "We knew we would have to store standard sizes, but we also needed to be able to store sheets measuring two by four meters. That's why TRUMPF and KNOLL jointly designed a multipurpose storage system." And then there is the automated storage and retrieval system (ASRS), which, along with the material supply system, is situated approximately one meter below the floor that supports the machinery. The advantage of this is that it's easy to put materials into storage. Besides, Riebsamen adds with a wink: "We actually saved some money, too, as the soil conditions required the construction crew to dig deep no matter what!"

"We estimate that we've boosted our productivity in sheet metal processing during the past four years by at least 20 to 25 percent, probably more. And we'll keep up the great work!", says Joachim Riebsamen, manager of the Unfinished Structures Department at KNOLL. Picture: Stephen Duscher

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The ASRS is the centerpiece of any modern warehouse. It zooms vertically and horizontally from one storage space to the next, retrieving the appropriate unprocessed material and transporting it just in time to the right processing machine. Afterwards, the ASRS stores finished parts, or supplies items to other machines for additional processing. Equipment designers prioritize minimizing machine queue times and keeping travel paths as short as possible. In other words, the ASRS should move no more than necessary within the overall warehouse system. As Riebsamen knows, this is a complex challenge that demands a lot of expertise and experience – not to mention a lot of conversations about the specifics of a given customer's manufacturing environment. "We realized during the planning/design phase that we would require a lot of

loading/unloading stations. We wanted to connect three laser cutting machines, a TruLaser Fiber 3030, a water-jet unit and several bending machines. TRUMPF proceeded to spell out the types and numbers of loading/unloading stations we would need and where." The TruLaser Fiber 3030, for example, is fitted with three stations. One supplies the machine with unprocessed material. A second station takes away finished parts, while a third station serves exclusively to dispose of scrap skeletons. Only three TRUMPF customers have instituted this solution thus far. Joachim Riebsamen thinks it's great: "Scrap skeletons are transported back to the warehouse. Within the system, they are stacked onto pallets and removed from the plant via the material supply system. Our production workforce no longer needs forklift trucks to dispose of scrap."

### Intelligent production control

Another special feature boosts efficiency further still: KNOLL and TRUMPF jointly developed quick-change systems. The production control system recognizes when a certain machine will need a certain material. If the required material is stored far away from the machine, then the control system will use ASRS queue times to transport the material in advance to the vicinity of the processing machine. As the material is already at hand, machine queue time is minimized.

### At night, the factory produces on its own

Such complex workflows are made possible by the TruTops Fab Storage production control system. This solution controls and monitors the flows of materials. It also initiates the pre-storage of materials based on job orders entered and can provide precise information at any time on inventories and utilization of machine capacity. Machine operators during the two daytime shifts rarely need to intervene. After all, TruTops Monitor collects and analyzes all machine data. It also supplies information on unscheduled downtime, breaks, queue times, causes of errors, and the duration of maintenance tasks. Nighttime and weekend operations require no people at all. Riebsamen explains: "Shift supervisors can use the TruTops Fab app on their computer at any time to see what is happening and intervene, if necessary."
KNOLL also uses TruTops Fab in production planning – for programming and nesting, for instance.

### Automation wherever it makes sense

An interface connects TruTops Fab with KNOLL's primary system for production control and planning. Joachim Riebsamen explains: "We use this interface primarily for materials management. We're not truly fully automated yet. Our SAP system doesn't transfer job orders straight to TruTops Fab. This is more of a long-term matter for us." After all, Riebsamen esteems his experienced specialists in production planning and NC programming: "They do a great job and they're efficient, too."

### Digitalization is process optimization

Production orders are issued by the SAP system that KNOLL introduced in 2016. Riebsamen explains: "Our company has always prioritized meeting deadlines and delivering on our promises to customers. We initially thought that orderly production planning with SAP wouldn't take much effort on our part. But it turns out it's not quite that simple." The company then decided in late 2016 to find suitable solutions that could streamline complex production at KNOLL going forward.

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Joachim Riebsamen, Abteilungsleiter Rohbau bei KNOLL Maschinenbau

Joachim Riebsamen is optimistic that this decision has brought the company a good deal closer to realizing its vision of a smart factory. And he's right, as TruConnect consultants from TRUMPF recently attested to. Their analysis indicated that KNOLL is in outstanding shape when it comes to digitalization – also in comparison with other sheet metal processors.

Joachim Riebsamen believes that now is the time to get the most out of the systems they have and to continue driving the company forward. "We estimate that we've boosted our productivity in sheet metal processing during the past four years by at least 20 to 25 percent, probably more. And we'll keep up the great work!"