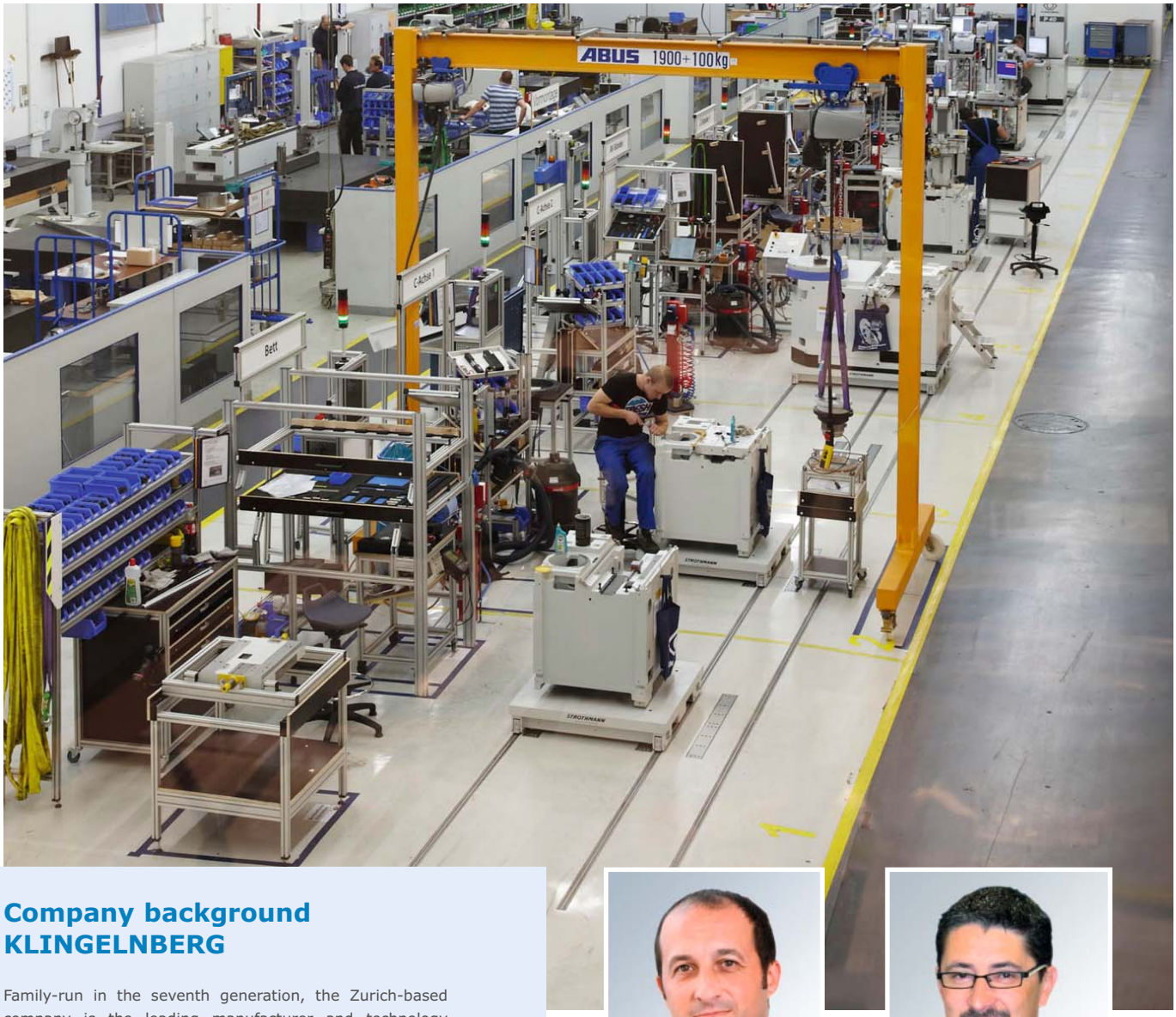
STROTHMANN
Machines & Handling

INNOVATION IN MOTION

High-precision measuring centers at KLINGELNBERG



Company background KLINGELNBERG

Family-run in the seventh generation, the Zurich-based company is the leading manufacturer and technology developer in all its three divisions, mechanical engineering (with a focus on machines for spiral bevel gear production), measuring centers for gearing and axially symmetrical components, and customized high-precision gear components.

A global network of service and sales offices, for instance in the USA, Mexico, Japan, and India, ensures customer proximity and short reaction times. The Klingelnberg Group employs some 1,000 people, including 170 engineers in R&D. Striving for long-term technological leadership, the company has secured 93 patents in the last five years.

Tomas Kirschenfauth, Chief Operating Officer

Markus Friedrich, Head of Assembly

An interview with KLINGELNBERG

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In line with the most exacting requirements: KLINGELNBERG manufactures high-precision measuring centers on RoundTracks®

High-precision measuring machines from Klingelnberg are employed for geometrical testing of gearing and axially symmetrical components all around the world. The company was an industry pioneer in enabling top-precision measuring technology for use outside special measuring rooms and bringing it into the factory. The low-maintenance, especially compact measuring equipment is optimally suited for use in Lean Production lines. Previously, the modular machines, which are individually configured according to the customers' measuring tasks, were manufactured through box assembly. In the spring of 2011, the company converted to flow assembly.

IntraLogistics specialist STROTHMANN implemented a RoundTrack® transport system with trolleys that are lowered onto leveling platforms at the work stations for especially exact positioning. Tomas Kirschenfauth, Chief Operating Officer, and Markus Friedrich, Head of Assembly at KLINGELNBERG, spoke with us about the challenges and particularities of restructuring their factory in Hückeswagen (North Rhine-Westphalia, Germany).

Mr Kirschenfauth, you have converted important production processes to flow assembly. What were the greatest challenges?

Tomas Kirschenfauth (TK): We take Lean Production and Lean Management principles seriously. Flow production is the most efficient form of production, without question. Logically, 'one-piece flow' is the ideal we aspire to. In the past, this was only a theoretical possibility. But once we had the tools for it, we streamlined the final assembly of measuring centers. Specifically, we defined the work steps, implemented work stations, and established a transport solution. Each of these tasks posed its own challenges. But the biggest challenge must have been convincing our staff.

Your crew mutinied?

Markus Friedrich (MF): Our experienced employees were firmly convinced that precision technology such as we manufacture can on principle not be produced in line. The transport would damage the delicate measuring mechanisms.

We had to prove that this does not have to be the case. I suppose, one aspect must have been that flow production is generally associated with mass production and with simple products that consist of a limited number of standard components. The workers mainly worried about concrete organizational questions.

Like, would they not be able to move about freely in future? Would their tasks be scheduled like a robot's? They were apprehensive that the climate on the shop floor might deteriorate. However, we managed to convey that the objective was not a workload increase but on the contrary, the reduction of unproductive, tedious menial tasks. We concentrated on value-added processes and endeavored to minimize everything else and to organize the essential tasks as clearly and transparently as possible.

KLINGELNBERG converted from box to flow assembly. The decision for STROTHMANN RoundTracks® means that mobile shelves, for instance, can easily cross the line.

Did that convince the skeptics?

TK: That, and personal experience. Researching solutions for flow production of large machines, I had come across Deckel Maho. They assemble machine tools on STROTHMANN transport platforms. The cycle times are approximately seven and a half hours, similar to our own production. We arranged for our staff to visit Deckel Maho's factory in Pfronten (Swabia / South Germany) to see their flow assembly line for milling machines and centers. By letting the technicians go by themselves without managers, we ensured that they could form their own opinions. Talking with people who had been working in that way for more than eight years, our assembly staff switched from skepticism to interest. They wanted to understand how very large machines could be manufactured in flow production. And not least, they got a good impression of the work environment. Afterwards, the responses were much more positive.

MF: There was a consensus that amounted to something like, *'With the right means of transport you can do everything.'*

Mr Friedrich, can you describe the situation at Klingelnberg at the outset of this project?

MF: We used to complete the final assembly of all machines and measuring centers at fixed work stations. All parts had to be supplied to the separate stations. If parts were missing, work would be stalled, and the technicians would turn their attention to another project instead. Based on our capacity planning, we could calculate in which week we would complete a machine. But there was no solid exact schedule. As a consequence, we could only make an acceptance date with our customers once a machine was 100% finished. In addition to that, usually not all contents of a contract were ready for acceptance at the same time. The outcome was that we had completed machines on hold for an unnecessarily long time. And of course there were the number of machines in the final assembly stage that were not being worked on.

Well, now you have an assembly line instead. What exactly has changed?

MF: We manufacture five models in one-piece flow. We have defined work steps and implemented 13 stations. A technician passes through the first six stations together with the machine they are working on, followed by the electric installation.

The workload assigned to the 13 stations is divided in such a way that it can be completed in eight hours. Larger models can require up to ten hours of work. But each cycle is always completed within one working day, allowing for the machines to be moved onwards down the line the next morning. If necessary, a stand-by co-worker can help out to ensure that the production flow is maintained and the atmosphere stays relaxed.

On the other hand, we also build large measuring centers for gearing that are mostly used by the wind power industry. They measure parts with diameters up to 3.5 m. If necessary, we can accommodate even up to 8 m wide gears. These machines are still manufactured in box assembly. Nevertheless, they are integrated into the new planning and visualization system, allowing us to fully utilize such benefits as transparency, predictability, and orderliness.

Tools and materials are allocated to individual workplaces, supporting transparency and order.

RoundTrack®
TECHNOLOGY

Would you say visualization is a core factor for the project's success?

TK: Definitely, yes. The final 23 days for all projects as well as all stations along with their material requirements and statuses are displayed on centrally mounted monitors. That overview replaces meetings and creates transparency for all departments, including purchasing and storage. Customers can revise their orders up to four weeks before we start the final flow assembly. Ten days before assembly, we start counting down. Ideally, all materials would be in place by then – everything that is not is visualized. Since everybody can see whose responsibility it is, there is a strong incentive to make sure that everything is ready in time.

What is special about your flow assembly line, let us say, in comparison to an automotive manufacturer?

MF: For our machines to deliver high precision, the delicate measuring mechanisms need to be handled with the utmost care. For an optimal work situation, we adjust the RoundTrack® trolleys by means of leveling platforms.

After checking the foundations, STROTHMANN cut the hall floor open and installed three tracks and leveling platforms. The trolleys were adapted to our requirements. They are moved into position manually and then lowered onto the leveling platforms by opening a compressed air valve. Thus, they come to stand precisely horizontally. To move ahead down the line, they are quickly lifted back up by connecting them to the compressed air supply.

The best thing about RoundTrack® technology is its simplicity. It performs its task, runs extremely smoothly, and is robust and reliable at the same time. It will not cause any downtimes. It provides high availability.

Mobile standing workplace with leveling platforms clearly visible in the floor.

Has this 'revolution' had effects on other parts of your business?

MF: You will not believe how soon this 'revolution' was taken for granted. Three days after commissioning, any excitement had run out, quite contrarily to initial apprehensions.

The reverberations, of course, reach far. Materials supply has been completely reorganized. The logistics team supplies bulk materials directly to the stations and fills up the containers there. The parts are supplied on a cart specifically as required for each order. We use foam rubber sheets with the shapes of all parts punched out. They protect the parts and show at a glance whether the supplies are complete. This scheme has also proven practical for some of our suppliers. Otherwise, they use reusable packaging.

TK: In connection with production planning and material management, we renegotiated with our suppliers. From now on, when a customer places an order with us, we notify them about what we will need, allowing them to plan ahead. Then, far in advance, we order the supplies for a fixed date. In return, they have agreed to delivery guarantees.

Furthermore, I expect that improved transparency and punctuality will also positively influence our image. Thanks to the restructuring, our sales operatives can commit to a handover date early on and inform customers until when they can alter their specifications. With customers who order more than one machine, we can arrange for their completion in a short timespan so they can collect all machines at once.

You commissioned the line in 2011. What is your provisional appraisal?

MF: The throughput time has been reduced. In the new production line, final assembly, which used to have no set timeframe, lasts ten days at most for any machine. Projects are scheduled to be completed at the agreed date, so we can directly hand over the completed machines to the customers. In the past, finished machines often just stood around in our factory for some time without having been billed. Now, almost everything is shipped immediately.

That sounds like an all-positive conclusion. Do you plan a follow-up project?

TK: Yes, we do. We would like to use the same benefits in other divisions as well. We are currently planning a production line for four gearing machine models with STROTHMANN.

Mr Kirschenfauth, Mr Friedrich, thank you for talking to us!

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