CUSTOMER SINCE 2013

Knorr Brake

Knorr Brake develops and manufactures braking systems for rail and commercial vehicles. The company has over 100 locations in 30 countries and employs more than 11,000 people worldwide.

Challenge

Despite a wide variety of variants and numerous screw parameters, Knorr Brake had to ensure complete and error-free documentation of the assembly processes – with as little training as possible for employees. The solution had to offer simple visualization of the work steps and integrate existing systems without any problems.

Resolved by PG

- Integration of existing systems
- Reduced training costs
- High product quality
- Compliance with liability requirements
- Step-by-step instructions

+ 200
Parameters monitored

+ 350
Work steps visualized

100 %
process reliability

★★★★★

The use of PG gives us 100% certainty that the defined process is being followed. In the event of a complaint, for example, we could prove in detail how precisely and accurately the assembly work was carried out. The advantage is that we have significantly less training effort for familiarization with new products, except for the one-time instruction in the use of the visualization software itself.

JOHANNES ZIZLER
Project Manager at Knorr Brake

Do you have any questions?
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Worker guidance PG brings quality to the rails

Ensuring mobility is a task that Knorr Brake dedicates itself to every day. The systems developed by this long-established Munich-based company safely brake trams, subways, locomotives, multiple units, freight cars, and high-speed trains. However, the manufacturer has picked up speed in terms of production reliability and quality: a worker guidance system supported by visualised work instructions assists in the assembly of various types of braking systems, thus ensuring an optimal, uniform workflow.

Screwing operations in particular place high demands on quality in the production of heavily stressed components. Torques, angles of rotation, tightening parameters, and the use of the right tools for the corresponding screw are precisely defined so that the respective component corresponds to the defined target state. Such specifications for the optimal processing of brake systems are, of course, indispensable in rail transport. It is therefore in the manufacturer's interest to ensure 100% quality in the production process. Furthermore, these processes must also be precisely defined and monitored in order to be able to demonstrate proper processing to customers at all times. However, a wide variety of brake systems for different train models, shapes, and sizes also places high demands on production, which must constantly adapt to new workflows.

Work steps visualized individually

With the introduction of the Production Guide (PG) solution from software company CSP GmbH & Co. KG, the challenges outlined at Knorr Brake have now been successfully resolved.

The application at the Munich site uses images to guide workers step by step through the assembly of components. To this end, a sequence of images is displayed on a screen, visualizing the order of the individual activities. At various points in the work process, the employee must also acknowledge certain information or work instructions before the next process step can be carried out. The data from production and the manually confirmed information are then automatically stored together in a database and thus serve as legally valid proof of product quality. To this end, PG also takes all available data that the production plant itself can collect, evaluates it, and thus completes the database. This ensures that the production process is comprehensively and completely documented. The systems from manufacturers Atlas Copco and Saltus, which have been in use at Knorr Brake for a long time, could be easily connected to PG via interfaces.

Previously, there was already proprietary software that was used to automatically store production data from these specialized screwdriving workstations in tables. However, workers were still given paper-based instructions for the respective brake system.

During the course of the project, PG was equipped with numerous additional developments and adaptations for Knorr Brake. The requirements for the new worker guidance system were correspondingly high: for example, it had to support a wide variety of variants and a large number of screw connection types – more than 200 different parameters are relevant at Knorr Brake.

A specific internal quality requirement was also a batch scan of the product before it could be used. Last but not least, the project team had requests regarding the PG user interface.

Work with worker guidance is well accepted

Project manager Johannes Zizler, responsible for work preparation at the brake control competence center at Knorr Brake Systems for Rail Vehicles, believes that the company is now in a better strategic position than before thanks to worker guidance: "The use of PG now gives us 100% certainty that the defined process is being followed. In the event of a complaint, for example, we could prove in detail how accurately and error-free the assembly work was carried out. The advantage is that we have significantly less training effort for familiarization with new products, except for the one-time instruction in the use of the visualization software itself." A total of about 40 employees work with PG in assembly. Initial reservations about the new solution on the part of employees were quickly overcome. In the meantime, even workers who are less computer-savvy have become accustomed to working with the modern software.

This makes training employees in new processes particularly efficient today. Among other things, PG also supports the nut selectors used at Knorr Brake:

Flashing lights visually indicate to the worker which tool must be used for specific work steps. Correct removal is detected and only then is the specific screwdriving task released.

However, it is not only the work in production itself that has changed, but above all the work preparation. For the specific variants of brake systems where workers are guided by PG, the corresponding images must first be provided. Usually, work preparation creates these photorealistic images using a CAD system. CAD drawings have an advantage over “normal” photos: they are very high-contrast and can be easily perceived by the human eye. The images are loaded into PG and the corresponding screw points are marked. Other details that are important for the screwdriving process must also be set up separately, such as the torque or instructions on which work step, for example, a screw must be greased.

High effort pays off

The largest image sequence that Knorr Brake displays in PG for workers is around 100 images for approximately 350 work steps. The relatively high effort is rewarded with the highest quality in screw fastening – however, it is not used for every brake system. Knorr Brake plans to use worker guidance for all variants of brake systems that are manufactured in large quantities – several hundred units per year or more. Approximately 2,000 of the most common brake systems are produced each year. In addition, PG also supports the work process whenever the manufacturer's customers explicitly request written proof of the screw fastening process for certain products.

As soon as a product is fully assembled and the result is marked as “OK,” all data from the production process is documented. All work steps and, as a rule, between ten and 15 parameters are recorded here by PG. Furthermore, torque, angle, time, and the respective worker are recorded. The data is transferred to the SAP system via a PDF log, which is created automatically. In addition, Knorr Brake has another quality assurance measure in place: Each manufactured brake system is tested for functionality on a test bench by simulating the possible cases that could occur on a train. Even the slightest deviations result in the product being readjusted immediately.

Based on the positive experience with worker guidance, there are currently plans to expand the collaboration with CSP. In the future, PG will also be available for additional process steps. These include processes such as greasing and gluing. Among other things, special light barriers will be used here to segment individual work steps.

There are also plans to expand PG to other locations and use worker guidance to improve and document product quality in Russia and China, for example. Johannes Zizler sums it up: "It is extremely important for Knorr Brake to ensure the highest quality. The damage that could be caused by a faulty brake system could easily run into millions. Investing in such a sophisticated worker guidance system for quality assurance therefore pays off very quickly."

About Knorr Brake

Knorr Brake Systems for Rail Vehicles is one of the leading manufacturers of braking and on-board systems for rail vehicles. In addition to complete braking systems for rail vehicles, the product range also includes door systems, air conditioning systems, control components, and windshield wipers. With production, sales, and service locations, the division is represented in 27 countries around the globe. Knorr Brake Systems generated sales of 2.19 billion euros in 2011. The company employs over 11,000 people. The headquarters of Knorr Brake Systems for Rail Vehicles GmbH is in Munich.

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