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Maintenance 4.0

Co-creation by SBB and Kistler will optimize train maintenance in eastern Switzerland





Miserendino Gaetano places the brake force sensor from Kistler on the bogie of a local train that is being serviced at the SBB's RICO depot in Oberwinterthur.

Kistler has collaborated closely with a Swiss Federal Railways (SBB) service depot to develop a new solution for measuring brake force on trains. This new system will boost the efficiency of the entire on-site maintenance process. All the system components fit into a case, and a customized software solution ensures that the processes run smoothly.

The Eastern Switzerland Regional Vehicle Maintenance Center (RICO) in Oberwinterthur is one of SBB's eleven regional service depots. RICO is responsible for a wide range of services including maintenance, repairs and conversion work on trains in the fleet operated by Thurbo (a regional subsidiary of SBB covering eastern Switzerland) and also on trains belonging to SBB GmbH (another SBB subsidiary operating in Germany).

The vast majority of trains in the fleets serviced by RICO consist of articulated railcars with two or more sections that operate on suburban railway (S-Bahn) lines and regional routes. Especially in the local traffic segment, requirements for reliability and safety are high: end users expect punctual, dependable services – which can only be guaranteed if the necessary maintenance work is performed efficiently and reliably. Ranieri Baratto is a fleet technician in the seven-strong team that is responsible for approving

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Marco Angliker, Head of Digital Solutions Engineering at Kistler

vehicles and new technical solutions. He explains: "Meeting deadlines is critical for a service center such as ours. As the only maintenance depot for the Turbo fleet, we have a heavy responsibility. Regular safety checks must be completed quickly and reliably on the trains so they can resume service. The more efficiently we can accomplish these recurring routine jobs, the more resources are freed up for complex tasks."

Process optimization thanks to measurement technology from sensor to cloud

These were also the factors that motivated RICO to collaborate closely with the measurement technology experts at Kistler on a project to improve the entire process of brake force measurement. Regular brake inspections at various stages are a core element of train maintenance, and the relevant procedures are specified by national and international regulations. "In the past, we were operating sensor technology from Kistler and also equipment from another provider. But the processes were prone to faults and generally not very efficient. That's why we were delighted when Kistler offered to examine the whole process with us on the basis of a development partnership, and then to optimize it with the help of a customized complete solution," Baratto recalls.

Common goals were defined: improvements to data acquisition and evaluation, and a system that would be generally simple to handle and operate. Marco Angliker, who heads the Digital Solutions Engineering Team at Kistler, explains their approach: "We aren't just taking an in-depth look at the complete measurement chain – most importantly, we're also focusing on the process that takes place at the customer's site. Our goal is to work together to develop an optimized working procedure, supported by measurement technology designed to match the customer's specific needs – hardware as well as software. This is a multi-stage process where we discuss and test the practical suitability of the solution, and adapt the components as necessary."



Josua Hunziker, Lead Solutions Architect at Kistler, checks the procedure for brake force measurements.



Maintenance is a complex operation: the pneumatic brake system in a local train, with pressure indicators and control valves for all the bogies.

The new BFMS (Brake Force Measurement Solution) developed by Kistler for RICO comprises four 9303A1B brake force sensors, a compact version of the modular KiDAQ data acquisition system, and a notebook with the application software. All the components fit into a rugged hardshell case to facilitate flexible transportation between vehicles. If required, wireless control of the measurement application software is possible via the company tablets issued to RICO employees.

“The original setup also made provision for a pressure sensor to enable direct comparisons of the real force built up on the brake disk with the pneumatic pressure present in the braking system. This would allow an overall statement about the braking system in one single measurement step. However, it turned out that the quick pneumatic coupling required for this purpose is not present on the bogie for the time being, so this measurement has to be captured in a separate step of the process inside the railcar. But thanks to the system's modular structure, it's simple to retrofit an additional pressure sensor at any later time – so users can continue to optimize and improve the measuring process. This guarantees excellent protection for the customer's investment,” Angliker adds.

Individual software + modular hardware = added value

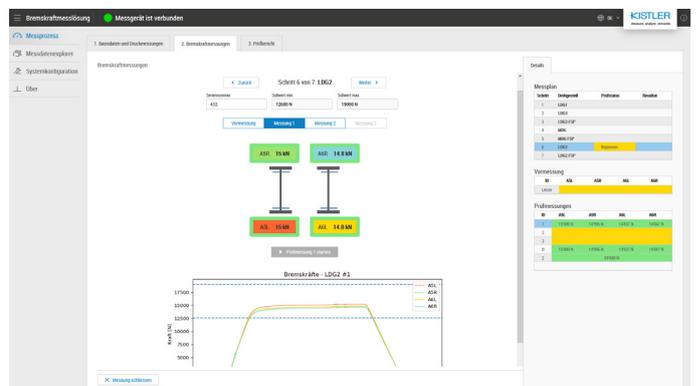
RICO focused particular attention on the software solution: on the one hand, it needed to meet traceability requirements and on the other, it had to provide automated documentation and reporting. To overcome these challenges, the Digital Solutions Engineering Team at Kistler took KiStudio Lab as the basis to develop a dedicated application that precisely maps the servicing processes at RICO. The BFMS software guides the service technicians through each step of the process: after selecting the train type, the user is shown a clear graphic view of the sequence of bogies and the number of brakes.

With the help of the four brake force sensors, a complete bogie can then be measured and visualized at a glance in one single process step: measured brake force per wheel and bogie, action of force over time, and direct classification and evaluation of key process-specific values as compared to specified references. At least three measurements must be performed for each bogie, and their average value must be within the specified range. All series of measurements are stored both locally and in the cloud, to ensure

security. For example, this means that previous measurements taken on the same train can be called up at any time for comparison, and the data can be included in the automatic reporting.

“The new solution from Kistler has performed very well in the initial phase, and it has the potential to boost the efficiency of our processes many times over. Now we need to see what it can achieve over a longer period of daily operation,” Baratto comments. To make RICO's investment as future-proof as possible, Kistler has implemented a consistent modular design for the BFMS. The measurement hardware can be extended as required by adding any desired number of extra units, and all of them are controlled centrally via the software. From 2021 onwards, for instance, even a long train composition with six cars and seven bogies can be handled efficiently and measured in just one step.

Baratto sums up the project in positive terms: “A very high level of trust and a constructive approach were the keynotes of our collaboration with Kistler, enabling us to move closer to the objective one step at a time. Once the test phase is completed, I anticipate that we will acquire a virtually ideal solution to support us as we continue improving the availability of our rolling stock. We're now well on track to cope with the increasing automation of servicing and maintenance – and Kistler plays a key part in this as a partner we can count on to help us continue developing.”



The software for the new Brake Force Measurement Solution (BFMS) developed by Kistler for SBB RICO accurately maps the process steps as well as the brake systems of the trains and the brake forces.

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