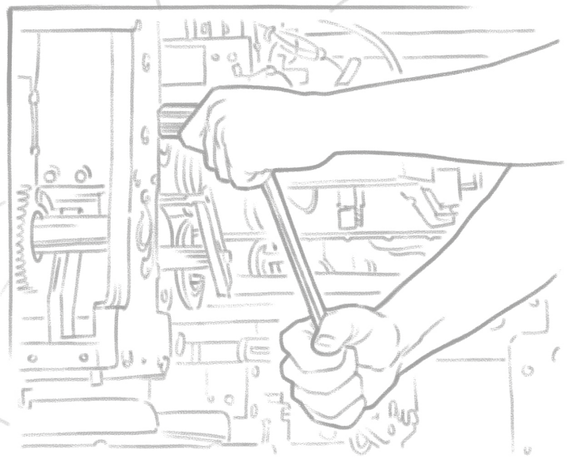
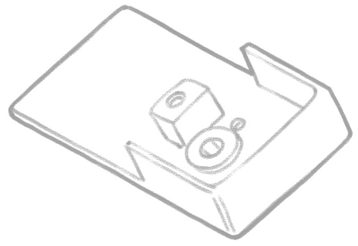




Machines of the future

There are many Industry 4.0 buzzwords: Machine Learning, Big Data, Blockchain or Augmented Reality. But can these technologies be profitably used in the field of pharmaceutical production? With the expertise gained from specialty machine engineering and the experience of an industry insider, the specialists at Harro Höfliger are looking for sensible solutions that provide added value to customers and to internal engineering processes.

Illustration: Bernd Schifferdecker

Picture this: Monday morning, 6.30 am, anywhere in the world. A machine has failed and production has stopped. The operator reaches for a pair of augmented reality glasses and establishes a connection to Harro Höfliger's Customer Service in Allmersbach, Germany. This is where an expert stands ready, initiates a remote maintenance session for the defective machine and sees through the operator's smart glasses – through the operator's eyes, so to speak – where the problem lies. The remote service technician walks the operator through the process of identifying the fault, and has the ability to provide images, step-by-step videos, and even three-dimensional instructions, such as texts, arrows and CAD drawings, that can be projected through the data glasses into the operator's field of vision on site in order to provide the best possible support. Once the issue has been located, the service technician can give detailed instructions on how to remedy the problem and, if necessary, arrange for the immediate shipment of spare parts. Or – if there is no other way, a service technician can be thoroughly briefed prior to an on-site visit. Luise Räuchle, Product Manager at Harro Höfliger's Customer Service, puts it in a nutshell: "Unplanned machine downtimes are a nightmare for our customers. This is why we have to take maximum action in these situations. With the help of digital solutions, such as remote maintenance combined with augmented reality, we can keep unforeseen machine downtimes as brief as possible and enable our customers to react flexibly and quickly to problems." We focus on the use of digital solutions in order to continuously improve existing methods and thus create added value for our customers. "Ultimately," says Fabian Elsässer, Director Engineering and Technical Services at Harro Höfliger, "the first question we ask ourselves with all Industry 4.0 solutions is, what added value they create for our worldwide customers. Useful concepts will be pursued and adapted to the requirements and needs in the pharmaceutical environment."

Show, don't tell

For instance, in the field of Augmented Reality, the Harro Höfliger specialists are currently working on four service initiatives. In addition to Remote Support – which means assisting the customer in troubleshooting during operation – the focus is on

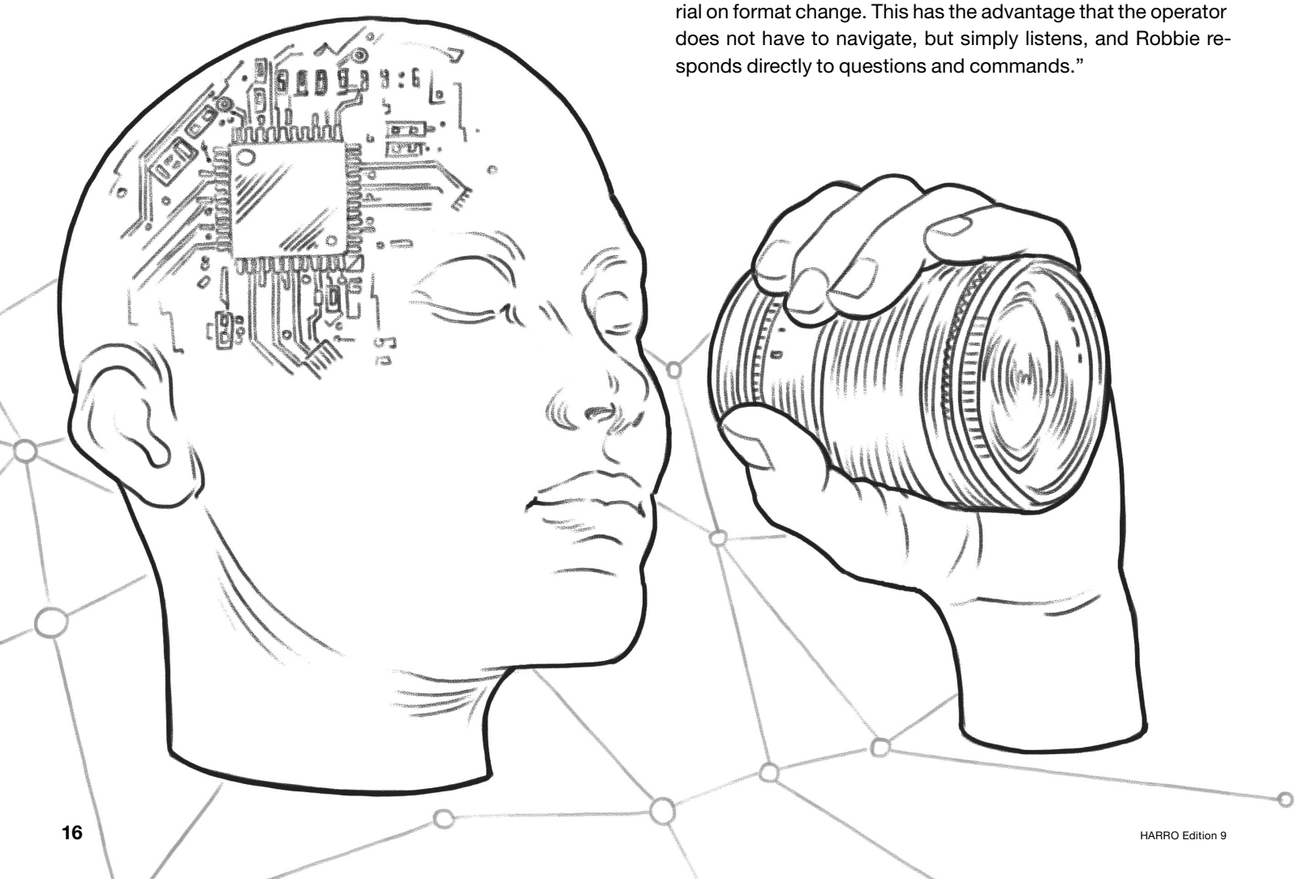
"With the help of smart devices, we are able to show operators how to do a format change instead of explaining it at length. This keeps training costs low."

Luise Räuchle, Product Manager at Customer Service

Augmented Maintenance, Augmented HMI and Augmented Changeover. All aspects are brought together in a knowledge database. Räuchle adds: "With the help of smart devices, we are able to show operators how to do a format change instead of explaining it at length. This keeps training costs low when there are staff changes and helps to effectively overcome language barriers." The same is true for maintenance manuals, she continues: "We are currently preparing maintenance schedules for our customers. In the future, it may be more efficient to provide videos showing step-by-step maintenance procedures. 3D animated maintenance instructions could also be an option." Augmented Maintenance also aims to support customers in the upkeep of their systems with the help of innovative technologies and mechanical engineering know-how. And with Augmented HMI, machine operators will always have all relevant information at their fingertips for a smooth production process.

Exploring new topics

The IoT Solutions Department at Harro Höfliger was created in 2018, and a whole Scrum team works on the application of digital solutions in the pharmaceutical sector. They also complement their research into new subject areas by utilizing degree theses written by students from a wide range of disciplines. Elsässer: "For years we have been working intensively with universities and have received valuable ideas and suggestions as a result of their efforts." For example, one thesis dealt with the use of virtual assistants, such as voice-controlled chatbots, to support the operator's tasks on a machine. Räuchle: "The augmented Avatar Robbie acts as an audio guide for a video tutorial on format change. This has the advantage that the operator does not have to navigate, but simply listens, and Robbie responds directly to questions and commands."



Private, Janine Kyofsky, Illustration: Bernd Schifferdecker

Training for networks

Another important focus topic from which customers will benefit in the future is image processing optimized with Deep Learning aided methods. Hartwig Sauer, Department Leader Vision Systems at Harro Höfliger, explains: "About 70 percent of our machines are equipped with camera systems for quality assurance. They use traditional rule-based image processing." In this process, one or more objects in the image are contrasted and isolated using edge finders or threshold methods to check for quality. With rule-based image processing, very accurate measurements can be achieved and it is also possible to read and decode 2D codes. Sauer adds: "With this method, however, it is often difficult to reliably detect fluctuations or deviations in complex surface structures. This is where Deep Learning comes in." With these methods, the neuronal network learns to reliably detect anomalies by means of example images. The system can also be taught to accept certain tolerances. Cosmetic defects such as scratches, stains and dirt are typical applications for such an image processing system. In addition, Sauer and his team are working on applications that actively intervene in the machine control system when an irregularity is detected so that certain values can be adjusted. Sauer: "Deep Learning does not replace but complements rule-based image processing."

More reliability in engineering

Harro Höfliger has also incorporated Industry 4.0 solutions in their own engineering processes. Elsässer: "In our Model Based Engineering group, we work on the virtual start-up of our machines." This is not about the virtual start-up of an entire system, but focusing on specific mechatronic units where we know in advance that special challenges have to be mastered. Elsässer: "With the help of a digital twin for these 'critical' units, we can ensure at a very early stage in development that the unit works. This saves time and money and minimizes the risk of unpleasant surprises at the end of a complex development process."

The challenge of specialty machine engineering

The experts at Harro Höfliger are faced with a major challenge in all their solution concepts: In specialty machine engineering, concepts that have been developed for one machine cannot simply be transferred to another. Due to the large number of individual components, the effort for maintaining and keeping digital solutions up to date cannot be carried out by developers alone. At Harro Höfliger we therefore rely on collaborative solutions for knowledge management. Developers are not the only ones to make their knowledge available. In addition, every single operator records activities once they have been performed, and enters them into the knowledge database. This grants colleagues access to relevant information at all times and thus expands their capabilities.

For Fabian Elsässer and his colleagues, the direction that Harro Höfliger will take in matters of Industry 4.0 is clear: "The time of buzzwording is over. There are ideas and solutions that offer us and our customers great advantages now and in the future. It is our intention to identify and further develop these technologies. Our combination of machine know-how and expertise in the pharmaceutical sector helps us to evaluate new digital concepts to further improve existing methods and processes."

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Hartwig Sauer, Department Leader Vision Systems

"The time of buzzwording is over. There are ideas and solutions that offer us and our customers great advantages now and in the future."

Fabian Elsässer, Director Engineering and Technical Services