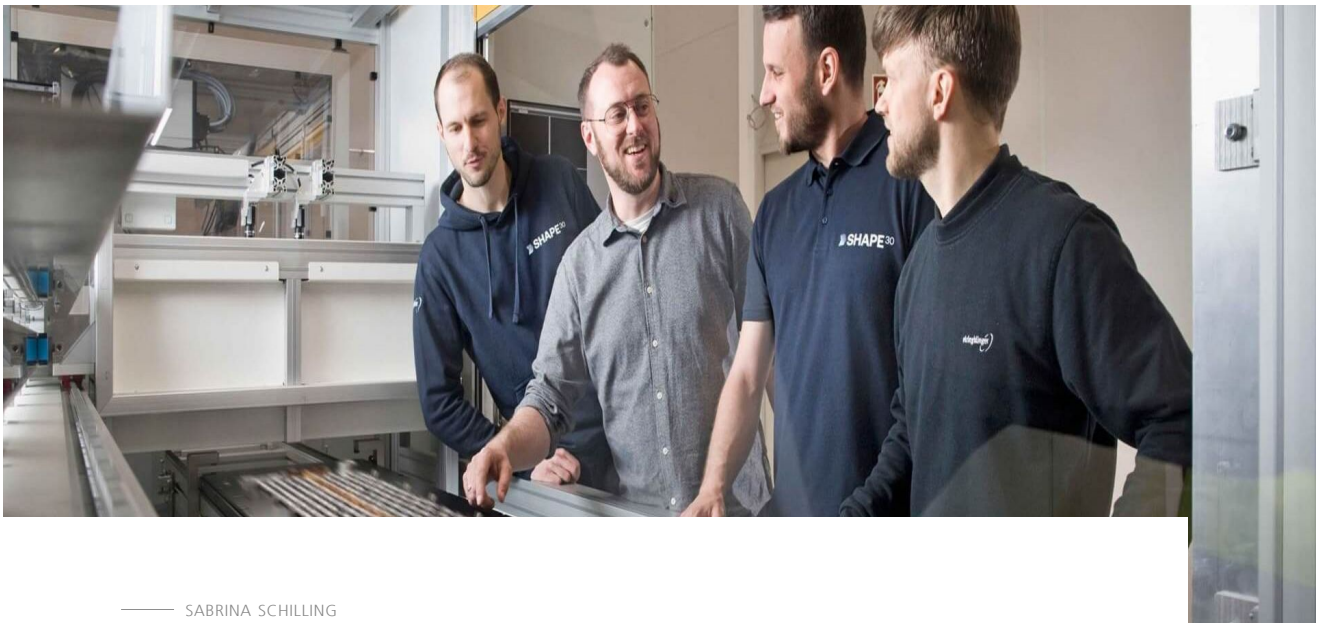

SABRINA SCHILLING

ElringKlinger: how AI brings people together

ElringKlinger uses TRUMPF's AI-based tool, EasyModel AI, to detect weld points. This makes it easy for even non-programmers to create AI models.

At ElringKlinger AG, series production would not be possible without experts such as Daniel Weller and his colleagues. They develop and test all production processes on a pre-series machine and must then transfer these to the production lines at one of ElringKlinger's 40 locations worldwide in a flawless and 100% reproducible manner. Their work is essential but expensive: every day of development work costs money that only flows when the series is up and running. Weller and his team must therefore keep the ramp-up phase for the production lines as short as possible. Any tool that speeds up development is welcome. Weller is therefore all ears when he hears about EasyModel AI during a visit to the TRUMPF Laser Application Center.

"The AI-based programming wizard was still in the final development stage at the time, but it was clear to me that it could be of interest to us," recalls Weller, an expert in joining technology in the Battery Technology division at ElringKlinger. And as is sometimes the case: shortly afterwards ElringKlinger receives an order for the series production of an innovative cell contacting system, for which the use of EasyModel AI is the perfect solution.

Intelligent solution for complex requirements

ElringKlinger AG is an independent global supplier to the automotive industry. The company supplies innovative solutions for all types of drives - for both passenger cars and commercial vehicles. For example, ElringKlinger has been manufacturing cell

contacting systems (CCS) for electric drives for many years. This important component for electric vehicle battery packs connects the individual battery cells to form a single unit, thereby enabling the transfer of electrical power from the battery to the consumer. The CCS also transmits measurement data on the voltage status and temperature to the battery management system via conductor paths. The zero-defect strategy applies to the series production of this important component. Up to now, module-to-pack battery pack designs have generally been the norm. Here, battery cells are first combined into modules and integrated into a battery housing. The CCSs required for this are approx. 600 millimeters long and have between 10 and 20 weld point positions, which the laser must detect and join with high precision during series production.

"The requirements have evolved in the meantime," reports Weller and explains: "In the next generation of vehicles, cell-to-chassis designs will be used in which the battery cells are inserted directly into the battery housing instead of being divided into several modules. The battery is not a separate component that is attached to the car body, but forms part of the car body and forms the sub-floor of the vehicle. This saves space and weight, increases the energy density and simplifies the design. However, it requires more precise production of the components." This is where CCS with around 50 weld points are used, with the product ´being almost two meters long but only 20 millimeters thick. "Developing a stable and efficient series production process with short cycle times is no small feat," says Weller.

Daniel Weller, joining technology specialist in the Battery Technology division at ElringKlinger, is responsible for pre-series development. He is responsible for joining processes that can be transferred to any production line at one of ElringKlinger's 40 locations worldwide.

The cell contacting system for electric vehicle battery packs connects the individual battery cells to form a single unit, thereby enabling the transfer of electrical power from the battery to the consumer. The zero-defect strategy applies to the series production of this important component.

Developing a series production process with fast cycle times for a cell contacting system with around 50 weld points was also a challenge for Daniel Weller and his team.

Simple and standardized detection

Previously, ElringKlinger AG used TRUMPF VisionLine Detect image processing with position-dependent exposure adjustment. This allowed the individual positions to be detected by specifically varying the exposure setting. However, the process had to be carried out individually and depending on the position within the processing field in order to compensate for the position-dependent reflection of the component surface. This is a time-consuming iterative process that can depend on many factors and must be carried out individually for each component position. "The models generated by EasyModel AI and the resulting filters transformed this highly manual process adjustment into a simple standard procedure," says Weller.

EasyModel AI brings a lot of speed. We now only need hours rather than days to achieve good results, and retraining also saves a lot of time.

Daniel Weller, joining technology specialist in the Battery Technology division at ElringKlinger.

Optimal results without programming knowledge

EasyModel AIis a zero-code programming wizard that allows even users without programming knowledge to create and train customized, image-based AI models. "As before, we use VisionLine Detect to record images of the component areas where weld points are located. We load these into the EasyModel AI tool via drag and drop, which can be accessed via MyTRUMPF," explains Weller. After creating a project, he and his colleagues use a marking tool to mark the weld points on the images that need to be detected. Essentially, this works just like drawing on a tablet. AI then evaluates the data and calculates a model that Weller and his colleagues can optimize step by step.

"Just a few training images are enough to create a functional AI model," says Weller. "As soon as the model is satisfactory, we integrate it into the production line and test it on our real component." This is where the new AI filter option for VisionLine Detect comes into play. This filter improves the feature detection of VisionLine Detect and distinguishes even more precisely between relevant image areas and elements such as fixtures, soiling or reflections. "The difference between VisionLine Detect with and without an AI filter is particularly clear here," emphasizes Weller. "The AI filter binarizes the image - i.e. it creates a display in black and white only. The detected component is displayed in white, while the surrounding areas are displayed in black. This allows the edge detection algorithms to easily identify the welding area to be detected."

The size of the cell contact system alone is a challenge: it is almost two meters long, but only 20 millimeters thick.

The new AI filter option for VisionLine Detect improves feature detection by binarizing the component - i.e. displaying it in black and white only. The welding areas stand out as sharply contoured white areas.

Just one or two hours after activating the EasyModel AI option and the AI filter, Daniel Weller (second from left) has the first results.

The ElringKlinger development team consisting of Jan Grajczak, Daniel Weller, Nils Kessenbrock and Jannik Syfus (from left to right) are delighted with the results achieved by the technology trio EasyModel AI, AI filter and VisionLine Detect.

AI speeds up process development

"Extending VisionLineDetect to EasyModel AI and the AI filter only required the option to be activated," reports Weller. During the commissioning of the pre-series system, TRUMPF experts guided Weller and his colleagues through the EasyModel AI process steps. "After an hour or two, we had our first result," says Weller. This simplicity of use is a clear advantage for Weller. "Even if the series is already running, there will be a need for adjustments from time to time. That's when our colleagues at the locations will have to step in," he says. "So it's good that the system works according to the 'what-you-see-is-what-you-get' principle. This is easy to understand even for non-programmers."

In pre-series development, the focus is on saving time. "EasyModel AI speeds up the process significantly here. We now only need hours to achieve good results rather than days, and retraining also saves a lot of time," says Weller. And because the EasyModel AI, AI filter and VisionLine Detect technology trio is so easy to use, Weller is also increasingly using it for small series and prototyping. "That was too time-consuming before," he explains. Weller and his colleagues are now keeping their

eyes open to see where else in the company the new solution can be used. "I see great potential everywhere where we have to detect many weld points within tight tolerances. It's simply quicker with AI."

SABRINA SCHILLING

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