

Success Story

SAFE WELDING IN BATTERY PRODUCTION

Full quality control with HALCON's deep learning functions

Founded in 1987, Manz AG, headquartered in Reutlingen, Germany, is a high-tech machine manufacturer with operations around the world. With many years of expertise in automation, laser machining, machine vision, metrology, wet chemistry, and roll-to-roll processes, the company offers innovative production solutions in the fields of photovoltaics, and electronics. Furthermore, Manz is well known for its modern laser systems for manufacturing lithium-ion batteries.

One of the biggest challenges in the automated production of battery blocks is to produce a secure and stable welded joint without damaging the battery housing. To meet the strict quality requirements of the automotive industry regarding welding and at the same time reduce costs for its customers, Manz is working on inline inspection systems that ensure full control over the welding process. However, it is not easy to inspect the quality of batteries. Up to now,



BLS 500 battery laser system, a flexible, modular platform for different laser processes.

WHY DID YOU CHOOSE MVTEC HALCON?

- Integrated deep learning functions based on artificial intelligence
- Self-learning algorithms and significantly reduced programming effort
- Only small amount of „good images“ required for training

welds have been tested statistically on individual components using destructive tests such as cross-section polishes or pull-off tests by Manz. This procedure is complex, expensive, and does not guarantee the flawless quality of each weld. Therefore, a new process had to be developed.

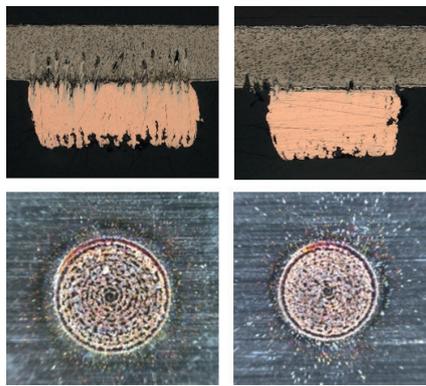
THE SOLUTION

To inspect the welding process of its modular BLS 500 laser system and fully automate it, Manz today relies on machine vision using the standard software MVTec HALCON. Its integrated deep learning functions based on artificial intelligence (AI) offer special added value for quality inspection. For example,

- improved defect detection thanks to self-learning algorithms,
- significantly reduced programming effort, as well as
- handling defects errors that were not clearly defined ahead of time.



In addition, HALCON solves another problem. Typically, KI training processes require a six-digit number of image data to achieve acceptable defect detection rates, but such a large set of training images is not typically available in mechanical and plant engineering. Moreover, the possible defects in all their manifestations are not usually known. At the beginning, Manz only has between 10 and 100 sample images available to start training a model.



The two top images show cross-section polishes of a good weld (left) and a weld in which little material mixing occurred (right). Below are the corresponding inspection images, which show few differences. Deep learning made it possible to classify the images with 100 percent accuracy, despite the minimal difference and varied backgrounds.

Remedy created MVTec HALCON's technology „anomaly detection“, which has been available in MVTec HALCON since release 19.11: The feature requires very little image data and only images that show defect-free objects, or „good images“ for training, which

saves machine manufacturers such as Manz a great deal of time and money. The alternative, which is to generate images of defects, is extremely laborious and cost-intensive.

CUSTOMER BENEFITS

Manz can provide full quality control of laser-supported production processes in the modular laser system using deep learning technologies in MVTec HALCON. Reliable defect detection also helps maintain battery production at a high level of quality over the long term. Thanks to the accelerated training processes, the company also saves a lot of time and thus costs.

Besides, Manz's customers can optimize their production processes thanks to the use of MVTec HALCON: They benefit from fewer rejects, lower costs, and faster processes, as well as higher quality and reliability.

For more information, visit www.manz.com/en and www.mvtec.com.

Text and images kindly provided by Manz AG.