Laser cutting and welding with artificial intelligence

Laser cutting requires high process stability and reliable process monitoring in continuous processes, such as in laser blanking, and in chained processes, such as in the production of bipolar plates or battery electrodes from the roll. Artificial Intelligence (AI) can be used to interpret process signals during cutting and welding, which means that quality assurance as well as process monitoring and control becomes more robust and can meet the high demands of real-time evaluation of dynamic processes.

The joint project DIPOOL

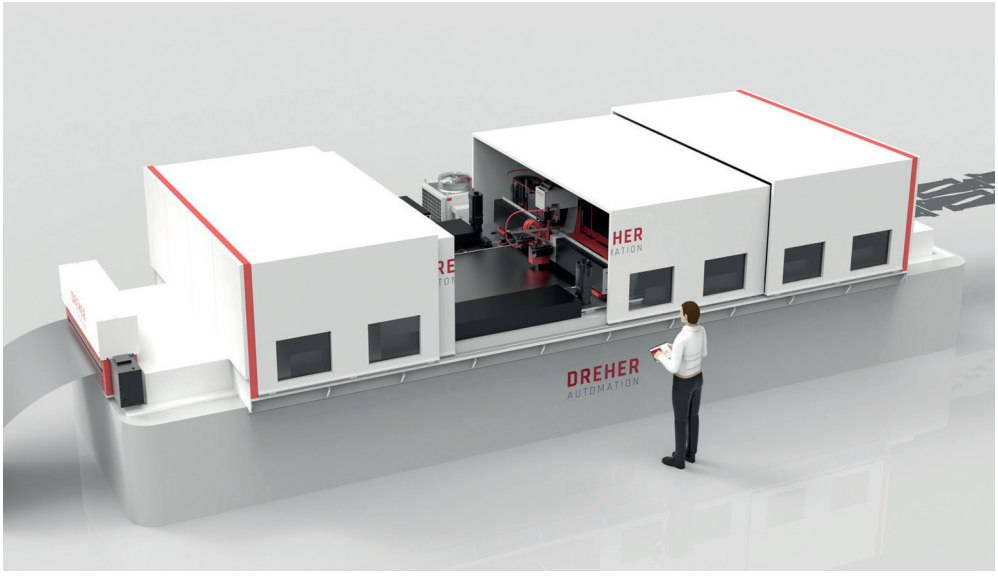
The joint project DIPOOL, scientifically coordinated by Fraunhofer ILT, aims to combine the unique temporal and spatial programmability and controllability of laser tools with suitable machine learning (ML) and AI methods. To obtain meaningful data quality, the institute applies minimally invasive laser modulation (MILM) patterns on the machining process. The process continuously responds to these with characteristic signals dependent upon its state. When such response signals are available and they are fused with further sensor data of the machine, a highly efficient training of ML algorithms is possible as well as reliable conclusions and decisions of the AI system.

Use in laser blanking

Fraunhofer ILT identified suitable modulation patterns and resulting response signals for the DIPOOL laser blanking demonstrator system. It integrated the AI into the system control on a real-time capable process computer with FPGA, on which data acquisition, pre-processing and inference are clocked at 1 to 2 milliseconds and thus run sufficiently fast for the high-speed cutting process. The DIPOOL project partners are currently also investigating how suitable the method is for welding car body components.

The joint project DIPOOL is funded by the German Federal Ministry of Education and Research (BMBF) within the funding measure ProLern (grant number 02P20A000) and is supervised by the Project Management Agency Karlsruhe (PTKA).

Author: Dr. Frank Schneider, frank.schneider@ilt.fraunhofer.de



DIPOOL laser blanking demonstrator system, © AutomaticSysteme Dreher GmbH.