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Daimler AG

RobScan - Robot-guided Remote Scanner for Laser Beam Welding

RobScan - Robot-guided remote Scanner for laser beam welding - is a new laser beam welding process, which has been developed for vehicle body construction by Dipl.-Ing. Bertold Hopf and Dr. Klaus Debschütz and their project team within the Daimler AG. The innovation of the system is the combination of different hardware components and the Daimler-developed process technology and control software. It represents a new approach to laser beam welding using the known advantages of laser welding and extending it with new possibilities in process technology and a new control system to utilize all the possibilities of the remote scanner. It was thus possible to increase the welding speed and improve the welding quality.

The RobScan process combines the high speed and precision of scanner optics with the flexibility of a robot. The programmable focusing optics is connected with an industrial robot. A disk-laser is used as a beam source, thus allowing the laser beam to be routed to the laser head via flexible optical fibers. The positioning times between the weld seams can be reduced due to the simultaneous superimposition of the scanner mirror and robot movement, a process referred to as welding on-the-fly.

Essential process advantages offered by laser welding are single-sided component accessibility and high welding speeds up to 15 times faster in comparison to resistance spot welding. Besides costs benefits the use of RobScan also provide opportunities for reducing the floor space required for body construction. Also the welding quality was improved for example by increased gap-bridging ability and reduction of craters. Around 15 % of all resistance welding spots have been replaced by this process in the new C-Class generation of Mercedes-Benz. In the area of the doors, rear center section and inner side wall of the new C-Class, over 900,000 weld joints are realized process-consistently per day.

The project team has initiated and pushed ahead all stages of the development - from the initial idea to production breakpoint. During the basic groundwork important correlations were identified by the engineers and implemented in patentable technologies. The technical core elements of the whole project were developed by the Daimler team and include the process development, online process diagnosis, the technology for welding coated metal sheets and higher-strength steels, the system control and flexible clamping technology. Within the overall system lasers and optical elements, such as scanners and fibers, were designed, constructed and tested together with the manufacturers. The project team formulated an innovative concept for linking together the individual laser, scanner and robot systems via a control system as well as the specific software for controlling this system. Simulations were used to support the experimental work and demonstrate the potentials of new designs.

Team Representative

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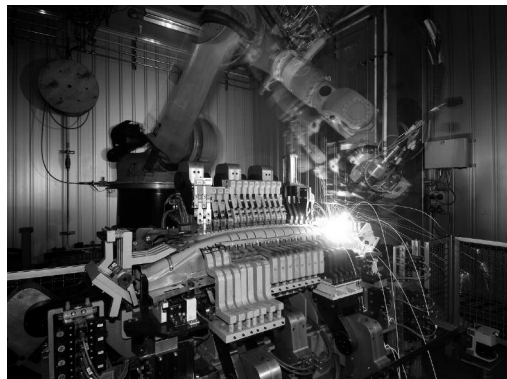
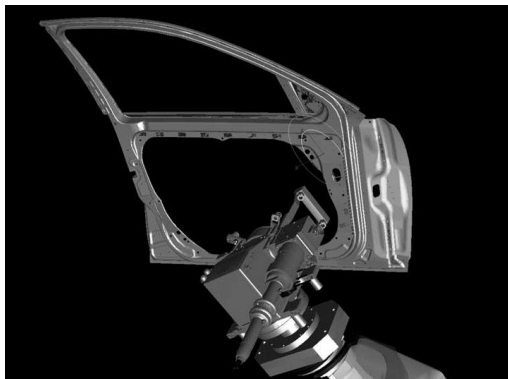
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Area of Application

Automotive Industry

Technological Impact

- Reduced manufacturing costs for body in white production
- Improved quality by better welding results, reduced flange width and increase of stiffness
- Decrease in cycle time by welding on the fly
- Improved quality assurance by use of a 100 % online quality control system
- Flexibility in production



Left: Simulation of the RobScan process for welding car doors.
Right: Welding of rear center parts with the RobScan Process
 (Photos: Daimler AG, Sindelfingen)