THE TECHNICAL ISSUE

Flexible robot welding system for varied product range

Meiller trusts in Cloos welding technology

Technical Issue of S. Nuechtern-Baumhoff, Carl Cloos Schweisstechnik GmbH, Haiger Photos: CLOOS

F.X. Meiller GmbH & Co. KG specialises in the manufacture of tipper bodies and trailers. At its Czech production site in Slaný the company recently invested in a new robot system from Carl Cloos Schweißtechnik GmbH. The fully-automated system is highly flexible and considerably increases the efficiency and quality of production. Meiller has trusted in the technology of the Haiger-based welding specialists for decades.

The family company Meiller, with headquarters in Munich, was founded in 1850 and can look back over a long tradition. Meiller has made its name as a worldwide market leader in the production and sale of tipper bodies and tipper trailers and high-quality lift doors. Through close cooperation with HGV manufacturers, chasses and bodies are optimally matched. In Germany it operates factories in Munich, Ulm, Karlsruhe and Ratingen. It has further production sites in Austria, in the Czech Republic, Poland and Turkey.

Flexible system for different components

At its Czech site in Slaný, 900 employees produce tipper bodies in different designs in a production area measuring around 25,000 m². According to Petr Hanzal, production manager at Meiller in Slaný, the varied product range is due to the different requirements of customers from the different markets. "In Russia, the demand is mainly for rear tipper trucks with high load capacities and in France we provide mainly two-way tippers. In Germany, however, the demand is mainly for three-way tippers", says Hanzal. "We offer our customers great product variety and do not manufacture in large quantities. The new robot system therefore needs to work on a wide range of components with different dimensions", adds Hanzal.

Two 6-axis robots operate three workstations

The new fully-automated welding system is the fifth-largest in the world from Cloos and the largest of its type in the Czech Republic. Here, tipper body sub-frames for three-way tippers, tipper bodies for rectangular rear tippers and half-pipe tipper bodies for rear tippers and semitrailers are produced in a three-shift operation. The system comprises three workstations A, B and C and two six-axis robots.

Tipper body sub-frames for three-way tippers, tipper bodies for rectangular rear tippers and half-pipe tipper bodies for rear tippers and semitrailers are produced with the robot system.

Tipper bodies for rear tippers are welded in Station A. Tipper body sub-frames for three-way tippers are welded in Station B and Station C is for the welding of smaller assemblies such as rear walls. The set-up times are reduced to a minimum because the program in the next station can start immediately after the end of the program in the previous station. While the robots weld one assembly, the welded assembly in the adjacent station can be removed and a newly tacked assembly positioned. Robots and jigs are designed such that manipulation and welding times are minimised.

The system comprises three workstations A, B and C which are arranged in a line.

All three stations are arranged in a line. A 33 m long gantry enables the two robots to reach all stations. Motion in the transverse direction is enabled by 3.5 m long booms which carry two 1.5 m long vertical handling units. The robots are attached at the bottom end of the vertical units and can

weld a workpiece simultaneously. The use of the robots guarantees very precise repeatability of approach to a point of 0.2 mm. The load capacity of each robot is 15 kg and they have a maximum possible range of around 4400 mm in diameter. This guarantees easy access of robots to the welding position. The movement on linear tracks is performed by servomotors which are connected to the robot controller. The robot axes are synchronised with the drives of the linear tracks so that long welds can be produced without interruption.

Four positioners guarantee optimum accessibility

Stations A and B are fitted with four positioners, each having a load capacity of 30 t. The positioners can place the assemblies in synchronisation with the robot movement into the required welding position. The two stations are fitted with 12 m long jigs for holding and clamping tipper bodies. An adapter frame for holding tipper body subframes guarantees universal use of the system. The steel components are clamped hydraulically, which enables the products to be clamped prior to welding to compensate for welding distortion

The two six-axis robots are each fitted with two welding torches and three sensors.

The robot sensors compensate for tolerances in the tacked assemblies and when positioning in the jig. Both robots are each fitted with three sensors: The tactile sensor determines the start or end of the weld. The arc sensor responds dynamically during the welding to tolerances on the workpiece. The online laser sensor is used if the other two sensors cannot be used, particularly in the case of overlapping connections. In this case the start of the weld is detected using a static laser measurement. The torch is guided to the required welding path during the welding process with the laser sensor.

Torch changing system for different application options

Each robot is fitted with two welding torches. Whilst the bent single wire torch is used for welding small, segmented and difficult-to-reach welds, the straight tandem torch can perform long straight welds at high speed. In the tandem process,two electrically independent arcs burn in a common molten pool. The high deposition rate ensures maximum productivity. The tandem torch can therefore weld the tipper bodies at speeds of 120 cm per minute. The torch is changed automatically by a command from the respective program.

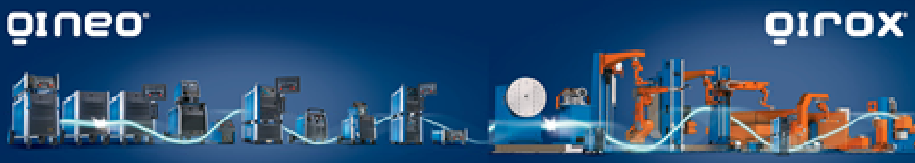
Offline-programming saves time

The robot system is programmed offline with the RoboPlan software from Cloos. While the system is in production, a new program can be simultaneously produced in RoboPlan. The software enables welding, search, travel paths and tools to be defined on 3-D models to which the welding parameters and further functions required for the running of the programme are then added. The program is developed in this way before being transferred to the robot controller for optimisation in the workplace. This process is less time-consuming than producing a whole new programme in the system.

As well as RoboPlan the Process Data Monitoring software (PDM) is used to monitor the program performance, generate error messages and to monitor welding parameters. In addition, Remote Diagnostics Software (RSM) enables remote maintenance of the robots.

Meiller will continue to produce using Cloos welding technology

Cloos has provided Meiller with a smaller welding robot including accessories on which the operators of this complex system can be trained. Here, the operators can put the things they have learnt into practice, manufacturing front and back walls. The PDM and RSM systems also monitor this workplace so that attention is drawn directly to any errors in operation, progress and welding sequence. These errors are then documented and addressed. The knowledge and experiences gained in the process go towards the development and



production of subsequent welding programs.

"Our cooperation with Cloos has been extremely constructive from the start" says Hanzal. "As long-term partner, Cloos knows our expectations and requirements very precisely. This gave us the confidence that such a comprehensive project would work" says Hanzal. Meiller operates a total of four Cloos robot systems and 300 Cloos welding power supplies in Slaný. One of the robots has been successfully in operation for 20 years and is still functioning perfectly.

Substantial savings and increased quality

The new universal robot welding system lifts the productivity and quality in the production of tipper bodies to a new level. Production time has been reduced by almost half in comparison to the previous manual welding. "Our customers expect top quality from us as a premium manufacturer. Automation enables us to guarantee reproducible quality" says Hanzal.

Meiller is therefore driving automation forward in this sector and is investing further. The project team is currently planning an additional production line with two systems and three robots. These are expected to commence operation midway through this year. The side-wall welding for the three-way tippers will also be automated in future. This means that the manufacture of the three-way tippers so much in demand by the German market will soon be fully automated at the Czech site.

When it comes to welding technology, production manager Petr Hanzal (3rd from left) and his team rely on CLOOS. The successful undertaking is in the hands of Miroslav Trávníček (1st from left), technical manager of the CLOOS subsidiary in Prague.

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