High integrity welding of rail bogies

The TIG root weld has been eliminated from the fabrication of rail bogies by the use of ‘Rapid Weld’ and a programmable power source that can store the precise power requirements to control the arc for the job in hand.

SMW (Spezialmaschinen und Werkzeugbau) of Neubrandenburg, Germany is a flagship operation which is expanding its market position in the production of rail bogies with the help of competent employees, a well managed material flow, and modern production technology.

The company, which emerged from the former GDR tank repair factory, has been systematically modernised since its takeover by the entrepreneur Eckhard Gellrich and has thus become a partner in rail vehicle construction internationally. Today it generates around €15M in turnover and has 150 employees and 15 apprentices, says SMW Managing Director Manfred Biber.

SMW processes steels in the qualities S355 without thickness limitation, fine grained steel up to S690 and up to 20mm thick and aluminium and stainless steel up to 12mm thick.

The company uses a number of techniques from sheet metal cutting and processing, drilling, turning, milling and grinding as well as various welding processes. All production stages are available in-house. SMW has its own tooling department which supplies gauges, jigs and special tools for the production of components. Even larger parts can be heat-treated in an annealing furnace. Components are finished by steel shot blasting and wet painting. At assembly points, complete assemblies including hydraulic and electrical components are fitted.

In the quality inspection section, SMW uses a three-axis CNC measuring machine to check dimensions as well as various inspection devices.

Much of the fabrication is by welding with between 60 and 150 metres of welded seams in a modern bogie, which can weigh 800 to 1000kgs. SMW manufactures on average 35 of these safety-critical assemblies every month, in addition to a further approximately 45 cradle carriers – assemblies which are located between the wagon floor and the bogie.

Welding

To weld, SMW uses the Rapid Weld process from Cloos and has three robot welders available for large batch jobs; for example, 25,000 buffers are produced for locomotives and wagons every year.

The Rapid Weld high performance welding process shows its advantages with mid to thick walled steels where high deposition rates and optimum penetration depths are required. Acoustically Rapid Weld leaves no doubt about its efficiency: the precise arc producing a sonorous, constant note. An adjustable wire-feed of up to a rapid 12m/min enables high processing speeds and thus short welding times. Thanks to the sharply focussed arc, the process works with minimal heat input, so that to a large extent a warp-free seam results. The Rapid Weld process reduces the welding time by at least 25%.

Traditionally welding processes required three weld passes (one TIG root and two MAG) to weld an HV seam precisely. Rapid Weld succeeds without the TIG root. In addition, this innovative process works with an exceptionally low amount of spatter, which considerably minimises re-working. Welding the cap pass may be dispensed with, if it is not required from a construction point of view.

Small batches

SMW also produces spare parts for older rail vehicles in small quantities down to a single item. This is a challenge, since these assemblies were originally produced without recording welding conditions and documentation. For these small batches and individual pieces SMW use the new, synergy-controlled pulsed arc power sources of the Cloos Qineo® series which represent a clear improvement on the previous technology.

The Qineo® Pulse provides the technical prerequisites for the Rapid Weld process, where the appropriate weld parameters for five different process variations as well as for the required arc characteristics are already programmed and only have to be downloaded. Two independent fine adjustments – for arc length and arc dynamics – ensure an optimum welding process. With the Master operating model, SMW can archive the parameters of up to a thousand jobs and can download them at the touch of a button.

Additionally, SMW has equipped the 600 A Qineo® power sources with double Wire Drive units so as to be able to work with two different wire thicknesses without re-equipping.

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