Nd:YAG Laser-MIG/MAG hybrid welding. A process optimisation for coated C-Mn high strength steel, and a parameter investigation of C-Mn high strength steel, stainless steel and aluminium alloys

Johan Andersson

Abstract

The purpose of the Laser-MIG/MAG hybrid process is to combine the positive aspects of the single processes and cover for each other’s setbacks. In order to introduce the Nd:YAG Laser-MIG/MAG process in the industry it is necessary to prove its stability, mechanical properties of the welds as well as the occurring weldment discontinuities and how defects are avoided. This investigation, at the KIMAB Joining Technology Centre, focused on a parameter investigation and an optimisation for welding of zinc-coated steels. The materials used in this study was the SSAB high strength steels Docol 260RP, Dogal 350YP (7 m hot dip galvanised), Dogal 260 RPX (20 m hot dip galvanised), the Outokumpu stainless steel HyTens® 1200, and the SAPA aluminium alloy AA 6063-T6.

Several of the parameter characteristics reported in literature were confirmed and new experiences were made. The parameter investigation showed that high travel speeds could be achieved. Inlap-fillet joints, >7 m/min for uncoated steel (t = 1.0 mm), ~4.5 m/min for 7 m hot dip galvanised steel (t = 1.0 mm), and ~4 m/min for stainless steel (t = 1.5 mm) and aluminium (t = 3.0 mm) was reached with high weldment quality. The gap bridging of butt joints indicate a bridging ability of 0.6 mm for t = 1.0 mm high strength steel, 1.0 mm for t =1.5 mm stainless steel and 1.0 mm for t= 3.0 mm aluminium.