

Mechanised Plasma-Powder-Arc-Welding (PPAW) of Aluminium Sheets

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Abstract. The use of aluminium alloys rose in the last decade, as its specific mechanical properties allow a reduction of mass as for example in automotive. Moreover aluminium, due to its high corrosion resistance, is a very important material class in plant construction, where it is used for pipes or container till 250 °C. Aluminium can be welded with different technologies. Nowadays TIG and MIG are mainly used for example in plant construction or in mechanical engineering. Laser beam welding is a widely established technology in automotive. The advantage is the high energy concentration, which leads to a high welding speed and a narrow heat affected zone. Plasma welding is applied when joining aluminium with alternating current, as an easy removal of the oxide layer in the surface of the weld pool is possible. Plasma-Powder-Arc-Welding (PPAW) method has been developed from Plasma Transferred Arc (PTA) weld surfacing and Plasma Arc Welding (PAW) methods by combining a small PAW torch (PAW is traditionally performed with wire as filler material) with powder filler material feeding as used in PTA-equipment. The coupling leads to a better mechanisation of the welding process as the consumable is fed directly through the welding torch. In this paper investigations on aluminium sheets (≤ 2 mm) AA5xxx and AA6xxx using different powder materials are reported. The influence of the processing parameters and conditions on the process reliability, when welding with industrial robots butt and corner welds is investigated. Conventional PPAW of aluminium is performed with AlSi12 filler material. A post processing of the joint, as for example anodising in order to improve corrosion resistance, leads to a very different optical aspect, as the colouration of the weld seam after anodising differs from the base material. Thanks to a correct choice of filler material it is possible to reduce the colour differences between base materials/heat affected zone and bead, so that the weldment can be set for high quality optical applications, too.