Science and Technology of Welding and Joining, 7(4): 247-252

A Novel Method of Cooling a Plasma Welding Torch Head

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Abstract

The performance of a design using swirling flow with a U shaped return passage to cool the tip of a plasma arc torch is numerically investigated. The new cooling scheme is first compared with the cooling design of a Nippon Steel plasma torch. Using a hypothetical swirling flow of different vortex angles but the same coolant flowrate and external heating boundary conditions as for the Nippon Steel torch, the flow and temperature fields for both torches were analysed using a computational fluid dynamics package and the results were compared. The results show that the present cooling scheme not only provides a more axisymmetric temperature field, but also results in lower averaged surface temperatures. Using a swirling flow generator implemented upstream of the tip of the U shaped region, numerical results indicate that improved cooling performance can be achieved with only a slight increase in coolant pumping head when compared with the cooling design for the Nippon Steel torch.