Experimental analysis on the variable polarity plasma arc pressure

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Abstract: Arc pressure is one of the key factors for variable polarity plasma arc(VPPA) and welding pool formation. In this paper, VPPA pressure was measured by pressure transducer and U-tube barometer methods. The effects of welding parameters, such as straight polarity(SP) current, reverse polarity(RP) current, time ratio of SP to RP, plasma gas flow rate, on VPPA pressure were investigated by using an orthogonal design. The experimental results indicated that the influencing degree of the welding parameters are in the order of plasma gas flow rate, SP current, time ratio of SP to RP, RP current. The physics behavior of VPPA was taken into account when the above influence mechanisms were analyzed. According to the mechanism of the cooling compression to the arc, the compression to VPPA is enhanced with the increase of plasma gas flow, so the VPPA pressure would increase obviously; although the temperature of VPPA is as a function of the welding current, the radius of VPPA is also enhanced. The effects of SP current on VPPA pressure are inferior to the effects of plasma gas flow; Because the frequency of welding current influences the arc pressure to the some degree VPPA pressure increases as a function of time ratio of SP to RP; The RP intervals are farther less than the SP intervals, so the influence to the pressure is the smallest.

Key words: variable polarity plasma arc, arc pressure, orthogonal experiment

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