電漿銲槍頭熱傳分析與設計改進

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摘 要

電漿銲接於近幾年廣泛的使用在工業界，其主要原因是它具有能產生高能量密度的電弧使得氣孔的生成率降低及低殘留應力等優點，而且設備花費又比電子束、雷射低廉，可廣泛應用於航空、核能上。由文獻可知，電漿銲接之電漿中心溫度可達到約16650℃~27770℃之間，過高溫度對於電漿銲槍頭會造成毀損。 瞭解電漿銲槍頭溫度分佈若以實驗方法量測較費時且不易因此，本研究利用計算流體力學（CFD）方式，以市售之日鐵電漿銲槍頭作熱傳模擬分析，並針對其冷卻方法之缺點作新的改進之分析。 由結果顯示，將電漿氣體流道圓滑化後可提升壁面摩擦係數，日鐵銲槍之冷卻水以非軸對稱的入口方式進入噴嘴內，在噴嘴壁面會形成非對稱的熱點的發生。在新的冷卻方式中，導流板的作用使流體有渦漩流的效果；噴嘴內U形彎曲流道的設計可使流體速度重新分佈，提升外壁側之流速；噴嘴壁厚的減少使熱傳路徑縮短。這些設計使得新幾何銲槍噴嘴的平均溫度較日鐵銲槍降低了許多。

關鍵詞 : 電漿焊接，電漿氣體，渦漩流，彎曲流道，計算流體力學

目錄

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