METHOD FOR WELDING FERRITIC STAINLESS STEEL TO CARBON STEEL

Technical Field

The present invention pertains to methods for welding ferritic stainless steel to carbon steel. In particular, it pertains to methods for providing corrosion resistant welds between such steels for use as cathode assemblies in industrial electrolyzers.

Background

Numerous grades of steel and stainless steel are known in the art and variations of such steel materials continue to be developed to provide for improvements in certain properties for specific applications. These applications require an emphasis on a diverse range of characteristics and include not only sound mechanical characteristics but frequently also specialized corrosion resistance characteristics. Further, economics and other reasons can make it desirable to employ dissimilar steel materials and thus methods for joining such dissimilar steels, while maintaining their desirable characteristics are often required. In particular, maintaining acceptable corrosion resistance of joined and/or welded steel components is frequently an issue when working with dissimilar steel materials.

As a consequence, many methods have been developed in the art for joining and/or welding various dissimilar combinations of steels and stainless steels. For instance, the welding of duplex stainless steels to carbon steels has been studied and welding techniques have been developed to provide corrosion resistant welds for certain applications. Some of these techniques employ gas tungsten arc welding (i.e. GTAW or TIG welding) and use duplex stainless steels as a filler metal. In a like manner, the welding of ferritic stainless steels to carbon steels has been studied and welding techniques have been developed to provide appropriate welds for the conventional applications employing this combination of steels. To maintain acceptable weld quality, the methods of the prior art for welding ferritic stainless steel to carbon steel can employ either grades of stainless steel such as 309 or 309LMo stainless steel (austenitic grades) or grades of carbon steel as a filler metal. When using such stainless steel filler metals, GTAW is employed and when using carbon steel filler metals, gas metal arc welding (i.e. GMAW) is employed. (Carbon steel or low alloy filler metal should not be deposited on stainless steel. For such dissimilar metals, it is customary to use a stainless steel filler metal that is sufficiently high in total alloy content to prevent martensite formation when diluted with carbon steel, while at the same time preserving residual amounts of ferrite. This counteracts the tendencies for hot cracking during welding.)

An application for specialty stainless steels is for use as electrodes in industrial electrolyzers, for instance sodium chlorate electrolyzers. Sodium chlorate is produced industrially mainly by the