Hardfacing of austenitic stainless steel with nickel-base NiCr alloy

Various components of the Fast Breeder Reactors encounter wear of adhesive or abrasive nature and sometimes erosion. Hardfacing by weld deposition have to be used to improve the resistance to high temperature wear, especially galling, of mating surfaces in sodium. Based on radiation dose rate and shielding considerations during maintenance, handling and decommissioning, nickel-base E NiCr-B hardfacing alloy was chosen to replace the traditionally used cobalt-base Stellite alloys. Studies, on the effect of long term ageing of NiCr hardface deposits on austenitic stainless steel substrate, demonstrated that E NiCr-B deposits after exposure at service temperatures up to 823 K would retain adequate hardness well above Rc 40 at end of the components’ designed service-life of up to 40 years. Further, based on detailed metallurgical studies, including residual stress measurements after thermal cycling, the more versatile plasma transferred arc welding (PTAW) process was chosen for deposition of the E NiCr-B hardfacing alloy, so that the width of the dilution zone could be controlled by optimising the deposition parameters. This paper outlines the selection Ni-base hardfacing material and alloy as also the hardfacing alloy deposition process that has been used for development of hardfacing technology for the various components of the Indian Prototype Fast Breeder Reactor (PFBR).

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