HBS Bulletin

HARDBANDING SOLUTIONS by POSTLE INDUSTRIES

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It's easy to introduce a hardbanding wire into the oil & gas Industry. It's not easy to develop one that performs.
At Postle we have the laboratory equipment necessary to develop high performance hardbanding alloys along with perform quality control checks.

The development of a new hardbanding wire along with quality control analysis of existing wires require that the hardbanding manufacturer have a fully functional research and development laboratory. It is imperative that the hardbanding wire manufacturer designs a formulation capable of achieving the performance characteristics that are expected.

- Protection of the drill pipe tool joint from abrasion and wear while maintaining a casing friendliness
- Ease of application on new drill pipe and field re-application capabilities
- Prolonged wear resistance of the hardband welding alloys to reduce the frequency of reapplication
- An applied welding deposit that is free of cracks and resists spalling and delamination

Abrasion Testing

Abrasion, the most common cause of wear, is measured on hardbanding deposits using an ASTM G-65 Dry Sand procedure. Quite simply, a test piece is placed in the testing apparatus and loaded with a 30.0 pound (13.6 KG) load against a rotating rubber wheel. Closely controlled sand is applied between the test piece and the rubber wheel. At the end of the predetermined number of rotations, the sample is then examined for weight loss. It is the weight loss that determines the abrasion resistance of the hardband material.

Hardness Testing

Although hardness is useful in the development of the hardbanding alloy, it is not necessarily a good indicator of the hardbanding material's total performance. Hardness should not be confused with abrasion resistance. Two metal components with the same hardness can have vastly different abrasion resistance values. Hardbanding samples can be checked to determine hardness values of the entire welding cross section including the weld deposit, the fusion zone, and the heat affected zone (HAZ) into the underlying tool joint (parent material).

If the hardness values of the HAZ and parent material are elevated are too high during the welding process, it can lead to catastrophic failure.

Casing Wear Test

Casing wear is another attribute of hardbanding that can be independently tested and documented. It is the casing wear test that determines what is commonly known as “casing friendly” performance. This is done on a testing apparatus which utilizes an actual section of casing and an actual hardbanded tool joint. The test consists of rotating a hardbanded tool joint in a casing sample with a measured force against the side of the casing for a specific duration. The test is periodically paused while the wear scar geometry is measured. At the end of the testing duration (typically eight hours), the data is documented and reported.

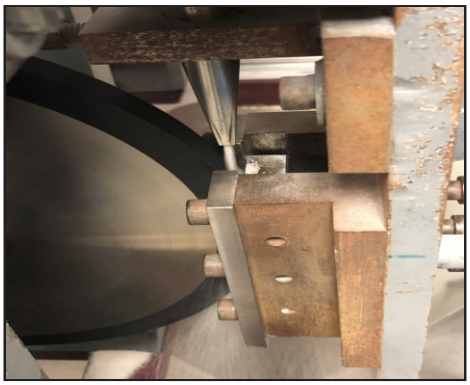
It is important when reviewing casing wear data to understand that there are variables in the test that will affect the casing wear results. Casing wear test variables include what type of mud is used during the test, the sideload force that is applied to the hardbanded sample, and the type of casing that is utilized during the test.

Magnetic Particle Inspection (MPI)

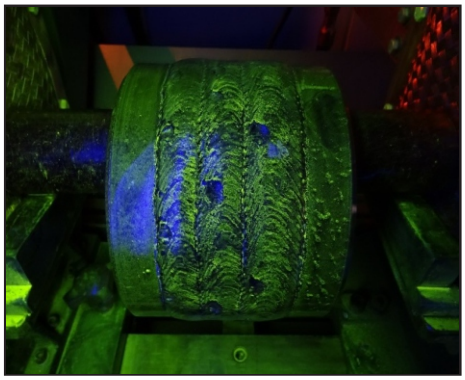
A visual inspection may reveal weld surface cracks, but for a definitive determination, magnetic particle testing is recommended. This non-destructive testing process is performed on a welded part to look for cracks or imperfections on the surface of the weld. Cracks can make the re-application of hardbanding very difficult, trapping impurities that can cause porosity and voids, cracking or even spalling. Deep cracks may migrate into the parent material, causing failure.

Hardbanding Compression Ring Adhesion Test

The hardbanding compression ring adhesion test encompass hardness testing, dye penetrant inspection and a visual inspection. This hardbanding adhesion test is designed to evaluate the interfacial bonding strength between the hardbanding alloy and the tool joint material. This is accomplished by compressing a section cut from a tool joint with hardbanding applied. The adhesion test apparatus compresses the sample which produces high tensile stresses in and around the fusion line and induces separation between the welded hardband and the base material.



G-65 Test Apparatus



Magnetic Particle Inspection (MPI)

Compression Ring Adhesion Test