

COVER STORY

PERFORMANCE IMPROVEMENTS START WITH *training*

John Postle, Hardbanding Solutions by Postle Industries, USA, shows how structured hardbanding application training is already paying industry-wide dividends in this month's cover story.

Knowledgeable energy companies and drilling contractors have come to appreciate the benefits they reap from hardbanding. They realise that quality hardbanding can protect the casing and the tool joint, as well as resulting in more efficient drilling with lower energy requirements. This protection means longer drilling cycles and reduced maintenance. Drilling contractors understand that superior hardbanding will protect their drill string assets by extending the life of tool joints and reducing the number of times the pipe needs to be pulled for maintenance.

The use of new and advanced drilling technologies is causing drill pipe and connections to be used beyond what they are engineered for. Drilling engineers



Figure 1. In Kenya's remote Hell's Gate National Park, technicians were able to train an inexperienced local applicator to apply hardbanding to a client's drill pipe within a week's time.

have come to realise that the use of hardbanding technology will improve drilling performance and help accomplish goals never thought possible.

But hardbanding is only as good as its application. The use of hardbanding is growing around the world, especially in emerging oil and gas markets. As it grows, so does the need for better-trained personnel to carry out this critical job. To fill this need, an aggressive worldwide training programme has been launched which is already having a positive impact in the field.

The importance of training

Smith Services Russia, an oilfield service company, operating on Russia's 600 mile-long Sakhalin Island, sought to expand the breadth of services they offer to local drilling contractors and operators. Hardbanding was an obvious choice and, as a result, they added a hardbanding unit to their machine shop in 2011. This was a first for the company and, accordingly, the company's welders were not experienced in the hardbanding process. Since Hardbanding Solutions Technical Centers worked with Smith Services previously, they were called upon to help train their operators and help them implement the hardbanding service programme.

Due to the rapid growth of hardbanding worldwide, there is a lack of skill and experience specifically related to applying hardbanding products, especially in new and remote drilling regions. Many applicators in these areas have never received the quality of training required to successfully understand and follow strict hardbanding procedures set out by the material manufacturers. A sound application is essential if the hardbanding is going to successfully protect the customer's drill string and casing. For this reason, Postle Industries Technical Centers were established in eight strategic locations across the globe. In addition to being a resource for the oil and gas industry in their respective regions, the Technical Centers offer practical educational sessions and provide assistance to applicators with hands-on training, right in the field. The training and assistance offered by these Tech Centers can make the difference between success and failure.

Specifically, the training that is provided includes giving applicators a basic understanding of the different types of applications of hardbanding. In addition, they are introduced to the principles of heat treatment and how it relates to the hardbanding process. This includes valuable training in the metallurgy of hardbanding and heat treatment related to drill string tool joints and drill collars.

Other training topics include the importance of inspection of the base metal and hardbanding (pre and post-hardbanding application), dimensional requirements (hardbanding and tool joint) and re-application considerations. Additionally, the applicators are trained regarding different types of applications on different types of tubulars. This includes the tong space, recess versus proud hardbanding, as well as hardbanding on 35° and 18° shoulders, drill collars and wear pads on heavyweight drill pipe. The end result is an applicator who understands their machine and welding process in order to produce an end product with guaranteed quality. After completing this structured training programme, Smith Services applicators were certified to apply Duraband NC hardbanding. The training of operators in this manner can be very valuable to companies as it allows them to bid for and win major hardbanding contracts.

Hardbanding training and assistance also proved valuable to another Russian applicator. In some areas of Russia, the hardbanding of drill pipe has never been done before because the benefits are not completely understood. Energy companies and drilling contractors spend millions of dollars replacing drill pipe. In this instance, drill pipe tool joints had become so worn that an operator was considering selling them for scrap. That was when a local hardbanding applicator, PromTechService, stepped in. The applicator's challenge was to restore the outer diameter of the tool joint and bring it up to premium class specification. The goal was to find a product that would produce a clean, porosity-free overlay, which would maintain the strength of the original tool joint and have a very similar hardness. Hardbanding Solutions was able to provide the assistance and technical support to help the company achieve this goal.

To ensure the best results, the applicator tested nine different weld materials and compared the results using strength tests on the finished product. It was discovered that Postle Industries HB-2892BU welding wire produced superior strength. In fact, the rebuilt tool joints were tested by a third party inspection company and declared to meet the Russian equivalent standard of G-105, known as GOST-R. This product is designed to safely increase the diameter of worn tool joints, after which a hardbanding product, such as Duraband® NC, can be applied over the new surface to protect the tool joint and casing from excessive wear. The applicator was able to successfully refurbish the drill pipe for their customer. The company has since provided this service to both a major drilling contractor and operator, and they have had repeat business after successful trials in the well.

Case study: Indonesia

The harsh drilling conditions of Indonesia prompted a call by PT. Sekawan Eka Sejati to the Hardbanding Solutions Technical Center in Singapore. The request was to learn more about the advantages of non-cracking, casing friendly Duraband NC applications in a geothermal or

HPHT environment, and to receive expert training on the proper application of hardbanding on their downhole tools. Duraband NC, is Fearnley Procter NS-1™ certified for new applications, as well as re-applications over itself and many other hardband products. This can save up to 75% of the cost of re-application by eliminating the need to remove existing hardbanding. This characteristic has the added benefit of reducing costly downtime.

As a result, a conference was organised in Jakarta, Indonesia. Attending the seminar, along with key personnel from PT. Sekawan Eka Sejati, were technicians from Indonesian drilling contractor Apexindo and engineers from Indonesian oil operator Pertamina. The two-day seminar included training along with demonstrations of the proper application of hardbanding. Following the classroom sessions, attendees moved to a hardbanding application site where they received hands-on training applying hardbanding to drill pipe.

Specialist challenges

Special needs in the field can create daunting hardbanding challenges. In one such situation, Ensco approached Postle Industries regarding 15 000 ft of 5 in. drill pipe with tool joints inlaid with Smooth X, including the taper, on 6 5/8 in. OD tool joints. The challenge was to have Duraband NC hardbanded proud over the new Smooth X Inlay and taper. Following a series of tests, it was quickly discovered that heat-affected zone cracking occurred in the taper sections because of heat shock during the standard hardbanding procedure. To solve this problem, a procedure was developed which completely eliminated heat-affected zone cracking.

In the summer of 2009, Tipsa, an Argentine applicator approved to apply Duraband NC and Tuffband NC, had a number of concerns regarding water-cooling drill pipe during Duraband NC reapplication hardbanding procedures. Samples of the hardbanded box ends were submitted to the Postle Metallurgical Laboratory where comprehensive microstructure analyses and microhardness profiles were conducted. As a result, the irregularities discovered during the studies were addressed, procedures produced and personnel trained to resolve the issues and satisfy Tipsa and their customer.

Remote operations

Often in the most remote drilling areas there is limited hardbanding training. That was the case in Hell's Gate National Park in Kenya. This was to be Weatherford International's first hardbanding operation in Africa. With no local experience to call upon, and trying to avoid the logistical nightmare of sending local welders to the hardbanding machine manufacturer's headquarters in Asia, the company was in a bind. To add to their challenge, their customer, Marriott Drilling, was eager to start the protection of drill pipe as soon as possible since they were experiencing very harsh drilling conditions in the geothermal field. A good hardbanding solution was essential.

A team of experts from the Hardbanding Solutions Technical Center flew to Nairobi and then made the long journey to Naivasha and finally to the drilling site. Once there, the training team helped Weatherford properly set up their hardbanding unit and began a five-day training



Figure 2. Personnel from PT. Sekawan Eka Sejati, technicians from Indonesian drilling contractor Apexindo and engineers from Indonesian oil operator Pertamina receive hands-on training at a hardbanding seminar in Jakarta, Indonesia.

course with a local welder, Kennedy Aming, on all aspects of the process. On the last day of training, Kennedy was given a qualification test, which he had no trouble passing. "Kennedy was putting down his first hardband on his second day of training. On day four, we started hardbanding our client's drill pipe," stated Weatherford's Kenya operations manager, Robert Austin.

As a result of this training, Marriott Drilling now has a reliable hardbanding service in place just a few metres from their rig. The Hardbanding Solutions team was able to provide hands on training in this remote part of the world.

In another instance, Tech Center assistance solved the mystery of improper and irregular weld deposits for an Australian applicator. The applicator wanted to become certified to apply Tuffband NC and Duraband NC hardbanding. The local Tech Center team inspected their equipment and provided a spool of Duraband NC for the applicator to run as a test. The weld deposit in the test piece was irregular and did not pass a visual inspection. The training team found that the welding arc was very erratic. They inspected the cables, connections, parameters, polarity, welding gas, torch angles and more. All of these variables checked out. They then removed the contact tip and found it to be a tip for 2 mm wire rather than the 1.6 mm wire they were running in the test. The welder explained that he used the larger tip as he could not get other wires to run through the 1.6 mm contact tips. The welder switched to the properly sized tip, arced up and began producing a consistently uniform application. Training in the field proved that even with the most experienced welder, good equipment and the best consumables, something as small as 0.4 mm can mean the difference between success and failure.

Reaping the rewards

Ultimately, proper hardbanding training can produce benefits for the applicators and their customers. Drill pipe manufacturers, drill pipe rental companies, drilling contractors and oil and gas operators all benefit from a strong, reliable hardbanding application. The longer that drill pipe remains in a well, the greater the profit potential. And now, with proper training, applicators are learning the essential skills to ensure long-lasting hardbanding applications. 01