



**NS ACCREDITATION & STANDARDS**

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## **Hardbanding Approval under the Fearnley Procter NS-1™ Accreditation Programme**

The Fearnley Procter (FP) NS-1™ Accreditation Programme is an independent evaluation service that is available to all suppliers of products, services and equipment to the Oil & Gas Industry. Trusted by end users and suppliers it provides an independent assessment of the welding procedures and qualification process for the initial application and re-application of hard banding products and a comparison of its casing wear test results versus bare pipe.

### Hardbanding Approvals

Within the Fearnley Procter NS-1™ Accreditation programme there are two types of approval available for the manufacturers of Hardbanding Products.

These are:

1. **Product Approval** - The Hardbanding Product and its initial application onto tool joints.
2. **Re-application Process Approval** - for the re-application of Hardbanding Product over existing used or worn down Hardbanding. This process approval is given to a specified Hardbanding and its application over another specified Hardbanding. The two Hardbandings concerned can be the same or different products.

### **PART 1 - Product Approval for Hardbanding and its initial application onto Tool Joints**

There exist three levels of Approval.

**Level 1** - Process Approval only

**Level 2** - Within this level the hardbanding products and their application processes are tested for performance. The testing of the hardbanding product – including hardness, adhesion tests, magnetic particle imaging and dye penetrant inspection are witnessed by the FP Engineer – and casing wear tests which are carried out by recognized centres and then reviewed by Fearnley Procter.

**Level 3** - To achieve this level the casing wear test must also be witnessed by a FP Engineer.

Due to the requirements of the industry for the performance of the products to be measured - the minimum entry requirement for the Fearnley Procter NS-1™ Approval Programme is Level 2.

Hardbanding companies wishing to have their products qualified under the Fearnley Procter NS-1™ Accreditation Programme are required to submit for assessment their Application Procedures Manual and Welding Procedure Specification (WPS), meeting the requirements of ASME IX.

The application of the hardband onto tool joints is performed on connections and/or the centre wear pad for HWDP. Sample tool joints will be representative of new drill pipe/HWDP tool joint properties.

Typically a 6 5/8 tool joint is used and a tube sample with dimensional requirements typical of centre upsets on 3-1/2" or 5" HWDP – both meeting the properties of the appropriate base material.

The complete process of application, as set out in the candidate company's Application Procedure Manual, is then witnessed by the assessing FP Engineer.

### **Post Weld Inspection & Test**

The general condition of the applied hardbanding is inspected with emphasis on weld bead profile, porosity, slag and spatter. Visual and Magnetic Particle Inspection are carried to check for compliance. Photographs of the sample are also taken for future reference.

### **Mechanical Testing**

Sample preparations and mechanical tests of the test pieces are completed and visual, microscopic, and mechanical examination is then carried out on the hardbanding layer, the HAZ and welded matrix plus the base material to ensure the physical integrity of the hardbanding and its adherence capability.

Adherence tests verify the bonding/fusion of the hardbanding and its acceptability of 'spalling'. The ability of products to perform under these conditions is key to whether or not they are approved under the NS-1™ Accreditation Programme.

### **Casing Wear Tests**

Under FP examination casing wear tests are carried out to the FP wear test procedures. Data analysed includes - normalized Casing Wear by percentage, actual Casing Wear, Radial Tool Joint Wear, Open Hole and Cased Hole results, Wear and Friction Factors.

Unless a product can be shown to be 'casing friendly' then it is not awarded a certificate of approval.

### **Re-Approval of Certificates awarded to Hardbanding Products**

One of the most important elements of the Fearnley Procter NS-1™ Accreditation Programme is the continuous approval of products on either an annual or bi-ennial basis.

These re-approvals not only re-assess the products technical capability but also examine the field data on the usage of the product. This includes contacting end users for their company's experience with the products under drilling conditions.

Throughout the lifetime of an approval certificate - end users are able to contact FP with any queries about the certificate awarded and if necessary initiate a complaint procedure against an approved product's performance.

FP, as an independent company, can then assess the complaint and if required put forward an action plan to rectify any issues identified. In the event that these issues cannot be addressed then FP will suspend or withdraw the approved certificate. If withdrawn, the holder of the certificate would need to re-apply and undergo a new initial approval.

## **PART 2 - Process Approval for the Re-application of Hardbanding Products**

Fundamental to the long life of both casing and drill pipe is the ability for a hardbanding product to be re-applied correctly with the knowledge that its re-application procedure has been tested to make sure that the product can operate to expected levels in the field.

Under the NS-1™ Approval Programme the products applied are already approved therefore it is the procedure of the re-application of hardbanding that is assessed. This includes maintaining the integrity and the performance properties of the approved products themselves.

Under the programme a Level 2 Process approval is awarded to successful applicants.

Approval is available for the following **types of application**:

1. Approved hardband product applied over itself.
2. Approved hardband applied over another 'named' hardband.
3. Existing hardband is fully removed and an approved hardband applied.

Each different application above requires both an individual WPS and individual approval.

A key element to this approval is the ability of the company to clearly know and be able to demonstrate a secure process for the establishment of the provenance of any tool joint and the currently applied hardbanding product. Without this no approval can be started.

In addition to the processes laid out above, once the hardbanding has been re-applied, particular focus is put upon the bond between the re-applied product and the existing worn down hardbanding. It needs to survive rigorous adhesive testing carried out and witnessed by the FP engineer to show the adhesive stability of the re-applied hardbanding layer.

### **Re-Approval of Certificates awarded to the Re-application Procedure for Hardbanding Products**

As in most things the proof of the products ability to perform in the field is the true test of its capabilities. This is particular true of re-applied hardbanding and the re-approval programme is thorough in its investigations in identifying any shortcomings of a product being re-applied over either itself or another product.

The process is the same as for the re-approval of hardbanding products and continuous re-approval will show a consistency of performance.

### **Technical Review Committees**

The Technical Review Committee is an independent group of industry experts, with proven track records within relevant topic areas. It is convened whenever there is a new specification produced, or a new product to be approved under the Fearnley Procter NS-1™ Accreditation Programme.

This independent committee will review as the Fearnley Procter engineering report on a product and that FP have followed the agreed workscope; have been diligent in their process; and taken the following areas into consideration, as an example:

- how the product will perform in real operating environments?
- is it designed with failure prevention in mind?
- how should it be maintained and inspected?
- how should it be manufactured and repaired?

Our guiding principle in all of this is to minimize the risk of equipment related non-productive-time.

A technical review committee is convened whenever a new hardbanding product is assessed for accreditation under the Fearnley Procter NS-1™ Approval Programme.



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### **12 Years of Re-approvals**

With products now being able to show up to 12 years of re-approval history the credibility of the Fearnley Procter NS-1™ Accreditation Programme for hardbanding product is well established.

Any new product entering the hardbanding market looks to hold this approval to demonstrate its credentials to its clients. Innovative product design and new application processes are put through the rigors of the approval system and those that are granted certificates have proven their ability to perform under exacting standards.