Coal and Cement Pulverizing rolls

Ni Hard 1, 2 or 4 or equivalent only
Not for High Chromium Irons and White Irons

Recommended Hardfacing

Postalloy 2834-SPL
PS-133
Postalloy 2836-SPL
Chemistry of Pulverizer Rolls should be verified

Typical Chemistry of Ni-Hard

**Ni-Hard 2**
- 2.6 – 2.9% Carbon
- 1.4 – 2.4% Chromium
- 3.3 – 5.0% Nickel

**Ni-Hard 1**
- 3.0 – 3.6% Carbon
- 1.5 – 2.6% Chromium
- 3.3 – 4.8% Nickel

**Ni-Hard 4**
- 2.6 – 3.2% Carbon
- 8.0 – 9.0% Chromium
- 4.5 – 6.5% Nickel

Overview.

The rebuilding and hardfacing of the pulverizer mill rolls for grinding coal and cement can be successfully completed by strict adherence to welding procedures, pre-weld inspection and knowledge regarding the previous hardfacing history of the roll. The performance of the rebuilt and hardfaced roll will depend upon control of the welding procedure, the number and shape of the hardfaced layers and the dilution with the base material.
Pre Welding Preparations.

1.0.1 **Power source.** A Constant Potential / Constant Voltage power source with a 650 minimum amperage continuous duty cycle must be used for uninterrupted application of the Hardfacing.

1.0.2 **Preheating.** A slow uniform preheating is recommended, bringing the part to be welded up to 250°F (120°C). This is necessary to promote the required tight check crack pattern and reduce thermal shock to the base metal. The use of a burner ring, oven or in many cases large rose bud type torches are used. Large pulverizer rolls should be preheated through the entire thickness for one hour per inch of thickness. Caution must be taken with the torch heating method to assure uniform heating and not being concentrated in one area or section. The interpass temperature must not exceed 500°F (260°C) so accurate temperature measuring methods must be used. *(NOTE: If the welding process is interrupted before completion, a minimum temperature of 200°F (95°C) must be maintained until the part can be completed. Do not allow the part cool overnight.)*

1.0.3 **Slow Cooling.** Do not allow the roll to cool until the hardfacing of the entire pulverizing roll has been completed. Methods to assure uniform slow cooling upon the completion of the welding process to room temperature include thermal blankets, oven or other suitable material to assure slow and even cooling.

1.0.4 **Pre Weld Part Inspection.** Pulverizer rolls should be visually inspected for soundness of the base metal prior to welding. Before undertaking the repair, Liquid Dye Penetrant should be used to determine whether cracks are present and any other questionable repair areas that might pose a threat to success. Previously hardfaced surfaces should be checked for soundness by employing a ball peen hammer test. By striking the previous hardface layer in the areas that are in question, you will hear either a ringing sound that indicates a sound deposit which can be welding upon, or you will hear a dull thud indicating a dis-bonded previous hardface layer and eventual area of spalling. This area must be removed and cleaned before welding.
1.0.5 Cleaning the surface. Two methods typically used.
1. Using a Power brush
2. Using a High pressure washer.

(NOTE: welding over a previously overlayed surface may produce gassing and porosity as a result of residues trapped in the cross check patterns).

1.0.6 Rotation Speed. A positioner or other equipment to turn the part while welding should rotate to a travel speed ranging from 50 to 60 IPM. (13 to 15 cm). The rotational travel speed is based on the diameter of the pulverizing roll and will need further adjustment during the hardfacing process as the hardfacing build-up get thicker.

1.0.7 Hardfacing Consumables. 7/64 (2.8mm) or 1/8” (3.2 mm) diameter Postalloy 2834 and PS-133 are all open-arc self-shielded wires. These alloys have been proven in service and produce the small tight check crack patterns necessary for a successful rebuild on rolls requiring as much as 2” (50 mm) thickness. Postalloy 2834 can be used for the entire build-up and hardfacing. When additional wear protection is desired, a final two layers of Postalloy 2836 can be used.

1.0.8 Sizing template. A template is highly recommended to assure proper finished welded dimensions on both the rolls. It is also a great tool to identify the lower areas to build up first thus assuring a desired finish dimension and taper.
1.0.9 Torch positioning to roll surface. Position torch 1/2” to 3” (12 mm to 75 mm) off top center (depending on the diameter) aiming to center of roll. Approximately 10 – 15 degree angle. The roll is to rotate in the direction opposite the side the torch is set. Torch position off center greatly determines the profile of the bead. A flat bead achieves the best fusion to the base.

1.1.0 Welding Procedure.

1.1.1 Make sure the surface to be welded is clean of all dirt grease and debris and all loose sections of previously welded deposits have been addressed.

1.1.2 Preheat slowly to 250°F (120°C). *(Never exceed 500°F (260°C) or allow the part to drop under 200°F (95°C) during the duration of the welding process)!

1.1.3 Adjust torch angle and stick out. (Stick out is considered the distance from the end of the torch tip to the work surface).

1.1.4 Start first layer at least 1” (25mm) from the outer edge of either side of the roll. This is a precaution to address possible Bi-Axial stresses that can lead to spalling. On a previously welded roll this is typically not an issue because of the lower wear areas to be addressed first. Gradually move each layer out to the edges to achieve proper contour.

1.1.5 The rotational travel speed is based on the diameter of the pulverizing roll and will need further adjustment during the hardfacing process as the hardfacing build-up get thicker. This is important to maintain a consistent bead shape.
1.1.6 Please refer to the appropriate Postle product data sheet for recommended parameters.

1.1.7 Weld beads should be as flats possible. **Do not weave.**

1.1.8 **First hardface layer** - On the first layer, the weld bead shape should be 3/8” (8mm) wide and a 1/8” (3.2 mm) thick with only about a 10 to 20% weld bead overlap. This process initiates a desirable small tight check crack pattern that will propagate up through the following layers.

1.1.9 **Additional hardface layers** - Maintain the same weld bead shape on all subsequent layers until completion. However, more weld bead overlap is required to produce the proper check crack pattern – the overlap should be 30 to 40%. This will produce a check crack pattern of hairline fractures spaced approximately 1/4” to 5/8” (6mm to 16mm) apart running perpendicular to the weld bead direction. **CAUTION - desirable cross check patterns are dependent on Interpass temperature, cooling rates and bead shape. Excessive interpass temperature exceeding 500°F (260°C) and wide bead widths will cause the cross check pattern to grow to 1 1/4” (32 mm) or greater. This is highly undesirable and when combined with improper cooling rates can lead to spalling and premature failure).**

1.1.10 When welding over previous hardface applications of worn rolls, you will encounter a wavy uneven surface on each rotation. By setting your stickout at the highest point on the revolution. The process will compensate for the uneven surfaces usually encountered by the second or third layers. (As the stick out increases on the low areas this cools the deposit causing the bead to have increased thickness. As the stick-out decreases on the higher areas this increases the temperature causing a flatter bead).

1.1.11 Upon completion of roll it is important to cool slowly and as evenly as possible to help maintain and assure the small and tight check crack pattern that has been established using these guidelines.

Further questions may be directed to Hardface Technologies by Postle Industries.