WELD WITH COMPLETE CONFIDENCE

NIHONWELD

HARDFACING GUIDEBOOK

VOLUME III

- Iron and Steel
- Railroad
- Logging and Lumber
- Rubber
- Pulp and Paper
- Sugar Cane

MANUFACTURED under ISO 9001 : 2008 CERTIFIED MANAGEMENT SYSTEM

Industrial Welding Corporation

Leader in Welding Technology

Many hardfacing applications are common to more than one industry. For example, the pounding on a railroad frog is essentially the same as the severe impact wear experienced on some impact hammers. Wheels used in mining, manufacturing and the steel industry are subjected to similar metal-to-metal wear. When hardfacing products have been selected for an application in one industry they can be used for similar parts in other industries. ***The important point to remember is that the wear type must be identified.***

Hardfacing should be utilized by small companies as well as large. Many industries can also take advantage of the benefits of hardfacing. The recommendations for many of the parts can be applied to similar parts in all kinds of industries.

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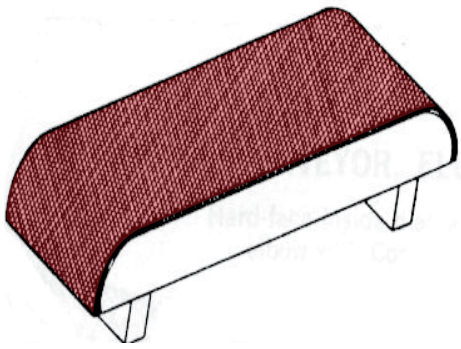
Iron and Steel

Steel mill applications involve every type of metal wear. Base metals range through manganese, high carbon, and alloy steel. Therefore, selection of procedures and hardfacing materials for these applications require a thorough understanding of the basic rules of hardfacing.

Steel mill rolls are typical of equipment to be repaired by hardfacing. Wear rolls may be caused by metal-to-metal friction plus corrosion. In many cases, a modified stainless steel deposit is recommended to prolong roll life. On the other hand, certain coke oven parts may require a deposit that will resist severe abrasion at high temperature.

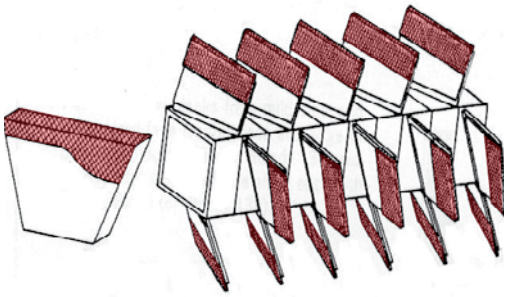
COKE OVENS AND SINTERING PLANTS

Coke Pusher Shoes



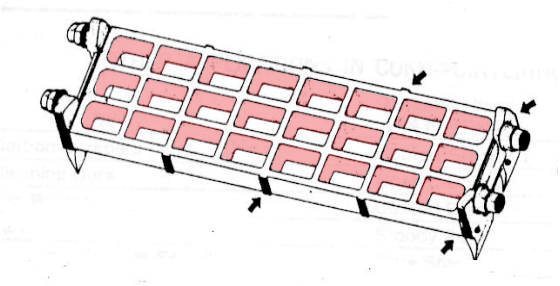
Applicable Hardfacing Electrode
Nidurit 65, Nidurit 63, Nidurit 61, NHF-716
Comments: Overlay wear area on shoes with Nidurit 65 or NHF-716. Preheat and postheat where necessary.

Pug Mill Paddles – Sintering Plant



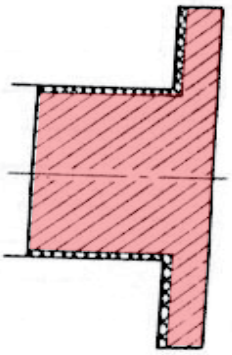
Applicable Hardfacing Electrode
Nidurit 65, Nidurit 63, Nidurit 61, NHF-716
Comments: Forge blanks from 1025 or 1040 carbon steel; overlay edges and leading face with Nidurit 65 or NHF-716 prior to installation.

Sinter Plant Pallets



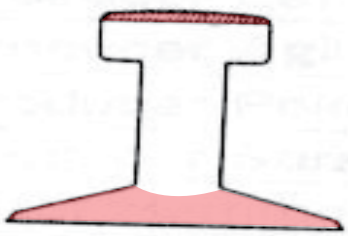
Applicable Hardfacing Electrodes
NHF-700
Comments: Three wear areas on cast iron sinter plant pallets can be effectively hardfaced with NHF-700: the striker block which absorbs the shock as the pallet drops at the end of travel; the pads or contact points on each pallet as the train moves along; the area contacted by the driving sprocket. Cast iron pallets must be preheated prior to hardfacing.

Sintering Pallet Wheels



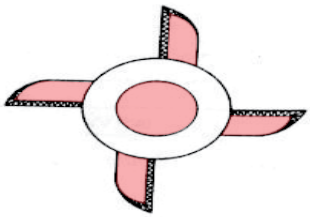
Applicable Hardfacing Electrodes
NHF-350B
Comments: Be sure worn wheels are structurally sound before welding. Use proper preheat and slow cool where necessary. Position wheel in rotating jig for downhand welding and apply NHF-350B to tread and face in circumferential or transverse beads.

Grizzly Bars



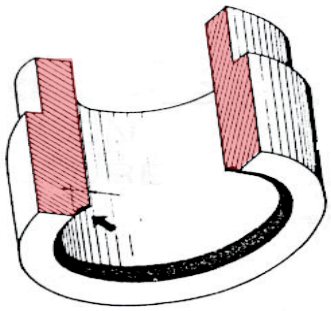
Applicable Hardfacing Electrodes
For Build-up: NHF-CrMn For Overlay: Nidurit 65
Comments: Overlay contact surface of bars with Nidurit 65.Reapply with necessary.

Finger Crushers



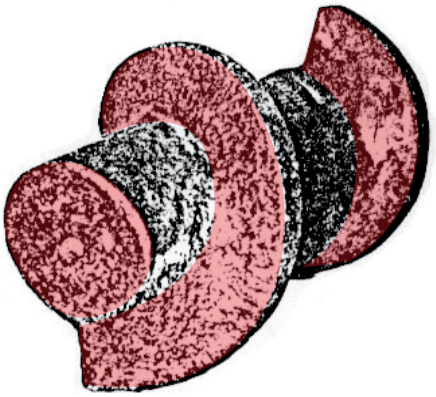
Applicable Hardfacing Electrodes
For Build-up: NHF-CrMn For Overlay: Nidurit 65
Comments: Hammer rotors or finger crushers used in conjunction with grizzlies should be hardfaced new with Nidurit 65. Reapply hardfacing as necessary.

Valve Seat, Coke Oven



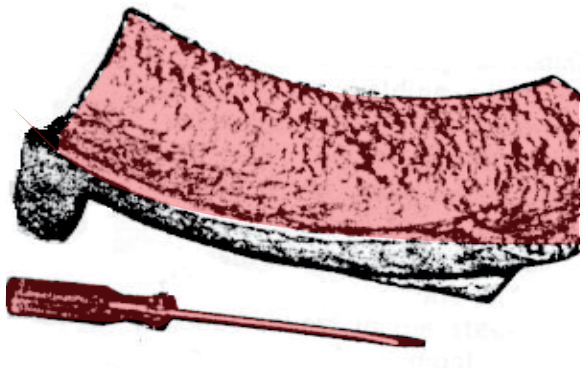
Applicable Hardfacing Electrodes
NHF-ST6R NHF-ST6
Comments: Recess valve seat with 3/16" radius as shown. Preheat to 400ºF and overbuild slightly with NHF-ST6R. Slow cool and finish grind to dimension.

Sintering Plant Augers



Applicable Hardfacing Electrodes
Niduirit 65 NHF-716, Nidurit 63
Comments: Hardface the flight faces and periphery with Nidurit 65 or NHF-716. Rehardface as necessary.

Ash Conveyor, Elbow



Applicable Hardfacing Electrodes
Nidurit 65
Comments: Hardface inside diameter of elbow with Nidurit 65.

OTHER APPLICATIONS IN COKE-SINTERING-GAS PLANTS

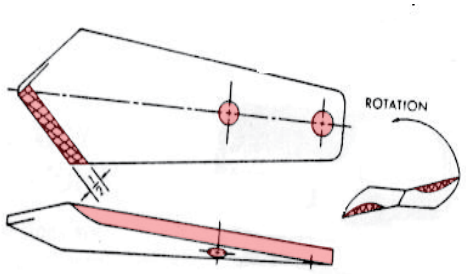
Application	Applicable Hardfacing Electrode
Carbon Scrapers	NHF-ST1
Cleaning Bars	Nidurit 65
Fan Blades	Nidurit 65
Fan Blade Spiders	NHF-600 , NHF-600B
Sintering Machine Seal Bars	NHF-ST6, NHF-ST6R
Ash Plows	Nidurit 65
Cone Crusher Segments	NHF-650B
Crusher Jaws	NHF-650B
Crusher Rolls	NHF-650B
Flapper Gates	NHF-ST6, NHF-ST6R
Gas Producer Leveling Arms	NHF-450
Gas Producer Agitator Fingers	NHF-ST1, NHF-ST1R
Gas Producer Pokers	NHF-ST1, NHF-ST1R
Gas Producer Stirrer Tips	NHF-ST1, NHF-ST1R
Pulverizer Hammers	Nidurit 65
Valves	NHF-ST6, NHF-ST6R
Quenching Car Wheels *	NHF-350B

Be sure to reheat and slow cool where necessary.

* Rebuilding cast iron wheels is not recommended.

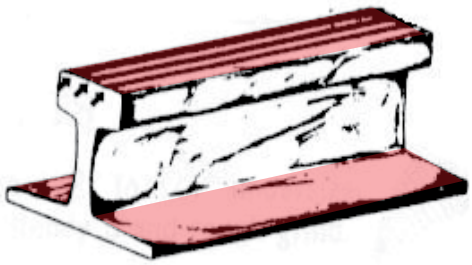
BLAST FURNACES AND AUXILIARIES FOR PIG IRON MANUFACTURE

Blast Furnace Tap Hole Drill Bits



Applicable Hardfacing Electrode
Nidurit 65 NHF-716
Comments: Forge bit blanks of 1025 steel and shape to desired size and contour. Apply NHF-716 or Nidurit 65 to cutting edges on leading face as show.

Pig Iron Casting Machine Rails



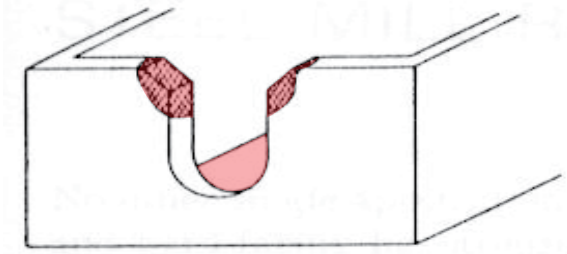
Applicable Hardfacing Electrode
NHF-600 NHF-700
Comments: Deposit stringer beads as shown in the sketch for an excellent impact and abrasion resistant surface.

OTHER COMMON BLAST FURNACE APPLICATIONS

Application	Applicable Hardfacing Electrode
Skip Car Body	NHF-650B
Skip Car Wheels	NHF-350B
Skip Car Loading Hopper	NHF-650B
Skip Hoist Cable Sheaves	NHF-350B
Slag Ladle Car Wheels	NHF-350B
Hot Metal Car Wheels	NHF-350B
Downcomer	Nidurit 65
Mud Gun Screws	Nidurit 65
Ore Chutes, Bolts and Rivets	Nidurit 65

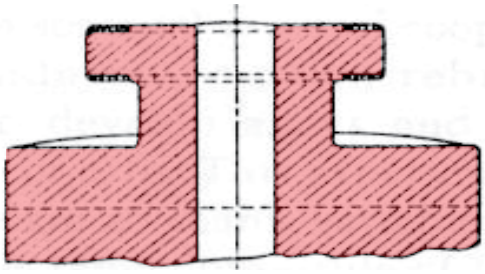
STEEL MAKING FURNACES

Charging Box – Open Hearth



BASE METAL: CARBON STEEL	
For Build-Up	For Hardfacing
NHF-350B NHF-300	NHF-700
BASE METAL: MANGANESE STEEL	
For Build-Up	For Hardfacing
NHF-NiMn	NHF-700
Comments: Use NHF-350B to build-up the worn ends of carbon steel boxes close to size as shown in the sketch. Use NHF-NiMn for manganese steel boxes. Hardface with NHF-700 to resist the metal-to-metal service wear.	

Open Hearth Peel Heads



BASE METAL: CARBON STEEL	
For Build-Up	For Hardfacing
NHF-350B NHF-300	NHF-700
BASE METAL: MANGANESE STEEL	
For Build-Up	For Hardfacing
NHF-NiMn	NHF-700
Comments: Use NHF-350B to build carbon steel peel heads close to size. Use NHF-NiMn for manganese steel parts. Hardface with NHF-700 to resist the metal-to-metal service wear.	

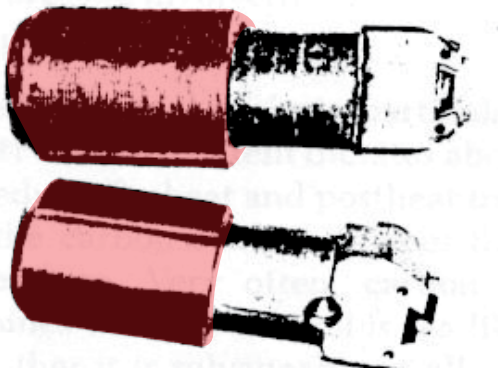
OTHER APPLICATIONS IN STEEL MAKING FURNACES

Application	Applicable Hardfacing Electrode
Ladle Trunnions	NHF-350B
Charging Machine Rails	* NHF-350B or NHF-NiMn
Furnace Scraper	Nidurit 65
Dry Pan Plows	Nidurit 65
Tap Hole Peels	Nidurit 65

* Depending on base metal.

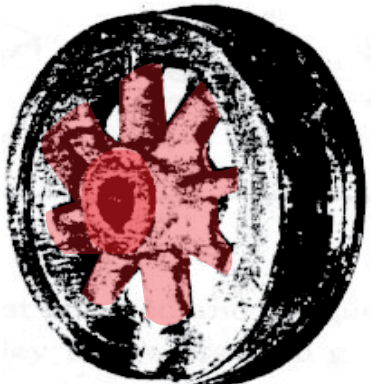
SOAKING PITS

Ingot Buggy Dump Pistons



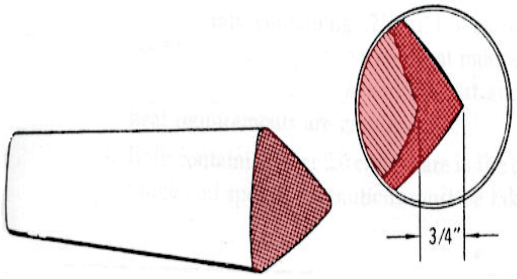
Applicable Electrodes
NHF-350B
Comments: Buggy dump pistons are reconditioned by using NHF-350B. Be sure to preheat and slow cool.

Ingot Buggy Wheels and Track



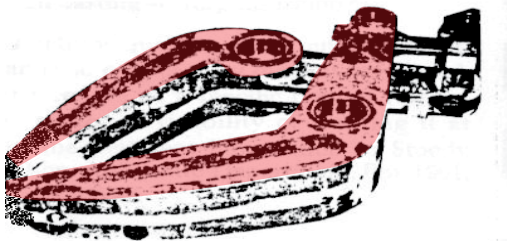
Applicable Electrodes
NHF-350B
Comments: Use NHF-350B to rebuild Ingot buggy wheels and track. Be sure to preheat and slow cool where necessary. Finish grind or machine.

Crane Tong Bits



Applicable Electrodes
N-NiCrMo-5
Comments: Hardface bit when worn 1/2" to 3/4" undersize. Overbuild slightly with Stoody C and rough grind.

Stripper Crane Bearings



Applicable Electrodes
NHF-ST6, NHF-ST6R
Comments: Bearings centrifugally cast of NHF-ST6 or NHF-ST6R have outperformed all other alloys on stripper cranes.

STEEL MILL ROLL REBUILDING

Rebuilding of steel mill rolls of all types affords the steel companies tremendous opportunities to make substantial savings in rolling mill costs. Many rolls which would normally be scrapped after only ten (10) percent or less of the original material in them has been lost due to wear can be reclaimed by replacing worn sections with suitable welded deposits. The type of weld deposit required and the procedure necessary to obtain the required wear resistance depend upon a number of factors.
These are:

1. Service to which roll will be subjected:

A. Rolls on primary mills such as blooming and slabbing mills or continuous casters where rolls are subjected to thermal shock.

B. Roughing mills where slabs or blooms are reduced to billets, plates, strip, etch

C. Finishing mills where further reduction of the final product takes place.

D. Leveler and straightener rolls where final products such as bars, pipe, sheet, etc.,are straightened.

E. Table Rolls-These are really conveyor rolls over which the material is moved from one section of the mill to another.

2. Analysis of the base metal of the roll being considered for reclamation:

A. AISI-SAE 1030 and 1040 steel mill rolls and the low carbon alloy steels require a moderate preheat of 250°-400°F (120°-200°C) at the start of welding

B. Some steel mill rolls are medium carbon alloy steels and require a thorough preheat. The preheat temperature varies with the base metal but a normal range is 500°F-750°F (260°-400°C).

C. Other steel mill rolls, for example finishing rolls, are made of high carbon alloy steels with complex metallurgical structures. Restoring dimensions by welding is generally not recommended, because fracture of the roll body is likely.

In any case, it is important to obtain the proper preheat temperature from a Preheat Calculator and to maintain the preheat during welding and follow proper post heat treatments for successful results.

3. Physical condition of roll:

A. How much weld deposit will be required?

B. Size, diameter and length of roll?

C. Cast or forged – are they sound?

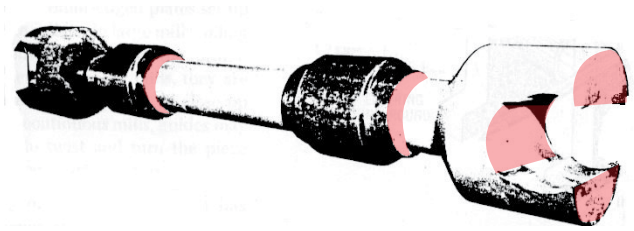
D. Surface condition – cracked? How much work will be required to obtain crack free surface?

The following rolling equipment offer substantial savings when rebuilt by arc welding:

I. The Roll Body
II. The Roll Necks (Bearing Seats)
III. Wobblers
IV. Coupling Boxes
V. Main Drive Spindles

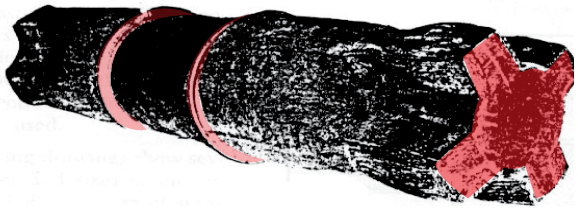
ROLLING MILL ACCESSORIES

Spindle, Universal Main Drive



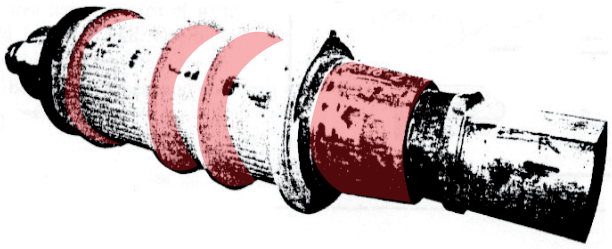
Applicable Electrodes
NHF-350B NHF-400B
Comments: Rebuild motor and mill ends of drive spindle slightly undersize with NHF-350B. Overlay with three layers of NHF-400B and grind to size. Be sure to preheat and slow cool.

Wobblers, Roll and Spindle



Applicable Electrodes
NHF-350B NHF-400B
Comments: Rebuild wobblers slightly undersize with NHF-350B electrodes. Overlay with three layers of NHF-400B and rough grind to template size. Be sure to preheat and slow cool.

Work Roll, Drive End

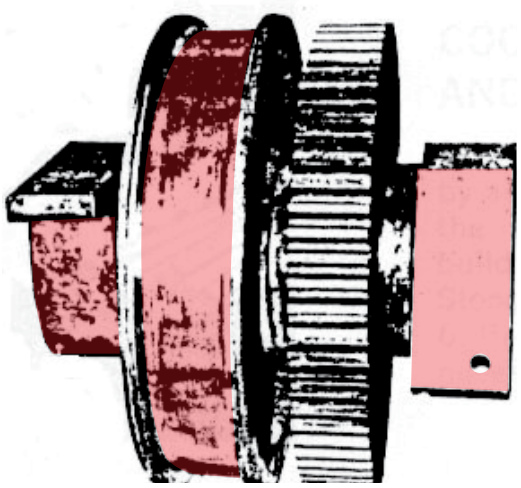


Applicable Electrodes
NHF-350B NHF-400B
Comments: Rebuild spade or drive ends of work rolls slightly undersize with NHF-350B electrodes. Overlay with three layers of NHF-400B and grind to template size. Be sure to preheat and slow cool.

Coupling Boxes

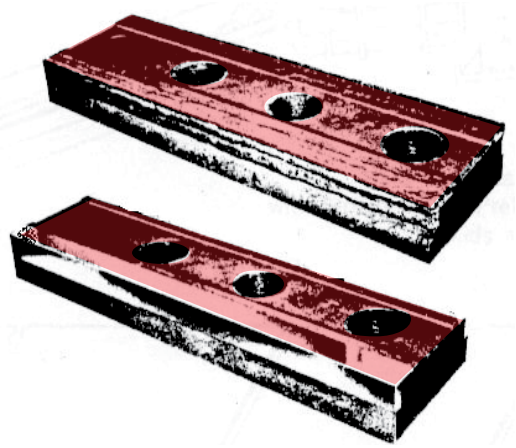
Applicable Electrodes
NHF-350B NHF-400B
Comments: Rebuild carbon steel coupling boxes slightly undersize with NHF-350B electrodes. Overlay with three layers of NHF-400B and grind to template size. Be sure to preheat and slow cool.

Crane Wheels



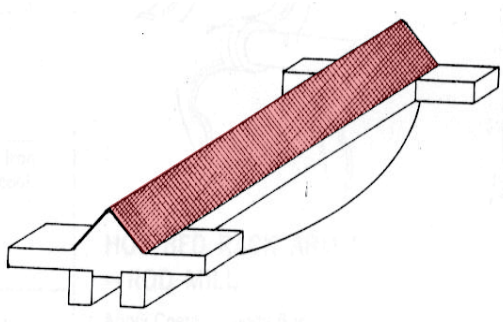
Applicable Electrodes
NHF-350B NHF-400B
Comments: Use NHF-350B to restore wheel within 1/4" of finished size. Overlay with three layers of NHF-400B and finish machine or grind. Be sure to restore flange to original size with these same alloys.

Hot Shear Blades



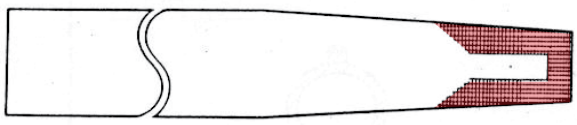
Applicable Electrodes
NHF-Thermashear
Comments: Undercut blank of 1050 steel 18" about 1-1/4" back from each cutting edge on top and side surfaces. Preheat up to 400ºF and overlay undercut area with two layers of NHF-Thermashear. Machine to size and grind to produce sharp cutting edge.

Blooming Mill Manipulator Rest Bar



Applicable Electrodes
NHF-400B
Comments: Rebuild with NHF- 400B and finish grind. Preheat and postheat where necessary.

Forge Shop Double Edge Blade

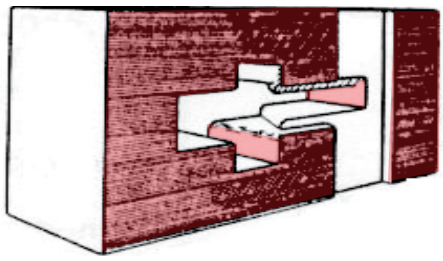


Applicable Electrodes
N-NiCrMo-5
Comments: Undercut blank of 1045 steel as shown. Overbuild slightly with N-NiCrMo-5 and finish grind.

Blooming Mill Manipulator Tilt Fingers

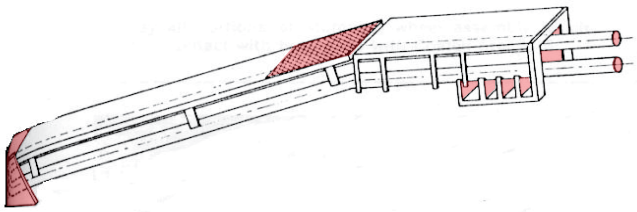
Applicable Electrodes
NHF-ST6, NHF-ST6R
Comments: Overlay contact area on finger with waffle patter of Coated Stoody 6.

Wear Pads-Stock Heating Furnace



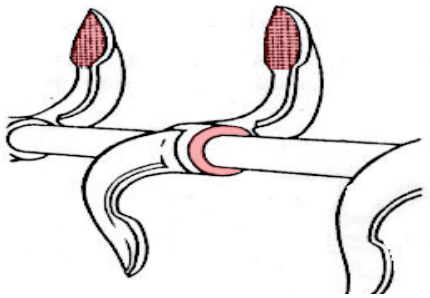
Applicable Electrodes
For build-up - NHF-CrMn For overlay - NHF-700
Comments: Some back wall wear pads from stock heating furnaces are made of cast iron. Preheat thoroughly and maintain temperature while overlaying with NHF-700. Slow cool. Use a buffer pass of NHF-CrMn stainless on badly worn parts.

Wet Skids, Charging Furnace



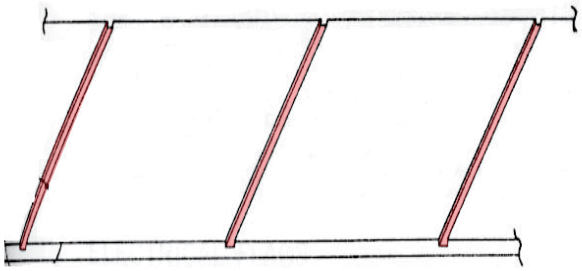
Applicable Electrodes
NHF-700
Comments: Hardface wear pad on skid with NHF-700. Preheat cast iron skids and slow cool.

Hot Bed Rack Arm Pads – Rod Mill



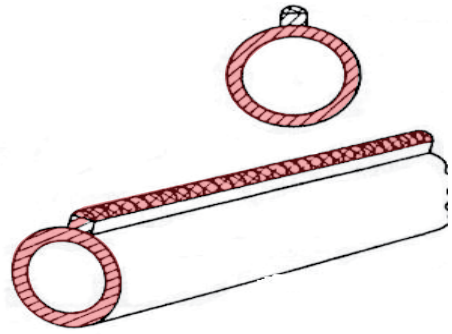
Applicable Electrodes
NHF-ST6, NHF-ST6R
Comments: Apply NHF-ST6 in waffle pattern to pads as shown. Use proper preheat and postheat where required

Kicker Channel, Shear Table



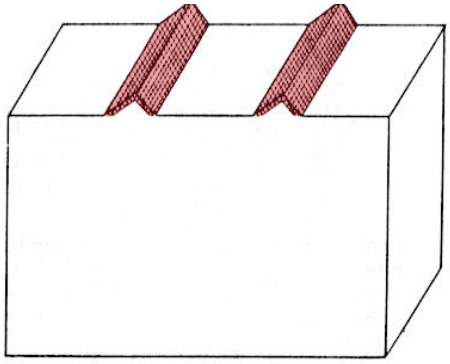
Applicable Electrodes
NHF-700
Comments: Rebuild worn channel with NHF-700 and finish grind. Preheat cast iron

Skid Rails, Reheat Furnace



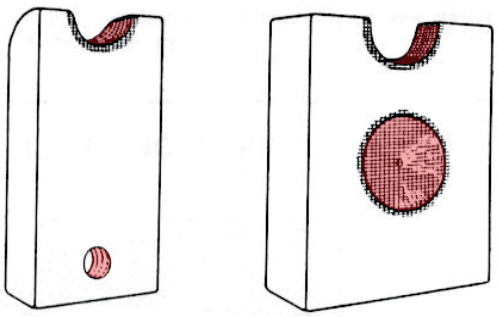
Applicable Electrodes
NHF-ST6, NHF-ST6R
Comments: Tack-weld bar stock of 1040 steel to skid rail with mild steel electrodes and overlay bar stock with a bead of NHF-ST6.

Axle Mill Jaw Grips



Applicable Electrodes
NHF-ST6, NHF-ST6R
Comments: Overbuild worn nipples slightly with NHF-ST6 or NHF-ST6R and grind to desired shape and size.

Ball Mill Shear Blades



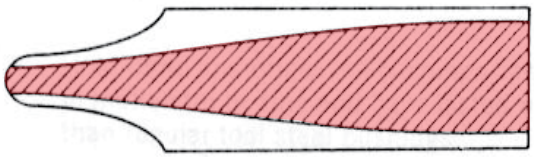
Applicable Electrodes
NHF-ST6, NHF-ST6R
Comments: Rebuild worn areas on blade with NHF-ST6 or NHF-ST6R and finish grind.

PIPE AND TUBE MILLS

Application	Applicable Hardfacing Electrode
Rotary Cut-Off Pressure Roll	Nidurit 65
Dancer Roll	NHF-ST6, NHF-ST6R
Descaler Guide Points	NHF-ST6, NHF-ST6R
Saw Carriage Pins	NHF-ST6, NHF-ST6R
Skid Bars	NHF-ST6, NHF-ST6R
B & D Valve Stems	NHF-ST6, NHF-ST6R
B & D Valve Seats	NHF-ST6, NHF-ST6R
Gib Crane Hooks	NHF-ST6, NHF-ST6R
Socket Shop Wear Plates	NHF-ST6, NHF-ST6R
Mandrels	NHF-ST6, NHF-ST6R
Crane Brake Drums	NHF-350B
Magnetic Roll	NHF-350B
Inside Cutter Holder	NHF-ST6, NHF-ST6R
Mug Rods	NHF-ST1, NHF-ST1R

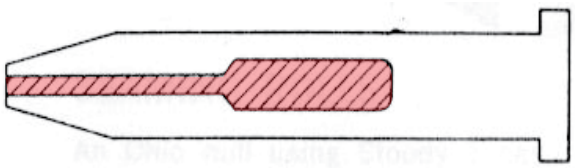
Check base metal analysis and use proper preheat and postheat requirements. Apply recommended alloys to wear areas and grind or machine deposits where necessary.

Piercer Guide Shoes – Pipe Mill



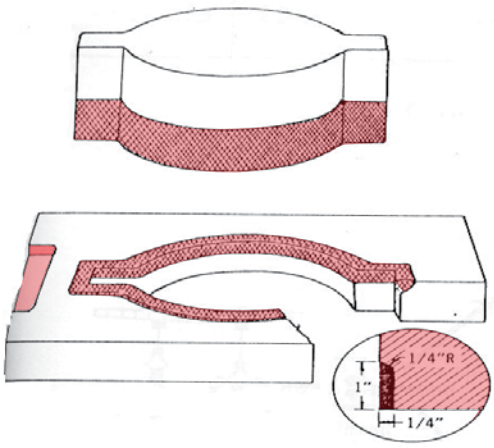
Applicable Electrodes
NHF-450
Comments: Overbuild slightly with NHF-450 and finish grind. Preheat and slow cool where necessary.

Upsetter Dies – Pipe Mill



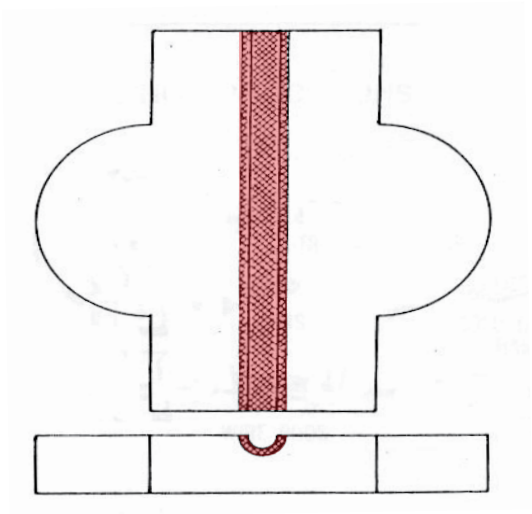
Applicable Electrodes
NHF-ST 6R
Comments: Overbuild slightly with NHF-ST 6R and finish grind. Preheat and slow cool where necessary.

Hot Trimming Dies



Applicable Electrodes
NHF-ST6, NHF-ST6R
Comments: Undercut area to be hardfaced 1/4". Overbuild slightly with NHF-ST6R or NHF-ST6 and finish grind. Preheat and postheat where necessary.

Straightening and Shear Die

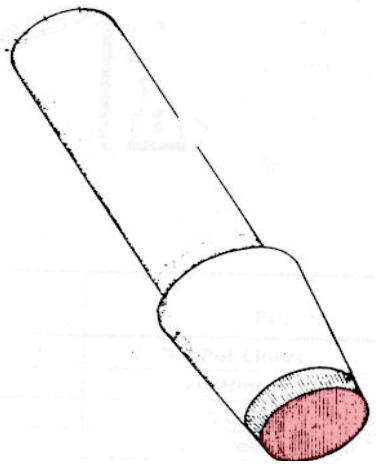


Applicable Electrodes
NHF-ST1, NHF-ST1R
Comments: Rebuild groove in the die as shown with NHF-ST1 or NHF-ST1R and grind to fine finish. Use proper preheat and postheat where necessary.

Piercing Punch, Hot Nut

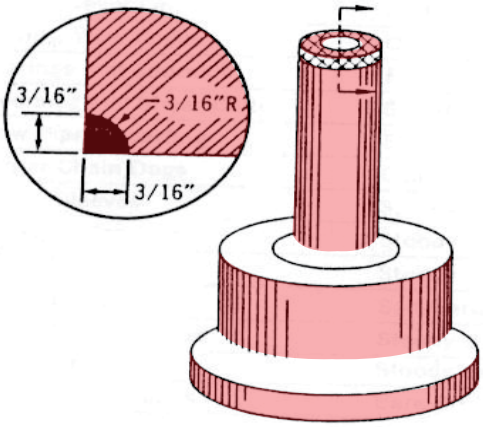
Applicable Electrodes
NHF-ST6, NHF-ST6R
Comments: Rebuild worn areas on punch with NHF-ST6 or NHF-ST6R, applied with oxy-acetylene process, and grind to fine finish.

Nail Head Die



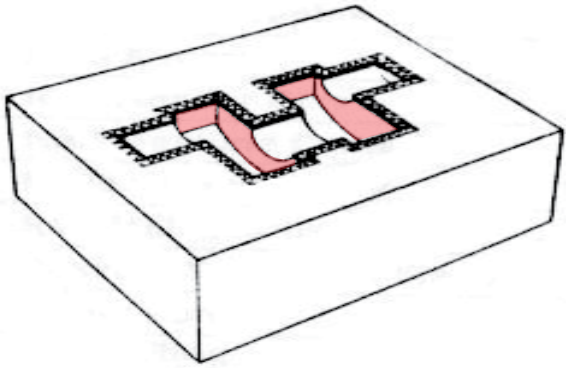
Applicable Electrodes
NHF-ST6, NHF-ST6R
Comments: Grind die 1/4" undersize on length and preheat to 800ºF. Overbuild slightly with NHF-ST6 or NHF-ST6R by oxy-acetylene process. Reheat to 1000ºF and cool in still air. Finish grind to size.

Hot Piercing Punch – Wheel Mill



Applicable Electrodes
NHF-ST6R
Comments: Service life of wheel mill piercing punches up to 6-14/" diameter and smaller sizes of hot blank punches can be increased up to 12 times by hardfacing with Stoody 6. Normal procedure used by many mills is to undercut punch surface on 3/16" radius, preheat to 400ºF, hardface with oxy-acetylene NHF-ST6R and finish grind.

Forging Die Blocks



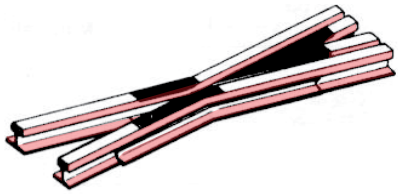
Applicable Electrodes
NHF-350B NHF-ST6
Comments: Rebuild worn blocks to within two layers of finished size with NHF-350B and overlay with NHF-ST6. Finish grind. Be sure to preheat and slow cool where necessary.

OTHER METAL PROCESSING APPLICATIONS

Application	Applicable Hardfacing Electrode
Air Rammer Tip	NHF-ST1, NHF-ST1R
Arbor, Sizing	NHF-ST6, NHF-ST6R
Ash Conveyor Link	NHF-450
Barrels, Wire Coiler	NHF-ST1, NHF-ST1R
Bearings and Journals	NHF-ST6, NHF-ST6R
Blooming Mill Shear Clutch	NHF-600
Blow Pipes, Scarfing	NHF-ST1, NHF-ST1R
Carrier Chain Dogs	NHF-450
Carrier Sleeves	NHF-450
Conveyor Bearings	NHF-450
Conveyor Gudgeons	NHF-450
Crane Brake Drums	NHF-600
Crane Contact Shoes	NHF-450
Craneways	NHF-300, NHF-300B
Cylinder Draw Rings	NHF-ST6, NHF-ST6R
Dies, Cold Header	NHF-450
Dies, Hot Header	NHF-ST6, NHF-ST6R
Dies, Hot Work	N-NiCrMo-5
Die Pot Liners	N-NiCrMo-5
Grips, Spike Machine	NHF-ST6, NHF-ST6R
Heat Treating Lead Pots	NHF-ST1, NHF-ST1R
Mandrel, Swaging	NHF-ST6, NHF-ST6R
Mud Augers	NHF-45
Nail Header Dies	NHF-ST6, NHF-ST6R
Nail Machine Cams	NHF-ST6, NHF-ST6R
Plates, Shear Entry	NHF-ST6, NHF-ST6R
Rail Mill Guides	NHF-450
Shaving Tools, Hot Flash	NHF-ST12, NHF-ST12R
Sizing Punch	N-NiCrMo-5
Sizing Ring	N-NiCrMo-5
Straighteners, Tie	NHF-ST6, NHF-ST6R
Trimmer Die, Forging	N-NiCrMo-5
Trip Dog, Punch Press	NHF-ST12, NHF-ST12R
Twist Guides	NHF-450

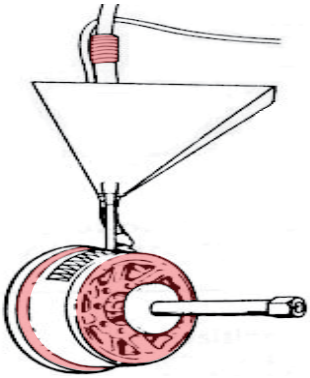
RAILROAD

Frogs, Switches, Rail Ends, Cross-Overs



Applicable Hardfacing Electrodes	
Manganese Steel	Carbon Steel
1. Grind off all work-hardened and fatigued base metal. 2. Overbuild slightly with NHF-NiMn or NHF-7200. Weave beads approximately 3/4" (19mm) wide. Skip weld to prevent build-up of interpass temperature. Do not allow interpass temperature to exceed 500°F (260°C). Peen each bead. 3. Finish grind.	1. Grind off work-hardened and fatigued base metal. 2. Preheat to 800°F (425°C). 3. Apply NHF-350B or NHF-300 in weave beads. Overbuild to allow for finish grinding. 4. Postheat 1000°F (600°C) and cover with a fiberglass blanket.

Wheels, Crew Car



Applicable Hardfacing Electrodes
NHF-300/NHF-300B
Comments: When welding manually, position wheel in rotating jig for donwhand welding and apply beads circumferentially to tread and flange. Preheat and postheat where required.

Locomotive Diesel Valves

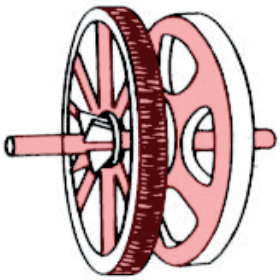
Applicable Hardfacing Electrodes
NHF-ST 6R
Undercut valve face 1/16". Deposit NHF-ST6R with oxy-acetylene torch to undercut area; overbuild slightly to allow sufficient stock for finish grinding or machining.

Other Common Railroad Applications:

Parts (Applications)	Applicable Electrodes
Ballast Cleaning Rotors	NHF-600/NHF-600B
Brake Shoe Hangers	NHF-7200
Car Retarder Beams	NHF-450
Cinder Screw Conveyors	NHF-600/NHF-600B
Coal Screw Conveyors	NHF-600/NHF-600B
Rocker Arms	NHF-ST 1R
Locomotive Throttle Guildes	NHF-ST 1R
Spreader Car Cutting Shoes	Nidurit 61

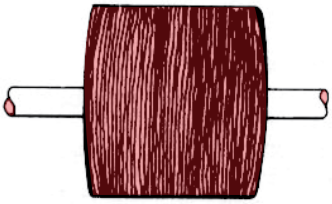
LOGGING AND LUMBER

Logging Arch Wheels



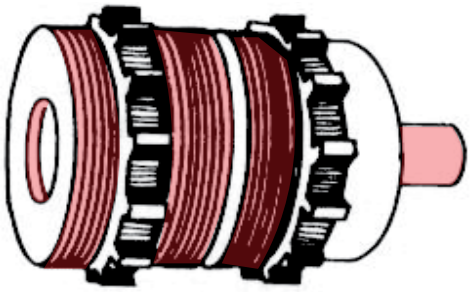
Applicable Hardfacing Electrodes
For Build-Up : NHF-300, NHF-350B For Hardfacing : NHF-700
Comments: Rebuild close to final size and hardface using the recommended electrodes listed above. As with hardfacing any wheel, use the proper preheat and interpass temperature.

Bark Conveyor Trunnions



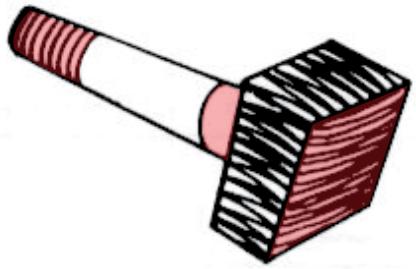
Applicable Hardfacing Electrodes
For Build-Up : NHF-300, NHF-350B For Hardfacing : NHF-700
Comments: Position trunnion in rotating jig and overbuild with the recommended hardfacing electrodes listed above.

Drive Sprockets and Drums



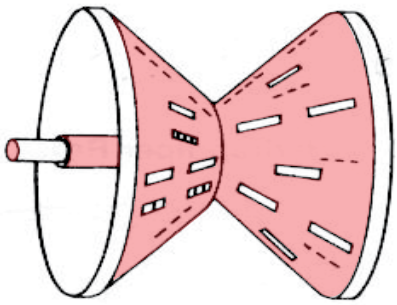
Applicable Hardfacing Electrodes
For Build-Up : NHF-300, NHF-350B For Hardfacing : NHF-700
Comments: Provide metal-to-metal wear resistant surface on worn sprocket teeth using NHF-700.

Hog Teeth



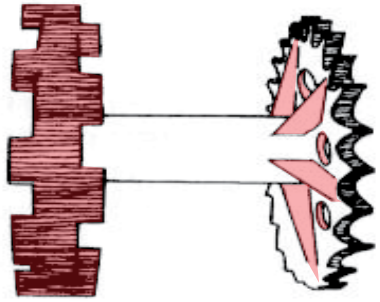
Applicable Hardfacing Electrodes
For Hardfacing : Nidurit 63, Nidurit 65, Nidurit 61
Comments: Provide the needed severe abrasion resistant deposit by hardfacing with Nidurit 63.

Hog Rotor



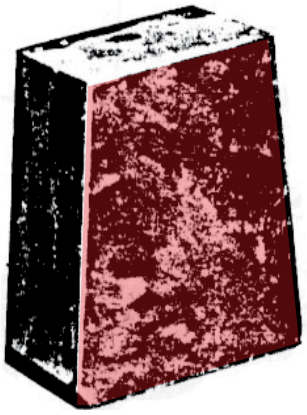
Applicable Hardfacing Electrodes
For Build-Up : NHF-300, NHF-350B For Hardfacing : NHF-716, Nidurit 61
Comments: Rebuild the worn area around the knife slots using NHF-350B. Overlay the entire wear area using Nidurit 61. Take all necessary precautions to minimize distortion of the rotors.

Chain Drive Tumblers



Applicable Hardfacing Electrodes
For Hardfacing : NHF-700
Comments: Overlay the tumbler drive blocks with two layers of metal-to-metal wear resistant deposits from NHF-700 electrode.

Hog Anvils



Applicable Hardfacing Electrodes
Nidurit 61
Comments: Overlay entire anvil with Nidurit 61 and finish grind. Remove from service as soon as practical after hardfacing has worn away and re-apply Nidurit 61.

Debarking Hammers

Applicable Hardfacing Electrodes
NHF-700
Comments: Deposit NHF-700 on hammer heels (area of high impact). Re-hardface as necessary.

Debarker Chain Links

Applicable Hardfacing Electrodes
NHF-7200
Comments: Restore nipples on manganese links with NHF-7200.

Geared Idler – Log Escalators

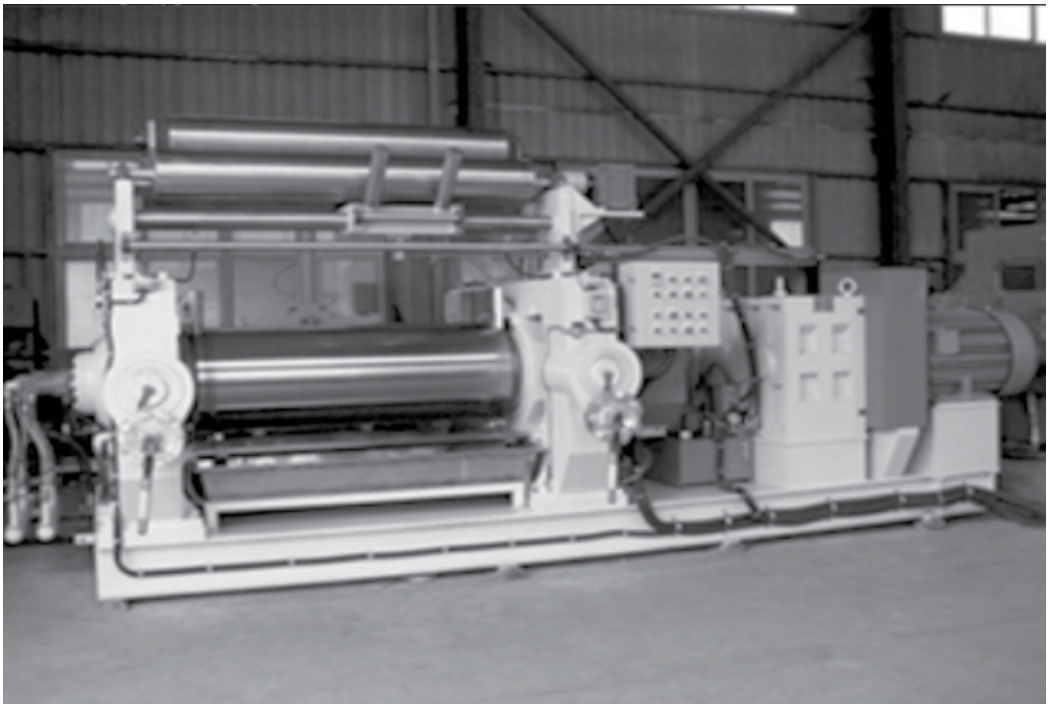
Applicable Hardfacing Electrodes
NHF-400/NHF-500
Comments: Deposit NHF-400/NHF-500 in transverse beads, restoring gear teeth to template size. Grind high spots. Preheat and slow cool where necessary.

Other Common Logging and Lumber Applications:

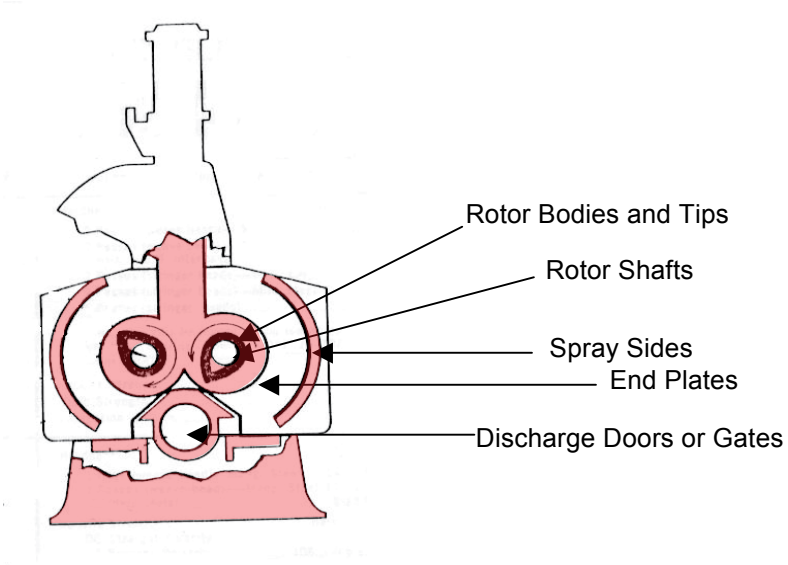
Parts (Applications)	Applicable Electrodes
Chipper Chutes	Nidurit 61
Chipper Discs	Nidurit 61
Chipping Machine Bed Plates	Nidurit 61
Clutch Fingers	NHF-St6R
Clutch Jaws	NHF-7200

RUBBER INDUSTRY

RUBBER MIXING MACHINES

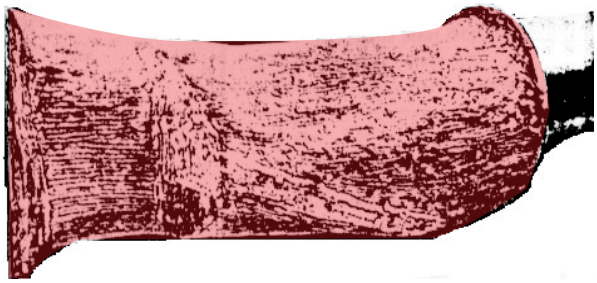


Mixing Machines



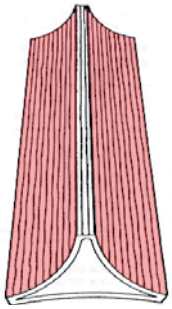
Four (4) major components of a rubber mixing machine which are hardfaced to increase efficiency and reduce maintenance costs.

Rotor Bodies and Tips



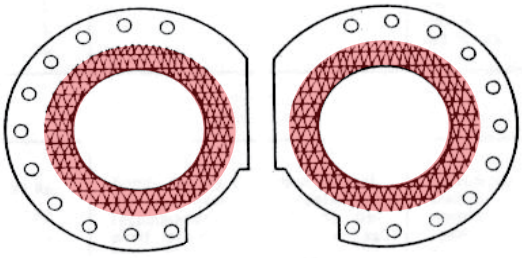
Applicable Hardfacing Electrodes
NHF-ST1FC
Comments: Overlay entire rotor body and tips with NHF-ST1FC. Rebuild to template size and rough grind. Preheat and slow cool if necessary. Remove from service as soon as possible after original hard metal has worn away and re-hardface.

Discharge Doors or Gates



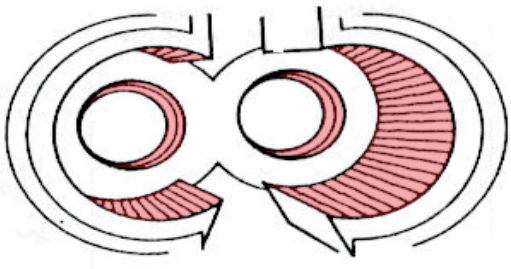
Applicable Hardfacing Electrodes
Nidurit 63, Nidurit 65
Comments: Hardface worn areas using two layers of hardfacing. Grind deposit to assure sound seat when door is in closed position. Preheat and slow cool if necessary. Remove from service as soon as possible after original hard metal has worn away and re-hardface.

End Plates



Applicable Hardfacing Electrodes
Nidurit 63, Nidurit 61, NHF-6700, NHF-716, Nidurit 65
Comments: Cover the areas indicated in the sketch with two layers of hardfacing. Remove from service and reweld as soon as possible after wearing through the hard metal.

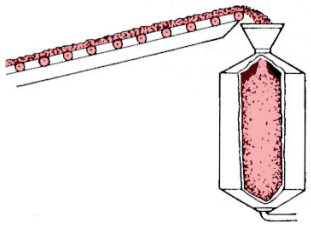
Spray Sides



Applicable Hardfacing Electrodes
NHF-ST1FC
Comments: Overlay complete side with two layers of NHF-ST1FC. Preheat and slow cool if necessary. Re-hardface as soon as possible after original hard metal has worn away.

PULP AND PAPER

Paper Pulp Digester Cladding

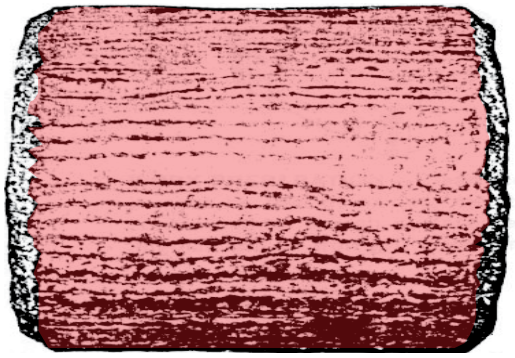


Equipment to be Cladded	Cladding Materials
Inside walls of Paper Pulp Digester	NSS-316L NSS-309L NSS-310
Comments: The deposits made with the above electrodes are of the austenic chrome-nickel type. Preheating, except to prevent underbead cracking in the base metal, is generally not recommended.	

Hydrapulper Rotors

Applicable Hardfacing Electrodes	
For Build-Up	NSS-309L
For Hardfacing	Nidurit 63, Nidurit 65
Comments: Rebuild both inner and outer segments using NSS-309L stainless steel electrode. Finish with two layers of Nidurit 63 or one layer of Nidurit 65.	

Cutter Blocks



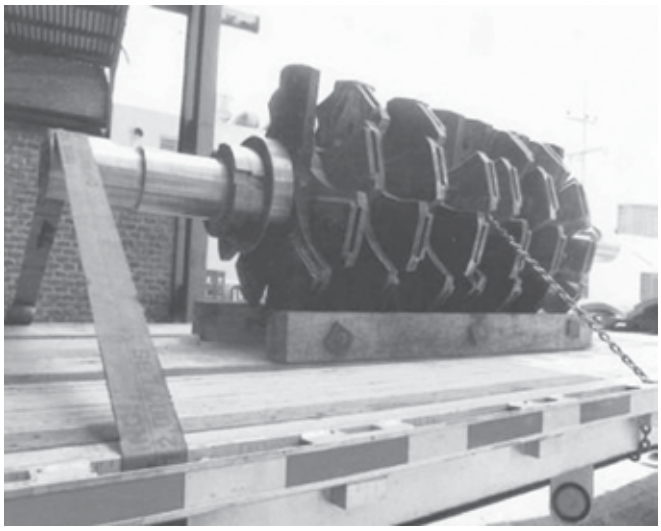
Applicable Hardfacing Electrodes
NSS-308, NHF-ST1FC
Comments: Rebuild wet board cutter blocks to within 3/16” of finished size with NSS-308 stainless electrodes and overlay with two layers of NHF-ST1FC. Finish grind.

Other Common Pulp and Paper Applications:

Parts (Applications)	Applicable Electrodes
Barker Thrust Rolls	NHF-ST1R
Blow Valve, Pulp Digester	NHF-ST6R
Centrifugal Pump Casings	NHF-650B
Centrifugal Pump Impellers	NHF-650B
Chute Liners	Nidurit 61
Paper Breaker Roll	Nidurit 61
Scraper Bars, Pulp Lap	NHF-ST6R
Shredder Knives	Nidurit 63, Nidurit 61, Nidurit 65

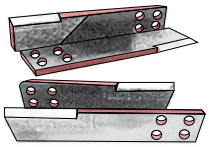
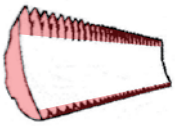
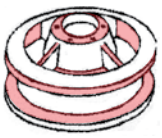
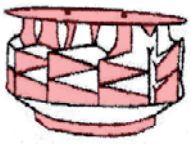
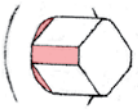
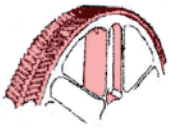
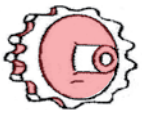
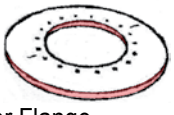
SUGAR CANE INDUSTRY

SHREDDER HAMMER

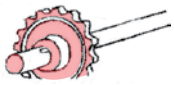
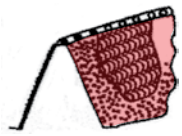
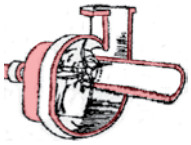
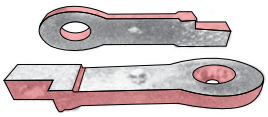


CANE KNIVES

Common Sugar Industry Applications:

PARTS(APPLICATIONS)	RECOMMENDED PRODUCT/S	PARTS(APPLICATION)	RECOMMENDED PRODUCT/S
 Cutting Knives	SUGARCUT	Impeller 	N-CuSn-C (AC/DC)
 Thrash Plates, Scrapper Plates	Nidurit 63	 Over head crane wheel	NHF-350B/ NHF-400B
 Mill frames, Crusher roller shafts	N-9018M + NSS-312	 ID Fan	Nidurit 65/ NHF-45
 Square End	NHF-350B/ NHF-400B	 Alloy Steel Gears	N-9018M + NSS-307
 Mill Pinion	NHF-350B/ NHF-400B	 Screw conveyor	Nidurit 63
 Mill Coupling	N-9018M	 Mill Sprocket	NSS-307
 Alloy Steel Pinion	N-9018M + NSS-307	 Top roller Flange	Nidurit 63

Common Sugar Industry Applications:

PARTS(APPLICATIONS)	RECOMMENDED PRODUCT/S	PARTS(APPLICATION)	RECOMMENDED PRODUCT/S
 Mill Bearings	N-CuSn-C (AC/DC)	 Magma rotter	N-CuSn-C (AC/DC)
 Cane Carrier Sprocket	NSS-307	 Gripping points on mill roller teeth	Azucal 80
 Building up of broken tooth of mill roller shell	NC-100/ NC-115	 Repairs of pump body	NC-25 + NC-100
 Shredder Hammer	NHF-CrMn+ HAMMERHARD		

COVERED ARC WELDING ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) FOR HARDSURFACING

Type of Coating	Brand Name	Equivalent Specifications AWS (JIS)	Type of Current	Typical All Weld Deposit Analysis (%)						Typical Hardness of all weld metal HRC (Hv)	Applications
				C	Si	Mn	Cr	Mo	Others		
LOW HYDROGEN TYPE	NHF-300	(DF2A-300B)	AC DC(+)	0.08	0.48	0.80	2.16	0.84	-	23-27 (255-280)	For light intermetaliic abrasion. Hardfacing of gears, shafts, wheels and rollers.
	NHF-450	(DF2A-450B)	AC DC(+)	0.23	1.15	0.60	2.52	0.53	V 0.38	45-49 (450-500)	For intermetallic abrasion. Hardfacing rails, cast steel rollers and parts of bulldozer.
	NHF-500	(DF2A-500B)	AC DC(+)	0.33	1.34	1.17	-	1.20	V 0.34	38-46 (370-460)	For hardsurfacing of idlers and truck links of bulldozers.
	NHF-600	(DF2B-600B)	AC DC(+)	0.76	0.87	0.40	7.45	0.52	V 0.57	54-57 (580-630)	Hardfacing of bulldozer blades, tractor parts, scraper blades, shovel, bucket lips and dipper teeth.
	NHF-700	(DF3C-600B)	AC DC(+)	0.66	1.26	0.81	5.53	0.51	-	55-61 (600-720)	For scratching abrasion, hardfacing of mixers, cutter knives and dredgers.
HIGH TITANIA TYPE	NHF-350B	(DFA-350R)	AC DC(+)	0.11	0.26	0.84	1.88	0.51	-	30-35 (300-350)	For hardfacing and rebuilding of tractor idler wheels, upper rollers and sprockets.
	NHF-400B	(DFA-400R)	AC DC(+)	0.17	0.38	0.56	2.90	-	-	43-46 (420-460)	Hardfacing of idlers, rollers, bulldozers, blades, sprockets and caterpillar links.
	NHF-600B	(DFA-600R)	AC DC(+)	0.65	0.52	0.43	8.78	5.03	-	54-58 (580-560)	Hardfacing of bulldozers, blades, bucket edges, dipper teeth.
	NHF-650B	(DFA-650R)	AC DC(+)	0.70	0.88	1.10	4.30	-	-	56-60 (610-690)	Hardfacing of augers, grousers, agricultural equipments, earth moving equipments, mixing paddles
SPECIAL COATING CHROMIUM CARBIDE ELECTRODE	NHF-45		AC DC(+)	6	-	-	22	6	Nb 6.0 W 2.0 V 1.0	63-65 (780-830)	Hardfacing of parts subject to intense abrasion with moderate impact up to 600 °C such as ore disintegration toothed rolls, blast furnace charging systems.
	NIDURIT 61	E FeCr-Al DIN 8555 E10-UM-60-GRZ	AC DC(+)	3.50	1.00	0.14	35.00	-	Fe Bal.	58-61 (660-720)	Hardfacing electrodes to resist strong grinding abrasion combined with medium impact such as conveyor screws, scraper blades, etc.
	NIDURIT 65	E FeCr-Al DIN 8555 E10-UM-60-GRZ	AC DC(+)	4.50	1.00	0.21	23.50	6.50	Nb 5.5 W 2.2 V 1.5	64-67 (800-900)	For hardfacing on working parts in the cement and brick industry as well as in steel mills and sintering plants.
	NHF-716	-	AC DC(+)	2.65	1.50	0.14	24.0	2.00	Ni 0.80 V 0.50 W 0.17	55-60 (630-760)	For hardfacing of parts subjected to severe abrasion but moderate impact such as sand slider, conveyor screws, mixing paddles, etc.
	NIDURIT 63	E FeCr-Al DIN 8555 E10-UM-60G	AC DC(+)	3.5	-	-	35.0	-	Fe Bal.	60-62 (750-790)	For hardfacing of parts subject to mineral friction wear combined with light impact such as mixer wings, conveyor screws, scraper blades, digging teeth.
SPECIAL COATING AUSTENITIC MANGANESE STEEL	NHF-NiMn	E FeMn-A	AC DC(+)	0.54	0.18	13.70	0.53	0.53	Ni 3.80	As welded 91-95 HRB (200-220) work hardened 45-51 (450-530)	Work hardening properties. For hardfacing and underlaying of manganese steels, casting or carbon steel such as crusher jaws, bucket manganese teeth, etc.
	NHF-CrMn	-	AC DC(+)	0.13	0.47	5.40	19.5	-	Ni 9.70	As welded 90-95 HRB (200-220) work hardened 31-33 (310-330)	Work hardening properties. For buffer layer final overlay of earth moving equipment. Suitable for buffer layering difficult repairs in restrained structures and deep cavities.

SPECIAL COATING AUSTENTIC MANGANESE STEEL	NHF-7200	-	AC DC(+)	0.70	0.27	13.00	4.5	-	Ni 4.00	As welded 95-100 HRB (220_260) work hardened 43-45 (420-450)	Work hardening properties. For hardfacing worn high Mn steel parts such as excavator pins, buckets, mill hammers, crusher jaws, cones and beaters, impeller bars, etc.

COVERED ARC WELDING ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) FOR HARDSURFACING

Type of Coating	Brand Name	Equivalent Specifications AWS (JIS)	Type of Current	Typical All Weld Deposit Analysis (%)						Typical Hardness of all weld metal HRC (Hv)	Applications
				C	Si	Mn	Cr	Mo	Others		
SPECIAL COATING FOR TOOL AND DIE WELDING	THERMA-SHEAR	DIN 8555 E3-UM-55-ST	AC DC(+)	0.35	0.55	1.35	7.10	2.55	-	55-58 (600-650)	Suited for build ups on parts subject to severe friction compression and moderate impact loads at elevated temperature. Heat resistant up to 550°C.
SPECIAL COATING COBALT BASED ALLOYS	NHF-ST-1 (flux coated)	E CoCr-C (D CoCrE)	AC DC(+)	2.15	0.47	1.03	31.25	-	W 12.72 Co Bal.	50-56 (520-60)	For corrosion and high temperature abrasion. Hardfacing of valve heads, seal rings of high pressure pump.
	NHF-ST-6 (flux coated)	E CoCr-A (D CoCrA)	AC DC(+)	0.84	0.57	0.97	30.46	-	W 4.53 Co Bal.	38-44 (370-440)	For corrosion and high temperature abrasion. Hardfacing of valve seats, forging dies, crushers and screws.
	NHF-ST-12 (flux coated)	E CoCr-B (D CoCrB)	AC DC(+)	1.43	0.56	0.98	31.62	-	W 8.67 Co Bal.	42-48 (410-490)	For corrosion and high temperature abrasion. Hardfacing sleeves of high pressure pump, cutting knives, liners.
SPECIAL COATING FOR SPECIAL APPLICATIONS	AZUCAL 80		AC DC(+)	3.40	0.92	1.92	27.8	-		60-63 (700-770)	Special formulated for hardfacing especially for sugar mill machinery such as rolls.

COVERED ARC WELDING ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) FOR STAINLESS STEEL

Type of Coating	Brand Name	Equivalent Specifications AWS (JIS)	Type of Current	Typical All Weld Deposit Analysis (%)						T.S. N/mm^2 (Ksi)	Elongation (%)	Applications
				C	Si	Mn	Cr	Ni	Mo			
LIME TITANIA TYPE	NSS-307	E 307-16 (D 307-16)	AC DC(+)	0.06	0.68	5.66	19.87	9.73	0.98	640 (93)	45	Welding dissimilar steel such as welding austenitic manganese steel to carbon steel forgings or castings.
	NSS-308	E 308-16 (D 308-16)	AC DC(+)	0.05	0.66	1.00	20.00	10.50	-	590 (86)	40	For welding of 18% Cr - 8% Ni steel such as AISI Types 301, 302, 304, 305 and 308.
	NSS-309L	E 309L-16 (D 309L-16)	AC DC(+)	0.03	0.69	0.97	24.00	13.21	-	558 (81)	44	For welding low carbon 22% Cr - 12% Ni Steel, carbon steel or low alloy steel to stainless steel and stainless clad steel.
	NSS-310	E 310-16 (D 310-16)	AC DC(+)	0.10	0.41	2.19	25.98	20.75	-	581 (84)	41	For welding of 25% Cr – 20% Ni steel and clad side of 18% - 8% Ni clad steel. Perfect austenitic microstructure.
	NSS-312	E 312-16 (D 312-16)	AC DC(+)	0.09	0.67	1.62	28.75	9.39	-	761 (110)	24	For welding of 29% Cr-9% Ni type cast steel. Joint welding difficult-to-weld steel. For a wear resistant build up and buffer layer hardfacing.
	NSS-316L	E 316L-16 (D 316L-16)	AC DC(+)	0.02	0.68	1.67	19.12	12.25	2.27	567 (82)	45	For welding low carbon, molybdenum-bearing austenitic alloys. Welding of 18%Cr-12%Ni-2%Mo steel where the corrosion resistant qualities are required.

COVERED ARC WELDING ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) FOR NICKEL ALLOYS

Type of Coating	Brand Name	Equivalent Specifications AWS (JIS)	Type of Current	Typical All Weld Deposit Analysis (%)							Y.P. N/mm² (Ksi)	T.S. N/mm² (Ksi)	EL (%)	I.V. J (kgf-m)	Applications
				C	Si	Mn	Fe	Ni	Mo	Others					
SPECIAL COATING	N-NiCrMo-5	E NiCrMo-5	AC DC(+)	0.04	0.3	0.9	5	Bal	17	Cr 16 W 5	-	690 (100)	-	210-240HB after work hardening 450HB	For impact, compassion, abrasion and heat resistance in hot work tools.

COVERED ARC WELDING ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) FOR CAST IRON

Type of Coating	Brand Name	Equivalent Specifications AWS (JIS)	Type of Current	Typical All Weld Deposit Analysis (%)							Y.P. N/mm² (Ksi)	T.S. N/mm² (Ksi)	EL (%)	Hardness HV (HRC)	Applications
				C	Si	Mn	Fe	Ni							
GRAPHITE TYPE	NC-25	E St (DFC Fe)	AC DC(+)	0.92	0.11	0.36	Bal	-			-	517 (75)	32	350-390 (35-40)	Nickel free and non-machinable cast iron electrode for repair of cast iron parts where machining is unnecessary.
GRAPHITE TYPE	NC-100	E Ni-CI (DFC Ni)	AC DC(+)	0.90	0.65	0.27	0.62	Bal			-	356 (51.6)	20	140-160 (75-80 HRB)	For welding of grey and malleable cast iron, cast steel and for joining the bare metal to steel and copper alloys.
GRAPHITE TYPE	NC-115	E Ni-CI (DFC Ni)	AC DC(+)	1.21	-	-	0.50	Bal			-	480 (70)	35	140-160 (75-80 HRB)	Finest electrode for the cold welding of grey cast iron.

COVERED ARC WELDING ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) FOR HIGH TENSILE STRENGTH STEEL

Type of Coating	Brand Name	Equivalent Specifications AWS (JIS)	Type of Current	Typical All Weld Deposit Analysis (%)							Y.P. N/mm² (Ksi)	T.S. N/mm² (Ksi)	EL (%)	I.V. °C,J (°F,Ft-Lbs)	Applications
				C	Si	Mn	Fe	Ni	Mo	Others					
LOW HYDROGEN IROIN POWDER TYPE	N-9018M	E 9018M	AC DC(+)	0.07	0.46	1.10	-	1.65	0.25		580 (84)	660 (96)	27	-51°,90 (-60°,66)	For 550-620 N/mm2 for alloy high strength steel such as HY-80 & HTY-90.

SOLID WELDING WIRE FOR GAS TUNGSTEN ARC WELDING (GTAW)

Type of Metal	Brand Name	Equivalent Specifications AWS (JIS)	Size Dia. (mm)	Typical Analysis of Filler Wire (%)						Y.P. N/mm² (Ksi)	T.S. N/mm² (Ksi)	EL (%)	I.V. J (kgf-m)	Applications
				C	Cr	Co	V	Ni	Si					
FOR COBALT BASED ALLOYS	NHF-ST1R	R CoCr-C	3.2 4.0 5.0	2.3	30	Bal	13	3 max	0.8	-	-	-	53-59	For seaming rolls, valve seats, pump sleeves, wear pads, seals, bearings, bushings, swa blades, cutters
	NHF-ST6R	R CoCr-A	3.2 4.0 5.0	1.1	28	Bal	4	3 max	1.1	-	-	-	38-46	For engine valves, pump shafts and sleeves, hot cutting and rotary knives, high pressure high temperature valves.
	NHF-ST12R	R CoCr-B	3.2 4.0 5.0	1.4	29	Bal	8	3 max	1.5	-	-	-	46-52	For extrusion dies, scissor blades, saw blades, guide bars, wood cutting tools, pump sleeves.

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PRINTED 2/17