INTRODUCTION TO HARDFACING

* STOODY

50 HARDFACING TIPS (continued)

APPLICATION RECOMMENDATIONS

38) Never put a tough ductile weld deposit on top of a harder, more brittle hardfacing deposit. Such deposits will spall, and lift off of the part. The hardfacing alloy should always be applied on top of the more ductile material.

39) When using self-shielded open arc wires, pay close attention to the amount of electrical stick out used (contact tube to work distance). Short sickout dimensions less than 1/2" (12.7mm) or less can result in porosity. Most open arc wires can be operated at sickout dimensions of 5/8" to 3/4" (15.8 to 19 mm) for .035/.045" (1.2 mm) diameter wires; and 3/4" to 1-1/4" (19 to 31.7 mm) for 3/32" (2.4 mm) 7/64" (2.8 mm) and 1/8" (3.2 mm) diameter wires.

40) For manual welding, the backhand welding technique is preferable. Forehand welding can produce porous weld deposits, when hardfacing.

41) When hardfacing parts that have been previously overlayed and still have hardfacing present on the surface: (a) if there is a single layer of hardfacing present, 1/8" (3.2 mm) maximum depth, and the overlay is sound, one additional layer of a similar material can be added, and the part returned to service; (b) if there is hardfacing present on the surface and it exhibits deep cracks, and is filled with foreign materials (rock dust, oils, trash) we would recommend removal of the existing deposit to sound base metal, and application of a two layer deposit of new hardfacing material.

42) The fastest way to remove old hardfacing deposits from parts is with an Air-Carbon-Arc (ARCAIR) system. This is also the best way to prepare grooves to place hardfacing into. A simpler yet less efficient method is to use an (Airless) Chamfering electrode. Grinding is a secondary method which can be used, although much slower in metal removal rates.

43) When thin edges and base metals are required to be hardfaced, first consider the advantages of using the Stoody Jet Spray Powder Torch, with nickel base buildup and hardfacing powders. Extremely thin parts and edges can be hardfaced without affecting the base metal dimensions.

44) The next most popular process for thin edges and base metals that require hardfacing is the oxyacetylene process. Dilution is very low, and the heat input to the base metal is easily controlled. This is also the best process for applying superior tungsten carbide deposits.

45) If electric arc welding must be accomplished on thin edges and base metals, consider: (a) use of tubular fabricated electrodes; these alloys will operate at lower amperage settings than solid core electrodes; and (b) use of .035/.045" (1.2 mm) diameter wires.

BEAD PATTERNS

46) Hardfacing weld beads spaced from 1/4" (6.3 mm) to 1-1/2" (38.1 mm) apart and against the flow of an abrasive material will improve the wear life without resorting to solid hardfacing coverage. Opposing the material flow across the part works very well for finely grained sands and soils.

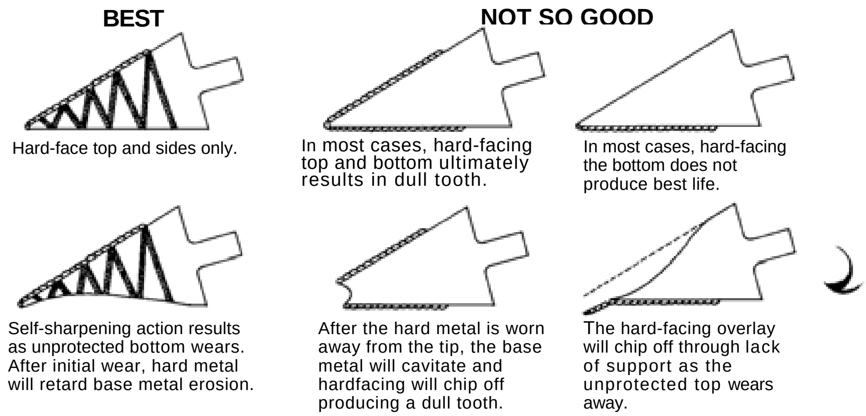
47) When larger pieces of rock, ore or slag are being handled, apply hardfacing beads parallel to the material flow. These weld beads will act as directional runners, allowing the abrasive material to ride high on the weld beads, and protect the base metal from erosion.

48) Waffle or herringbone patterns work well in sand or dirt which may have some clay content. The overburden will tend to pack into the spaces between the weld beads, and offer further base metal protection.

49) Apply a dot pattern at areas that do not see heavy abrasion but are subjected to wear; and use a dot pattern on thin base metals, where distortions and warpage may be a problem.

50) In some applications, hardfacing deposits applied to surfaced and edges of parts are vulnerable to spalling from impact and high compression side loadings. By applying the hardfacing into grooves cut into the base metal or into grooves surrounded by high impact resistant weld metals (manganese steels), the resistance to spalling is greatly improved. This method alloys good service life of brittle hardfacings operated under high impact conditions.

Wear patterns for hardfacing earth-moving shovel buckets & teeth (for working primarily in rock) should be hardfaced with beads running the length of the tooth. This allows the rock to ride on the hard metal beads. When working in dirt, clay or sand, run the beads across the flow of material. The material will fill cavities between weld beads, giving the base metal added protection. The dot process works well on hard-to-weld base metals that should not be overheated. Spacing of dots should be varied – by trial and error initially – to determine the best pattern. Another effective pattern is the waffle or crosshatch. Apply hardfacing to the top and sides of the tooth 2" up from the point. Note: Use 308 Stainless when attaching "Wear Plates" onto worn buckets.



Hard-face top and sides only.

In most cases, hard-facing top and bottom ultimately results in dull tooth.

In most cases, hard-facing the bottom does not produce best life.

Self-sharpening action results as unprotected bottom wears. After initial wear, hard metal will retard base metal erosion.

After the hard metal is worn away from the tip, the base metal will cavitate and hardfacing will chip off producing a dull tooth.

The hard-facing overlay will chip off through lack of support as the unprotected top wears away.

Did you ever wonder what each of the ingredients does for the total deposit? What contributes most to the abrasion resistance? How about impact? And, which element contributes to the metallurgy of the deposit subjected to high temperatures?

Contributions of each element follows; **Carbon (C)** - Combines with other elements to form very hard and wear-resistant carbides. Carbon is contained in almost all hardfacing alloys. **Chromium (Cr)** - Hardness, toughness, wear and corrosion resistance. With carbon, forms chrome carbides. **Manganese (Mn)** - Increases ability to harden and adds toughness to the deposit. **Molybdenum (Mo)** - Adds strength and hardness. Improves wear resistance and modifies carbide geometry. **Nickel (Ni)** - When combined with chromium up to three percent provides toughness; above seven percent, provides corrosion resistance and forms austenite. **Phosphorus (P)** is an impurity and serves no useful purpose in hardfacing deposits. **Tungsten (W)** provides hardness, outstanding wear resistance and resistance to softening during tempering. **Vanadium (V)** adds wear resistance, strength and resistance to softening during tempering. **Sulphur (S)** improves machinability of deposits and adds to deposit soundness and tensile strength. **Iron (Fe)** is the basic element that appears in almost all hardfacing products: it is referred to as steel when it is combined with small amounts of carbon.

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