WEARTECH® SHS™9700E

Severe Abrasion, Stick (SMAW) Electrode

Application Process

SMAW Weld Overlay for Hardfacing

Material Chemistry (wt%)

Chromium	< 18%
Niobium	< 10%
Boron	< 6%
Aluminum	< 5%
Potassium Silicate	< 5%
Carbon	< 3%
Manganese	< 2%
Silicon	< 2%
Iron	Balance

Rockwell C (HRC) Hardness

67 - 70 HRC

Wear Resistance

ASTM G65-04 Procedure A
Typical mass loss of 0.13g

Weld Deposit Properties

Density (g/cm³) 7.36

Impact Resistance

Drop Impact Testing:
Passed multiple impacts at 165 ft-lbs

Overlay Description

SHS9700E Stick Electrode is an iron based steel alloy with a near nanoscale (submicron) microstructure that features exceptional abrasive wear resistance with superior toughness and no high-cost nickel, tungsten and molybdenum in material chemistry. SHS9700E has been designed to be deposited on mild and low alloy steels.

Key Performance Characteristics

- 67 - 70 HRC single and double pass weld deposits
- Cost effective alternative to complex carbides: iron-based chemistry contains no tungsten, no molybdenum and no nickel
- Provides exceptional wear resistance lasting significantly longer than most chrome carbide and complex carbide alloys
- High resistance to abrasion while maintaining high toughness
- Crystalline microstructure is engineered to submicron (400 nm) size
- Maintains high hardness after exposure to elevated temperatures

SHS9700E is a multicomponent steel alloy with a unique uniform glass-forming melt chemistry that allows high undercooling to be achieved during welding. This results in considerable refinement of the crystalline microstructure down to a near nanosize (submicron) range. Unlike conventional weld overlay materials which are macrocomposites containing hard particles and general carbides in a binder, the refined microstructure of SHS9700E is a uniformly hard matrix when welded and does not incorporate distinct hard particles in a binder. This allows SHS9700E to provide vastly improved hardness and wear resistance, and to significantly outlast conventional macrocomposites. Additionally, SHS9700E is an iron-based alloy without tungsten carbide particulates.

High Hardness

Near maximum hardness is achieved in both single and double layer overlays with SHS9700E when overlaying mild steel or low alloy iron based materials. The alloys have been designed such that the greater base metal dilution present in a single layer overlay does not cause a significant reduction in hardness.

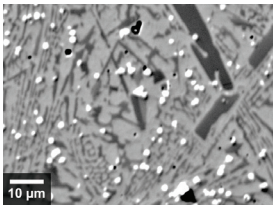
High Wear Resistance

SHS9700E weld deposits should be limited to two layers maximum for most applications. Both single and double layers provide exceptional wear resistance of typical 0.13g mass loss in ASTM G65-04 dry sand rubber wheel abrasion tests.

Industrial Uses

Mining

Microstructure



SHS9700E features a near nanoscale microstructure with grain sizes less than 400 nm

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Damage Tolerance

The superior toughness of SHS9700E occurs from the in-situ formation of high-volume fraction of refined complex borocarbide phases during welding which are surrounded by ductile phases. The borocarbide phases, which form during solidification, are completely wetted by the matrix and prevent premature pull-out, delamination and crack nucleation. The refined nature of the borocarbide phases allows the reduction of stress concentration sites and the ductile matrix supplies effective crack blunting and bridging.

Weld Characteristics

SHS9700E welds with a smooth stable transfer when applied with the recommended parameters. It is best to maintain a moderate arc length to minimize shorting of the arc to the silica slag that floats in the weld pool. Weld deposits have a smooth surface texture with minimal slag spots that can be removed with a chipping hammer or needle gun.

Substrate Compatibility

SHS9700E has been designed for overlay applications on mild and low alloy steels.

SHS9700E is not suitable for overlay applications on cast irons, manganese steels, austenitic stainless alloys or can we put on one line non iron based materials such as nickel or cobalt based alloys.

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