



DRIVERS & TRENDS

Heavy machinery as well as expensive tools and dies may require repair welding due to incidental damage. Another associated activity is the restoring of wear resistance to heavy duty service components used in forging, mining; steel processing, earth moving and dredging activities.

APPLICATION REQUIREMENTS

Welding of heavy machinery and expensive tool components requires a serious removal of defects as well as contaminations.

Repair welding

When drawing up a plan, the following issues have to be taken into account:

- removal of all defects
- joint preparation
- welding processes and welding consumables
- preheat and interpass temperatures as well as post-weld heat treatment
- environmental circumstances
- welding procedures and execution
- mechanical post-weld treatment of the welds

Build up and hardfacing

Restoring worn parts normally consists of three steps:

1. Buttering

For a deposit that will dilute the carbon and alloy content of base material and the risk of cracking

2. Build up

Seriously worn areas must be rebuilt close to working size using tough, crack resistant welding materials, which can be deposited in an unlimited number of layers

3. Wear resistant surface layers

The type of wear resistance determines the type of consumable that is selected. Wear resistance, coupled with elevated temperatures, can be sub-divided into:

- Sliding, Rolling, Metal-to-Metal (friction)
- Moderate and/or Severe Impact
- Moderate and/or Severe Abrasion

Hardfacing is usually limited to one, two or three layers.

ALLOYS & PROCESSES

All types of steels and alloys are being used, depending on the application.

Lincoln Electric offers optimized and customized solutions for Maintenance & Repair applications



- ✓ Consumables for SMAW, GMAW and FCAW
 - Maintenance & Repair line for general solutions
 - Welding consumables for Production, Repair and Maintenance applications
- ✓ Complete program for standard repair jobs
- ✓ Full program for hardfacing and surfacing
- ✓ Advice and training for selected program in your workshop or yard
- ✓ Reconditioning of forging dies by welding with the GRIDUR-F range special flux cored wire electrodes
- ✓ Technical customer support

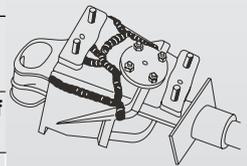
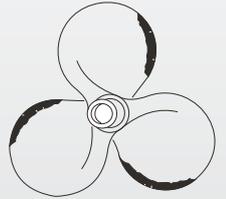
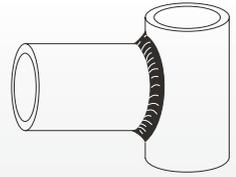


MAINTENANCE & REPAIR

CONSUMABLES

MAINTENANCE & REPAIR

Base material	SMAW	FCAW	Type of application
Mild steel	Omnia® (46)	Outershield® 71M-H, 71E-H Innershield® NR®233	Joining thin plates
	Supra®	Innershield® NR®203Ni1 (207)	Joining plates, including contaminated plate
High strength steel	Conarc® 49C	Outershield® 71M-H, 71E-H or T55-H Innershield® NR®233	Joining and rebuilding
Difficult-to-weld steel	Conarc® 49C or 60G	Outershield® T55-H	Joining & rebuilding with preheating
	Limarosta® 312	-	Joining alloyed or higher C steels with austenitic/ferritic stainless steel
	Kardo®	-	As buffer layer on difficult-to-weld steels and Cast steels
Cast steel	Conarc® 49C	Outershield® 71M-H, 71E-H or T55-H Innershield® NR®233	Joining and rebuilding
Stainless steel	Nichroma	-	Joining, also dissimilar weldments (to mild and low alloyed steel)
Nickel alloys	NiCro 70/15Mn	-	Joining, dissimilar weldments, cladding
Aluminium alloys	RepTec AlSi5	-	Joining and repair of cracked components
	AlSi12	-	
Al-bronze	RepTec Cu8	-	Porosity free welding and cladding of Al-bronzes; cladding of steel
(Malleable) Cast iron	RepTec Cast 1	LNM NiTi (solid wire)	Grey cast iron
	RepTec Cast 31	LNM NiFe (solid wire)	Other cast iron types and joining to steel
	RepTec Cast 3		



HARDFACING

Wear conditions		Wearshield® SMAW	Lincore® FCAW (SAW)	Type of application
Rebuilding/buttering	all wear conditions	BU-30	33	On carbon and low alloyed steels. Builds up worn steel parts prior to hardfacing. Machinable surface with moderate hardness
Metal-to-Metal	+ metal friction (martensitic)	MM or MM 40	40-O or 55	Heat treatable weld metal for tempered martensitic structure. Used on crane wheels, cable shaves, sprockets, gear teeth's
	+ heat	T & D	T & D GRIDUR F-range	Punch & forming dies, shear blades, work rolls. GRIDUR F- flux cored wires for repairing of Drop-forging dies regeneration
	+ impact	MI (e)	55	Earth moving & agricultural equipment
Severe Impact	build-up with work hardening	Mangjet (e)	M	Building up austenitic manganese steel and cladding carbon steel. Applied on crusher hammers, construction equipment
		15CrMn	15CrMn	Joining manganese steels to itself or carbon steels; resist severe impact and is highly crack resistant
Abrasion	+ impact	ABR	50	Versatile electrode producing good resistance to abrasion with impact. Applications in teeth's, blades, bucket & dump body surfaces
		44	-	Resist abrasion under impact at temperatures up to 600°C; good spalling resistance on two or more layers
	+ impact + corrosion	420	LNM 420 + flux 802	Dredging equipment and sand pumps
Metal to Earth	abrasion + impact	ME (e)	50	Top surfacing layers on build-up made with Wearshield BU-30, Wearshield 15CrMn or even Limarosta 312 and Arosta 307-160. Used for bucket teeth's, scraper blades, crusher rolls, paddles
Severe Abrasion	abrasion	50MC	-	Very high abrasive wear resistance at temperature below 600°C. Limit 2 layers. Stable structure, also corrosion resistant. Used in cokes and ore breakers
		60 (e)	60-O	Very high abrasion resistance in 2 layer hardfacing
	+ heat	70	65-O	Highest resistance to abrasive wear up to 760°C

