WALLCOLMONOY
SURFACING ALLOYS

WALLCOLMONOY
TECHNICAL DATA SHEET

Colferoloy™ 6005

Iron-Based Powder for Thermal Spray and PTA Welding or Laser Cladding Applications

Colferoloy™ 6005 coating applied to an under carriage bushing by the Sprayweld™ process and furnace fused at 1115°C (2040°F).

Description:

Colferoloy™ 6005 is an iron-based alloy powder, designed to produce coatings/claddings with good wear resistance in demanding applications.

Colferoloy™ 6005 is an economical solution for severe wear environments, extending the lifespan of critical components by providing a combination of abrasion and corrosion resistance.

Colferoloy™ 6005 can be deposited by thermal spray processes and fused to achieve a hardness of **Rockwell C 58 min**. It is also available in a particle size distribution suitable for PTA welding or Laser cladding.

Typical applications include under carriage bushings, steel rolls, pump housings, impeller shafts, downhole tools, paper rolls, sink rolls, corrugating rolls, wire drawing equipment, exhaust fans, compressor blades, couplings, shafts, sleeves, pump valves, gate valves, bed knives, plug gauges, bushings, mixer blades, and seal rings.

Nominal Composition - % by Weight:

B	C	Cr	Ni	Si	Fe
3.2	2.1	14.0	6.0	2.8	Bal

Forms Available:

Colferoloy™ 6005 is available in particle sizes for Spray & Fuse and PTA / Laser applications.

Micron Size	Application
-125+45 µm	Spray & Fuse
-150+53 µm	PTA / Laser

Properties:

Physical Properties (approximate):

Density	6.56 g/cc
Coating Hardness	HRC 60 (typical)
Melting Characteristics	Solidus: 1030°C (1886°F) Liquidus: 1125°C (2057°F)
Typical ASTM G-65 Dry Sand Abrasion Practice A	16 mm^3 volume loss, average

Application Methods:

Colferoloy™ 6005 is easily applied to all steels having less than .25% carbon, gray cast iron; Meehanite, malleable, ingot and wrought iron; nickel, Monel alloy 400, Inconel alloy 600, Nichrome, Chromel. Most high-temperature alloys can be overlaid without special precautions.

Steel having more than .25% carbon can also be overlaid, but requires controlled slow cooling after fusion, in suitable insulation such as Sil-O-Cel, mica, etc. Do not apply to ferrous metals that require subsequent hardening and tempering, because the dimensional change associated with the formation of martensite will crack the deposits of Colferoloy™ 6005. Hardenable base metals may be overlayed but must be annealed isothermally after uniform austenitizing to prevent cracking of the deposits of Colferoloy™ 6005. (Consult Technical Services for further details).

Application by Spraywelder™:

Colferoloy™ 6005 powder is applied by use of the Spraywelder™, which is the recommended Thermal Spray system designed by Wall Colmonoy to produce dense coatings. The powder is sprayed on the part to be hard surfaced as in ordinary metal spraying procedure, and the overlay is then fused to the base metal by torch, induction or furnace. This is ideal when deposits of uniform thickness are being applied over a large area. Reference Spraywelder Brochure and Manual for more information.

Application by Plasma Transferred Arc Welding (PTA):

There are numerous Plasma Transferred Arc Welding systems on the market and a wide range of welding parameters can be used to produce excellent weld overlays.

Wall Colmonoy recommends that a pure argon plasma gas be used in combination with an argon-hydrogen shielding gas and an argon carrier gas.

Welding parameter settings will depend on the base metal, its thickness, geometry, and metallurgical condition as well as the desired properties / geometry of the weld overlay and the type of PTA equipment being used.

Preheat and weld inter-pass temperature can affect the quality of the weld deposit and its wear properties.

Preheat Temperature by Class for steels

Class	Description	up to ½"	½" to 1"	1" to 2"	Interpass
10xx	C steels	100 – 600	100 – 700	100 – 800	200 – 700
13xx	Mn steels	350 – 500	400 – 600	450 – 700	450 – 600
23xx	Ni steels	200 – 400	200 – 500	300 – 700	300 – 600
31xx	Ni – Cr steels	200 – 600	300 – 700	400 – 900	>400
32xx	Ni – Cr steels	300 – 900	400 – 1000	500 – 1100	500 – 900
33xx	Ni – Cr steels	500 – 900	600 – 1000	700 – 1100	700 – 900
34xx	Ni – Cr steels	900 – 1100	900 – 1100	900 – 1100	900 – 1100
4140	Cr – Mo steel	600	700	800	600 – 800
4340		600	800	900	700 – 900
46xx		400 – 600	500 – 700	600 – 800	≅ 600
4820		600	700	800	600 – 800
5120		100 min	200 – 300	250 – 350	≅ 300
5145		400 – 500	450 – 550	500 – 600	≅ 500
86xx		100 – 400	200 – 500	300 – 600	≅ 400
High strength alloy steels (quenched and tempered)					
A533, B		50 – 200	100 – 350	200 – 450	100 – 350
A542		150 – 300	200 – 350	250 – 450	200 – 350
HY-130		75 – 225	75 – 275	200 – 375	200 – 350

Application by Laser Cladding:

Colferoloy™ 6005 produces an excellent weld overlay using various direct laser deposition instruments.

Laser Cladding utilizes a laser beam as a heat source to weld a surfacing material to a substrate. Surface cladding powder is delivered to the weld zone through a powder feeder with an inert gas carrier. The power level of the laser, the powder feed rate, pre-heat of the base metal, and 3-dimensional movement speeds must be balanced to produce a metallurgically bonded, low dilution, crack free, porosity free clad overlay.

Properly applied laser clad overlays can have significantly higher hardness than a corresponding thermal spray applied coating of the same material. Alloy selection for the laser cladding process should take this into consideration.

Laser Cladding can be conducted in a sealed, inert environment, or in an open shop environment. In the latter case, the use of argon or helium carrier gases with argon and/or helium shielding gases are recommended. Nitrogen is not an inert gas and it is not recommended for general use in Laser Cladding.

Grinding and Lapping:

Grinding is used to remove any necessary material. Smooth surfaces usually wear better, because they generate less heat and friction. Aluminum oxide or Silicon carbide wheels are recommended. Use 24 to 36 grit for roughing and 60 grit or finer for finishing. Grind wet when possible; do not let the wheel get loaded; dress frequently. Take light, fast cuts. (Manufacturer can provide full details for grinding.)

Dry lapping can be used to give the alloy an excellent finish. Silicon carbide, boron carbide and diamond

dust are all capable of cutting coating, but they must be embedded in a cast iron or steel wheel to properly lap these deposits. Apply with a steady pressure and avoid overheating.

Single point turning may be possible but the rate of tool wear may require the use of very slow surface speed and limited infeed.

Safety:

When handling powders do so in such a way to avoid creating a dust cloud; avoid inhalation or contact with skin or eyes. Conduct coating operations in a properly ventilated area. For more information, consult 11.8 (Ventilation), *AWS Thermal Spraying: Practice, Theory, and Application* available from American Welding Society, OSHA Safety and Health Standards available from U.S. Government Printing Office, and the manufacturer's Safety Data Sheet (SDS).

Warning: Thermal spray torches and heating torches used for application of this product utilize compressed gases including oxygen and a flammable fuel gas. Follow your employer's safety procedures when using and handling these gases and equipment. Infrared and ultraviolet radiation (light) emitted from flame and hot metal can injure eyes and burn skin. Use appropriate personal protective equipment.

Danger: Plasma transferred arc (PTA) welding is a welding process used for application of this product. Follow your employer's safety procedures and the equipment manufacturer's instructions when PTA welding. Electric shock can kill. Properly install and ground electrical equipment prior to use. Infrared and ultraviolet radiation emitted from the hot metal or welding arc can injure eyes and burn skin. Use appropriate personal protective equipment.

Warning: Laser cladding processes may use high power levels when applying this product. Follow your employer's safety procedures and the equipment manufacturer's instructions when laser cladding. Refer to AISI Z136.1 "Safe use of Lasers" and consult your employer's Laser Safety Officer regarding the proper use of personal protective equipment.

Storage Requirements:

Keep thermal spray powders in a closed container and protect against moisture pick-up. The containers should be tumbled before using the powder. If moisture is absorbed from the atmosphere, it can be removed and flowability can be restored by drying the powder, with the seal removed and lid loosened, at 66-93°C (150-200°F) for two hours prior to use.

The information provided herein is given as a guideline to follow. It is the responsibility of the end user to establish the process information most suitable for their specific application(s). Wall Colmonoy assumes no responsibility for failure due to misuse or improper application of this product, or for any incidental damages arising out of the use of this material.

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