

CERMACLAD™

PERFORMANCE AT THE SPEED OF LIGHT

CermaClad™ Metallurgical Clad Pipes

- Easy to inspect, bend, reel and install compared with mechanically lined pipes
- Seamless, with no weld-area compared to roll bonded clad plate to pipe
- No thickness limitations compared to mechanically lined and roll bonded clad plate to pipe – works fabulously well with thick-walled and large diameter pipes
- Very high productivity, lower dilution, minimal porosity compared to weld overlay clad pipe
- Uniform thickness and higher strength compared to co-extruded clad pipe
- No limitations in terms of metals and alloys (nickel, steel, carbides, titanium) that can be applied and the cladding thicknesses (0.15mm to 15mm)



AWARDS



Forbes



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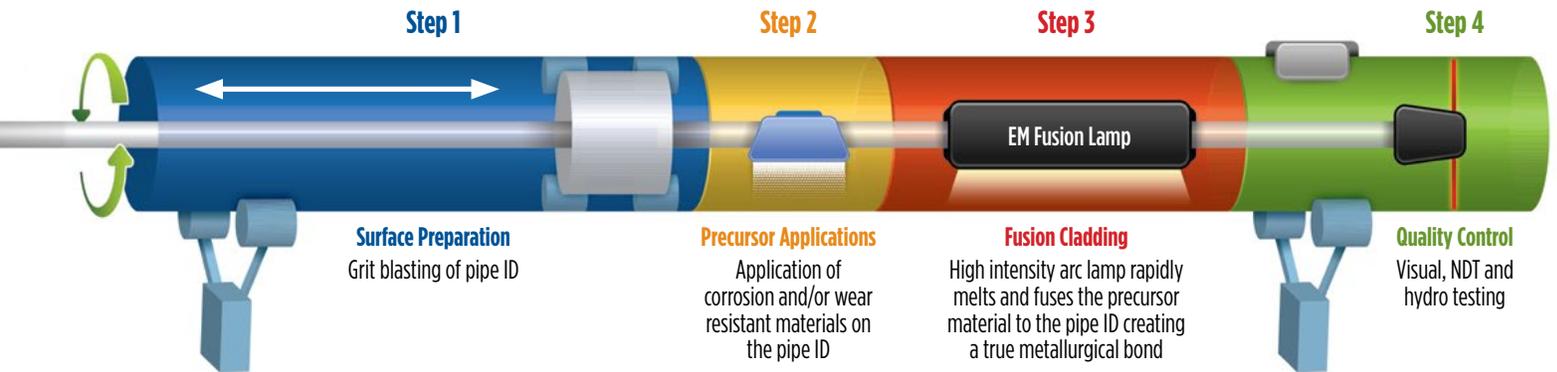
MESO:COAT

CermaClad™ Overview

CermaClad™ combines high-speed fusion cladding equipment that is faster, better and more cost-competitive than current processes with proprietary corrosion resistant alloy (CRA), and wear resistant alloy coating materials incorporating patented microstructural and compositional modifications that lead to industry-leading performance and life.

CermaClad™ technology utilizes a high-intensity arc lamp to rapidly melt, fuse and metallurgically (inseparable) bond protective, proprietary cladding materials on steel pipes and tubes (both internal and external surfaces), plates, sheets and bars. The CermaClad™ high intensity arc lamp can rapidly heat a spot up to 10-15,000°C and there is no limitation in terms of the material or thickness that can be clad to the substrate, without causing any damage to the substrate.

CermaClad™ Application to Pipe Interior Surface



CermaClad™ Product Line

CermaClad™ CRA (Corrosion Resistant)

CermaClad CRA cost-effective clad products are made from Corrosion Resistant Alloys (Alloy 626, 825, 904L, Monel 400) and Stainless Steel at cladding thicknesses between 1.5mm – 4mm.

Applications:

- Oil and Gas (OCTG ID, Risers, Flow lines, Transportation pipelines, Tankers, Vessels, Reactors)
- Oil Sands (Slurry Lines ID)
- Mining (Slurry lines ID, Wear plates)
- Power Generation (Boiler tubes)

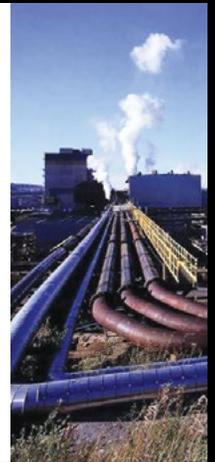


CermaClad™ WR (Wear Resistant)

CermaClad WR cost-effective clad products are made from Wear Resistant materials like Chromium Carbide and Tungsten Carbide at cladding thickness between 2mm – 8mm.

Applications:

- Oil Sands (Slurry Lines ID)
- Oil and Gas (Pipe ID, Tankers, Vessels, Reactors)
- Mining (Wear plates)
- Power Generation (Boiler tubes)



CermaClad™ LT (Low Thickness)

CermaClad LT cost-effective clad products are made from corrosion resistant materials like Stainless Steel and Aluminum at cladding thickness between 0.15mm – 1mm.

Applications:

- Shipbuilding (Ballast and Cargo Tanks, Decks)
- Infrastructure (Rebar, Beams)
- Bridges (Steel Structures, Beams)
- Oil and Gas (Transportation & Refinery Pipe OD & ID)



CermaClad™ HT (High Temperature)

CermaClad HT cost-effective clad products are made using nickel-chromium and metal-chromium-aluminum alloys for high temperature applications at cladding thicknesses between 0.15mm – 3mm.

Applications:

- Energy (Boilers, Heat Exchangers, Nuclear)
- Pulp and Paper
- Marine
- Chemical and Petrochemical



Value Proposition

Performance:

- Easy to bend, reel, inspect and install compared to mechanically lined pipe
- Significantly lower amount of weld area compared to metallurgically clad plate to pipe
- High productivity manufacturing process ensures on-time delivery and shorter lead time
- Ability to melt, fuse and metallurgically bond almost all metals and composites
- True metallurgical bond, > 30,000 psi
- Lower corrosion and wear rate compared to competing technologies
- Significantly lower dilution and porosity

Cost:

- Allows application of very thin metallurgical clad layer with minimal dilution leading to significant cost savings
- High productivity manufacturing process ensures project costs are significantly lowered
- Low capital investment enables setting-up regional facilities to serve local demand

Time:

- 15-100X faster than weld/laser cladding, lowers lead time by 75-80%
- Coverage of 75-580 sq.ft./hour with a single system
- Matches line speed of steel mills, thus avoiding any delay in the project schedule and scope

Markets

Primary Addressable Market

- Immediate: \$2 billion (clad pipe)
- Current: \$4 billion (clad pipe, plate, components)
- 2016: \$7 billion
- New Markets: \$20+ billion

Oil and Gas (\$2 billion)

- Pipes, Risers, Flowlines

Oil Sands (\$225 million)

- Slurry lines, Hydro-transportation and tailings pipe, wear plates

Nuclear & Energy Generation (\$1+ billion)

- Heat Exchangers, Pressure Vessels, Tanks, Reactors

Shipbuilding (\$10+ billion)

- Ballast and Cargo tanks, Ship Decks

Infrastructure (\$10+ billion)

- Rebars, Structures, Components

CermaClad™ vs Traditional Laser Cladding



CermaClad™

Application Width:
12 to 30cm



Traditional Laser Cladding

Application Width: 0.7cm

PRICE POINT

HIGH

HIGH

MODERATE

LOW

COMPETITIVE POSITIONING

■ Solid Alloy Pipe

Premium



CermaClad™

Preferred

Best Value

■ Metallurgical Clad Plate to Pipe

■ Flexible Pipe

Risk

Acceptable

Good Value

■ Mechanically Lined BuBi Pipe

■ Weld Overlay/
Laser Cladding

Unacceptable

Poor Value

Low Value

LOW

■ Carbon Steel

Current Status

MesoCoat's first 1-line clad pipe manufacturing facility is now operational in Euclid, Ohio and the company expects to qualify full length clad pipes to the DNV-OF-F101 and API-5LD standards, and then commence full-scale production. MesoCoat is currently in the process of setting-up two 4-line clad pipes manufacturing facilities in Indonesia and Brazil to serve the growing clad pipe market.

Independent testing at the largest risk management laboratory, Det Norske Veritas (DNV) sponsored by the company's technology development partner, Petrobras S.A (NYSE: PBR), has confirmed that clad products manufactured using the HDIR fusion cladding process provides a better product with 95% lower dilution, over 50% higher metallurgical bond strength, and significantly higher mechanical integrity and toughness; compared to the defining API 5LD standard requirements for metallurgically bonded clad pipe.

Summary

The very high productivity of the CermaClad technology also enables MesoCoat to set-up clad pipe manufacturing facilities at a tenth of the capital cost of competing technologies; which allows MesoCoat to set-up multiple facilities across the globe to serve the regional market and fulfill the growing and critical local content requirement in South America, Indonesia, Africa, Middle East and other regions - a trend that is expected to continue and grow over the foreseeable future. The company intends to have capability of producing up to 200 kms of 10" clad pipes, and then expects to add new clad pipe manufacturing facilities in Middle East, Mexico, Alberta and Europe to produce more than 500 kms of 10" clad pipes to serve the rapidly growing clad pipe market across the globe.

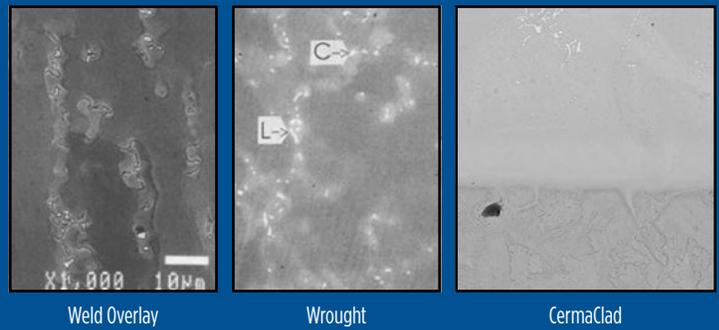
The clad pipe market is growing at a rapid pace and the current solutions have several limitations in terms of inspectability, installation, quality and productivity. HDIR technology enables metallurgically bonded cladding over large areas at high production rates, and without the size, thickness and reeling/installation limitations of other methods. CermaClad clad pipes, due to its strong metallurgical bond and mechanical properties, are easier to inspect, bend, reel and install—unlike the mechanically lined pipes—and provide a seamless cladding unlike the roll bonded plate to pipe alternative.

More importantly, there is huge demand for thick-walled clad pipes in the Gulf of Mexico and Brazil—and a massive requirement for large-diameter clad pipes in the Asia-Pacific and MENA regions. The mechanically lined pipe and roll bonded plate-to-pipe alternatives are not ideal for thick-walled and large-diameter clad pipes due to several quality and mechanical limitations.

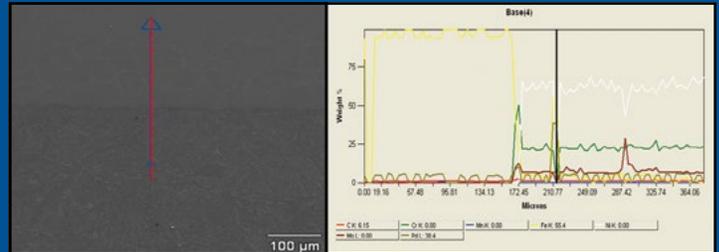
CermaClad clad pipes provide the ideal solution for thick-walled and large-diameter clad pipes by providing a compelling solution that addresses all the concerns associated with the current solutions that is not only cost-effective but highly scalable. No wonder CermaClad provides the best solution in the industry.

TRANSFORMING THE WORLD

CermaClad™ 625 Microstructure Comparison

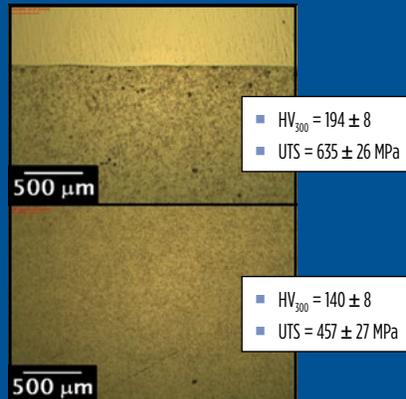


CermaClad™ Enables Minimal Dilution

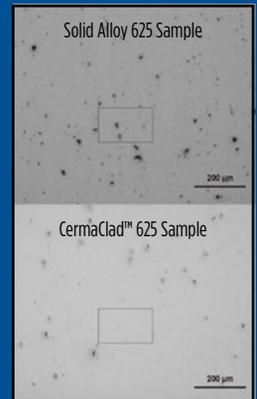


Chemical composition of the fused 625 CermaClad™ at 0.1 mm from the fusion line better than 625 weld overlay at 4mm, demonstrating very little dilution

Very Small Heat Affected Zone



Low Porosity, Fine Grained Structure



THROUGH SURFACE ENGINEERING

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