Explosive Metal Welding
The Hermetic Solutions Group Bonded Metals Division

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The Hermetic Solutions Group Bonded Metals Division

Who we are:

Hermetic Solutions Group Bonded Metals Division
  – In operation since 1970
  – Formally known as Northwest Technical Industries

What we do:

We use explosives to weld or bond dissimilar metals together and to explosively form metals into exotic shapes that are difficult or impossible to do by conventional methods. Explosives are also used to compact or consolidate metal powders into near net shapes.
The Explosive Metal Bonding Process
Why Explosive Bonding?

- Perfect for meeting both heavy weight and light weight design requirements
- Much stronger than friction and diffusion welded joints
- Location of bond layers can be controlled within a design
- Weldable bi-metallic transitions (ferrous to non-ferrous)
- Eliminates galvanic corrosion (between dissimilar metals)
- Reduced need for mechanical integration (bolt-on vs. welding)
- Precious metal conservation (linings, facings, etc.)

Markets for this technology include:
- Chemical industries (corrosion resistance)
- Power plants
- Naval applications
- Particle accelerators
- Semiconductor production (sputter targets)
- Space satellites
The Explosive Metal Bonding Process

Step 1: Metal Preparation

Here, copper and nickel sheets are surface prepped:

Copper Plate

Nickel Plate
The Explosive Metal Bonding Process

Step 2: Metal Preparation

Shot assembly applied to bond Inconel to nickel
The Explosive Metal Bonding Process

Step 3: Transporting Material to Remote Blast Site

Noise created by blasts require material to be transported to a remote area for detonation
The Explosive Metal Bonding Process

Step 4: Preparing for Detonation

Final shot readied for detonation

Hoppers for pouring explosives into charge gap
The Explosive Metal Bonding Process

Step 5: Detonation
The Explosive Metal Bonding Process

Step 6: Flattening

Ni/Inconel plates before flattening

Plates after flattening
Explosive Metal Bonding Examples

Aluminum/Stainless

- SS Rib
- SS Weld
- Transition Bar
- Al Rib

Transition Ring

- SS Pipe
- Al Pipe
Explosive Metal Bonding Examples

Copper/stainless UHV conflat flange

Custom 6” conflat flange with stainless, copper & stainless

Cu/stainless exit slit for UHV beam line
Explosive Metal Bonding Examples

Al Tube/Steel Billet

Copper/Stainless
Explosive Metal Bonding Examples

SA 240 2507 SS / SA 516 Grd 70 steel to be machined into a tube sheet in heat exchanger

Copper/aluminum
Testing the Bond

Shear lug testing

Ram tensile testing
Bonded Metal Applications

Current conducting arms made from copper/steel clad

Current conducting arms (CCA) for Electric Arc Furnaces (EAF)

Electric Arc Furnace
Bonded Metal Applications

Clad Tubes

Copper/stainless

Aluminum/steel

Tantalum on I.D. of steel pipe

70/30 Cu-Ni/steel
Explosive Metal Bonding Applications

Fabricated into high-strength, corrosion-resistant aircraft tie-downs

Alum tube/steel billet

Deployed on US Navy aircraft carriers
Explosive Metal Bonding

Learn More

Contact the Hermetic Solutions Group’s Bonded Metals Division via:
  – E-mail at bondedmetals@hermeticsolutions.com
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Or Visit: