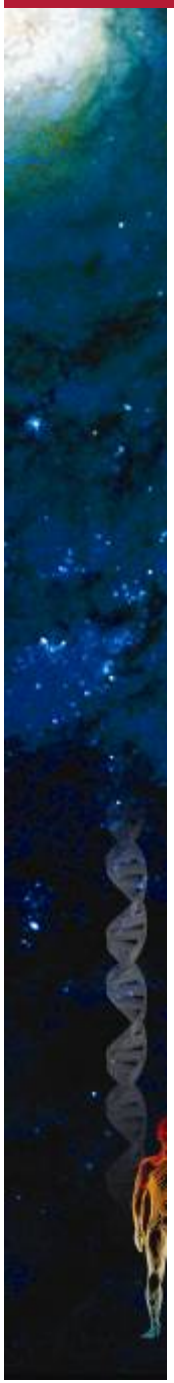
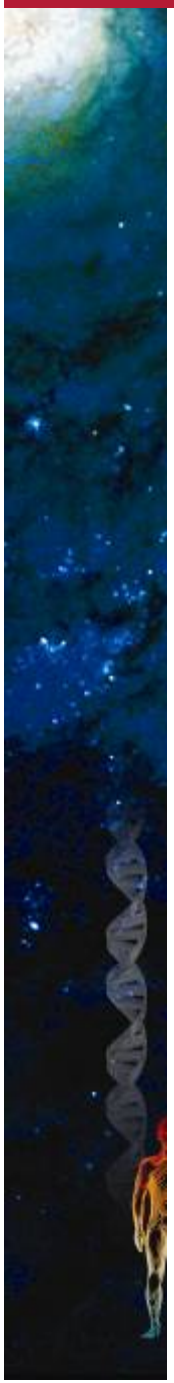


SOURIAU PA&E

Explosive Metal Bonding Capabilities

SOURIAU PA&E Bonded Metals Division:

2249 Diamond Point Road
Sequim Washington



Who we are:

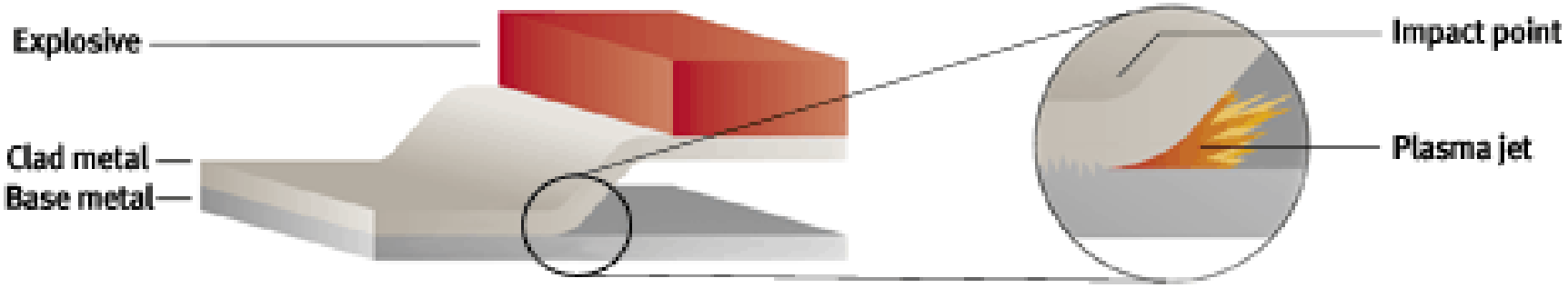
SOURIAU PA&E Bonded Metals Division

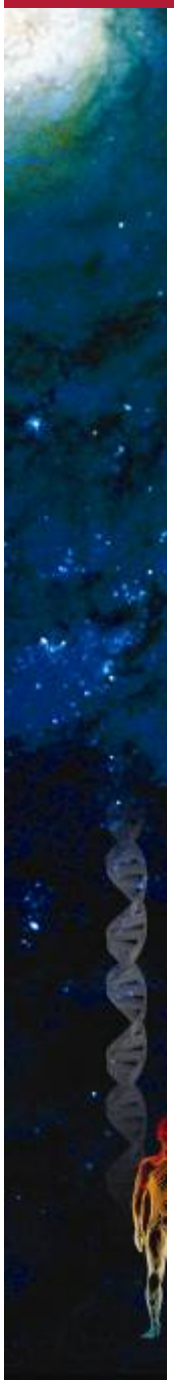
- In operation since 1970
- Formally known as Northwest Technical Industries
- Part of SOURIAU PA&E since 1995

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 Bonding Process





Why Explosion Bonded?

- 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

Creating Explosively Bonded Metals

Step 1: Metal Preparation

Here, copper and nickel sheets are surface prepped:

Copper Plate

Nickel Plate

Creating Explosively Bonded Metals

Step 2: Metal Preparation

PA&E employees apply shot assembly to bond Inconel to nickel

Creating Explosively Bonded Metals

Step 3: Transporting Material to Remote Blast Site

Noise created by blasts require material to be transported to a remote area for detonation

Creating Explosively Bonded Metals

Step 4: Preparing for Detonation

Final shot readied for detonation

Hoppers for pouring explosives into charge gap

Creating Explosively Bonded Metals

Step 5: Detonation

Creating Explosively Bonded Metals

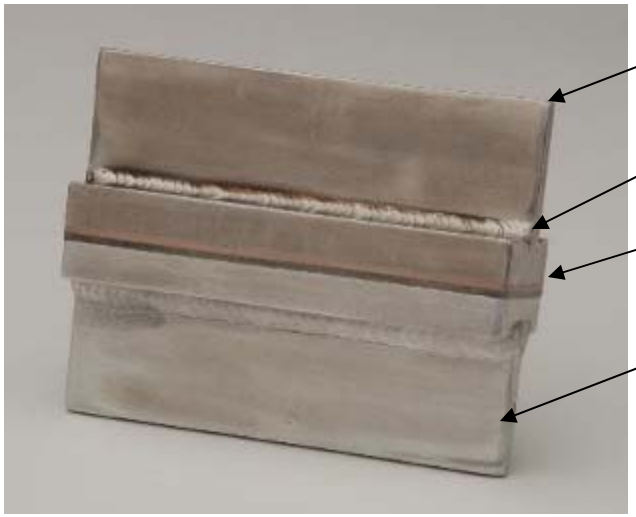
Step 6: Flattening

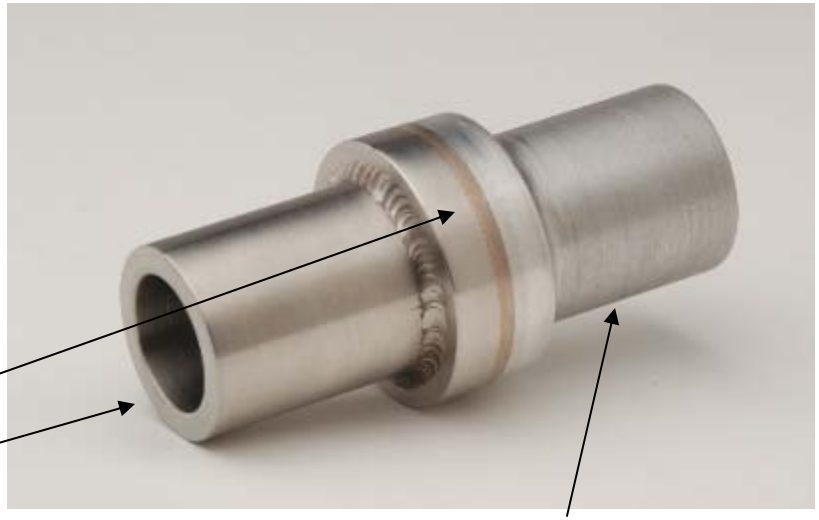
Ni/Inconel plates before flattening

Plates after flattening

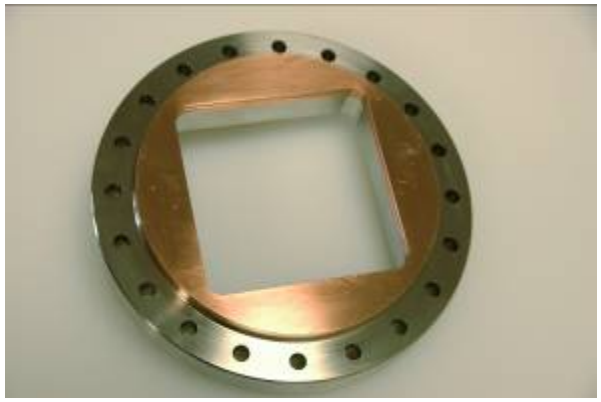
Explosive Bonded Metals Examples

Aluminum/Stainless

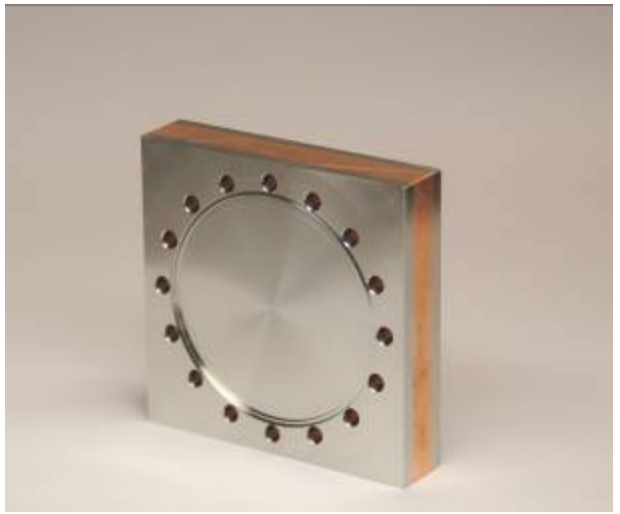




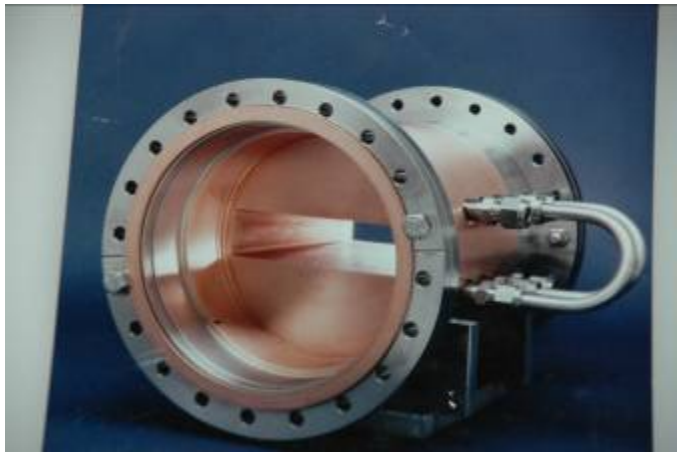
Explosive Bonded Metals Examples



Copper/stainless
UHV conflat flange



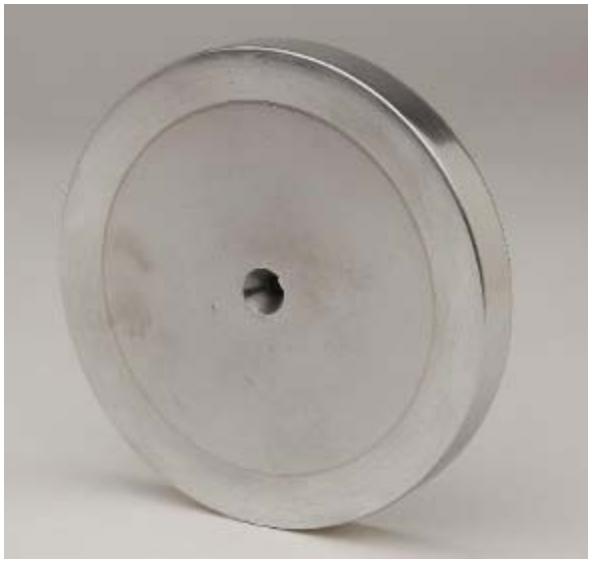
Custom 6” conflat
flange with
stainless/copper/stainless

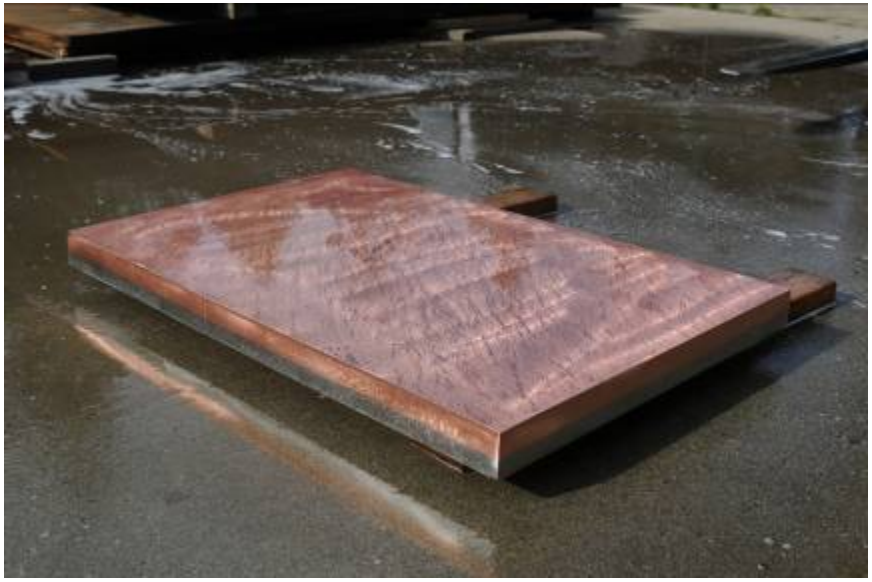


Cu/stainless exit slit for UHV beam line

Explosive Bonded Metals Examples

Alum Tube / Steel Billet

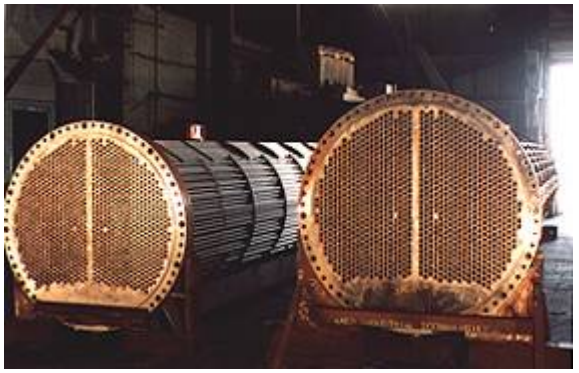




Copper / Stainless

Explosive Bonded Metals 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

Quality Assurance includes bend testing, chisel testing, shear lug testing, ram tensile testing, die penetrate testing, ultrasonic testing and mag. partial testing

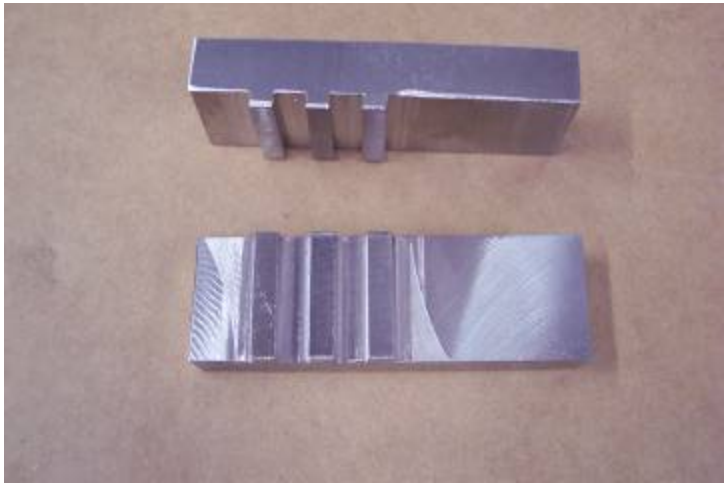
Copper/aluminum bend test

Aluminum/stainless steel hammer test

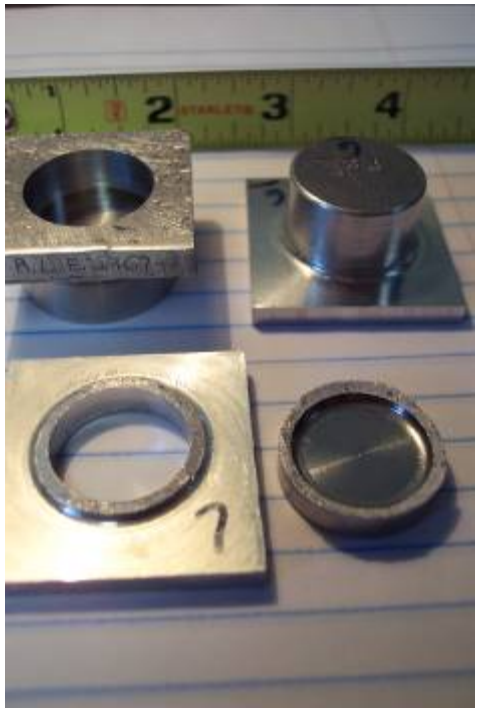
Tensile test

Testing the Bond

Quality Assurance includes bend testing, chisel testing, shear lug testing, ram tensile testing, die penetrate testing, ultrasonic testing and mag. partial testing.



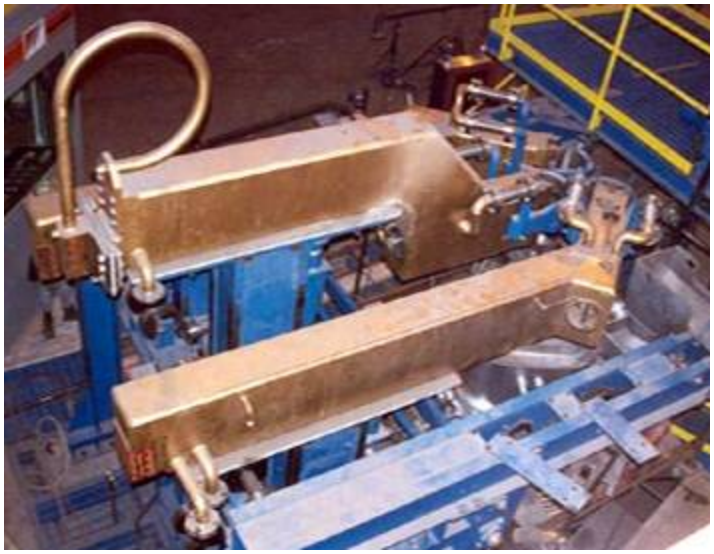
Shear lug testing



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 recycling scrap metal

Bonded Metal Applications

Clad Tubes

Copper/stainless

Aluminum/steel

70/30 Cu-Ni/steel

Tantalum on I.D. of steel pipe

Bonded Metal Applications

Naval Applications

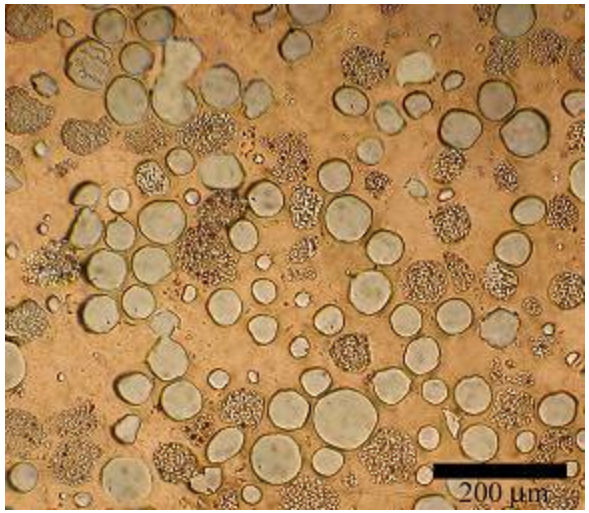
Alum tube/
steel billet

Deployed on US Navy aircraft carriers

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

Bonded Metal Applications

Copper / Moly Explosive Powder Compaction



Learn More!

Contact SOURIAU PA&E's Bonded Metals Division via:

- E-mail at bondedmetals@pacaero.com
- Phone at: 360-683-4167

Or Visit:

- http://www.pacaero.com/products/explosive-bonding.htm