

AUBERT&DUVAL



POWDER METALLURGY HIP COMPONENTS

**Innovative and dependable technology
for cutting costs**



Aerospace - Defense - Energy - Mechanics - Medical - Tooling - Transportation

Enhancing your performance

PM HIP alternative opens per

Innovation

New thrilling opportunities!

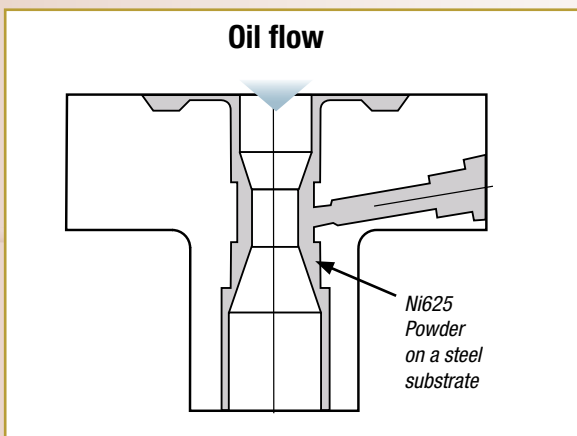
To meet always more challenging technical and economical requirements, manufacturing breakthroughs are necessary. The possibility of using Powder Metallurgy and Hot Isostatic Pressing (HIP) for the whole component or only for the part exposed to harsh environment, offers new bright perspectives to today's metallurgist. The surge in raw materials price and in machining cost, combined with the need for safer and immediately available products have recently fostered new inroads for PM-HIP solutions.

Multi-layer parts

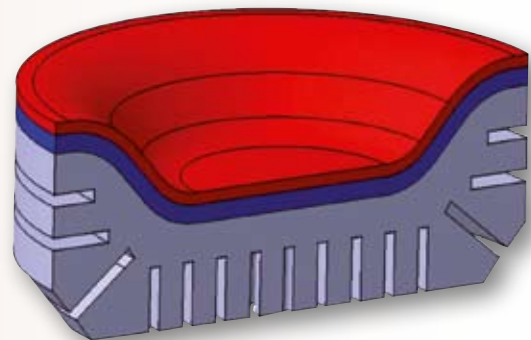
Bimetal parts or compounds can be produced by Hot Isostatic Pressing of an alloyed powder layer on a metal substrate: a unique solution to use high performance materials only where it matters!

A high performance alternative solution to:

- Conventional overlaying: PTA cladding, welding, brazing
- Surface diffusion processes: Surface diffusion bonding, carburizing, nitriding



Bonnet for oil and gas industry



Multilayer mold for glassware



Bimetal copper-stainless LHC component

spective for critical components

Main Applications

Fluids transfer

- pipes,
- flanges,
- fittings,
- valve bodies,
- manifolds,
- casings, etc.

Mechanical components

- engines,
- injection nozzles,
- machine components,
- tooling, etc.

Alloy types

- Alloyed steels and stainless steels: virtually all kinds are feasible, from low-alloy steels, tool steels, austenitic and martensitic stainless to duplex steels, etc.
- Superalloys: nickel or cobalt-based
- Titanium

Complex shaped parts

HIP Near-Net Shape technology can be used to produce a wide variety of shapes. It is also the only solution to produce complex inner shapes such as cooling channels, fluid ducts.

A high performance alternative solution to:

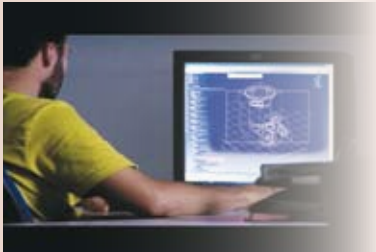
- Forging and subsequent machining and welding operations
- Casting

In addition, powder metallurgy allows the manufacturing of higher alloyed materials such as high C-, Cr-, Ni-, W- containing grades.



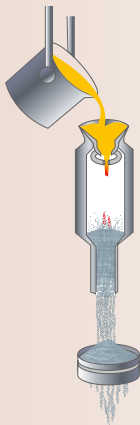
Prototype of a Ni-base component for space launcher

The PM HIP process



Customer needs' assessment
and choice of material

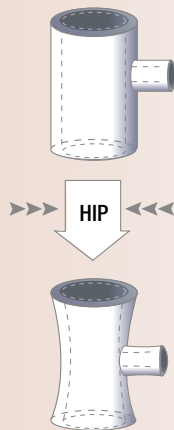
Container design optimization



Material melting

Powder atomization

Powder filling
and container sealing



HIP consolidation

Post – Heat treatment

Container removal if necessary
(by machining or pickling)



Inspection
(NDT, mechanical testing...)

Final Machining

Get the product you need quicker, safer and at a better cost



Sustainable development

Use less material
=
lower your cost and protect
your environment

Faster route to market

- Drastically reduced lead-times
- Reduced machining
- Reduced welding and validation
- From prototype to any batch size
- No die required

Affordable cost

- No loss of expensive materials
- No capital investment
- Noble materials reserved for functional area of the part

Guaranteed metallurgy

- Long and predictable part life
- Part integrity
- Finer and isotropic microstructure
- Higher alloy content

Customization and flexibility

- Widest variety of shapes
- Good dimensional precision
- Possibility to allocate functional characteristics to specified areas



We master every single step

From powder design to control tests

Thanks to Eramet group's own manufacturing capabilities, Aubert & Duval is fully integrated from customers

A unique alloy expertise

The initial alloying and melting greatly influence quality. Thanks to its unique expertise in alloy choice and manufacturing, Aubert & Duval fully masters the powder production process, a key point for part quality. Powder production equipment includes gas atomizers, a VIM atomizer, a 35 kg laboratory atomizer and a rotating electrode.

Container design

During the HIPing process, the container must withstand a pressure up to 1000 bars (14500 psi). As shrinkage varies according container shape, initial dimensions must be carefully calculated. Container design is a key know-how to take full advantage of the PM HIP technology so as to:

- cover a wide range of shapes
- minimize the loss of noble materials
- eliminate tedious and costly welding-assembly

Aubert & Duval also provides extruded PM HIP superalloys billets for aeronautics and energy industries.



of the PM hipping process

needs' identification to the delivery of the final product.

HIP consolidation

The definition and control of pressure and temperature gradients are critical to the quality of the final product.

Thanks to our experience and to our R&D team, we supply a metallurgy that will perfectly meet our customers' requirements.

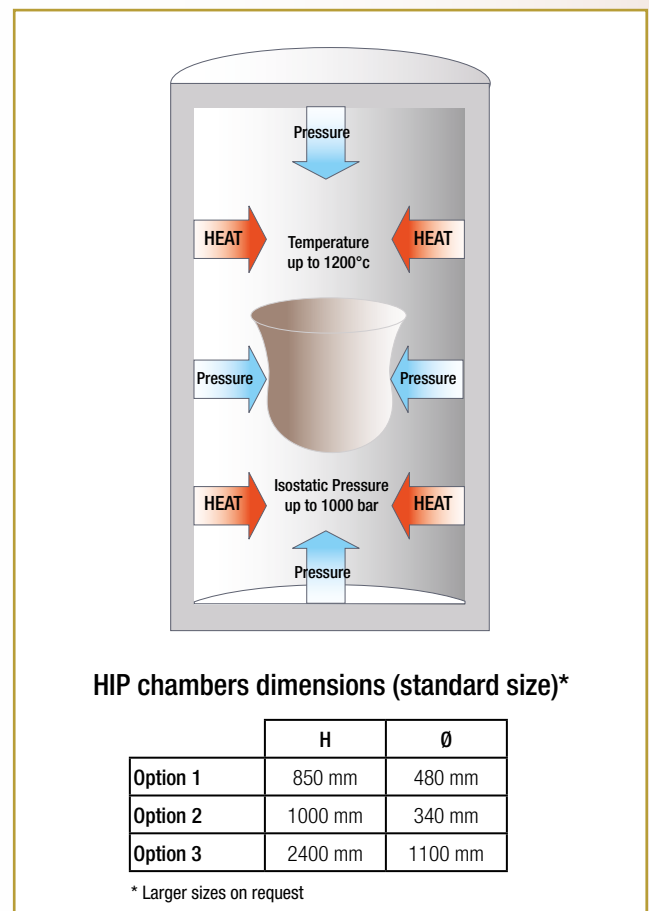
Quality control and testing

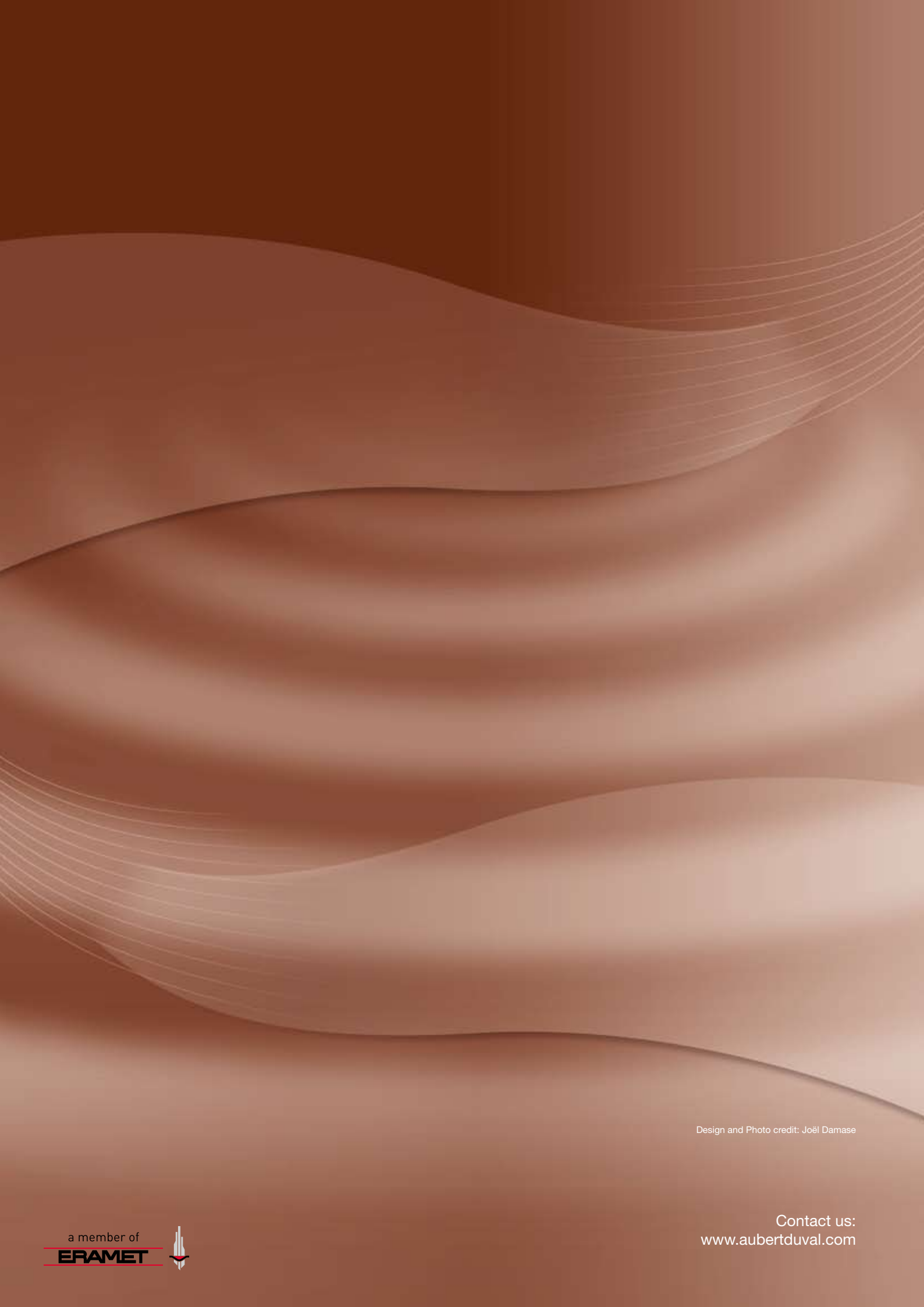
As metallurgists specialized in aeronautics and nuclear fields, we are able to meet the most stringent requirements for our customers' materials. In addition, a full range of equipment is available for testing and evaluation of material and part characteristics and properties such as:

- mechanical and physical properties
- corrosion resistance
- fatigue properties
- metal microstructure and cleanliness

Certifications

- ISO 9001/EN9100
- AQAP2110
- NADCAP non destructive testing
- ISO14001/OHSAS18001





Design and Photo credit: Joël Damase