

Uses of PM HIP technology: a world of possibilities

Energy / Oil and Gas Industry



Swivel



Manifold



Wye-piece



Impeller



Valve Body

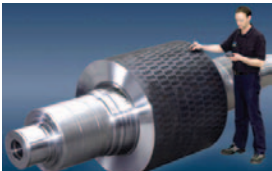


Oil Riser Tube

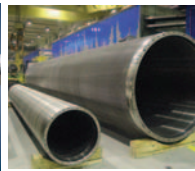


Turbine Rotor

Process Industry

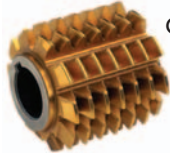


Grinding Roll



Suction Roll Shell for Paper Machine

Tooling for metal, plastics & paper processing



Gear Cutting Tool

Broaches

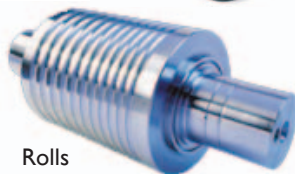


Screws for Plastics Extrusion

Paper Slitting Blades



Rolls



Transportation



Injection Nozzle



Rocket Impeller

Science

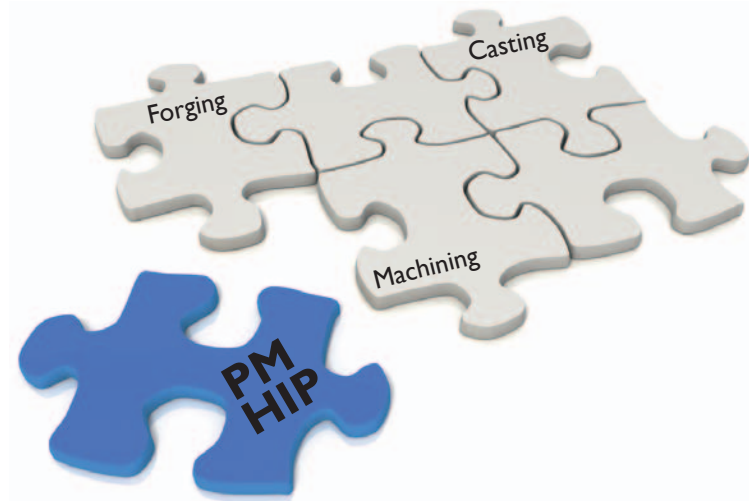


CERN End Cover



ITER Part Prototype

PM HIP Technology



Imagine new designs
with Powder Metallurgy and Hot Isostatic Pressing

- Are you looking for innovative solutions to reduce production and machining costs?
- Do you design metal parts with difficult-to-machine shapes or with complex internal cavities?
- Do you wish to reduce the number of welds and associated ultrasonic inspection?
- Do you wish to shorten your manufacturing cycle times?
- Are you looking for improved metal characteristics such as fine microstructure and isotropic properties?
- Do you wish to improve the wear or corrosion resistance of your components?
- Are you looking for innovative solutions to produce series of parts?

If you answer **YES** to one or several of these questions, the PM HIP technology is for you!

Photos and sketches: Courtesy of Aubert Duval, Bodycote, Erasteel, Kennametal HTM, Koepfern, Metso, Sandvik Powdermet, Snecma and Synertech PM.

This leaflet is a publication of the EPHG, the PM HIP group of EPMA. For more information contact Jonathan Wroe at jw@epma.com



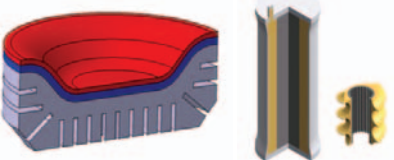
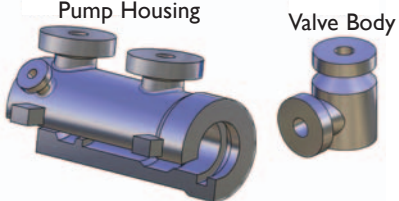
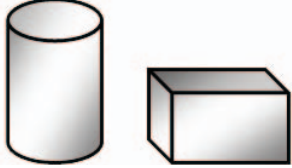
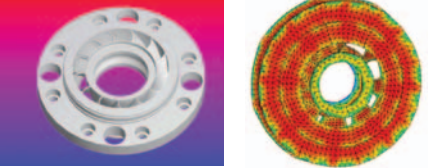
5 reasons to choose PM HIP technology

What is Hot Isostatic Pressing?

Hot Isostatic Pressing* is a process to densify powders in a HIP furnace at high pressure (100-200 MPa) and temperatures from 900 to 1250°C. The gas pressure acts uniformly in all directions to provide isostatic properties and 100% densification.

* HIP is also used for diffusion bonding or for the densification of cast parts, MIM parts, cemented carbides or ceramics.

1 - Freedom of concepts

<p>Bimetal or composite parts Solid-powder or Powder-powder</p> 	<p>Near Net Shape (NNS) Reducing the need for machining</p> 
<p>Semi-Finished Products For cost efficiency, further forged & rolled</p> 	<p>Complex Net Shape Requiring no further machining</p> 

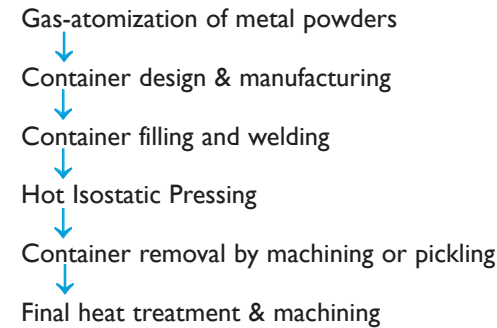
2 - Freedom of sizes

- For part weights from 500g up to 30 tons
- Series: 1 up to 20,000

3 - Freedom of alloys

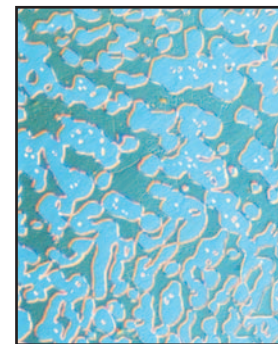
- Nickel-base alloys
- Cobalt-base alloys
- Stainless Steels
- Tool Steels and High Speed Steels
- Low Alloyed Steels
- Titanium alloys
- Metal Matrix Composites (MMC)
- Customized alloys with higher alloy content for improved properties can also be used

4 - A lean production route



5 - An alternative technology to forging & machining

- Improved properties thanks to finer microstructure
- Easier ultrasonic inspection
- No material loss during process
- Shorter cycle time
- Reduction in number of welds
- Cost effective for small series
- Improved material and functional properties
- Development of unique alloy systems
- Improved function and lifetime of toolings made of HIPed steels



Microstructure Cast



Microstructure Hot Rolled



Microstructure HIP

The PM HIP technology is also an alternative technology to Casting.