Uses of PM HIP technology: a world of possibilities

Energy / Oil and Gas Industry

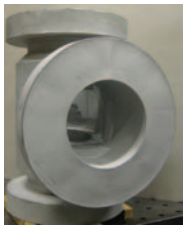

Swivel


Manifold


Wye-piece

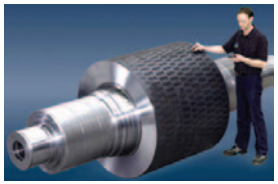

Impeller


Oil Riser Tube


Valve Body


Turbine Rotor

Process Industry


Grinding Roll


Suction Roll Shell for Paper Machine

Transportation


Injection Nozzle

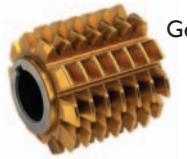

Rocket Impeller

Science


CERN End Cover


ITER Part Prototype

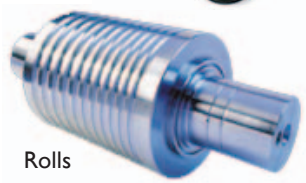
Tooling for metal, plastics & paper processing


Gear Cutting Tool


Broaches

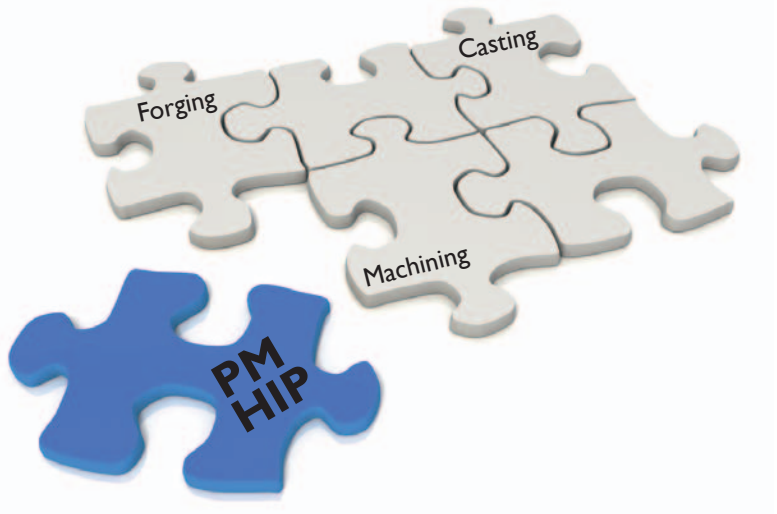

Screws for Plastics Extrusion


Paper Slitting Blades


Rolls

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

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!

This leaflet is a publication of the EPHG, the PM HIP group of EPMA.
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EPMA
european powder metallurgy association

5 reasons to choose PM HIP technology

What is Hot Isostatic Pressing?

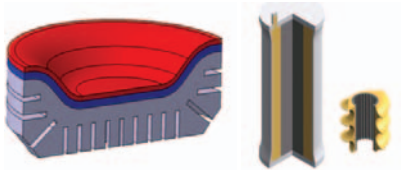
Hot Isostatic Pressing* is a process to densify powders in a HIP furnace at high pressure (100-200 MPa) and temperatures from 900 to 1250°C. The gas pressure acts uniformly in all directions to provide isostatic properties and 100% densification.

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

1 - Freedom of concepts

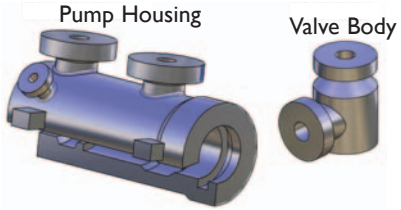
Bimetal or composite parts

Solid-powder or Powder-powder



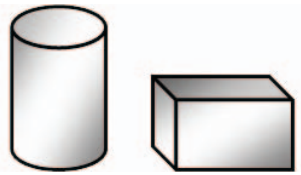
Near Net Shape (NNS)

Reducing the need for machining



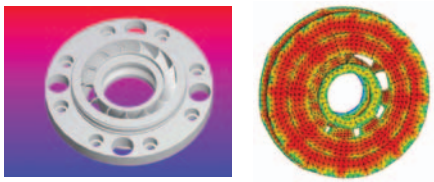
Semi-Finished Products

For cost efficiency, further forged & rolled



Complex Net Shape

Requiring no further machining



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

Gas-atomization of metal powders
↓
Container design & manufacturing
↓
Container filling and welding
↓
Hot Isostatic Pressing
↓
Container removal by machining or pickling
↓
Final heat treatment & machining

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.