

Hot Isostatic Pressing

Supporting the Metal Injection Moulding Industry



Supporting Metal Injection Moulding

Common applications include:

- » Defect healing of MIM parts (pore elimination)
- » Consolidation of powder metal and ceramic parts
- » Diffusion bonding

HIP is expanding into new sectors such as:

- » Automotive and Aerospace
- » HIPing of large volumes
- » Material heat treatment by quenching
- » Stress relief of MIM parts by pressure assisted heat treatment
- » MIM parts, i.e., fire-arms, watches, automotive, consumer electronics, etc

For decades, Hot Isostatic Pressing (HIP) has been used successfully by manufacturers around the world. HIP is used to eliminate pores and remove defects to dramatically increase the material properties.

With typical pressures from 400 to 2,070 bar (5,800 to 30,000 psi) and temperatures up to 1,400°C (2,552°F), HIP can achieve 100% of maximum theoretical density and improve the ductility and fatigue resistance of critical, high-performance materials. The components after sintering for MIM, regardless of de-binding method, benefit from HIPing.

A proven process for Metal Injection Moulding (MIM) parts

Common applications for Hot Isostatic Pressing include defect healing of MIM parts (pore elimination), consolidation of metal powder and diffusion bonding of dissimilar metals or alloys. The technology is expanding into new applications for fire arms applications as well as heat treatment.

Sports watchcase



Gear wheels



Body assembly



Spacer assembly



Locking bar, pin, rack



Open center impeller



Why you should HIP:

~100% of theoretical density

- » Longer life time
- » Predictive life time
- » Lighter and/or lower weight designs

Improved material properties

- » Increased mechanical properties e.g. fatigue, wear, abrasion and elongation
- » Reduced scatter of material properties
- » Stress relief of MIM parts

More efficient production vs. traditional manufacturing

- » MIM combined with HIP can reduce energy use up to 50%
- » MIM combined with HIP can reduce material costs up to 90% of MIM parts (pore elimination)
- » Consolidation of powder metal and ceramic parts
- » Diffusion bonding

HIP and Heat Treatment simultaneously

Quintus Technologies' optional Uniform Rapid Cooling (URC®) and Quench (URQ®) furnaces can provide decreased cycle time, higher productivity, and even combine HIP and heat treating. Benefits are reduced production steps, reduced energy consumption, reduced cost and that the material is ready for following production steps, i.e. machining.

Pore elimination

Gives dramatic effects of the fatigue life when it comes to stress levels and number of cycles before failure. Up to 10 times improvement can be achieved by HIPing in the right conditions.

Post treatment

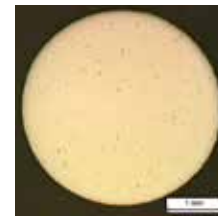
By applying the right conditions in the HIP, post treatment steps like in a stress relief furnace, the total cycle times can be shortened by 50%.

Improving parts for the Aerospace industry

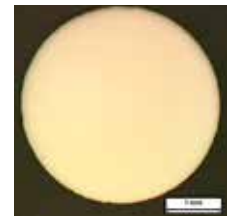
Of all the HIP installations in the World, more than 50% are utilized to consolidate and improve the material properties for the Aerospace and Automotive industry. Today HIP is the standard procedure to give longer and predictive life time of turbine blades in an aircraft engine as well as improving wear parts, i.e., firearms, watch cases and valves. Regardless of alloy system, or de-binding system, HIP is the way forward for optimized material properties and cost savings for safe and efficient production with high quality.

Improving parts for the Automotive industry

Part after sintering



Part after HIP



Photos courtesy of HÖGANÄS AB

HIP quenching values

With cooling rates up to 3,000°C/min URQ can offer:

- » Heat treatment steps can be included into the HIP cycle
- » Process steps, like stress relief, can be removed from the usual process route to increase productivity and lower cost/kg

Benefits compared to conventional heat treatment methods

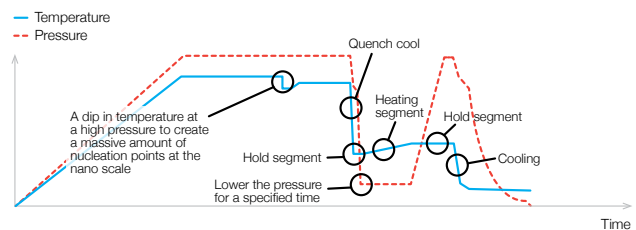
- » Programmable temperature distribution with good accuracy
- » Reduced thermal stresses
- » Reduced cracking

New and unique materials can be achieved:

- » Material optimization
- » Improved fatigue and ductility

URQ – Uniform Rapid Quenching with different pressures

Variable cooling and heating rates and pressure levels will make it possible to precisely control the quality and mechanical properties of treated parts. From work with Indexator AB at the Quintus Technologies isostatic lab in Västerås, Sweden.





The Global Leader in High Pressure Technology

Quintus Technologies specializes in the design, manufacture, installation, and support of high pressure systems for sheet metal forming and densification of advanced materials and critical industrial components. Headquartered in Västerås, Sweden, and represented in 35 countries worldwide, the company is the world leader in high pressure technology and has delivered more than 1,800 systems to customers across the globe within industries such as aerospace, automotive, energy, and medical implants.

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