

Recent Developments in Hot Isostatic Pressing (HIP) for Casting Applications

Presenter : Mr. Chad Beamer¹

1 Quintus Technologies LLC,

8270 Green Meadows Drive North, Lewis Center, OH 43035

Abstract

Hot Isostatic Pressing (HIP) has been commonly used in the casting industry in high demand applications and critical components. The stringent requirements on the material properties for such components rely on HIP to remove shrinkage and gas porosity to further improve mechanical properties and fatigue resistance. Historically HIP has been used to eliminate these defects with subsequent heat treatment performed using conventional technologies to obtain the desired microstructure and mechanical performance. With advancements in HIP systems it is now possible to also achieve the desired microstructure during the HIP cycle with the aid of high-pressure gas cooling and quenching. This modern approach offers the freedom to consider a combined HIP and heat treatment cycle known as High Pressure Heat Treatment (HPHT) leading to shorten process times, cost reductions, and increase productivity while reducing scatter in material properties. This presentation will first cover the fundamentals of HPHT highlighting key technology changes enabling this approach in modern HIP equipment. Then a transition to recent studies capturing the benefits for cast materials and applications leveraging HIP and the HPHT methodology will be reviewed. Keywords: Cast, Heat Treatment, HIP, Hot Isostatic Pressing, Mechanical Properties, Reduced Cycle Time, Lean Manufacturing, Combined HIP and Heat Treatment, HPHT, High Pressure Heat Treatment